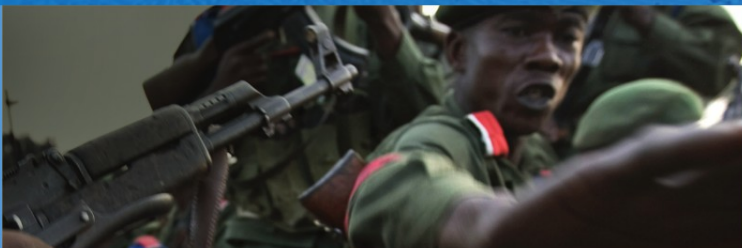


Hexagon Series on Human and Environmental
Security and Peace VOL 8



Jürgen Scheffran · Michael Brzoska
Hans Günter Brauch · Peter Michael Link
Janpeter Schilling *Editors*



Climate Change, Human Security and Violent Conflict

Challenges for Societal Stability

 Springer

**Hexagon Series on Human
and Environmental Security and Peace**

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Jürgen Scheffran, Michael Brzoska, Hans Günter Brauch,
Peter Michael Link and Janpeter Schilling
Editors

Climate Change, Human Security and Violent Conflict

Challenges for Societal Stability

With Forewords by Olusegun Obasanjo, former President of Nigeria; Connie Hedegaard, European Commissioner for Climate Action; Christiana Figueres, Executive Secretary, UNFCCC; R.K. Pachauri, Director General, The Energy and Resources Institute (TERI), Chairman, Intergovernmental Panel on Climate Change (IPCC).

With 159 Figures and 67 Tables

 Springer



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Foreword

It is my pleasure to contribute a foreword to this volume of the Hexagon Book Series, which has arguably become one of the most important resources on climate change, human security and violent conflict.

Over the years, the issue of human security has tended to be conceptualized in terms of external security of protection against physical violence, death and bodily harm, physical attack, or physical incapacity. Thus, providing for human security tended to go hand in hand with providing for state and/or government security by strengthening the military and paramilitary arsenal of the state.

Human security, as it affects people, has a lot more to do with the totality of the welfare and well-being of the citizens than military or police protection which is more the protection and security of the state or the government. While that must not be ignored to ensure the integrity of the state, the human security aspect of the citizens, which buoys up internal state security and government stability, is essential. A citizen without adequate education and skills is basically handicapped in the ability to provide adequately for self, family, community and nation. Consequently, the human security of such a citizen as an effective contributor to the internal peace, progress and cohesion of the community and society becomes impaired.

A citizen debilitated with malaria, chronic disease, or avoidable epidemic is equally human security deficient and he, his family and society suffer the same consequences as the uneducated, ill-educated and unskilled.

A child who is malnourished, poorly developed and stunted in growth - physical and mental development - as a result of inadequate provision of balanced food and nutrition and inadequate healthcare as he grows, will suffer human security deficit throughout his entire life and, rather than being an asset to himself, his community and society, may become a liability.

But, more importantly and more threatening today is the danger posed by unemployed youth who are in three categories. The first group are those with little or no education or skills who have dropped out of school or are prevented by lack of finance from continuing their education. They are mainly street boys who sleep in makeshift places, eking out a living from crimes and nonconformity. I call them 'area boys'. The second group are those who have basic education, some up to secondary and early tertiary levels, and have access to the Internet. They eke out their living from scams using the Internet and other ICT facilities. They are mostly otherwise unemployed. These I call 'yahoo boys'. The last group of unemployed youth are what I call 'blackberry boys'. They have good education and are mostly equipped with good skills but they are unemployed. They even have access to smartphones and such devices as Blackberry and iPad.

The greatest danger I see for Africa including my own country of Nigeria is the coming together of these groups of unemployed youth as a result of their unfulfilled and unsatisfied human security, and this has both a direct and indirect bearing on their fundamental human rights. The rise and coming together of such unemployed youth in Africa would be worse in consequence than the so-called 'Arab Spring'.

But it can be prevented. Indeed, it should be prevented. If the human security aspect, in terms of employment for young men and women in Africa is given local, national, regional and global attention, the danger would be averted. Violence and conflict spearheaded by African youth in Africa will have adverse ramifications globally.

If our modest experience in medium-sized but thriving agribusiness, offering direct and indirect employment for thousands of youth in Nigeria and a few African countries, is a basis for affirmation, I believe that agribusiness will largely fit the bill by providing a full, correct and adequate solution to the issue of human security as far as employment is concerned in Africa, particularly for the youth. But what is the future of agribusiness in the context of climate change?

Oke-Mosan, Abeokuta,
Ogun State, Nigeria, July 2011

Olusegun Obasanjo
Former President of Nigeria
(1999-2007)
Founder of the Centre for
Human Security



Photo by Klaus Holsting

Foreword

The consequences of climate change for human security need greater attention from policymakers and the scientific research community. What we are seeing is that, as well as posing a threat in its own right, climate change is multiplying other threats and exacerbating existing tensions and instability.

The dire situation in the Horn of Africa over recent months is a vivid and tragic illustration of these consequences for human security. Because of climate change, droughts in the region are getting worse and more frequent. Now the most serious drought in decades threatens millions of children and adults with starvation and is leading to mass migration. This disaster has been aggravated by the conflict in Somalia, high food prices, population growth, and deadly competition over resources.

Reduction of arable land, widespread shortage of water, diminishing food and fish stocks, increased flooding, and prolonged droughts are already happening in many parts of the world. In 2010 the UN's *Office for the Coordination of Humanitarian Affairs* (OCHA) has calculated that drought affected more than one hundred million people, and more than 38 million others were forcibly displaced by climate-related events, mainly floods and storms.

All this is happening with global warming of around 0.8°C above pre-industrial levels. As temperatures continue to climb, the human and economic impacts of climate change will become more severe still.

The international community has recognized the scientific case for keeping the global temperature rise below 2°C; there is much evidence that an increase beyond that level would greatly heighten the risk of irreversible and potentially catastrophic global changes. But the reductions in greenhouse gas emissions pledged by developed and developing countries so far are, collectively, not enough to keep us below the 2°C ceiling.

Without more ambitious commitments the world is headed for warming of 3°C or even more, and that will pose serious security risks. It will fuel existing conflicts over limited resources and land, and worsen tension over energy supplies. Rising sea levels threaten coastal regions which are home to about one in five of the world's population. Some small island states even risk disappearing completely. In a worst-case scenario major environmental changes, for example the release of huge volumes of methane gas as the Arctic tundra melts, could cause runaway climate change that would become impossible to control.

The consequences of climate change for human security are rightly receiving increasing attention from the world's governments. In July 2011, the UN Security Council debated climate change and its security implications for the second time, at the initiative of Germany and the European Union. This work on security must proceed in tandem with actions both to reduce the emissions that are at the root of the problem and to adapt to the impacts of climate change that are already unavoidable.

Further scientific research and analysis of climate change and its security implications is crucial for underpinning the comprehensive global agreement on climate change that the world badly needs. Publications such as this one which highlight the links between climate change, human security and violent conflict, make an important contribution to this process.

Brussels, November 2011

Connie Hedegaard
European Commissioner for
Climate Action
European Commission, European Union



Foreword

The title of this book, “Climate Change, Human Security and Violent Conflict: Challenges for Societal Stability” points to an emerging reality that must be taken very seriously: climate change as a potential driver of violent conflict and forced migration. The book looks very concretely at which groups of people in which parts of the world are already being affected by the steady rise in the number and severity of extreme weather events. And it looks at what this means for peoples’ livelihoods, what the security-related implications are, and what the policy responses need to be. Policymakers across the government spectrum would do well to study these examples as a matter of urgency.

The academic world is clearly coming to grips with the new realities that climate change is bringing, but it is not alone. Military establishments around the globe are also starting to assess the impacts of climate change. Security chiefs have a keen eye for looming threats and have begun adjusting their strategies, priorities, and budgets to factor in climate change impacts. But while the military establishments of the globe can and must plan ahead, they and their governments also need to exert their political and societal influence to make their populations more aware of the consequences of climate change and how best to deal with them.

Clearly, the only way to create a world which is more resilient to this challenge lies in drastically reducing the greenhouse gas emissions which drive climate change and providing populations, particularly the poor and vulnerable, with the assistance they need to adapt to climate change. This in turn requires urgent investment in environmentally sound technologies, especially renewable energies, as well as increased efforts to adapt economies and societies to the inevitable impacts which are already on the way. And it requires developing the right, coordinated policies at the regional, national, and international levels.

At the end of 2010, in Cancun, Mexico, the international community provided a renewed foundation for more ambitious action by adopting the Cancun Agreements on climate change. Governments agreed on a comprehensive set of new climate institutions, including an international committee to coordinate work on adaptation, a technology mechanism to promote environmentally sound technologies, and a new fund to channel the billions of dollars developing countries require to respond to climate change in a sustainable way. Governments also sent the clearest signal yet that they are moving collectively towards a global, low-carbon society by agreeing to prevent average global temperatures from rising more than two degrees Celsius and pledging to review the adequacy of this goal against actual progress in the near future.

This international response to the challenge of rising greenhouse gas concentrations in the atmosphere was the most significant yet, but it still falls short of ambition. The sum of national emission reduction pledges so far made by the international community amounts to only 60% of what science says is required to have the best chance of limiting the global temperature to the agreed two degrees.

In order to rise to the challenge, governments must undertake much steeper cuts in their greenhouse emissions, with industrialised countries taking the lead to bridge that gap. This year, at the UN Climate Change Conference in Durban, the world needs to push forward with the further development of a global framework to limit and reduce greenhouse gas emissions in line with the known scientific milestones. At the same time, the institutions agreed in Cancun must be speedily completed, so that they can begin concrete work to stimulate the financial, technology, and adaptation support which developing countries urgently need.

It is in the best interests of all parts of society to press for swift action, including the military establishments whose core responsibility it is to protect their populations from major threats. In climate change, tackling the root cause of the problem by reducing greenhouse gas emissions directly lives up to that responsibility in an altogether peaceful way that may yet secure us all a peaceful future.

Finally, I would like to express my gratitude towards the authors of this book for providing valuable academic inputs to the design of policies which can help societies adapt to climate change and take the necessary steps to reduce emissions. And I would like to express my thanks to them for raising awareness of the explosive linkages between climate change, human security and violent conflict.

Bonn, in August 2011

Christiana Figueres
Executive Secretary,
United Nations Framework
Convention on Climate Change



Foreword

I am pleased to write the foreword for this very useful volume on *Climate Change, Human Security and Violent Conflict: Challenges for Societal Stability*. The importance of this book lies in the fact that while the physical sciences have seen a mushrooming of literature related to climate change and its implications, we have not seen a similar scale of effort in the field of the social sciences related to climate change. The contents of this volume are particularly relevant to a range of policy initiatives. For instance, by exploring the linkages between climate change, human security, social stability and violent conflict the authors have been able to shed considerable light on those issues which arising out of climate change could cause serious disruption in the social order. Similarly, in dealing with the issue of migration in relation to climate change the authors have analysed an area of human activity in which there is likely to be a substantial increase in numbers of people who could move as a result of climate change and the serious problem that this could cause in case the world is to face unmitigated climate change in the future. Of particular interest and significance is the subject of climate change and security in the Middle East. This is a region which has hardly received interest in the context of climate change in the past even though problems of water stress, increase in summer temperatures and security dimensions related to the export of oil are all issues that need enhanced analysis and attention.

Overall, this book should stimulate considerable debate on the social, geopolitical and strategic implications of climate change and through its contents perhaps a major contribution will be made to initiating a dialogue round the world on these critical issues. I am sure the average reader would feel greatly interested in the issues covered in this volume.

New Delhi, in July 2011

R. K. Pachauri
Director General, The Energy and
Resources Institute (TERI)
Chairman, Intergovernmental Panel
on Climate Change (IPCC)
Peace Nobel Laureate, 2007

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Hamburg and Mosbach, Germany
in December 2011

Jürgen Scheffran
Michael Brzoska
Hans Günter Brauch
Peter Michael Link
Janpeter Schilling

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In chapter 2 *Halvard Buhaug and Ole Magnus Theisen* have generated a map based on a dataset of their colleagues.

- **Figure 2.1:** Contemporary armed conflicts. **Source:** The map is generated from version v4-2009 of the UCDP/PRIO Armed Conflict Dataset (Gleditsch/Wallensteen/Eriksson et al.). Symbols indicate the geographical mid-point of conflicts active in 2008.

In chapter 3 *Peter F. Nardulli and Kalev H. Leetaru Leetaru* used a figure of a research team in which they are actively involved:

- **Figure 3.1:** Societal Stability Event Ontology. **Source:** The authors and the SPEED research team.

In chapter 5 *Jürgen Scheffran, Michael Link and Janpeter Schilling* adapted some figures previously published by one of the authors:

- **Figure 5.1:** Global anomalies in *sea surface temperature* (SST) with respect to the period 1951-1980 (above) and the number of armed conflicts (below) for the time period 1945-2008. **Sources:** Drafted by the authors based on data by NOAA (2009) above and PRIO (2009) below.
- **Figure 5.2:** Possible pathways from climate change to conflict. **Source:** The authors' own representation, adapted from Buhaug, Gleditsch, and Theisen (2008).
- **Figure 5.3:** Causal relationships between climate change, natural resources, human security, and societal impacts. **Source:** Adapted from Scheffran (2011) published by Springer-Verlag.
- **Figure 5.4:** System-system interaction, exemplified by atmosphere and biosphere systems. **Source:** Modified from Scheffran (2011) published by Springer-Verlag.
- **Figure 5.10:** Conflicting and cooperative relationships between two actors. **Source:** Modified from Scheffran and Hannon (2007) with permission of one of the authors.

Chapter 15 by *Frank Biermann and Ingrid Boas* heavily draws on: Biermann, Frank; Boas, Ingrid, 2010 (in press): "Preparing for a Warmer World. Towards a Global Governance System to Protect Climate Refugees", in: *Global Environmental Politics*. Written permission was obtained from the original copyright holder.

In chapter 17 *Úrsula Oswald Spring* obtained permission from the copyright holder for reproducing the following figures:

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- **Figure 17.2:** Estimated ‘unauthorized migrants’ in the USA (in million people). **Source:** Passel/Cohn (2010: 1). Reprinted with permission of the copyright holder (PEW).
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Part I Introduction

Chapter 1 Introduction: Climate Change, Human Security, and Violent Conflict in the Anthropocene

Hans Günter Brauch and Jürgen Scheffran

1 Introduction: Climate Change, Human Security, and Violent Conflict in the Anthropocene

Hans Günter Brauch and Jürgen Scheffran

1.1 Context of the Book¹

1.1.1 Concepts and Objectives

This book focuses on possible causal linkages among the three scientific research areas of *climate change*, *human security*, and *violent conflict* and asks whether they have posed *challenges for societal stability* in the past and in the present, and whether climate change might intensify societal instability in the future. It addresses scientific problems that are primarily analysed

- in the natural sciences: *climate change* as an object of climatology, physics, chemistry, oceanography, physical geography, and integrative earth systems analysis or science;
- and in the social sciences: *security*, *conflict*, and *stability* as themes of political science, sociology, human and political geography, economics, history, and international law.

All four scientific concepts are “essentially contested” (Gallie 1955–1956):

- *Climate change* refers both to the ‘natural variability’ in the climate system, which has fluctuated between warm and cold periods during the Holocene since the end of the glacial periods 12,000 years ago, and to anthropogenic global warming during the ‘Anthropocene’² (Crutzen 2002, 2006, 2011) which has increasingly become an object of scientific analysis since the 1970s.

1 This introduction partly relies on previous texts by Brauch (2008, 2009, 2009a; Brauch/Oswald Spring 2009; Oswald Spring/Brauch 2011; Brauch/Dalby/Oswald Spring 2011) and Scheffran (1997, 2008, 2008a, 2009, 2011; Scheffran/Battaglini 2011), where many of the key concepts, ideas, and evidence have been developed in detail and extensively referenced.

- *Security* is a societal value, a political goal, and an instrument aimed at protection, risk reduction, certainty, predictability, reliability, trust, and confidence, in contrast to danger, risk, threat, disorder, and fear. “Security, in an *objective* sense, measures the absence of threats to acquired values, in a *subjective* sense, the absence of fear that such values will be attacked” (Wolfers 1962: 150), and in an *intersubjective* sense, it is “what actors make of it” (Wendt 1992, 1999) by upgrading problems to issues of ‘utmost importance’ that require ‘extraordinary measures’ (Wæver 1995, 1997, 2008). ‘Human security’ refers to a fundamental shift in the referent object of security from the state world (national, regional, international or global security) to a people-centred approach, where not only human beings, families, and communities constitute a ‘referent object’, but so does humankind.³
- *Conflict* refers in the social sciences to a contest between two or more actors (individuals, societal groups, states, or groups of states) over scarce and sought-after material and immaterial goods, where the parties pursue contradictory aims or means. Conflicts may be distinguished with regard to the object as political, economic, environmental, societal, or social, but also as disputes over competing values, ideologies, interests, social systems, or ways of life, and with regard to the means as peaceful, violent, or devastating. Social conflict

2 The Anthropocene refers to the period of earth history since the industrial revolution when production and consumption patterns have had direct impacts on the earth system. On the history of dealing with climate change see: Brauch (1996), Graßl (2009, 2009a).

3 See on the global reconceptualization of security since 1990 the three volumes of the *Global Human and Environmental Security Handbook for the Anthropocene* edited by Brauch, Oswald Spring, Mesjasz et al. (2008, 2011) and Brauch, Oswald Spring, Grin et al. (2009) with an extensive bibliography on the security concept.

refers to a perspective “in which conflict permeates and shapes all aspects of human interaction and social structure, or as one of the innumerable specific fights or struggles such as wars, revolutions, strikes or uprisings” (Kriesberg 1996: 122).⁴

- *Stability* has been a widely used concept in the natural, engineering, and social sciences.⁵ In political science stability refers to a status of order, durable firmness, reliability, and predictability of the institutional and processual dimensions of politics, including the capacity to deal with internal and external challenges while maintaining an equilibrium (Schmidt 2004: 686).⁶

Linking these four concepts and problem areas from the natural and social sciences requires scientific concepts, approaches, models, and theories that cross the boundaries between the narrow disciplinary analyses and assessments that still prevail in the organization and funding of scientific research. The American biologist Edward O. Wilson (1998) noted a growing *consilience* (interlocking of causal explanations across disciplines) in which the “interfaces between disciplines become as important as the disciplines themselves” that would “touch the borders of the social sciences and humanities”.

Thus, the key problem that will be addressed in this book is the complex linkage between anthropogenically induced changes in the climate system and their societal outcome as multiple forms of conflicts that sometimes lead to violence or societal instability, and how the latter can be managed, prevented, or avoided. To this end, reactive or proactive political

strategies, policies, and measures can address the cause by reducing *greenhouse gas* (GHG) emissions and can address the impacts by political adaptation and mitigation measures to avoid an escalation into violent conflicts.

This goal is being addressed by the excellence cluster *Integrated Climate System Analysis and Prediction* (CliSAP) at the University of Hamburg, where meteorologists, oceanographers, and ecologists cooperate with social scientists and economists, as well as with peace and conflict researchers and media scientists. In this cluster members of the university, of the Max Planck Institute for Meteorology in Hamburg, and of the Institute for Coastal Research of the Helmholtz-Zentrum Geesthacht cooperate. In the vicinity of this excellence cluster the KlimaCampus Hamburg has emerged. Within this context a professorship (chair) of climate change and security was established in August 2009 connected to the Institute of Geography and offering the framework for the *Research Group Climate Change and Security* (CLISEC).⁷ CLISEC conducts multidisciplinary research and education on the potential security risks, social instabilities, and conflicts induced by climate change, and on possible strategies for international cooperation, conflict management, and sustainable peace. Current research focuses on the development of data and modelling tools suitable for assessing and stabilizing climate-society interaction at global and local scales, with a specific emphasis on regional climate hot spots.

CLISEC’s international conference “Climate Change, Social Stress and Violent Conflict - State of the Art and Research Needs” in Hamburg on 19–20 November 2009 brought together national and international experts to explore research needs and discuss the main elements of the current ‘state of the art’ in terms of knowledge about the security implications and conflict potential of climate change (see the key issues and guiding questions in box 1.1).

This book is based on selected papers that were presented at this conference and were evaluated by at least two anonymous peer reviewers and carefully revised and approved by the responsible co-editor. Additional chapters were commissioned. Based on the accepted texts, this book has developed the initial research questions further. The authors, coming from many scientific disciplines – primarily the social sciences, geography, political science, and economics, but also from physics and law – have contributed to the

4 This is based on Schmidt (2004: 371–372); Strasser (1998: 316–319); Kriesberg (1996).

5 The term ‘stability’ refers in British English (*Shorter Oxford English Dictionary*) to “firmness or steadiness of character, resolution, steadfastness, mental soundness” (Oxford 2002: 2990) and in American English (*Webster’s Third New International Dictionary of the English Language*) to “quality, state or degree of being stable as a) the strength to stand or to endure...; b) the state of being in stable equilibrium ...; c) the property of a body that causes it ...; d) resistance to decomposition” (Gove 2002: 2217). Searching the term ‘stability’ in the Guardian’s website <www.guardian.co.uk>, the first 10 hits include “international stability”, “stability director at the Bank of England”, “stability [in Libya]”, “stability of food supplies”, “financial stability”, “stability in the Balkans”, “a continent of peace and stability”, and “stability for Iraq”.

6 Regarding the stability concept in complexity science, security, and environmental policy see: Scheffran (1983, 1989, 1996, 2008b).

7 See at: <<http://clisec.zmaw.de/Research-Group-Climate-Change-and-Security.854.o.html>>.

Box 1.1: “Climate Change, Social Stress and Violent Conflict – State of the Art and Research Needs”, CLISEC Conference, Hamburg, 19-20 November 2009.

Key issues:

- The challenges climate change poses to the world’s policymaking and governance structures.
- The magnitude and diversity of risks associated with global warming that could trigger a sequence of cascading events, involving environmental degradation, economic decline, social unrest, and political instability, threatening human security and societal stability and leading to violent conflict.
- The erosion of social order, state failure, and violence in the worst-affected regions that can destabilize regions and overstress global and regional governance structures.
- Conflicts that spill over to neighbour states, e.g. through refugee flows, ethnic links, environmental resource flows, or arms exports.
- The increase of resource competition between major powers (e.g. in the Arctic) and strategies with additional risks and conflicts (e.g. nuclear power, bio-energy, geo-engineering).

Guiding questions:

- What are the major causal chains between climate change and violent conflict, and what is the empirical basis for these linkages, revisiting previous assessments of environmental conflict?
- Which approaches, methods, and theories are helpful for analysing the links between climate change, social stress, and violent conflict?
- Is it adequate to call climate change a threat to national or international security?
- Are broader security concepts (such as environmental or human security) useful for evaluating the violence risks of climate change?
- What is the likelihood, potential damage, and resulting risk for violent conflict of water and food scarcity, mass migrations, and natural disasters induced by climate change?
- Will the international community face more violent conflict or more cooperation on climate change and the use of natural resources?
- What are the most likely and most adequate responses of the world’s policymaking and governance structures when addressing the climate-conflict nexus, and what can institutions contribute?

analysis of the linkages between *climate change, human security, and violent conflict*, and have made this multidisciplinary volume possible.

1.1.2 From the Holocene to the Anthropocene: Climate Variability vs. Anthropogenic Change⁸

In earth history, the Holocene began with the end of the glacial period about 12,000 years ago, which led to the onset of major human progress and the development of advanced civilizations in the Mediterranean, China, India, and Mesoamerica. In earth history and human history, a fundamental change has occurred since the Industrial Revolution (1750) and Watt’s invention of the steam engine (1782) from the ‘Holocene’ to the ‘Anthropocene’. This is due to increasing human interventions, especially the burning of fossil energy that has resulted in an anthropogenic period of climate change. The ‘Anthropocene’ is an informal geological-chronological term that refers to the global impact of human activities on the earth’s ecosystems. The term was coined by the Nobel laureate in chemistry Paul Crutzen (2002, 2006, 2011) and

by ecologist Eugene Stoermer (Crutzen/Stoermer 2000), who argue that the influence of human behaviour on the Earth’s atmosphere has constituted a new ecological era. According to Crutzen (2002), the Anthropocene is “a new geologic epoch in which [hu]mankind has emerged as a globally significant – and potentially intelligent – force capable of reshaping the face of the planet” (Clark/Crutzen/Schellnhuber 2004: 1; Ehlers/Krafft 2001, 2006; Ehlers 2008).

The ‘Holocene’ is a period of geological transition with dramatic environmental change, in particular major sea level rise resulting from the melting of the huge ice sheets covering large areas of the northern hemisphere. Bond, Kromer, Beer et al. (2001) postulated a 1,500-year cycle throughout the Holocene with an important contrast in hydrological circulation patterns. These changes in climate have had a major influence on the development and collapse of advanced civilizations (Fagan 2004; Diamond 2005; Bluemel 2009: 104). The Roman Empire coincided with the ‘Roman optimum’ while its collapse occurred during a cooler period when massive migration of peoples occurred from Central Asia to Europe and from Northern Europe to the Mediterranean (Issar/Zohar 2004: 14, 2007: 12, 2009: 125). The next climatic downturn led to the “little ice age” (Fagan 2000, 2002; Zhang/Zhang/Lee et al. 2007; Tol/Wagner

⁸ This text partly relies on Brauch/Oswald Spring (2011a).

2010) and this coincided with bad harvests, famines, pandemics (plague), and the Thirty Years' War (1618–1648).

The role of the earth's climate throughout history as a cause, trigger, or intensifier of the decline and fall of civilizations (Diamond 2005), of massive migrations of peoples ('Völkerwanderung'), and of violent conflicts and wars (Lee 2009) has been disputed between climate determinists and climate sceptics (Brown 2001). Since the 1930s the anthropogenic model has placed all the blame on human malpractice (Issar/Zohar 2004, 2007). The neo-deterministic paradigm "emphasizes the dynamic interaction between the natural environment ... and the human society" (Issar/Zohar 2009: 110–120). Many neo-determinists have argued that during the Holocene cold periods, precipitation changes, and long periods of drought have triggered massive population movements.

Due to natural climate variability, longer periods of drought and famine contributed to the sudden collapse of advanced civilizations (Diamond 2005).⁹ However, analogies between the Holocene and the Anthropocene of the cases of assumed linkages between climate change and violent conflicts and wars (Dyer 2008; Lee 2009; Welzer 2008; Leggewie/Welzer 2009) are hardly possible, as the projected physical effects of anthropogenic climate change up to 2100 will be 'in addition' to the natural variability that will also continue.

Since the late 19th century, several authors have referred to human intervention in nature (Marsh 1864, 1965; Stoppani 1873; Vernadsky 1926, 1998) and in the earth system, facilitated by major population growth (Malthus 1798; Zlotnik 2011; UNPD 2011) as a result of technological and medical advances and the availability of cheap fossil energy sources (McNeill 2000, 2009). Crutzen (2006: 13–17) pointed to the chemical

impacts of human activities during the Anthropocene resulting in increasing air pollution, acidification of precipitation, and major changes in land use (Vitousek/Dantonio/Loope et al. 1996; Müller/Lotze-Campen/Huber et al. 2011).

1.2 The Discourse on Climate Change, Human Security, and Violent Conflict

The interest of policymakers in the climate change and security nexus has differed with regard to national, international, and human security:

- From the perspective of US national security, the interest of the defence and intelligence community is in how the US military can continue to operate in a world where climate change impacts are increasing and in how the US can maintain its position as the single military superpower and influence outcomes in the interest of its own national security. Thus, the focus is primarily on conflict management but also on conflict prevention.
- From the perspective of international security, many UN member states have emphasized in the General Assembly (UN 2009) and in the Security Council (UN 2007, 2011) the need to prevent climate change becoming a 'threat multiplier' that may trigger a violent escalation of the manifold existing conflicts by strengthening sustainability strategies, policies, and measures, and thus to strengthen efforts to minimize security threats, challenges, vulnerabilities, and risks. A major focus has been on preventing conflicts from escalating into violence triggered by the physical and societal impacts of climate change.
- From the perspective of human security, the goal has been to avoid climate-induced violent conflicts occurring that would affect the livelihood of human beings, most particularly those with the highest degree of social vulnerability in the poorest countries who lack the capacities for proactive adaptation and mitigation and whose capacity for resilience is limited.

9 The urban Late Uruk society in Mesopotamia suddenly collapsed at about 5200–5000 BP due to a short but severe drought (Weiss/Bradley 2001). The collapse of the Mycenaean Kingdom, the Hittite Empire in Anatolia, and the Egyptian Empire (3206–3150 BP) were due to a persisting drought (Drew 2000; Weiss 1982). Between 810 and 910 AD, several mega-droughts occurred in the Yucatán Peninsula and in the Petén Basin that resulted in land degradation (Coe 1999: 26–27; Braswell 1990) and the collapse of the Mayan civilization (Demarest 2004; Demarest/Rice/Rice 2004; Sabloff 1990; Gill 2000). In China, the decline of the Tang (850–940), the Yuan (1340–1360), and the late Ming period (1580–1640) were all related to a reduction of the monsoon and to severe droughts.

1.2.1 The Early Phase of the Debate¹⁰

The discussion on the linkage between climate change, security, and conflicts has been conceptually influenced by three earlier phases of the research on environmental security, especially by the work of the Toronto Group (Homer-Dixon 1991, 1994, 1999; Homer-Dixon/Delingiannis 2009) and the Swiss EN-COP Project (Bächler 1998, 1999, 1999a; Bächler/Böge/Klötzli et al. 1996; Bächler/Spillmann 1996, 1996a; Bächler/Spillmann/Suliman 2002; Mason/Hagmann/Bichsel et al. 2009).

Based on research into environmental conflict, the debate on the security implications of climate change began at the end of the 1980s. At the “World Conference on the Changing Atmosphere – Implications for Global Security” in June 1988 in Toronto, Gro Harlem Brundtland, the Prime Minister of Norway, said that “the impact of world climate change may be greater than any challenge mankind has faced, with the exception of preventing nuclear war”.¹¹ Two research papers were published as early as 1989 (Brown 1989; Gleick 1989), but only a few publications addressed the issue during the 1990s (Swart 1996; van Ireland/Klaassen/Nierop et al. 1996; Scheffran/Jathe 1996; Scheffran 1997, Edwards 1999; Rahman 1999).

The climate-security nexus has gradually been taken up since 2000 (Brauch 2002; GECHS 2005; Gleditsch/Nordas 2007; Bohle/O’Brien 2007). A new phase was entered when the debate on the securitization of climate change was driven by political analysts and policymakers. This included reports by consultants (BMU 2002; Schwartz/Randall 2003/2004; CNA 2007), by national governments (Germany: WBGU 2007, 2008; USA: NIC¹²), supranational institutions (EU 2008, 2008a), and international organizations (UN 2007, 2009, 2009a, 2011) and regimes (Figueres 2011, see her foreword in this volume).¹³

10 This text partly relies on Brauch (2009) and Brauch/Oswald Spring (2011a).

11 Philip Shabecoff, “Norway and Canada Call for Pact to Protect Atmosphere”, in: *New York Times*, 28 June 1988; at: <<http://query.nytimes.com/gst/fullpage.html?res=940DEoDA163BF93BA15755CoA96E94826o&sec=&spn=&pagewanted=print>>.

12 See the list of commissioned *National Intelligence Council* (NIC) studies (2009) on the projected climate change impacts for US national security: “The Impact of Climate Change to 2030”, Commissioned Research and Conference Reports, 2009–2010; at: <http://www.dni.gov/nic/special_climate2030.html>.

13 These policy proposals and debates have been analysed by Brauch (2009).

The policy debate reached the UN Security Council (UNSC) on 17 April 2007 (chap. 33 by Kurtz) during the British UNSC Presidency and again on 20 July 2011 during the German UNSC Presidency.

The year 2007 was a turning point in the securitization of climate change, when the *Intergovernmental Panel on Climate Change* (IPCC (2007, 2007a, 2007b, 2007c) released its *Fourth Assessment Report* (AR4) and the Nobel Peace Prize was awarded to the IPCC and to Al Gore. Since 1989, and increasingly since 2000, several studies have argued that the projected impacts of temperature increase, sea level rise, and natural hazards will most likely pose severe societal and political challenges for the affected regions and countries that may possibly lead to multiple security problems. These may force people to migrate, protest, and rebel, and in the worst case this may lead to small-scale violence and to resource conflicts.

1.2.2 Climate Change and National Security

In the middle of the last decade, the *securitization* of climate change also reached the traditional *securitizing actors*, namely the national defence ministries, the military establishments, and the intelligence community. These have all begun addressing climate change as a new threat to national security. Climate change as a national security issue slowly began to take off in the USA in February 2004 when a study by Schwartz and Randall (2004) for the US Department of Defense was leaked to the press. In spring 2007, a report on *National Security and the Threat of Climate Change* by the US Center for Naval Analyses (CNA 2007),¹⁴ and in November 2007, a second report on *The Age of Consequences: The Foreign Policy and National Security Implications of Global Climate Change* (Campbell/Lennon/Smith 2007) by the Center for Strategic and International Studies (CSIS) and the Center for a New American Security (CNAS) triggered a policy debate on climate change and US national security that has been taken up by the administrations of George W. Bush and Barack Obama (Brauch 2011).

In the UK, the British *Ministry of Defence* (MoD) and its Development, Concepts and Doctrine Centre have identified climate change as a key strategic trend.¹⁵ The UK’s Chief of Defence Staff has sug-

14 This report was discussed at a meeting on “National Security and the Threat of Climate Change”, by the *Environmental Change and Security Program* (ECSP) of the Wilson Center on 14 May 2007.

gested that climate change is a threat to global security that military planners must include into their calculations.¹⁶ In September 2007, the MoD awarded a £12 million research contract to the UK Met Office Hadley Centre that calls for identifying those world regions “where global warming could spark conflict and security threats, as well as predict the likely conditions in which British forces may have to deploy in the future”.¹⁷ In some countries, climate change has been addressed in national security documents (chap. 8 by Brzoska), and the defence ministries of several NATO countries have launched studies to analyse the implications of the climate-change security nexus for their defence planning processes.

1.2.3 Climate Change and International Security in the EU

Three related events, the publication of the fourth IPCC Assessment Reports, the debates in the United Nations (*Security Council* [UNSC] and *General Assembly* [UNGA]), and the award of the Nobel Peace Prize to the IPCC, have imparted high political visibility to climate change and its impacts. Germany responded to this during its dual presidency of the EU and of G-8, while the UK took the lead in putting this challenge on the agenda of the UNSC. In 2002, a report for the German environment ministry (BMU) focused on the causes of climate change and their complex interactions with other drivers of *global environmental change* (GEC), especially those environmental factors that contribute to environmental stress as a driver causing or triggering potential conflictual or cooperative outcomes (Brauch 2002). Based on a report on *Climate Change as a Security Risk* by the *German Advisory Council on Global Change* (WBGU 2007, 2008), released just prior to the G-8 summit in Heiligendamm in June 2007, the German government proposed an EU strategy paper on the security impacts of climate change. In June 2007 the European Council asked Javier Solana and

the European Commission to draw up a report on the security issues of climate change.

The *German Advisory Council on Global Change* (WBGU 2007, 2008) argued in *Climate Change as a Security Risk* that “without resolute counteraction, climate change will overstretch many societies’ adaptive capacities within the coming decades. This could result in destabilization and violence, jeopardizing national and international security to a new degree”. But a positive development would also be possible if the international community that “recognizes climate change as a threat to humankind and soon sets the course for the avoidance of dangerous anthropogenic climate change by adopting a dynamic and globally coordinated climate policy”.¹⁸ Key arguments of this report are reflected in the paper by the European Commission and Javier Solana, approved by the European Council on 14 March 2008.

The security aspects and implications of climate change have since been considered by government representatives within the *Organization on Economic Cooperation and Development* (OECD) and between the British *Foreign Office* (FCO) and the German *Environment Ministry* (BMU) since 2001. The public policy debate on the *securitization* of climate change has evolved in the UK since 2004 when ministers and high-level policy advisers, leading scientists, and retired diplomats addressed this linkage (Stern 2006, 2009).

In October 2006, Margaret Beckett, the UK Foreign Secretary, considered climate change a “serious threat to international security” that “must not be dealt with using guns and tanks, but through dialogue and the sharing of new technologies between developed and developing countries”.¹⁹ UNSC Res. 1625 of 14 September 2005 had already called for promoting sustainable development as part of a broad strategy of

15 See Abbott (2008: 10); Development, Concepts and Doctrine Centre: *The DCDC Strategic Global Trends Programme, 2007-2036* (Ministry of Defence, December 2006); at: <www.dcdc-strategictrends.org.uk>.

16 See at: <<http://www.mod.uk/DefenceInternet/About-Defence/People/Speeches/ChiefStaff/ClimateChange-PoliticsVsEconomics.htm>>.

17 See Abbot (2008: 10); “Met Office climate change study could help identify future security threats”, in: *Defence News* (11 September 2007); at: <<http://tinyurl.com/3yrsqe>>.

18 See for details the WBGU website at: <http://www.wbgu.de/wbgu_jg2007_engl.html>, where several expert studies are also available for download at: <http://www.wbgu.de/wbgu_jg2007_kurz_engl.html> and the full report is at: <http://www.wbgu.de/wbgu_jg2007_engl.pdf>.

19 See: British Embassy Berlin: “Speech given by Foreign Secretary, Margaret Beckett, at the British Embassy, Berlin, 24 October 2006”; at: <<http://www.britischesbotschaft.de/en/news/items/061024.htm>>; the quotes are from “Climate change ‘serious threat to global security’”; at: <[http://www.politics.co.uk/news/foreign-policy/international-development/debt-and-debt-relief-in-developing-world/climate-change-serious-threat-global-security-\\$455615.htm](http://www.politics.co.uk/news/foreign-policy/international-development/debt-and-debt-relief-in-developing-world/climate-change-serious-threat-global-security-$455615.htm)>.

conflict prevention. This linkage was explicitly stressed in the UK's concept paper that put climate change on the agenda of the UNSC on 17 April 2007.

Among the countries that supported this 'securitizing move', Sindico (2007) distinguished three groups: a) those wanting to raise global awareness of climate change (UK), b) those focusing on conflict prevention (Germany, France), and c) the most vulnerable small island states. The opponents argued that climate change as a sustainable development issue should not be considered by the UNSC but by the UNGA and the *Economic and Social Council* (ECOSOC). By taking climate change to the UNSC, it has been upgraded from an environmental and development to a security issue.

On 14 March 2008, the Council of the European Union released a paper on "Climate change and international security" (SII3/08)²⁰ that reflected key arguments of the 2007 WBGU report. The report specifically recommended enhancing capacities at the EU level (building up knowledge, assessing the EU's own capacities, improvement in the prevention of, and preparedness for early responses to, disasters and conflicts). With regard to "cooperation with third countries" the paper calls for "revisiting and reinforcing EU cooperation and political dialogue instruments, giving more attention to the impact of climate change on security". The paper argued that "this could lead to greater prioritization and enhanced support for climate change mitigation and adaptation, good governance, natural resource management, technology transfer, trans-boundary environmental cooperation ..., institutional strengthening and capacity building for crisis management". The EU has thus taken up the conceptual and political debate on the *securitization* of climate change in the UK and in Germany, and hence the European Council has become a major *securitizing actor* in translating the scientific messages into concrete policy proposals that will lead to action in the years to come.

Since 2007, many international organizations have worked on climate change. In March 2008 the World Bank addressed the "Social Dimensions of Climate Change" (Mearns/Norton 2009), and in September

20 Joint paper by the Commission and the Secretary-General/High Representative concerning "Climate change and international security" to the European Council, Brussels, 3 March 2008; at: <http://euractiv.com/29/images/SolanaCCsecurity%20reportpdf_tcm29-170886.pdf>.

2009 it published its *World Development Report 2010: Development and Climate Change*.

1.2.4 Climate Change and International Security at the UN

On 17 April 2007, four years prior to the debate in the UNSC on 20 July 2011, the UNSC addressed climate change as an international security issue²¹ for the first time, and the UN General Assembly held a special thematic debate on *Climate Change as a Global Challenge*. Climate change was increasingly being addressed as a new objective security danger and subjective security concern for the livelihood and survival of humankind.

The policy debate on the possible security implications of global climate change culminated on 20 July 2011 during the German Presidency of the *United Nations Security Council* (UNSC) in a *Presidential Statement* (S/PRST/2011/15, 20 July)²² that reflected the lowest common denominator of a controversial debate, in which 65 speakers, including the Secretary-General of the United Nations, Ban Ki-moon, and the Executive Director of the *United Nations Environment Programme* (UNEP), Achim Steiner, participated. While Russia and China and many representatives of the *Group of 77* (G-77) opposed the discussion of climate change as a security concern by the UN Security Council, a coalition of OECD countries, including all EU states, the USA, Canada, Japan, South Korea, Australia, New Zealand, and the Pacific Small Island States, stressed the need to address in the UNSC the linkage between climate change and its potential security implications from a proactive perspective.²³

This debate was prepared by a 'Concept Note' of 19 July 2011 from the Permanent Mission of Germany to the UN in New York referring to the previous debate in the UN Security Council in April 2007 on "the

21 See: "Press Conference by Security Council President, 4 April 2007"; at: <http://www.un.org/News/briefings/docs//2007/070404_Parry.doc.htm>; UN Security Council, SC/9000, 5663rd meeting, 17 April 2007: "Security Council holds first-ever debate on impact of Climate change on peace, security, hearing 50 speakers"; at: <<http://un.org/news/press/docs/2007/sc9000.doc.htm>>.

22 Statement by the President of the Security Council on "Maintenance of Peace and Security: Impact of Climate Change", S/PRST/1011/15, 20 July 2011; at: <<http://access-dds-ny.un.org/doc/UNDOC/GEN/N11/424/28/PDF/N1142428.pdf?OpenElement>>.

link between energy, security and climate (S/PV.5663)", to the UNGA resolution A/RES/63/281 (3 June 2009), and to the Secretary-General's 2009 report (A/64/350; see chap. 33 by Kurtz). The 'Concept Note' suggested that the reporting of the UN Secretary-General should take "the security implications of climate change and its impact on resource availability into account in conflict analysis, mission planning and mission monitoring. The same applies to peacebuilding activities." To structure the debate in the UNSC, the 'Concept Note' referred to the special security implications of climate change caused by sea level rise and the food security nexus.

In his remarks to the press, the President of the Security Council, the German Ambassador Peter Wittig, stressed that "the Council acted in a preventive mode" and that this initiative "was directed to prevent new emerging conflicts of this century", noting that the SC "recognizes the potential threat of climate change to international peace and security" and that it asks the Secretary-General "to report on security implications of climate change in his reporting", implying a "kind of mainstreaming of the security implications of climate change in the system of the reporting of the Secretary-General", thus "recognizing the potential threat of climate change to international peace and security".

During the 7 hours of debate on 20 July 2011 there were 13 references to 'human security'. The Secretary-General, Ban Ki-moon, noted in his opening statement that

Competition between communities and countries for scarce resources, especially water, is increasing, exacerbating old security dilemmas and creating new ones. Environmental refugees are reshaping the human geography of the planet, a trend that will only increase as deserts advance, forests are felled and sea-levels rise. Mega-crises may well become the new normal. Those are all threats to *human security, as well as to international peace and security* [in the following quotes, emphasis in italics is added by HBG/JS].

The delegate from El Salvador, Mr García González, argued that "Climate change ... reduces economic growth and social progress, multiplies and magnifies territorial vulnerability and exacerbates environmental

degradation, and thus constitutes a *human security problem*". The representative of the European Union, Mr Pedro Serrano, also stressed that "access to water and water availability may be both a great *human security threat* and a threat to regional stability, which may lead to serious disputes".

Ms Štiglic of Slovenia stressed that "climate change has detrimental effects on *human security* and well-being, it endangers economic development and efforts to eliminate poverty and has a negative impact on international peace and security". Mr Osuga (Japan) stated that "most countries have no doubt that climate change threatens *human security* and, in the long term, would have indirect adverse effects on national security as well". He stressed that Japan "remains fully committed to providing assistance to Pacific island countries ... in other areas as well, such as the environment and *human security*, including health and education." Mrs Aitimova argued that Kazakhstan "understands the rationale for discussing the subject in the Security Council, because at present the effects of climate change pose a serious threat to *human security*". Mr Kamau also stressed that for Kenya

climate change presents a real and present danger that consistently haunts the existence and lives of our people. This happens in five key dimensions. *The first is human security*; the second is economic security; the third is national security in the collective sense; the fourth is in the context of peace and stability; and the fifth is in the context of trying to find solutions for these issues. Insofar as *human security* is concerned, for us climate change impacts on the lives and livelihoods of Kenyans ..., they impact in ways in which lives are lost, children suffer and we all collectively find ourselves in a spiral of deteriorating circumstances. The food security situation in our country ... are conditions that are directly correlated to the *human security* of our people and their livelihoods.

Mr Tachie-Manson (Ghana) also stressed that "the impact of climate change has implications for *human security*. ... The areas in which climate change has led to conflict are mainly where the capacity of the population to adapt to changing conditions is weak and it is susceptible to conflict." Mr De Laiglesia (Spain) argued that the UNSC had previously discussed HIV/AIDS and "in that same spirit that we ought to address the issue of climate change, which is a genuine threat to peace that has enormous consequences not only for countries' security but also for *human security*."

This brief review of the UN Security Council debate of 20 July 2011 indicates that a few delegations (EU, Slovenia, Spain, Kenya, Ghana, El Salvador, Ka-

23 See the minutes of the all-day debate, at: <<http://daccess-dds-ny.un.org/doc/UNDOC/PRO/NII/422/59/PDF/NII42259.pdf?OpenElement>> and at: <<http://daccess-dds-ny.un.org/doc/UNDOC/GEN/NII/423/97/PDF/NII42397.pdf?OpenElement>> and the UN summary for the press, at: <<http://www.un.org/News/Press/docs//2011/SC10332.doc.htm>> (27 July 2011).

zakhstan, Japan) associated the climate change debate in the UNSC with the human security concept, while during the specific informal thematic (2008, 2011) and formal (2010) debates in the General Assembly on Human Security on 22 May 2008,²⁴ on 20 and 21 May 2010,²⁵ and on 14 April 2011²⁶ most countries referred to climate change as one of the major threats for human security.

1.3 Human Security Concepts and Discourses

From a human security perspective, climate change has been addressed by the *Global Environmental Change and Human Security* (GECHS) programme of IHDP in June 2005²⁷ and was the focus of the Greek Presidency of the Human Security Network (2007–2008)²⁸ that aimed “to raise the international community’s awareness of the impact of climate change and global warming on human security, with regard to vulnerable groups, particularly women, children and persons fleeing their homes due to climate change”.²⁹ A policy memorandum on ‘*Climate Change*

and Human Security’³⁰ (Wisner/Fordham/Kelman et al. 2007) pointed to manifold impacts for international, national, and human security for selected direct, indirect, and slow-onset linkages. The conceptual debate on climate change and human security is just starting. Barnett and Adger (2005: 1) discuss how climate change may undermine human security, and how human insecurity may increase the risk of violent conflict; they also discuss the role of states in human security and peace-building. The link between climate change and human security is currently being addressed by *Working Group* (WG) II of the IPCC, and its fifth assessment report will be released in 2014.

In the following sections we will summarize the policy and scientific debates on human security in the context of climate change.

1.3.1 The Policy Debate on Human Security at the United Nations

How did the Secretary-General define human security, and did he refer in his reports to the General Assembly on climate change (2009) and on human security (2010) to climate change as a threat to human security? In his report on human security (A/64/701) of 8 March 2010 the Secretary-General offers an update on developments related to the advancement of human security since the 2005 World Summit, where governments committed themselves to “discuss and define the notion of human security”. This report identifies core elements and the added value of human security:

Human security is based on a fundamental understanding that Governments retain the primary role for ensuring the survival, livelihood and dignity of their citizens. It is an invaluable tool for assisting Governments in identifying critical and pervasive threats to the welfare of their people and the stability of their sovereignty. It advances programmes and policies that counter and address emerging threats in a manner that is contextually relevant and prioritized. This helps Governments and the international community to better utilize their resources and to develop strategies that strengthen the protection and empowerment framework needed for the assurance of human security and the promotion of peace and stability at every level - local, national, regional and international.³¹

The Secretary-General’s Report stated that “broadly defined, human security encompasses freedom from

24 See the analysis of the first debate in Brauch (2009), his statement in the third debate on 14 April 2011 at: <<http://www.un.org/en/ga/president/65/initiatives/Human%20Security/DrBrauch.pdf>>, and the report on this meeting; at: <<http://www.un.org/News/Press/docs//2011/ga11072.doc.htm>>.

25 On 8 March 2010, the UN Secretary-General Ban Ki-moon released a report on human security (A/64/701). A formal debate on human security was held at the UNGA on 20 and 21 May 2010, and in July 2010, the General Assembly adopted by consensus its resolution on human security entitled *Follow-up to paragraph 143 on human security of the 2005 World Summit Outcome* (A/RES/64/291). See the UN press release, 21 May 2010; at: <<http://www.un.org/News/Press/docs/2010/ga10944.doc.htm>>.

26 See the UN press release, 14 April 2011; at: <<http://www.un.org/News/Press/docs//2011/ga11072.doc.htm>>.

27 On 21–23 June 2005, *The Global Environmental Change and Human Security* (GECHS) project of IHDP organized a workshop in Oslo on ‘climate change and human security’; at: <<http://www.cicero.uio.no/humsec/>>; papers are at: <http://www.cicero.uio.no/humsec/list_participants.html>.

28 See the Greek concept paper on: “Human Security and the Climate Change Impact on Vulnerable Groups” of 8 May 2007; at: <<http://www.humansecuritynetwork.org/docs/2007-ministerial-meeting-04-greek%20paper.doc>>.

29 See Greece, Foreign Ministry at: <http://www.mfa.gr/www.mfa.gr/Articles/en-US/tst8052007_KL2115.htm>.

30 See the memorandum written by Wisner, Fordham, Kelman. et al. (2007).

fear, freedom from want and freedom to live in dignity” and that

threats such as natural disasters, violent conflicts and their impact on civilians, as well as food, health, financial and economic crises, tend to acquire transnational dimensions that move beyond traditional notions of security. While national security remains pivotal to peace and stability, there is growing recognition of the need for an expanded paradigm of security. ... As a result, the guarantee of national security no longer lies in military power alone. Essential to addressing security threats are also healthy political, social, environmental, economic, military and cultural systems that together reduce the likelihood of conflicts, help overcome the obstacles to development and promote human freedoms for all.

The Secretary-General also referred to the initial definition in the *Human Development Report* by the *United Nations Development Programme* (UNDP 1994) that broadly defined human security as “freedom from fear and freedom from want” and noted that “four basic characteristics (universal, people-centred, interdependent and early prevention) and seven key components (economic, food, health, environmental, personal, community and political security) were presented as the main elements of human security”. Five years later, the *Human Security Network* (HSN; Fuentes/Brauch 2009) defined human security as:

A humane world ... where every individual would be guaranteed freedom from fear and freedom from want, with an equal opportunity to fully develop their human potential ... In essence, human security means freedom from pervasive threats to people’s rights, their safety or even their lives ... Human security and human development are thus two sides of the same coin, mutually reinforcing and leading to a conducive environment for each other.

In its report *Human Security Now: Protecting and Empowering People*, the *UN Commission on Human Security* (CHS 2003) defined the goal of human security as being

to protect the vital core of all human lives in ways that enhance human freedoms and human fulfilment. Human security means protecting fundamental freedoms – freedoms that are the essence of life. It means protecting people from critical (severe) and pervasive (widespread) threats and situations. It means

using processes that build on people’s strengths and aspirations. It means creating political, social, environmental, economic, military and cultural systems that together give people the building blocks of survival livelihood and dignity.

This definition has been adopted as the working definition of human security by the Friends of Human Security, an informal network that has met since 2007 at UN Headquarters. The Secretary-General’s report pointed to these commonalities of the human security concept:

Common to all the above definitions are three essential components that encompass the principles of human security and help further explore the added value of the concept. First, human security is in response to current and emerging threats – threats that are multiple, complex and interrelated and can acquire transnational dimensions. Second, human security calls for an expanded understanding of security where the protection and empowerment of people form the basis and the purpose of security. Third, human security does not entail the use of force against the sovereignty of States and aims to integrate the goals of freedom from fear, freedom from want and freedom to live in dignity through people-centred, comprehensive, context-specific and preventive strategies.

The Secretary-General’s report further noted:

The concept of human security acknowledges that due to catastrophic events people may be faced with sudden insecurities and deprivations that not only undo years of development but also generate conditions that may lead to growing tensions. As a result, human security draws attention to a wide range of threats faced by individuals and communities and focuses on the root causes of such insecurities. In addition, by understanding how particular constellations of threats to individuals and communities translate into broader intra- and inter-State security breaches, human security seeks to prevent and mitigate the occurrence of future threats, and in this regard can be a critical element in achieving national security and international stability.

The human security report of Secretary-General Ban Ki-moon argued that

human security underscores the universality and primacy of a set of freedoms that are fundamental to human life, and as such it makes no distinction between civil, political, economic, social and cultural rights, thereby addressing security threats in a multidimensional and comprehensive manner. In this way, the human security concept introduces a practical framework for identifying the specific challenges that are at stake in a particular situation of insecurity as well as for considering the institutional and governance arrangements that are needed to ensure the survival, livelihood and dignity of individuals and communities. Improve-

31 This quote is from the summary of the SG’s report on “Human Security” (A/64/701) of 8 March 2010 at: <http://www.humansecuritygateway.com/documents/UNGA_A64701_ReportOfTheSecretaryGeneralOn_HumanSecurity.pdf>.

ments in human security directly and positively impact people's daily lives and as a result give rise to more immediate and tangible results that help strengthen the legitimacy of actions taken by Governments and other actors.

The Secretary-General maintained with regard to the nature of the threats and challenges that:

Some human security challenges are specific to the internal dynamics of a particular community, such as lack of access to resources and opportunities, while others are transnational, such as pandemics, climate change and financial and economic crises.

The report referred 13 times to climate change, focusing specifically on "Climate change and the increase in the frequency and intensity of climate-related hazard events" and noting its "multidimensional impact":

Climate change and its interactions with other insecurities is one of the most pressing issues of our time. Among its many consequences are an increase in the frequency, variability and intensity of events such as floods, storms, desertification and droughts. Climate change also exacerbates poverty. Climatic fluctuations, environmental degradation and extreme weather patterns disrupt harvests, deplete fisheries, erode livelihoods and increase the spread of infectious diseases. Vulnerable groups are particularly at risk, not only from the immediate impacts of climate-related disasters but also from knock-on risk factors such as displacement and migration.

As I outlined in my report on climate change and its possible security implications (A/64/350), climate change can also be a 'threat multiplier' where the loss of land, coupled with persistent poverty, displacement and other insecurities, may trigger competition over increasingly scarce natural resources that can intensify into societal tensions. With a majority of climate-related deaths and economic losses occurring in poor regions, climate change puts an enormous stress on the social and economic systems of poor countries.

Meanwhile, where climate change threatens to exacerbate socio-economic conditions, a better understanding of the interlinkages between climate change and other dimensions of human security is needed. Such an understanding can help assess the causes and identify the actions needed to manage the combined risks of climate-related insecurities. In these fragile spots, special attention from the international community is required to assist countries in reducing the social stresses that emerge when State institutions are overstretched and the delivery of basic services is inadequate.

However, in his earlier report on *Climate change and its possible security implications* (A/64/350 of 11 September 2009), Secretary-General Ban Ki-moon had not used the human security concept at all, except in a footnote in a citation of the literature.

1.3.2 Scientific Human Security Discourses

In the scientific discourse, the Copenhagen School (Buzan/Wæver/de Wilde 1998) proposed a *horizontal widening* and *vertical deepening* of the primarily 'state-centred' national and international security concept. As in the political debate in the UN, the scientific discourse on human security and scientific efforts to define this concept have primarily focused on the three pillars of human security:

- a) 'freedom from fear' addressing the conflict and humanitarian law agenda;
- b) 'freedom from want' in the context of the human development agenda; and
- c) 'freedom to live in dignity' the UN Secretary-General Kofi Annan introduced his report *On Larger Freedom* (Annan 2005) with reference to human rights, the rule of law, and good governance.

In the UN debates, a focus on these three pillars of human security has so far prevailed. No agreement exists in science and politics on the definitions, referent objects, scope, and boundaries, or on the policy goals and human security agendas. The human security concept has been proposed in scientific discourses as an alternative normative paradigm. In the social sciences, the concept has been widely discussed in *development studies* (Picciotto/Olonisakin/Clarke 2007; Ulbert/Werthes 2008) and *peace studies* (Tadjbakhsh/Chenoy 2006; Tadjbakhsh 2009; Thakur 2006/2007; Werthes/Debiel 2009), and to a lesser extent in *environmental studies* (Page/Redclift 2002; Dodds/Pippard 2005) and *security studies* (Dannreuther 2007; Booth 2007), where many realists have totally ignored this discourse (Kolodziej 2005). Several proponents of a narrow human security concept (Mack 2004, 2004a; Krause 2004, 2004a, 2008; Mac Farlane/Khong 2006; Black/Swatuck 2009) have opposed its horizontal widening to include other policy agendas of development and environment policy (Brauch 2009a).

The paradigmatic shift from 'national security' to 'human security' implies a change in the reference objects, the values to be protected, and the security dangers and concerns faced by individuals and humankind and that they have to cope with, as well as in policy agendas and strategies for achieving human security. Human security does not replace the national, regional, or international security of the world of states, but it shifts the focus from nation states to "We the peoples of the United Nations" as referred to in the Preamble of the UN Charter, from sovereignty to human well-being and survival, from the fixation with

the 'other' (state, ethnic, or religious group) to 'us' as the cause (e.g. of global environmental change and global warming) and the victims of 'our own consumptive behaviour' (through an increase in the number and intensity of hydro-meteorological hazards).

Human security requires a fundamental shift in the thinking on security (of worldviews and mindsets, Brauch 2003), as it addresses different policy requirements and needs, and requires horizontally integrated political coping strategies where the role of development and environment policies is vital. The role and missions of the military changes from fighting wars to *protecting* the people against genocide and natural hazards, where society and social movements have a vital role to play in *empowering* the people to build resilience and to enhance their coping capacities. Thus, the human security concept implies fundamental changes in the priorities of nation states in fulfilling the basic human needs of its people, to *protect* its human beings from manifold security dangers and to *empower* them to cope with these manifold security dangers.

While the theory of *securitization* was developed by the Copenhagen school for a widened security agenda for a world of states, the human security concepts and policy agendas enhance the role of societal groups and of knowledge-based scientific epistemic communities (such as the *Intergovernmental Panel on Climate Change* (IPCC)) as new *securitizing actors* that have put issues of global environmental change and climate change on the top policy agendas of nation states and of the global and regional UN system, the Bretton Woods institutions, and of the G-8, G-5, G-20, G-77, and the European Union (Brauch 2009; Oswald Spring/Brauch 2009, 2011).

The policy debate and the scientific discourse on human security have become an essential part of the broader reconceptualization of security dangers and concerns, focusing on different soft security threats, challenges, vulnerabilities, and risks (Brauch 2011) caused by and affecting the well-being and survival of humankind and human beings alike. Human security has the human being and humankind as a referent object, whose values at risk are human well-being, quality of life, and survival, and whose sources of threat are the state, globalization, and nature (Møller 2003: 279).

While the narrow Canadian conceptualization of human security is limited to the political and military dimension, the wider Japanese notion includes the economic dimension, while the all-encompassing

UNDP concept (1994) covers the societal and environmental³² dimension as well. Human security has been discussed in relationship to *national* (Đurđević-Lukić 2004), *international* (Dannreuther 2007), or *global security* (Stoett 1999) but also in relationship to several sectoral security concepts, especially to *water* (Oswald Spring/Brauch 2009), *soil* (Brauch/Oswald Spring 2009, 2011), *food* (Oswald Spring 2009a), *health* (Leaning 2009; Leaning/Arie 2000, 2001; Szreter 2003; Chen/Leaning/Narasimhan 2003; Oswald Spring 2011), and *livelihood security* (Bohle 2009; Bohle/O'Brien 2007). Oswald Spring (2001, 2008, 2009) has proposed a composite concept that links human with gender and environmental security (HUGE).³³

In the scientific discourse since the 1980s, even before the global turn, a few scholars had called for an expanded concept of international security (Westing 1986: 183–203) and for a comprehensive or human security approach (Westing 1993). But the scientific human security discourse was triggered by the UNDP's (1994) *Human Development Report* (HDR) in the political science, international relations (Ulbert/Werthes 2008), and more particularly in the peace studies and development communities (McGrew/Poku 2007), but also in geography (Lonergan 1999; Bohle/O'Brien 2007), international law (von Tigerstrom 2007), education (Nelles 2003), philosophy (Fabra Mata 2007), theology (Eisen 2008), and even in the health sciences (Leaning 2009).

Alkire (2003: 15–39; 2003a; 2004) pointed to the many different definitions of human security as: "a) safety from chronic threats such as hunger, disease and repression; b) protection from sudden and hurtful disruption in the patterns of daily life". The CHS (2003) focused on threats from both poverty and violence and aimed "to protect the vital core of all human lives in ways to enhance human freedoms and human fulfilment", a goal that should be realized "by joint strategies of protection and empowerment".

Within international relations, the human security concept has remained controversial. While many neo- or structural realists and the strategic studies community (Paris 2001, 2004), as well as 'state-centred' peace researchers (Buzan 2000, 2002; Müller 2002; Brock 2008), have rejected the human security concept, au-

32 This has been covered elsewhere in detail by Brauch (2005, 2005a, 2006, 2007, 2008) and Barnett (2001).

33 For different perspectives on the linkage between gender and human security see: Truong (2009); Serrano Oswald (2009).

thors with liberal and constructivist perspectives and those from peace research have rallied behind this concept. However, some proponents are critical of wide concepts such as ‘freedom from want’ (Krause 2004; Mack 2004, 2004a) and have argued instead for “pragmatism, conceptual clarity, and analytic rigor” (Owen 2004: 375). But most of the authors of a forum in *Security Dialogue* (2004) supported a wide agenda that includes ‘freedom from fear’ (violence) and ‘freedom from want’ (development).

Human security as an analytical and theoretical tool differs from human security as a political mandate. Uvin (2004, 2008) uses the concept as a “conceptual bridge between the ... fields of humanitarian relief, development assistance, human rights advocacy, and conflict resolution” (Owen 2004). For Hampson (2004), human security gives ‘voice’ to the politically marginalized, while Acharya (2004) interpreted it as a response to the globalization of international policy, and for others human security is a response to genocide and the limits of sovereignty, justifying humanitarian interventions.

Newman (2001) distinguished four interpretations of human security: basic human needs, an assertive or interventionist focus, social welfare or a development focus, and new or non-traditional security issues such as drugs, terrorism, small arms, and inhumane weapons. The victims of *human security challenges* have been: “1) victims of war and internal conflict; 2) persons who barely subsist and are thus courting ‘socio-economic disaster’; and 3) victims of natural disasters” (Suhrke 1999) that create severe humanitarian emergencies.

To overcome the dispute between the proponents of a narrow and a wide human security concept, Owen (2004) suggested combining the wide definition of UNDP (1994) with a threshold-based approach “that limits threats by their severity rather than their cause”. He suggested that each category of threats should be “treated separately for the purpose of analysis”. For Owen (2004), “human security is the protection of the vital core of all human lives from critical and pervasive environmental, economic, food, health, personal and political threats” regardless of whether people are affected by floods, communicable disease, or war, but all those threats would be included “that surpass a threshold of severity [and] would be labelled threats to human security” (Owen 2004).

Mary Kaldor (2007: 182–187) who headed the *Study Group on Europe’s Security Capabilities* (Glasius/Kaldor 2005) placed human security “at the

sharp end of human development”. Kaldor (2007: 190–191) argued that “physical insecurity is linked with material insecurity. New wars involve high levels of population displacement, rapid urbanization, loss of rural livelihoods, destruction of infrastructure and productive assets, and greater vulnerability to natural disasters.” She suggested that a human security approach to these new security dangers “would aim both to stabilize conflicts and address the sources of insecurity.” This requires public security, Kaldor argued, based on the rule of law and effective law enforcement; for international organizations this implies: a) an expanded international presence; b) new human security forces; and c) a legal framework.

There has also been an intensive scientific discourse on human security concepts and issues among and with scholars from developing countries, in Latin America (Neff 2003; Palma 2003; Kornblith 2003; Bonilla 2003; Lopez 2003; De Lombaerde/Norton 2009; Rojas Aravena 2009; Singh 2009), in South Asia (Ariyabandu/Fonseka 2009; Chari/Gupta 2003, 2003a; Abdus Sabur 2003, 2009; Bajpai 2000, 2004; Najam 2003), in South-east Asia (Othman 2009; Wun’Gaeo 2009), in Japan (Shinoda 2009), in Africa (Hendricks 2008; Goucha/Cilliers 2001; Naidoo 2001; Hussein/Gnisci/Wanjiru 2004; Mulongo/Kibasomba/Njeri Kariri 2005; Mutesa/Nchito 2005; Mpagala/Lwehabura 2005; Mataure 2005; Ngoy Kaungulu 2005; Correia de Barros 2005; Mlambo 2005; Dzimba/Matooane 2005; Poku/Sandkjaer 2009; Schott 2009), and in the Arab world (Chourou 2005, 2009).

This selective review of definitions of human security and of threats for human security, as well as of issues relevant to human security, indicates both a diversity and a lack of clear consensus, neither of which has helped communication with policymakers or their efforts to move from declaratory statements to concrete policy initiatives and actions. After 18 years of debate on human security in the social and human sciences, the conceptual discourse remains inconclusive, and the definition of human security used depends on the approach and preferences of the respective author or donor.

Both in the policy debate and in the scientific discourses on human security, the environmental security dangers and concerns have in most cases been ignored. But new challenges are being posed by the environmental dimension of human security (Barnett 2001; Brauch 2005, 2005a, 2006, 2007, 2008; chap. 10 by Hardt), and these have led to a proposal for a fourth pillar of human security that is gradually being

taken up by governments in the HSN (Fuentes/Brauch 2009).

1.3.3 Environmental Dimension of Human Security: Freedom from Hazard Impacts

Given the gap in the conceptualization of human security challenges posed by climate change, during the informal debate of the UNGA on 14 April 2011 Brauch addressed “The Environmental Dimension of Human Security”, and proposed a fourth human security pillar as “Freedom from Hazard Impacts”³⁴, arguing that

While hazards cannot be prevented, their impact can be reduced. These hazards did not affect national and international security but they had severe impacts on the human security of human beings and the most affected communities and on their water, soil, food, health and livelihood security. This is the background for a fourth pillar of human security as ‘Freedom from Hazard Impacts’ to deal with the environment, sustainable development and disasters and to include the respective organizations, programmes and initiatives within the UN system.

In 2005, a report for the *United Nations University Institute on Environment and Human Security* (UNU-EHS) suggested as the fourth pillar of human security ‘freedom from hazard impacts’ focusing on “reducing vulnerability of societies confronted with natural and human-induced hazards” with the goal “to improve the knowledge base for the assessment of vulnerability and coping capacity of societies facing natural and human-induced hazards” (Brauch 2005, 2005a).

‘Freedom from hazard impacts’ calls for reducing the environmental and social vulnerability and enhancing the coping capabilities of societies confronted with environmental, geophysical, and climate-related hazards. It implies that people can mobilize their resources to address sustainable development goals. Human security as ‘freedom from hazard impacts’ is achieved when people who are vulnerable to environmental hazards and disasters (Nathan 2009) that are often intensified by poverty, food insecurity, and improper housing in flood-prone and coastal ar-

reas are better warned of impending hazards, and are *protected* against them and *empowered* to prepare themselves for them. Brauch argued that putting the environment and natural hazards on the human security agenda means addressing its impacts on water, soil, food, health, and livelihood security. Global environmental change as the outcome of the interaction between the earth and human systems and of direct human interference with nature has become a scientific, political, and security issue since the 1970s. Since 2004, climate change has become a security concern.

A human security perspective on climate change puts human beings, communities, and humankind at the centre, addresses how *physical* and *societal* impacts of climate change pose human security dangers, and how human beings, states, and the international community can cope in order to avoid major human catastrophes. As ‘we’ are the threat (through our energy consumption), it is ‘we’ who have to change our consumption and must adapt governance structures to reduce global greenhouse gas emissions. A *policy-focused human security approach* to climate change prioritizes the climate-induced security threats humankind will face during the 21st century. Its task is to develop policies for coping better with the human security impacts of climate change by measures of mitigation, adaptation, and resilience-building to *protect* and to *empower* the affected people. This requires local survival strategies and global strategies for a decarbonization of the world economy.

In a human security approach, non-military means prevail. The development of new scientific knowledge, its technological application, and its effective political implementation matter. Such an *approach* allows policymakers and scientists to develop coping strategies. Its task is to allocate the resources needed for these policy measures in order to achieve the goals in a proactive manner. This is a fundamental shift from short-termism to a legally binding post-Kyoto regime in order to promote sustainable development and resilience in the poorest countries most affected by climate change, and to recover environmental services for adaptation and mitigation globally.

Global environmental change comprises the interaction of water, soil, climate change, and biodiversity with population change, rural and urban systems, and socio-economic processes that may cause environmental scarcity, degradation and stress, and climate-induced natural hazards. Both may trigger extreme societal outcomes, migration, crises, and conflicts that directly affect human beings, local communities, and humankind.

34 See this document at: <<http://www.un.org/en/ga/president/65/initiatives/Human%20Security/DrBrauch.pdf>>; and the UN press release at: <<http://www.un.org/News/Press/docs//2011/ga11072.doc.htm>>. For a background paper, see at: <[http://www.afes-press-books.de/html/PDFs/Brauch_UN-GA_Paper_I2%204%202011_final%20\(2\).pdf](http://www.afes-press-books.de/html/PDFs/Brauch_UN-GA_Paper_I2%204%202011_final%20(2).pdf)>.

From a human security perspective, climate change directly impacts on water, soil, food, health, and livelihood security. Climate change will exacerbate these sectoral security problems if the communities and social groups fail to create mitigation and adaptation strategies with resilience-building through preventive learning and decisions. ‘Freedom from hazard impacts’ addresses the consequences for human security. From a policy perspective, a holistic coping strategy requires better horizontal coordination of strategies, policies, and the measures carried out by ministries and international organizations. The best human security strategy for achieving ‘freedom from hazard impacts’ is to reduce global GHG by 50 per cent globally by 2050. Even if this goal should be achieved, extreme weather events will further increase and may lead to cascading effects triggered by climate change and its physical and societal impacts. ‘Freedom from hazard impacts’ requires a proactive environmental strategy for implementing the three Rio Conventions.

The Secretary-General proposed in his report on *Climate change and its possible security implications* “several ‘threat minimizers’, ... [to] lower the risk of climate-related insecurity. ... Accelerated action at all levels is needed to bolster these threat minimizers”. These measures could enhance the human security of the people affected most. The daily survival problems of a few billion people, their social vulnerability, and their physical exposure to climate change are creating additional dangers for human security, but also challenges for an integrated human security approach combining all four pillars. Brauch concluded his statement to the UN General Assembly by proposing that:

‘Freedom from Hazard Impacts’ implies a close cooperation between those agencies working on the global environmental agenda and on the hazard agenda. It may be the appropriate time for the United Nations General Assembly to consider adding to the first three pillars of Human Security as

- ‘Freedom from fear’ referring to the policy agenda of peacekeeping, peace-building humanitarian law and disarmament;
- ‘Freedom from want’ referring to the policy agenda of human and sustainable development;
- ‘Freedom to live in dignity’ referring to the policy agenda of human rights, democratic governance and rule of law;
- a fourth pillar as ‘freedom from hazard impacts’ that brings in the policy agendas dealing with global environmental issues as well as natural hazards and disasters (early warning, disaster response, disaster preparedness, resilience building and reduction of social vulnerability).

This volume addresses the multiple societal impacts of climate change from a wider human security perspective and it intends to bring the climate change and hazard agenda into the wider scientific human security discourse and thus contribute to the development of the fourth pillar as ‘freedom from hazard impacts’.

1.4 Concepts and Approaches of Climate Security

1.4.1 Types of Literature

During the 21st century, the causal relationship between the drivers and severe societal outcomes of climate change may result in environmentally-induced massive and forced movements of peoples, hunger- and famine-induced protests, and small-scale societal violence, and possibly also in violent conflicts within and between countries; these may present a number of security dangers that are increasingly being addressed by governments and international organizations.

While future climatic scenarios can be simulated and socio-economic trends can be projected, specific events (Gaddis 1992–1993), such as climate conflicts and wars as the outcome of the decisions of future policymakers, cannot be predicted, but rather a number of ‘conflict constellations’ can be foreseen (WBGU 2007, 2008; Bauer 2011) that may possibly escalate into violence. The causal linkages and possible extreme and sometimes fatal societal outcomes have been discussed from four different scientific perspectives:

1. *Determinists* have claimed that climate change will lead to wars during the 21st century. This argument has been made by scientists (e.g. Welzer 2008; Lee 2009), humanitarian organizations, and NGOs and a few governments.
2. *Empiricists* have stressed (Dalby/Brauch/Oswald Spring 2009; Oswald Spring/Brauch/Dalby 2009) that environmental stress and climate change have contributed to forced migration and small-scale violence (Kahl 2003, 2006). They have analysed the securitization of climate change impacts (Detraz/Betsill 2009; Brauch 2009; Scheffran 2011) and reviewed conflict constellations triggered by climate change (WBGU 2008; Bauer 2011).
3. *Sceptics* have pointed to a lack of evidence in the peer-reviewed, quantitative literature on the link

between climate change and wars (Gleditsch/Nordas 2009; Breitmeier 2009).

4. *Deniers* have challenged the links between climate change and conflicts that may present security threats (Lomborg 2009, 2004; Tetrais 2011). Within the context of the UN, Russia, China, and many G-77 countries have considered climate change primarily as an issue of sustainable development, to be addressed by the UNGA, ECOSOC, and the *United Nations Framework Convention on Climate Change* (UNFCCC), but not as an issue of international peace and security for consideration by the UNSC.

Four different genres of publications may be distinguished:

- a) *Policy analyses* by consultants aiming to put the linkage on the policy agenda of national governments and international organizations. This goal has been successfully achieved by putting it on the agenda of the UNGA, the UN Secretary-General, and the UNSC.
- b) *Scenario analyses* with the goal of preparing policymakers for potential future security threats posed by the projected societal impacts of climate change. Such studies have been funded by defence ministries, intelligence agencies (US NIC), and supranational (EU 2008) and international organizations.
- c) *Discourse analyses* have analysed the policy statements of national and international policymakers and press reports in terms of international, national, and human security (Brauch 2009; Detraz/Betsill 2009; chap. 12 by Rothe; chap. 33 by Kurtz)
- d) *Conceptual and model analyses* of the linkage between climate change and society as part of the interactions between natural and human systems (Scheffran 2008, 2008a, 2009, 2010).³⁵
- e) *Theoretical and empirical analyses* that use a wide range of scientific approaches, theoretical orientations, and methods to analyse the 'observed' and 'projected' interrelations between four physical effects of climate change (increasing temperature, sea level rise, number and intensity of climate-related natural hazards, and changes in precipitation) on the state, society, and the economic sec-

tor and business community, and on individuals, community groups, and humankind.

Work in the first two genres has been carried out primarily by political consultants, and in the third by sociologists, political scientists, and media specialists. The fourth and the fifth require inter-, multi- and transdisciplinary cooperation (Pohl/Hirsch Hadorn 2006) among scientists from the natural and the social sciences.

1.4.2 Global Risk Society: Precaution and Prevention

The analysis of the linkages between climate change, human security and violent conflict may challenge Bacon's influence on "knowledge-based environmentalism" (Marocco 2008: 312–322) through identifying effects (e.g. of climate change), determining their causes (GHG emissions), and addressing these causes through specific measures (e.g. green technologies). Beck has analysed the new predicament of a 'risk society' (Beck 1986, 1992) and more recently of a 'world risk society' (Beck 1999, 2007, 2011). Starting from the premise "We don't know what it is we don't know – but from this dangers arise, which threaten mankind!", Beck (2011: 11) argues:

The irony of risk is that rationality, that is, the experience of the past, encourages anticipation of the wrong kind of risk, the one we believe we can calculate and control, whereas the disaster arises from what we don't know and cannot calculate. The bitter varieties of this risk irony are virtually endless: climate change, mad cow disease 9/11 terror attacks, global financial crises, swine flu virus and latest but not last, volcano ash clouds disrupting air traffic in Europe and elsewhere. To the extent that risk is experienced as omnipresent, there are only three possible reactions: *denial*, *apathy*, or *transformation*. The first is largely inscribed in modern culture, the second resembles postmodern nihilism, and the third is the 'cosmopolitan moment' of world risk society (Beck 1986, 1992, 2006, 2007, 2009).

Drawing on the empirical research findings of the Munich Research Centre on 'Reflexive Modernization', Beck (2011: 11) developed his argument in three steps:

1. Old dangers - new risks: What is new about world risk society?
2. Ruse of history: To what extent are global risks a global force in present and future world history, controllable by no one, but which also open up new opportunities of action for states, civil society actors etc.?

35 See related publications: Scheffran 1999, 2002, 2008a, 2011; Scheffran and Jathe (1996); Scheffran and Hannon (2007); Eisenack, Lüdeke, Petschel-Held et al. (2007); chap. 5 by Scheffran, Link and Schilling.

3. Consequences and perspectives: In order to understand the manufactured uncertainty, lack of safety and insecurity of world risk society is there a need for a paradigm shift in the social sciences?

Beck (2011: 12) argues that his theory of ‘world risk society’ maintains

That modern societies are shaped by new kinds of risks, that their foundations are shaken by the global anticipation of global catastrophes. Such perceptions of global risk are characterized by three features:

1. *De-localization*: Its causes and consequences are not limited to one geographical location or space, they are in principle omnipresent.

2. *Incalculableness*: Its consequences are in principle incalculable; at bottom it’s a matter of ‘hypothetical’ risks, which, not least, are based on science-induced not-knowing and normative dissent.

3. *Non-compensability*: ... Given this new quality of ‘threats to humanity’ - argues Francois Ewald (2002: 275) - the logic of compensation breaks down and is replaced by the principle of *precaution through prevention*. Not only is prevention taking precedence over compensation, we are also trying to anticipate and prevent risks whose existence has not been proven.

This principle of *precaution through prevention* has been instrumental for the British (2007) and German (2011) initiatives in the UNSC but also for the approach taken by the European Union since 2008.

From an interdisciplinary perspective, William C. Clark of the Kennedy School of Government, Harvard University, Nobel laureate Paul C. Crutzen of the Max Planck Institute in Mainz, and Hans Jochen Schellnhuber, director of the Potsdam Institute of Climate Impact Research, have called for a “second Copernican revolution” in science that will result in “a new paradigm for sustainability” (Clark/Crutzen/Schellnhuber 2004) to meet the climate paradox of a 50 per cent reduction of global GHG or of an 80 per cent reduction for the G-8 countries within four decades. They argue that the guidance system for a sustainability transition requires “systems for adaptive management and social learning” whose elements require “appropriate information, incentives, and institutions”. Such reform efforts should mobilize “the right knowledge”, “integrate knowledge”, balance “flexibility and stability”, and address the required “infrastructure and capacity”. They concluded by calling for a new “social contract” between society and the scientific community, an idea that was developed further in a WBGU (2011) report.

This book, by analysing the linkages between climate change, human security, and violent conflict,

aims to contribute new knowledge based on a plurality of scientific disciplines, approaches, theories, and methods in order to develop Beck’s ‘principle of *precaution through prevention*’, to contribute to the discussion of geopolitical aspects of the required transformation to ‘manage’ conflicts, to ‘prevent’ their escalating into violence and wars, and to contribute to a discussion on a scientific and policy agenda for a ‘sustainability transition’ (Grin/Rotmans/Schot 2010) by addressing a policy priority to ‘avoid’ future climate-induced violent conflicts and to move towards a sustainable peace.

1.4.3 Causal Linkages, Chains, and Feedbacks

Instead of a simple stimulus-response model that claims direct links between stress factors and societal responses, the *Pressure-State-Response* (PSR) model of the OECD (1994; 1998; 1999; 2001; 2001a) assumes that human activities put pressure on nature that leads to environmental changes (climate change, water and soil degradation, biodiversity loss) to which the state and society respond with ecological and economic measures and programmes.

The OECD’s PSR model distinguishes between ‘pressure’ (P), ‘state of the environment’ (S), and ‘response’ (R) indicators. Under ‘*pressure*’ key factors are listed (population growth, consumption, poverty), while ‘*state*’ refers to the environmental conditions that emerge from this pressure (air pollution, deforestation, degradation) that influence human health and well-being, and ‘*response*’ points to the numerous activities carried out by society to avoid, prevent, and reduce negative impacts on the environment, and to protect natural resources from these effects. Among the *pressures* are human activities in the energy, transport, industry, and agricultural sector on natural resources (air, water, soil, organisms) to which the state, society, business, and international actors respond. Between these three elements of the PSR model there are many complex interactions (resource transfers, information, decisions).³⁶

The *UN Commission for Sustainable Development* (UN-CSD) used with its DSR (*Driving Force*

36 Jochen Jesinghaus (n.d.), at: <http://esl.jrc.it/envind/theory/handb_03.htm>. The PSR model was developed in the 1970s by the Canadian statistician Anthony Friend, and subsequently adopted by the OECD’s *State of the Environment* (SOE) group; for an illustration see at: <<http://www.virtualcentre.org/en/dec/toolbox/Refer/EnvIndi.htm>>.

State-Response) model a slightly modified framework.³⁷ The *European Environment Agency* (EEA 1998) has developed a framework that distinguishes “Driving Force - Pressure - State - Impact - Response (DPSIR)³⁸ that offers a mechanism for the analysis of environmental problems and for the development of environmental indicators.³⁹

A different model was used as a framework for the *Millennium Ecosystem Assessment* (MA 2003, 2005; Leemans 2009). It distinguished between direct and indirect drivers of change that directly affect human well-being and ecosystem services. In this framework, besides the material minimum for a good life, health, and good social relations, security is considered as one of the key elements of human well-being that influence freedom of choice. Security has been defined as: a) the ability to live in an environmentally clean and safe shelter, and b) the ability to reduce vulnerability to ecological shocks and stress (MA 2005; Leemans 2009). These four models were used to develop environmental indicators and to guide ecosystem assessment. But they did not focus on the linkages between processes of climate change and natural hazards and their sociopolitical consequences.

The *Pressure-Effects-Impacts-Societal Outcomes-Response* (PEISOR) model was stimulated by these pressure and response models and by the debates on environmental security (Homer-Dixon/Deligiannis 2009; Mason/Hagmann/Bichsel et al. 2009) and on natural hazards. The PEISOR model (Brauch 2009; Brauch/Oswald Spring 2009; chap. 17 by Oswald Spring; chap. 37 by Brauch) combines five stages:

- *P* (*pressure*) refers to six or eight drivers of global environmental change (*survival hexagon* or ‘octogon’);
- *E* to the *effects* of the linear, non-linear, or chaotic interactions within the ‘hexagon’ on environmental scarcity, degradation, and stress;
- *I* to extreme or fatal *impacts* of human-induced and climate-related natural hazards (storms, flash floods, flooding, landslides, drought);

- *SO* to *societal outcomes*: internal displacement, migration, urbanization, crises, conflicts, state failure, and
- *R* to *response* by society, the business community, and the state, where both traditional and modern technological knowledge can make a difference.

While hazards cannot be prevented, their impact in terms of deaths, affected people, and economic and insured damages can be reduced by a combination of policies and measures that link protection with empowerment of the people to enable them to become more resilient. Figures 17.6 and 37.3 refer in the first column under causes or pressure to six or eight key factors contributing to GEC, three supply or environmental factors (land, air, water, and biodiversity) and three demand or human factors (population living and working in rural or urban systems and socioeconomic systems). These six or eight factors interact in a non-linear or sometimes chaotic way, and impose pressure on the political and societal context, where they may trigger, impact, or affect socio-economic interactions, either causing or contributing to anthropogenic *environmental degradation* (of water, soil, air) or *scarcity* (of water and soil). The interaction between these two processes may result in *environmental stress* that can have various extreme and even fatal impacts.

However, there may also be a direct impact of climate change resulting in an increase in hydro-meteorological hazards. This aspect has hardly been addressed in the initial environmental security research (Dalby/Brauch/Oswald Spring 2009) but it is key to the debate on the *securitization* of climate change. Environmental stress may increase the impact of hazards (for the highly socially vulnerable) and cause or contribute (with natural hazards and conflicts) to internal displacement, to urbanization, and to transboundary forced migration.

Whether these factors result in domestic crises, disasters, or (in a few worst cases) violent conflicts, or whether these can be avoided, depends on many specific factors and activities resulting from the interaction between the three actors representing the state, society, and the business community. It also depends on the use of both traditional and modern technical and organizational knowledge and knowledge-based response strategies by governments and international organizations and transnational societal and economic organizations.

As discussed below by Scheffran, Link, and Schilling (chap. 5), there are various possible pathways between climate change and conflict that are influ-

37 UN Commission for Sustainable Development: “Indicators of Sustainable Development”, at: <<http://www.un.org/esa/sustdev/isd.htm>>.

38 Jochen Jesinghaus: “European System of Environmental Pressure Indices”, at: <http://esl.jrc.it/envind/theory/handb_03.htm>.

39 European Commission: “Towards Environmental Pressure Indicators for the EU”, at: <<http://www.e-m-a-i-l.nu/tepi/firstpub.htm>>.

enced by a number of contextual conditions, intermediate variables, and intervening responses. The societal and political levels are not only affected by climate change, they also affect it themselves, indicating that circular feedbacks are relevant. Within this context, the analysis is embedded into an integrated assessment framework of climate-society interaction that represents the causal links between climate change, natural resources and environmental stress, human values and needs, and the societal consequences and instabilities (figure 5.3):

1. Changes in the climate system, such as increases in greenhouse gas concentration, temperature, and precipitation, affect environmental systems and natural resources (e.g. soil, water, ecosystems, forests, biodiversity) through a sequence of complex interactions.
2. Changes in natural resources can have adverse impacts on human values and capabilities, which may provoke human responses that can affect social systems.
3. Depending on the degree of vulnerability, socio-economic stress increases as a result of water and food insecurity, health problems, migration, economic degradation, the weakening of institutions, diminishing economic growth, and eroding societies.
4. Interdependencies between these factors may lead to societal instability that can manifest itself in violent forms such as riots, insurgencies, urban violence, or armed conflict.
5. A feedback loop allows human beings and societies to adapt to the changing situation and mitigate climate stress through strategies, institutions, and governance mechanisms that may apply technology or human and social capital to adjust the economy and the energy system to the altered environmental conditions.

The significance of the impacts of climate change on society and security can be deduced from the links between the variables and how events spread along the causal chain or cascade, which is a function of the sensitivities between variables. Kominek and Scheffran (2011) have discussed for two examples from early 2011 different ‘cascading processes’. While the Japanese earthquake, tsunami, and nuclear catastrophe triggered a delegitimization of nuclear energy, the many natural hazards in Russia, Ukraine, Canada, and Australia were instrumental in the rapid increase in the global food crisis, which may have been one of several causes for the ‘Arabellion’ that triggered a se-

ries of incidents of public unrest throughout the Arab world (chap. 37 by Brauch).

1.5 Structure of the Book

1.5.1 Focus of the Nine Parts

The book is divided in nine parts. After this introduction, in part II five chapters (chap. 2–6) deal with “Climate Change, Human Security, Societal Stability, and Violent Conflict: Empirical and Theoretical Linkages”, while in part III eight chapters (chap. 7–14) discuss “Climate Change and the Securitization Discourse” and in part IV four conceptual and empirical chapters (chap. 15–18) examine the linkages between “Climate Change and Migration”. The next three parts offer regional case studies focusing in part V in four chapters (chap. 19–22) on “Climate Change and Security in the Middle East”, in part VI in five chapters (chap. 23–27) on “Climate Change and Security in Africa”, and in part VII in five chapters (chap. 28–32) on “Climate Change and Security in Asia and the Pacific”. In part VIII five chapters (chap. 33–37) address cross-cutting issues on “Improving Climate Security: Cooperative Policies and Capacity-Building” and in part IX (chap. 38) the five co-editors summarize the results in “Conclusions and Outlook”.

1.5.2 Climate Change, Human Security, Societal Stability, and Violent Conflict: Empirical and Theoretical Linkages⁴⁰

In part II the first two chapters offer two different theoretical and quantitatively oriented perspectives on the linkages between climate change and armed conflict (chap. 2) and on climate change and societal stability (chap. 3). This is followed by a policy-oriented assessment on “Climate Change, Conflict, and Fragility” (chap. 4) and two chapters by the CLISEC Research Group on “Theories and Models of Climate-Security Interaction: Framework and Application to a Climate Hot Spot in North Africa” (chap. 5) and on “Global Climate Policy Reinforces Local Social Path-Dependent Structures: More Conflict in the World?” (chap. 6).

40 The brief summary of the research questions and the structure of the chapters are based in part verbatim on the introductory section of the individual chapters in order to reflect their focus as closely as possible.

In chapter 2, *Halvard Buhaug* and *Ole Magnus Theisen* (both from the Peace Research Institute Oslo (PRIO), Norway) review, from a political science perspective, the theoretical foundation for the central arguments linking climate change to armed conflict, assess the quantitative literature on the subject matter, point to discrepancies in findings and interpretations, and provide an empirical assessment of drought and civil war in sub-Saharan Africa since 1960.

In chapter 3, *Peter F. Nardulli* and *Kalev H. Leetaru* (both Cline Center for Democracy, University of Illinois, USA) introduce the *Societal Infrastructures and Development* (SID) project and its scope and relevance for research into the societal effects of climate change, with a special focus on the *Social, Political, and Economic Event Database* (SPEED) project, which generates data on small-bore civil unrest events that are temporally and spatially referenced. It illustrates how SPEED data can be used to provide succinct insights into societal stability, and it describes how SID and SPEED data can be used in different research designs to examine the destabilizing effects of climate change.

In chapter 4, *Dan Smith* and *Janani Vivekananda* (both International Alert, UK) conclude, given the uncertainties surrounding the impact of climate change and the related political contestation, and the complex environment in which impacts must be addressed, that the most productive path of inquiry is to focus on *resilience*, the capacity of a system to withstand shocks and to rebuild and respond to change - including unanticipated change.

In chapter 5, *Jürgen Scheffran*, *Michael Link*, and *Janpeter Schilling* (all *Research Group Climate Change and Security* (CLISEC), KlimaCampus and Institute of Geography; University of Hamburg, Germany) address “Theories and Models of Climate-Security Interaction: Framework and Application to a Climate Hot Spot in North Africa”. As a systematic and integrated assessment of the climate-security link is still lacking, the authors argue that there is a need to design interdisciplinary and theoretical approaches to improve the understanding of how actors adapt to climate change and whether potential security implications can be avoided. In this chapter theoretical approaches and modelling tools are presented for analysing the complex relationships, and an integrated assessment framework is introduced for examining the causal chain between climate change, natural resources, human security, and societal stability in order to provide a deeper understanding of the links between climate and security links and their potential

for inducing destabilizing effects, affecting tipping points, and triggering conflicts.

In chapter 6, *Jasmin Kominek* (CLISEC Research Group and Institute of Sociology, University of Hamburg, Germany) argues that “Global Climate Policy Reinforces Local Social Path-Dependent Structures”, and asks whether this will result in more conflict in the world. Based on the different steps in a problem-solving process, a formal scheme is presented that distinguishes between the overall problem-solving process, situational analysis, modelling and evolving strategies, and situational intervention. Using this structure, in each section each step is explained in greater detail and the theoretical background is presented, expanded, and developed.

1.5.3 Climate Change and the Securitization Discourse

In part III, eight political scientists (chap. 7-13) provide theoretical perspectives on the evolving discourse on the ‘securitization’ (Wæver 1995, 1997, 2008) of climate change. *Maria J. Trombetta* (Delft University of Technology, The Netherlands, from Italy) reviews in chapter 7 the “Climate Change and the Environmental Conflict Discourse” and provides a genealogy of environmental conflict, outlines how this discourse has been challenged, illustrates the recent debate on climate change and conflicts, and offers an account of the contemporary dynamics of the security field with respect to a double process of securitization of global governance and governmentalization of global security.

In chapter 8 on “Climate Change as a Driver of Security Policy”, *Michael Brzoska* (Institute for Peace Research and Security Policy; Political Science, University of Hamburg, Germany) argues that climate change has become a top item on the security agenda of many states and international organizations, but that there is no consensus that climate change is a security threat, nor agreement on what and who will be threatened by climate change. This chapter reviews selected national security strategies and defence planning documents, and asks whether climate change is seen as a security issue and what kind of security climate change is said to endanger. It focuses on the consequences that security elites have drawn from the framing of climate change as a security issue, and it discusses possible reasons for differences between various countries in their positions regarding the climate change and security nexus.

In chapter 9 *Angela Oels* (KlimaCampus, University of Hamburg, Germany) argues for moving “From ‘Securitization’ of Climate Change to ‘Climatization’ of the Security Field: Comparing Three Theoretical Perspectives”. She asks what the articulation of climate change as a security issue means in terms of policy implications, how climate change is to be rendered governable as a security issue, and what the consequences of this are. To answer these questions, she introduces three theoretical perspectives: the Copenhagen School, the human security perspective, and the Paris School. They offer theoretical perspectives on what it means to render something governable as a security issue and whether or not this is desirable. The review of each analytical perspective concludes with an assessment of the strengths and weaknesses of the respective approach.

In chapter 10 on a “Critical Deconstruction of Environmental Security and Human Security Concepts in the Anthropocene”, *Judith Nora Hardt* (University of the Basque Country, Spain, from Germany and France) provides a critical understanding of security as a positive value that ensures basic needs with a normative transformative aspiration, and notes its understanding as a negative value linked to environmental conflict and the risk of militarization. The chapter elaborates a framework for analysis based on *Critical Security Studies* (CSS) for the Anthropocene; it discusses the concepts of environmental security and human security and points to the risks and weaknesses of the different versions of environmental security and of the human security approach in relation to GEC.

In chapter 11 *Linda Wallbott* (Johann Wolfgang Goethe-University, Frankfurt am Main, Germany) focuses on the “Political in Nature: The Conflict-fuelling Character of International Climate Change Policies between Paternalism and Hegemony”. The chapter analyses how the framing of climate change has changed over time, but also how the actual policies employed have safeguarded the hegemonic and paternalistic character of this policy field. It shows how environmental change defines problems and solutions at various political levels, elaborates the climate change-security nexus, develops three reasons for the implementation of context-sensitive adaptation policies, and traces the evolution of international climate change policies.

In chapter 12 on “Security as a Weapon: How Cataclysm Discourses Frame International Climate Negotiations”, *Detlef Rothe* (University of Hamburg, and Helmut Schmidt University, Hamburg, Germany) asks

why the storyline of climate change as a security threat is so successful but does not lead to the political consequences that are assumed by the securitization framework. He draws on the insights of post-structuralist discourse theory to overcome the shortcomings of the Copenhagen School in a metaphor-based discourse analysis focusing on the negotiations of a post-Kyoto agreement, using 60 newspaper articles from major German print media and speeches by political actors in 2009.

In chapter 13 on “Audience: A Weak Link in the Securitization of the Environment?”, *Tasos Karafoulidis* (Organization of Vocational Training, Greece) addresses the reasons for the failure of the securitization of climate change. Focusing on the audience, he tries to explain the insufficient securitization of climate change. He develops a theoretical prism for the analysis, outlining the reasons why the securitization approach is useful and may be applied to climate change. He stresses the role of the audience and discusses how ‘securitizing actors’ increase the persuasiveness of their ‘securitizing moves’ for the audience, and how these results explain the lack of securitization in relation to the audience’s role.

In chapter 14 on “Words, Visuals, and the Vanished Enemy: Visual Securitization and the COP15 Opening Film”, *Tore Rørbæk* (Royal Danish Defence College, and University of Copenhagen) introduces ‘visual securitization’ theory as a way of comprehending the dynamics of securitization, using a film shown at the opening of COP 15. He focuses on climate change as a security issue, reviews the critique of securitization theory for ignoring modern communicative techniques, presents the categories of ‘immediacy, circulability, and ambiguity’ to distinguish an image from a text, and applies these to the analysis of a film.

1.5.4 Climate Change and Migration

In part IV, the authors of four chapters (chap. 15–18) analyse the links between climate change and human migration. These have resulted in, or will lead to, environmentally-forced migration or climate refugees, and this situation is instrumental in generating intensive efforts to justify new technologies and equipment for “Policing Borders in a Time of Rapid Climate Change”.

In chapter 15 on “Climate Change and Human Migration: Towards a Global Governance System to Protect Climate Refugees”, *Frank Biermann* (Department of Environmental Policy Analysis, VU University Amsterdam, The Netherlands/Germany) and *Ingrid*

Boas (University of Kent, UK) analyse the current global governance of refugees and provide a blueprint for a global governance architecture for the recognition, protection, and voluntary resettlement of climate refugees, before reflecting on the political constraints that these proposals are likely to face, and drawing their conclusions. They believe that the protection of climate refugees requires an effective system of multi-level governance, with a strong global framework providing vital support for, and coordination of, national and local efforts.

In chapter 16 on “‘Climate Refugees’ as Dawning Catastrophe? A Critique of the Dominant Quest for Numbers”, *Cord Jakobeit* and *Chris Methmann* (both with the chair of International Politics, University of Hamburg, Germany) survey the research on the climate-migration-nexus, and argue that existing approaches are fundamentally flawed in projecting future numbers of climate refugees. They claim that the maximalist quest for numbers stretches the predictive capacity of the social sciences beyond its limits, and they propose to turn to better understanding the link between climate change and flight and migration, using detailed and thorough case studies that allow for reconstructing the complex causal mechanisms, thus emphasizing the need to understand a complex phenomenon before making predictions.

In chapter 17 on “Environmentally-Forced Migration in Rural Areas: Security Risks and Threats in Mexico”, *Úrsula Oswald Spring* (National University of Mexico (UNAM), Regional Multidisciplinary Research Center (CRIM), Mexico) deals with international migration and its geopolitical repercussions between Mexico and the USA, arguing that different sociopolitical conditions may pose human, environmental, water, soil, food, and health security risks for both countries. She analyses environmentally-forced migration from rural areas in Mexico to towns and to the USA and Canada, develops the theme of environmentally-forced migration, and outlines the specific sociopolitical context for Mexico based on the PEISOR model in the framework of its five consecutive stages.

In chapter 18 on “Policing Borders in a Time of Rapid Climate Change”, *Steve Wright* (Praxis Centre, Leeds Metropolitan University, UK) argues that the process of securitization is already under way due to concerns about internal state security and international terrorism. His central thesis is that a new arsenal of technologies of political control has evolved and that these weapons together with new military doctrines will result in their active deployment against

civilians in new public order roles, including negative human responses to climate change. He explores the risks posed by enhanced border control and crowd control initiatives, together with the massive funding for future security technology innovations provided in the wake of 9/11. He discusses these developments and ethical areas, and highlights some of the complicated moral, legal, and ethical factors. He concludes with several policy suggestions, including the potential role of ‘research activism’.

1.5.5 Climate Change and Security in the Middle East

In part V, four chapters (chap. 19–22) examine the linkage between climate change and security in the Middle East. In chapter 19 on “Climate Change on the Arabian Peninsula – Regional Security, Sustainability Strategies, and Research Needs”, *Dennis Kumetat* (London School of Economics and Political Science, UK) sketches the potential implications of climate change for the Gulf countries, and links it to the changing security dynamics of the region. After an analysis of Yemen, the sustainability strategies of some Gulf States are examined. The chapter offers a policy brief on the impact of climate change in the Gulf and identifies fields for future research.

Chapter 20 by *Andy Spiess* (Gulf Cooperation Council Network for Drylands Research and Development, Germany) on “Environmental Degradation, Climate Uncertainties, and Human Vulnerabilities: Toward a Shifting Security Paradigm in the Arab Gulf Monarchies” addresses the multiple effects that environmental degradation, resource depletion, and climate uncertainties will have on future human security in the region, and outlines the Gulf countries’ limited adaptation capacities. A comparison of the cases of Saudi Arabia, Bahrain, and the United Arab Emirates (UAE) illustrates differences and shows that each Gulf country must be assessed separately. While the Arab oil monarchies urgently need to include these new threats in their regional security discourse, their range of possible actions may already be trapped in a vicious circle.

In chapter 21 on “Altering Security Dynamics? Climate Change Impacts on Iraq”, *Achim Maas* and *Kerstin Fritzsche* (both adelphi, Berlin, Germany) offer an analytical framework for analysing how climate change may lead to insecurity, violent conflict, and political fragility. In this way they are able to create synergies between existing approaches. They provide a brief overview of the main concepts and approaches

to climate change and security, apply the *Regional Security Complex Theory* by Buzan and Wæver to the case of Iraq, and show how climate change could induce (further) instability there and in the neighbouring countries. Iraq was chosen for its political relevance and as a downstream country that most likely will be negatively impacted by climate change. They focus on violent or armed conflict from a non-traditional approach to security.

In chapter 22 on “Reality and Discourses of Climate Change in the Israeli-Palestinian Conflict”, *Clemens Messerschmid* (Universities of Göttingen and Freiburg, Germany) examines climate change implications in the Middle East for Israel and the occupied Palestinian territories in their respective discourse and in particular with respect to the sociopolitical consequences for the water conflict. He discusses how the *climate change* (CC) discourse can be instrumentalized for non-scientific hydrostrategic agendas and he argues that CC is successfully employed to excuse the injustice in water relations under the Israeli occupation. The critical CC discourse analysis is juxtaposed with the conflict. The solutions proposed for adaptation and mitigation are discussed for the respective discourses on cooperation.

1.5.6 Climate Change and Security in Africa

In part VI, five chapters (chap. 23–27) map climate insecurity in Africa, address the resource competition and conflict amongst pastoral communities in Kenya, review possible linkages between climate change and violent conflicts in Nigeria, discuss efforts to enhance security and resilience of low-income communities in Kampala, and assess malnutrition and conflict in East Africa by pointing to the impacts of resource variability on human security.

In chapter 23 on “Locating Climate Insecurity: Where Are the Most Vulnerable Places in Africa?”, *Joshua W. Busby* (LBJ School of Public Affairs; Robert S. Strauss Center for International Security and Law, University of Texas at Austin, USA), *Todd G. Smith* (LBJ School of Public Affairs), *Kaiba L. White* (Climate Change and African Political Stability (CCAPS) Programme, Robert S. Strauss Center for International Security and Law), and *Shawn M. Strange* (Sustainability Education and Economic Development (SEED) Center, LBJ School of Public Affairs) argue that Africa is most vulnerable to climate change with severe physical effects due to the low adaptive capacity of many African states. This chapter opens with a discussion of vulnerability and includes a review of

several examples of vulnerability indices, it presents an overview of the approach of the authors to vulnerability and a detailed review of the methodology, and it presents the findings and several maps of areas of particular concern.

In chapter 24 on “Climate Change, Resource Competition, and Conflict amongst Pastoral Communities in Kenya”, *Beth Njeri Njiru* (Kenyatta University, School of Environmental Studies in Nairobi, Kenya) argues that violent conflicts involving pastoralists are associated with resource competition aggravated by climate change. Conflicts among the pastoral communities have become very common and increasingly relentless in the northern region of Kenya. The study documents the evidence of climate change in the pastoral areas of Kenya, determines its effects on pastoralist livelihoods, and discusses its effects on resource-based conflicts among pastoral communities. Primary data was obtained from pastoralists, agro-pastoralists and key informants, and four focus group discussions were conducted on how climate change has affected pastoralism. She concludes that resource competition among the pastoralists has resulted in conflict.

In chapter 25 on “Climate Change and Violent Conflicts in Nigeria: Human Needs and Relative Deprivation Theories”, *Oscar Edoror Ubhenin* (Ambrose Alli University, Ekpoma, Nigeria) discusses the major causal chains between climate change and violent conflicts and what theories are helpful for the analysis of the links between climate change and violent conflicts in Nigeria. Two theories, namely ‘human needs’ and ‘relative deprivation’, provide a framework for explaining the causal link between climate change and violent conflict. The first theory argues that a root cause of conflict is the failure to satisfy universal human needs. The relative deprivation theory explains the gap between people’s expectations and reality, between what their life ‘is’ and what their life ‘ought to be’. Based on the literature, he analyses the Niger Delta conflict and the Boko Haram uprising, and identifies the prospects for addressing climate security challenges for Nigeria.

In chapter 26 on “Enhancing Security and Resilience of Low-Income Communities to Climate Change in Growing Cities: An Assessment of Flood Management and Planning Regimes in Kampala City Uganda”, *Paul Isolo Mukwaya* (Department of Geography, Geo-informatics and Climatic Sciences, Makerere University, Kampala, Uganda), *Hannington Sengendo* (Department of Architecture and Physical Planning, Makerere University), and *Shuaib Lwasa*

(Department of Environmental Management, Makerere University) assess the influence of flood management and planning regimes in enhancing the resilience and security of these low-income settlements.

In chapter 27 *Pedram Rowhani* (Department of Geography, University of Sussex, Brighton, UK, from Luxembourg), *Olivier Degomme* (Ghent University and University of Louvain, Belgium), *Debarati Guha-Sapir* (*Centre for Research on the Epidemiology of Disasters* (CRED), University of Louvain, Research Institute Health and Society, Brussels, Belgium, from India), and *Eric F. Lambin* (Department of Geography, University of Louvain, Belgium; Woods Institute for the Environment, Stanford University, USA, from Belgium) deal with “Malnutrition and Conflict in East Africa: the Impacts of Resource Variability on Human Security”. They present a study of the geographical distribution of malnutrition and armed conflicts in eastern Africa (Sudan, Ethiopia, Somalia), where droughts, floods, famines, and violence have prevailed for decades. They offer a statistical investigation into whether there is a regional-scale association between spatio-temporal variations in ecosystem attributes and the occurrence of malnutrition and conflicts, while controlling for other important factors. Contrary to a widely-held view, they suggest a positive association between ecosystem productivity and conflicts. Their analysis does not show any association between short-term land degradation and either conflicts or malnutrition.

1.5.7 Climate Change and Security in Asia and the Pacific

In part VII, in five chapters ten authors offer case studies on Bangladesh, India, and Indonesia, and on the challenge posed by climate change for sovereignty, with a focus on the Pacific.

In chapter 28 on “Climate Awareness and Adaptation Efficacy for Livelihood Security against Sea Level Rise in Coastal Bangladesh”, *Md. Mustafa Saroar* (Urban and Rural Planning, Khulna University, Bangladesh) and *Jayant K. Routray* (Regional and Rural Development Planning; Disaster Preparedness, Mitigation, and Management, Asian Institute of Technology, Bangkok, from India) analyse the influence of climate awareness on coastal people’s adaptation efficacy against the impacts of *climate change and sea level rise* (CC-SLR) on their livelihood security. They focus on the coastal community in Bangladesh who are most susceptible to SLR. They assess the coastal people’s relative awareness of climate change through

the perception of CC-SLR-related events, familiarity with climate change and extreme weather signals, and tacit or intuitive knowledge about the impacts of future SLR. Three indices, a ‘perception index’, a ‘familiarity index’, and a ‘knowledge index’, as proxy indicators of climate awareness, are introduced and subsequently constructed.

In chapter 29 on “Security Implications of Climate Refugees in Urban Slums: A Case Study from Dhaka, Bangladesh”, *Sujan Saha* (consultant from Bangladesh who lives in Denmark) asks whether climate refugees are a threat to peace and security. He offers an empirical examination of the climate-induced instability thesis using a micro-level analysis of the security implications of climate change. This is based on a survey of individuals who have migrated from the slums of Dhaka, and examines the role of the interactions between migrated individuals and groups in leading to violent conflicts at the micro level.

In chapter 30 on “A Psychological Perspective on Climate Stress in Coastal India”, *Ruchi Mudaliar* and *Parul Rishi* (both Indian Institute of Forest Management, Bhopal, India) offer a pilot study of a coastal site in India and develop a conceptual framework for the behavioural analysis of people in the context of climate change and how they have adapted to it. If global climate change is anthropogenic, then the solutions are also rooted in human behaviour.

In chapter 31 *Mohammad Zulfan Tadjoeeddin* (University of Western Sydney, Australia, from Indonesia), *Anis Chowdhury* (University of Western Sydney; and Department of Economic and Social Affairs of the United Nations (UN-DESA), New York, from Australia/Bangladesh), and *Syed Mansoob Murshed* (Institute of Social Studies (ISS), The Netherlands; and Birmingham Business School, University of Birmingham, UK, from Bangladesh) examine “Routine Violence in Java, Indonesia: Neo-Malthusian and Social Justice Perspectives”. They analyse the role of population pressure and inequality and their possible joint effects on routine violence in Java by looking at violence from the perspectives of neo-Malthusianism and social justice. They empirically scrutinize these two determinants of violent conflict, and their possible joint effects on routine, everyday violence in the ethnically rather homogenous and densely populated Java. They review past research on violent conflict in Indonesia and discuss the framework of analysis of routine violence that is linked to population pressure and inequality. They explain their model and data issues and present the results, and some conclusions.

In chapter 32 on “Territorial Integrity and Sovereignty: Climate Change and Security in the Pacific and Beyond”, *Achim Maas* and *Alexander Carius* (both adelphi, Berlin, Germany) discuss the impacts of climate change on the Pacific island states. They review the possible security implications of climate change for different sectors, ranging from non-traditional security threats to traditional security challenges, relating these to territorial integrity and sovereignty, and discussing key regional security threats. They start with a discussion of the meaning of security regarding climate change and security for Pacific small island states, review the implications of climate change for the Pacific, outline the potential security implications of climate change at the domestic level, discuss the impacts on borders, territories, and statehood, and reflect on five key challenges regarding their global implications and how to turn these challenges into opportunities.

1.5.8 Improving Climate Security: Cooperative Policies and Capacity-Building

In part VIII, in five chapters (chap. 33–37) seven authors address cooperative policies for the climate change-security nexus by reviewing the political debate on securitization at the UN, considering climate change in the context of peacekeeping and UN reform, the relevance of the forestry aspects (REDD) in the context of international climate change policies, and presenting an extensive case study discussing possible responses to climate change impacts but also economic opportunities in the Mediterranean and the MENA region. One chapter looks into the role of information systems in improving resilience and security.

In chapter 33 *Gerrit Kurtz* (University of Potsdam, Germany) examines the “Securitization of Climate Change in the United Nations 2007–2010” using an interpretative analysis, based on discourse theory, of the speeches by representatives of UN member states as well as surrounding documents. The theoretical framework relies on the securitization theory of the Copenhagen School and on the ‘sociological’ approach of the Paris School, and includes the concerns of Critical Security Studies. After a discussion of the theoretical and methodical framework of a revised securitization theory, the empirical part identifies discourse coalitions in the UN debates based on a common understanding of security. The author offers a functional analysis of the discursive tools employed by

the speakers and their combination with certain frames, narratives, and storylines. He then discusses the results of these analyses by placing them in their explicit institutional and temporal context, and tries to answer the questions of why climate change is securitized in the United Nations and what the corresponding policy implications are that can be discerned from the actors’ discourse strategies.

In chapter 34 *Bo Kjellén* (*Stockholm Environment Institute* (SEI); Uppsala, Sweden) and *Peter Wallensteen* (Dag Hammarskjöld Professor of Peace and Conflict Research, Uppsala University; and University of Notre Dame, Indiana, USA) discuss linkages between “Climate Change, Peacekeeping, and Perspectives for UN Reform”. They note that the security concerns of nations are changing: whereas traditional security policy has been crafted to face threats from other nations or coalitions of nations, the Anthropocene has created a new kind of threat as we cannot negotiate *with* climate change. They call for a new diplomacy for sustainable development and assess the role of the *UN Framework Convention on Climate Change* (UNFCCC).

In chapter 35 on “International Climate Change Policies: The Potential Relevance of REDD+ For Peace and Stability”, *Dennis Tänzler* (adelphi, Berlin, Germany) and *Felix Ries* (German social anthropologist who works in Fiji) address the lack of reflection on the linkages between climate change impacts and peacebuilding by analysing a key aspect of the mitigation debate, namely reducing deforestation, and how this may impact on potential (post-)conflict constellations. To this end, the major linkages between the relevant security implications of climate change and the major challenges for peacebuilding are outlined, and the potential of policies aimed at mitigating climate change through the reduction of deforestation in the context of the (de-)stabilization of conflict-prone areas are discussed. The chances and risks associated with these policies are explored, along with the conditions under which they are likely to achieve their goals through the strengthening of capacities and sound engagement with the international climate change process.

In chapter 36 on “The Role of Information Systems in Improving Resilience and Security through Innovation-Oriented Capacity Building”, *Tagelsir Mohamed Gasmelseid* (King Faisal University, Al Ahsaa, Saudi Arabia, from Sudan) presents the concept of capacity development in urban water management, with an emphasis on the challenges and limitations. He addresses its conceptualization in the context of sustain-

able innovations in urban water management, and reflects on information systems in this context.

In chapter 37 *Hans Günter Brauch* (Free University of Berlin; and editor, Hexagon Book Series, Mosbach, Germany) discusses “Policy Responses to Climate Change in the Mediterranean and in the Middle East and North Africa in the Anthropocene”. He starts with a discussion of the geographic focus and of the PEISOR model for the analysis of interactions between nature and human systems, and notes the gap between the projected impact of global climate change and the insufficient political awareness, diagnosis, and policy implementation. He then presents possible policy responses, as strategies, policies, and measures to address climate change in the MENA region, using projections to 2030, 2050, and 2100. The chapter discusses the need for improving the knowledge base by research that relies on a required fundamental change to scientific paradigms, to the worldviews of scientists, and to the mindsets of policymakers. This change is needed to cope with the projected multiple security challenges in either a ‘reactive’ or a ‘proactive’ mode. Although the study is based in the social and policy sciences, relying on qualitative-sociological methods and approaches used in the research programmes of peace, security, and environmental studies, its goal is multidisciplinary, and it offers a regional case study illustrating the need for a ‘fourth sustainability revolution’ in the framework of the suggested new ‘political geo-ecology for the Anthropocene’.

1.5.9 Conclusions and Outlook

In part IX in chapter 38 the five co-editors, Jürgen Scheffran, Michael Brzoska, Hans Günter Brauch, Peter Michael Link, and Janpeter Schilling, summarize the theoretical and empirical results of the contributions, and try to place the results from this book within the framework of emerging international scientific research on the climate change and security nexus, as well as work at Hamburg University, including that in the framework of the CliSAP cluster of excellence and the research programme of the CLISEC Research Group.

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**Part II Climate Change, Human
Security, Societal Stability, and
Violent Conflict: Empirical and
Theoretical Linkages**

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2 On Environmental Change and Armed Conflict

Halvard Buhaug and Ole Magnus Theisen

2.1 Introduction

Environmental security (ES) is a complex concept with many connotations. It is a central part of the even broader concept of human security (UNDP 1994) and is inherently linked to sustainable development (Brundtland 1987). All these terms emerged at a time when the threat of large-scale nuclear war was no longer perceived as credible, and policymakers and military actors alike saw the need for a wider application of the security term.

Renner (2006) identifies four broad aspects or categories of research on environmental security. The first is whether and how environmental change impacts conflict formation, violent as well as non-violent. A key component of this approach is environmental scarcity, which may be due to increasing consumption, decreasing supply, inequity in access, or a combination of the three (Homer-Dixon 1999). The second aspect of ES connects resource wealth with conflict. Environmental consequences of extensive, industrialized resource extraction (such as pollution, deforestation, changing upstream-downstream dynamics), and unfair distribution of benefits and income are central here. Third, ES includes environmental impacts of armed conflict (nuclear winter being an extreme-case scenario), while the fourth component discussed by Renner (2006) covers environmental peacemaking. In line with an increasing focus on the social consequences of climate change, a large majority of contemporary scholarly contributions to the ES literature relates to the first category. For this reason, we limit the subsequent assessment of theoretical and empirical work to that focusing on the security implications of environmental scarcity and change.

This chapter starts with a review of the theoretical foundation for the central arguments linking climate change to armed conflict.¹ Next, the quantitative literature on the subject matter is assessed, pointing to notable discrepancies in findings and interpretations. The substantive contribution of the chapter is an

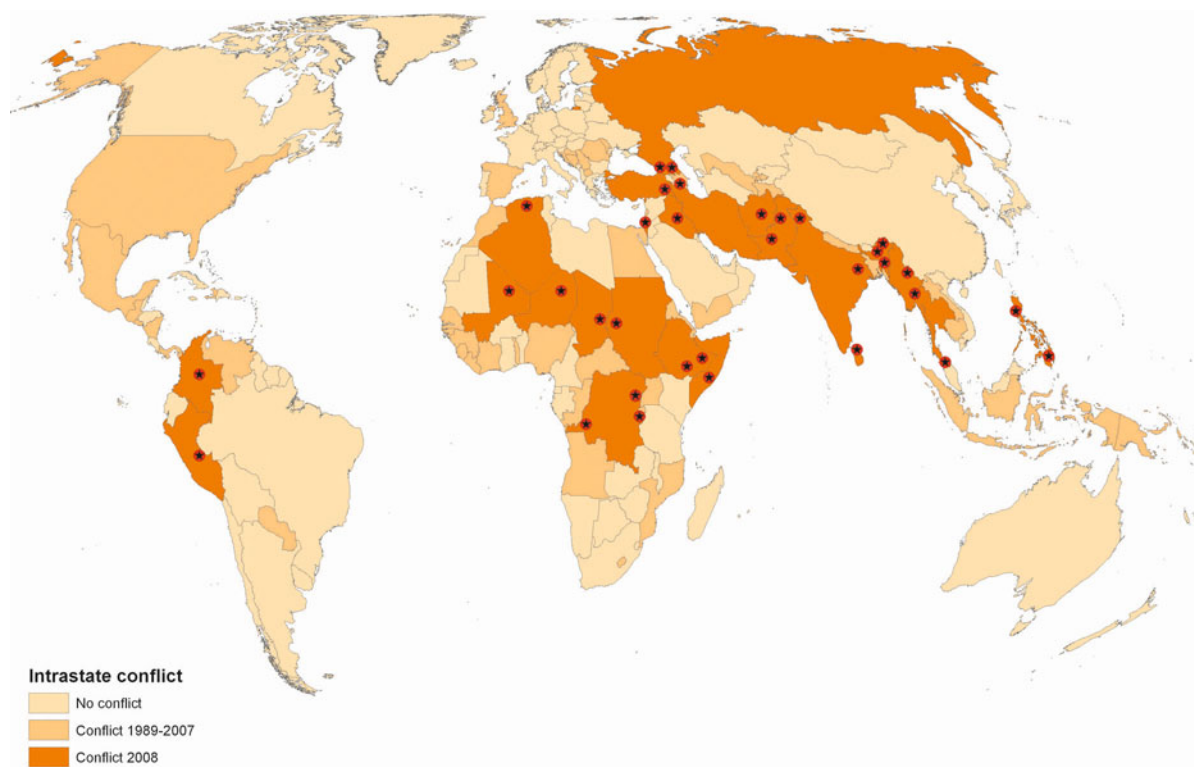
empirical assessment of drought and civil war in sub-Saharan Africa since 1960, using a large variety of complementary measures of short-term rainfall deficiency. Almost all specifications return an insignificant result for drought; however, we do find weak signals in some models that drought two years earlier increases the risk of the onset of civil conflict. The chapter concludes by offering a few suggestions for future research.

2.2 Point of Departure

Since its peak in the early 1990s, the global prevalence of armed conflict has undergone a remarkable decline (Harbom/Wallensteen 2009). The reasons for this decline are many, including the collapse of the bipolar world system, successful resolution of the many consolidation conflicts in the former Soviet Union and Yugoslavian republics, increased international community interventions (notably by UN peacekeeping forces), and the spread of liberal norms and values (Gleditsch 2008). Armed conflicts today are overwhelmingly concentrated in poor, developing countries with illiberal and corrupt political regimes. Most of these countries share a border with at least one other conflict-ridden country, epitomizing the transnational character of contemporary conflicts (Gleditsch 2007). As shown in [figure 2.1](#), almost all active armed conflicts are found in central parts of Africa and southern Asia.

1 This study focuses on state-based internal armed conflict and civil wars. Our definition of conflict corresponds to the UCDP/PRIO Armed Conflict Dataset (Gleditsch/Wallensteen/Eriksson et al. 2002), i.e., violent fighting between a state and one or more organized non-state actor(s) resulting in at least 25 fatalities per year. We use the terms conflict and war interchangeably in this chapter. See discussion for alternative forms of violence.

Figure 2.1: Contemporary armed conflicts. **Source:** The map is generated from version v4-2009 of the UCDP/PRIO Armed Conflict Dataset (Gleditsch/Wallensteen/Eriksson et al.). Symbols indicate the geographical midpoint of conflicts active in 2008.



Contemporary armed conflicts are almost exclusively located in developing countries, many of which are experiencing significant environmental stress, be it due to industrialization, pollution, population growth, other anthropogenic effects, or natural processes such as changing weather patterns and high exposure to natural disasters. Future climate change may add to the burden in these societies. Large parts of the globe, including the subtropics of Africa and Asia, are projected to undergo adverse environmental changes (e.g., increasing frequency and severity of drought and extreme weather events) in the coming decades (Christensen/Hewitson/Busuioc et al. 2007).

Experts agree that Africa will be hit first and most extensively by a less hospitable climate (Boko/Niang/Nyong et al. 2007; Stern 2007). This is explained in part by the continent's high economic dependence on rain-fed agriculture, in part by its high environmental vulnerability, and partly by its mostly weak institutional coping capacity. Since only four per cent of arable land in sub-Saharan Africa is irrigated, the continent's predominantly agricultural economies suffer from a low resilience to extreme weather events and increasing climate unpredictability. The result might

be loss of agricultural productivity and considerable vegetation die-off in exposed regions, with negative implications for food security (Breshears/ Cobb/Rich et al. 2005). According to recent estimates by the *United Nations Environment Programme* (UNEP 2008), almost all sub-Saharan countries will be in a state of water stress by 2025. Two-thirds of the workforce in sub-Saharan Africa is employed in the rural sector, adding to the particular vulnerability to climate change of this region (Stern 2007).

There is little doubt that the cocktail of high environmental vulnerability and future climate change constitutes a significant threat to human security in a broad sense. Loss of rainfall, more extreme precipitation and wind patterns, and an increase in average and peak temperatures may have devastating impacts on livestock and farming. Among the many plausible consequences are escalating food prices, malnutrition and famine, and increased exposure to diseases, all of which might cause rapid and large-scale human displacement (e.g. Laczko/Aghazaram 2009). Some argue that these challenges also constitute a security threat in a narrow, or classic, sense. In fact, the ES literature includes a number of references to competi-

tion over scarce resources that take the form of armed conflict (e.g. Baechler 1999; Homer-Dixon 1991, 1999; Kahl 2006). A common feature in the majority of these cases is the involvement of politically and environmentally marginalized groups in discriminatory regimes. One such example is found in Kahl (2006), who argues that highly politically exclusive institutions and salient ethnic cleavages in combination are crucial contingent factors for whether *demographic and environmental stress* (DES) will produce violent conflict. Similarly, Reardon and Taylor (1996) remark that poor households frequently lack access to non-farming economic activities and are forced to sell livestock and other assets in the face of drought. Discrimination from state authorities adds a further strain on a group's resources. This will affect the group's ability to adapt to a climatic shock (Barnett/Adger 2007). If a group is being denied access to central decision-making processes it is left with few peaceful means of addressing its grievances and concerns (Tilly 2003). Moreover, political exclusion and economic marginalization can generate or reinforce a common identity for the group, which is a key foundation for effective mobilization (Gellner 1983; Gurr 2000; Tilly 1978).

Environmental marginalization might also have more indirect implications for human security and the risk of armed conflict. Forced migration is often considered a key conflict-inducing mechanism in this regard (Christian Aid 2007). While some people may choose to relocate in response to increasing scarcities, distress migration may only transfer the problem elsewhere, if host communities are unable to meet a rapid increase in demand for fresh water, pasture, firewood, etc. This might give rise to resource competition and ethnic tension, as well as land use conflicts between the migrants and the host community (Reuveny 2007). Owing to data limitations and the lack of conceptual clarity, no empirical study has been able to explore the security implications of 'environmental migration' across multiple cases (Raleigh/Jordan 2010).

A somewhat different reasoning for a scarcity-conflict connection is found in the economic literature on civil war. In rain-fed agrarian societies, it is argued, significant deviations from normal precipitation levels reduce income from agriculture and other rain-dependent industries. Such environment-induced economic shocks might heighten the risk of conflict in two ways (Burke/Miguel/Satyanath et al. 2009; Miguel/Satyanath/Sergenti 2004). First, loss of state revenues due to less taxation and fewer exports and other income-generating activities may result in a wid-

ening wealth gap between the privileged (i.e. political elites and their supporters) and the discriminated-against segments of society (Albala-Bertrand 1993). Moreover, it can reduce the government's capacity for counter-insurgency (e.g. monitoring, policing, military fighting power) and its ability to deliver public goods. Both outcomes may engender greater opportunities and incentives for dissident organizations to employ violent means to realize their goal. Second, an economic shock may lower the economic opportunity cost to individuals of becoming rebel soldiers by increasing unemployment and lowering wages. This argument can be related to a view of rebellion as individual criminal behaviour, where a potential rebel's decision is based on calculations of expected private economic gain (Collier 2000; Grossman 1991).

The proposed mechanisms that translate a diminishing per capita resource base into violent conflict differ between the literatures; ES-based arguments point to migration, local inter-ethnic competition, and state exploitation as important catalysts, while the economic approach relies on macro-structural explanations of failing state institutions and rationalist individualist behaviour. Yet the theorized outcome is quite similar: riots, rebellion, and civil war.

2.3 Quantitative Research: State of the Art

The first wave of generalizable, large-N research on environmental scarcity and civil war emerged more than a decade ago (e.g. Hauge/Ellingsen 1998; Esty/Goldstone/Gurr et al. 1998). These studies were quite simplistic by today's standards, relying on mostly static measures of environmental features and suffering from considerable missing data. In the interests of space, this pioneering work will not be reviewed here but instead the interested reader is referred to Buhag, Gleditsch, and Theisen (2010), Salehyan (2008), and Theisen (2008).

Following increasing awareness of global warming and concerns about its possible social effects, research on environmental scarcity and armed conflict has seen a revival in recent years. A notable contribution to the second generation of work is the special issue of *Political Geography* on "Climate Change and Conflict", guest-edited by Nordås and Gleditsch (2007). In many ways, this journal issue embodies the current state of knowledge: the inconclusiveness concerning the impact of the environment on violent conflict. For example, Hendrix and Glaser (2007), study-

ing the association between rainfall patterns and civil war in sub-Saharan Africa, find that drier years increase conflict risk but conclude that future climate changes are unlikely to have a dramatic effect on the incidence of conflict overall. Intriguingly, their analysis also suggests that civil conflict is *positively* associated with freshwater availability per capita. Other studies that report an inverse relationship between rainfall and civil war include Miguel, Satyanath, and Sergenti (2004), and Jensen and Gleditsch (2009). However, as demonstrated by Ciccone (2010), this correlation is an artefact of the particular rainfall growth measure that all of these studies employ (see also Buhaug 2010). Moreover, a disaggregated analysis of local precipitation and civil war outbreak fails to uncover a systematic relationship even with the problematic rainfall growth variable (Theisen/Holtermann/Buhaug 2010).

A second contribution to the special issue looks at a wider set of environmental indicators on a global scale (Raleigh/Urdal 2007). This study finds some support for the population pressure hypothesis in that civil wars are more frequent in densely populated areas and areas with high rates of population growth. The substantive impacts of these factors are low, however, as political and economic factors far outweigh demographic explanations of civil war. In another study, Urdal (2005) finds that high pressure on potential cropland is *negatively* related to civil conflict, but that population growth and density jointly increase the risk of conflict, if only marginally. The comprehensive statistical analysis by Hegre and Sambanis (2006) provides no support for the neo-Malthusian population pressure hypothesis. Similarly, Binningsbø, de Soysa, and Gleditsch (2007) find that countries with a high consumption of renewable resources are *less* at risk of civil conflict, even after controlling for economic development (Theisen 2008).

Recently, a quantitative investigation received much publicity for its finding that higher temperatures are associated with higher civil war frequency in sub-Saharan Africa (Burke/Miguel/Satyanath et al. 2009). In fact, the article concludes that future warming is likely to outweigh any pacifying effect of future economic growth and democratization in the region. This is certainly a worrying projection. Yet, as with the authors' previous study (Miguel/Satyanath/Sergenti 2004), the finding is sensitive to the techniques of model specification and estimation. A follow-up study by Buhaug (2010) shows that small alterations to the unconventionally coded dependent variable (major civil war years) completely dissipate the result, and

the conclusion also falls if a standard non-linear model with time-varying covariates (i.e. logistic regression) is chosen, or the temporal domain is expanded to include the most recent years.

A promising avenue for further scrutiny concerns the relationship between communal violence and climatic factors. So far, most evidence runs counter to a simple scarcity-violence connection. For example, Meier, Bond, and Bond (2007) found little evidence of violence being more pronounced in the dry season in the borderlands of Kenya, Uganda, and Ethiopia. Witsenburg and Adano (2009) found that, on average, wet years brought twice as many deaths in inter-group cattle raiding episodes as dry years in Marsabit and Moyale districts in northern Kenya. Likewise, Raleigh (2010) finds some evidence for more violent events during the rainy seasons than during the dry season for Kenya. Still, the consequences of environmental degradation and resource scarcity for low-level violence and communal conflicts remain critically under-researched. As data on non-state conflicts and local violent events are increasingly being collected in a systematic manner (e.g. the UCDP Non-State Conflict dataset), this should have high priority for future research.

In the next section, we offer a new empirical assessment of rainfall variability and civil war for the entire African continent. We draw on an unparalleled selection of precipitation parameters, including not only current and past-year estimates of annual rainfall but also various deviation measures, as well as a direct drought indicator that taps intra-annual deviations from normal precipitation. Moreover, we expand the temporal domain of Miguel, Satyanath, and Sergenti (2004) and subsequent studies to the entire post-colonial period.² Finally, we explicitly incorporate socio-political structures and investigate a series of plausible interaction effects suggested in the ES literature.

2.4 Rainfall Patterns and Civil War: A Closer Look

As outlined above, the literature is still in disagreement regarding the true relationship between drought and civil conflict. This chapter seeks to offer the most

2 For various reasons, Hendrix and Glaser (2007), Jensen and Gleditsch (2009), Ciccone (2010), and Buhaug (2010) all apply derivatives of the same dataset, containing annual observations of countries in sub-Saharan Africa for the period 1981–2002.

comprehensive empirical assessment of drought and civil war to date. Our general expectation, which is inspired by arguments and narratives presented in the environmental security literature, is articulated in the following deliberately simplistic hypothesis:

Hypothesis: Drier years are associated with a higher risk of civil war.

To test this hypothesis a multivariate regression analysis is conducted on independent African states for the period 1960–2004. The heavy reliance on rainfall for African livelihoods and the distinct seasonality of precipitation patterns in much of the continent make not only the amount but also the timing of the rain crucial. The latter dynamic has been ignored in the empirical literature thus far. Heavy rainfall outside the rainy season(s) may contribute to normal amounts of annual precipitation in otherwise dry years, and yet lead to failed harvests as the rainfall comes too late, too early, or in too concentrated a period. For instance, in 2000 large areas of Ethiopia experienced a drought according to the EM-DAT natural disasters database (CRED 2009). The Wello and Hararge areas in the central east of the country were hit particularly hard. At the same time, annual statistics for the year 2000 show that Ethiopia as a whole saw 12 per cent more precipitation than the annual average for the period 1951–2004. Even though half of Ethiopia experienced rainfall shortage or disrupted rainfall patterns that led to a drought affecting nearly 5 million people, this was masked by the aggregated statistics.

In order to capture intra-annual variation in precipitation the high-resolution *Standardized Precipitation Index* (SPI6) is used, available at $0.5^\circ \times 0.5^\circ$ grid resolution. This index is based on moving rainfall deviation scores from the monthly average during the six preceding months, which are aggregated to the calendar year. The annualized index is dichotomized where drought is defined as three consecutive months with at least 1 standard deviation below normal precipitation or two consecutive months with at least 1.5 standard deviations below normal precipitation (see McKee/Doesken/Kleist 1993 for the idea behind the measure). Two versions of the SPI measure are tested. The first (labelled SPI) is a discrete variable taking the value 1 if a drought was recorded anywhere within the country (i.e. in at least one grid cell) in the year of interest and zero if not. The second (SPI share) captures the geographical share of the country experiencing an SPI6 drought during the year.

The SPI variables capture both intra- and inter-annual rainfall variability and probably constitute the

best available indicator of weather anomaly and local acute water scarcity.³ However, to make our results comparable with earlier studies (notably Burke/Miguel/Satyanath et al. 2009; Hendrix/Glaser 2007) indicators of inter-annual change in precipitation are also included

$$(\text{Rain } \Delta_{it} = \frac{\text{Rain}_{it} - \text{Rain}_{it-1}}{\text{Rain}_{it-1}})$$

as well as rainfall deviation from the long-term country average

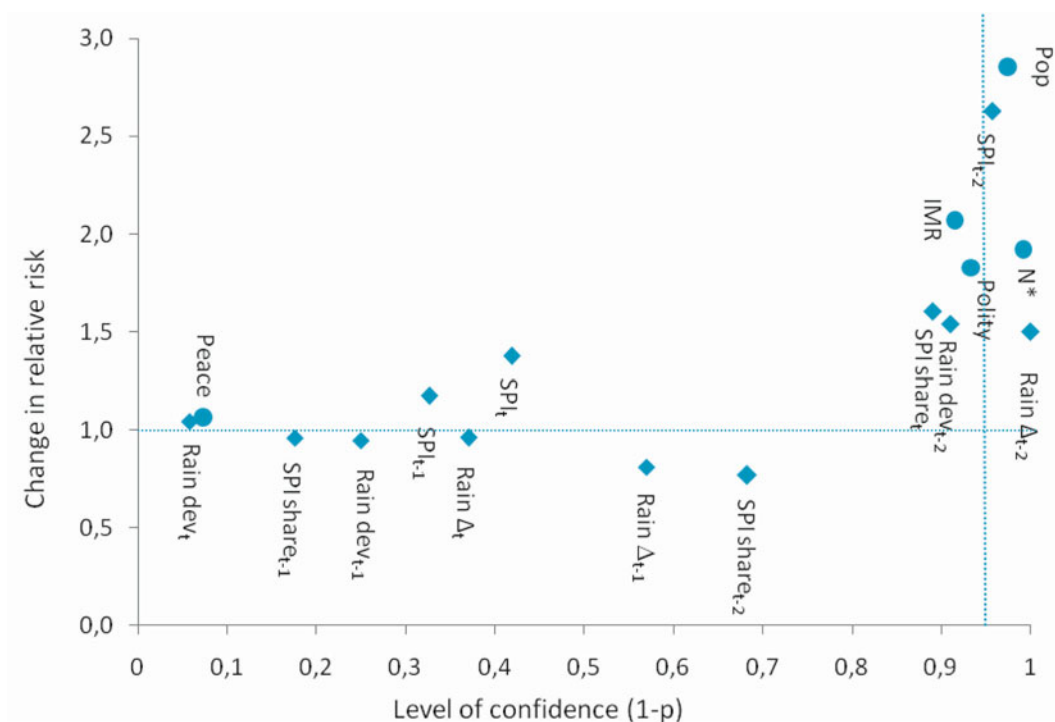
$$(\text{Rain dev}_{it} = \frac{\text{Rain}_{it}}{\text{Rain}\mu_{it\dots itn}}).$$
⁴

All four measures of drought are tested for the current year (t), the previous year (t-1), and two years earlier (t-2). The precipitation data are based on geo-referenced data from the Global Precipitation Climatology Centre of the UN-sponsored World Meteorological Organization (GPCC; Rudolf/Schneider 2005). Country year precipitation estimates were generated by taking the cell mean value for all 0.5×0.5 degree grid cells belonging to the country.

A limited number of control variables are also included. As an indicator of institutional inclusiveness, an updated version of the N^* index of ethno-political exclusion (Cederman/Girardin 2007) is used based on the new *Ethic Power Relations* (EPR) database (Wimmer/Cederman/Min 2009). Put simply, the N^* index gives the proportion of a country's population that belongs to ethnic groups that are excluded from political influence at the national level. A log-transformed variant is used as the initial levels of exclusion-ary ethnocracy are expected to increase the risk more than further steps down the same ladder. We also include the level of democratic institutions measured by the Polity 2 index of the Polity IV project (Marshall/Jagers 2002). The N^* measure and the Polity 2 indicators were both lagged one year to reduce the chance of reverse causality. Further, as a proxy for societal vulnerability, we include data on *infant mortal-*

3 Rainfall shortage is of course only one component of water shortage. Yet, given the limited use of irrigation and scarcity of ice-capped mountains in Africa, rainfall is the key determinant of freshwater availability. Besides this, precipitation is exogenous to (short-term) human activities and social processes such as armed conflict, in contrast to irrigation, waterhole development, and desalination and purification industries.

4 Mean annual precipitation was measured based on statistics for the period 1951–2004.

Figure 2.2: Relative risk and significance for explanatory variables. **Source:** The authors.

Note: Drought measures represented by squares, control variables represented by circles. Plots above the horizontal line at $Y=1.0$ indicate increasing conflict risk with higher values, plots below the line have negative effects. The vertical line marks the threshold value (0.95) for statistical significance.

ity rate (IMR) from the UN's Population Division, supplemented by data from Urdal (2005). The IMR variable is lagged five years to reduce endogeneity. The final control variable is (natural log of) country population size (from Gleditsch 2002). In addition, all models include a non-linear term measuring the time since the previous conflict, based on the UCDP/PRIODATASET (Gleditsch/Wallensteen/ Eriksson et al. 2002), since countries with a violent near past may run a higher risk of experiencing renewed conflict.⁵

Our dependent variable is the onset of civil conflict as defined by the UCDP/PRIODATASET (Gleditsch/Wallensteen/Eriksson et al. 2002), which requires at least 25 persons killed each year in fights between organized non-state actors and state forces. We exclude coups, however, as these by definition are intra-government and so are likely to follow a different logic.⁶ A period of at least two cal-

endar years of peace is required for recurrence of violence to be coded as a new onset.

The results from the regression analysis on the relationship between various rainfall/drought measures and the outbreak of civil conflict are displayed in figure 2.2 below. Each rainfall/drought parameter (represented by squares) was run in a separate model with all of the control variables (circular dots). The vertical axis gives the estimated change in *relative risk* (RR) of civil war onset when the given drought variable shifts from the 10th to the 90th percentile value, with all other factors kept at their median value.⁷ The interpretation is quite straightforward: plots above the horizontal line ($RR=1$) indicate an increasing risk of conflict onset with higher values on the drought variables while $RR<1$ implies a negative association. A relative risk of 2 means a doubling of the risk. The horizontal axis gives the statistical level of confidence for the parameter estimate; the dotted vertical line marks the threshold value for the conventional 95 per cent confidence level. Thus, the plots at the upper rightquad-

5 This was realized as a decay function capturing the time since last conflict in the country with a half-life set to two years.

6 The decision as to whether or not to include coups as civil conflicts does not affect the overall conclusion of the analysis.

7 If it is a dummy variable the effects are computed from moving from 0 to 1.

rant of the figure represent variables that increase conflict risk in a statistically significant manner.

As seen in figure 2.2, the factor that has the largest impact on conflict risk is population size, a finding that corresponds well with earlier studies that population size is one of the three most robust correlates of civil war (Hegre/Sambanis 2006). Furthermore, ethno-political exclusion is found to have a statistically significant and substantive risk-inducing effect, corroborating Cederman and Girardin (2007), Wimmer, Cederman and Min (2009), and Buhaug (2010). Two other controls, *infant mortality rate* (IMR) and democracy (polity) also are positively correlated with the risk of civil conflict onset, although the effects are not significant at the conventional 5 per cent level of uncertainty. This is probably due to the relative homogeneity of African countries with respect to democratic institutions (most are autocratic or semi-autocracies) and development of societal infrastructure (many are among the world's poorest societies).

Most precipitation parameters hover around the horizontal line ($RR=1$) and therefore do not have much to say about conflict risk. The most influential climate variables are the dummy for drought in at least one grid cell in the country two years ago [earlier?] (SPI_{t-2}) and inter-annual rainfall change from $t-3$ to $t-2$ ($Rain_{t-2}$); both increase conflict risk significantly and positively. Furthermore, above-average rainfall in $t-2$ is almost significant at the 95 per cent level. The two latter findings run counter to expectations and give hints of an odd characteristic of the rainfall data.⁸ Sensitivity analyses (not shown) reveal that both these effects are caused in large part by a single case, Djibouti, which exhibits very large variability around its mean precipitation level. When Djibouti is dropped from the analysis, the effects of these parameters dissipate. The result is also sensitive to other minor adjustments in measurements and model specification, which jointly imply that we do not put much faith in this correlation. Contrary to other studies (Hendrix/Glaser 2007) we do not find any effect of current or previous-year precipitation, though the reader should keep in mind that this analysis covers the entire African continent and twice as many years as earlier research.

8 As Ciccone (2010) explains, several African countries affected by civil war experienced unusually wet years at $t-2$. This led Miguel, Satyanath, and Sergenti (2004) to conclude that drying at $t-1$ increases the risk of civil war even though the negative 'growth' in rainfall between $t-2$ and $t-1$ in effect represented a normalization.

We concur with Ciccone (2010) in that using inter-annual change to estimate rainfall shocks is inappropriate as rainfall is mean reverting. This implies that seemingly high positive or negative growth rates frequently represent regression towards the mean trend and not genuine deviations. Deviation from the long-term mean is more reliable, but still misses potentially very important intra-annual variations in precipitation patterns. The fact that different precipitation measures produce different results and any apparent statistically significant relationship disappears once the most extreme outliers are removed forces us to reject the proposed hypothesis; the data do not reveal a robust impact of rainfall variability on civil conflict risk. The results visualized in figure 2.1 do not change substantively if alternative estimation techniques or model specifications are used.⁹

Much of the environmental security literature points (explicitly or implicitly) to interactions between scarcity and distribution, where the political, economic, and cultural contexts come into play (Homer-Dixon 1999; Kahl 2006). In order to test such arguments more properly, the alternative realizations of drought/deviations in rainfall were tested in interaction with three variables that tap some of the potentially conditional effects on civil conflict: political exclusion, the share of a country's population defined as rural, and infant mortality rate. The level of inclusive political institutions in combination with ethnic cleavages is crucial in explaining why some countries experience civil conflict and others do not, and discriminatory political regimes and high ethnic barriers are also argued to be important in making scarce resources more inflammatory. To test this, interaction terms were created between each of the measures of drought with the N^* index of political exclusion. Even though such a connection seems plausible, it did not return a significant coefficient. Next, interactions were investigated with a share of the rural population, as most rural inhabitants in developing countries depend on renewable resources for their livelihood. This interaction added significantly to the model fit in just two specifications. Relatively larger drought-affected areas in the current year (SPI_{share_t}) are associated

9 We ran models with coups included in the classification of civil conflict and used rare-events logit (relogit) instead of ordinary logit regression (King and Zeng 2000). Results are even less in support of the ES argument if we run models for sub-Saharan Africa only (with or without coups, with logit or relogit), as the drought two years earlier (SPI_{t-2}) loses significance in these specifications.

with higher risk of conflict onset, but this effect is driven by the demographic component, not by drought. A similar but somewhat weaker pattern is found for the SPI share_{t-1}. However, the analysis also shows that the cases most prone to conflict are drought-stricken cases with a *low* share of rural population, a finding that is the opposite of what is expected. The only seemingly robust interaction effect uncovered here is the joint occurrence of drought two years ago [earlier?] (SPI_{t-2}) and a high infant mortality rate. While this suggests that there might be a genuine causal link between water scarcity and violent behaviour, the substantial time lag and the failure of other measures of water scarcity to produce similar results imply that this finding should be interpreted with much care.¹⁰

Earlier quantitative studies of rainfall and conflict have produced mixed conclusions. The results presented here are largely in line with those of Buhaug (2010), Ciccone (2010), and Theisen, Holtermann, and Buhaug (2010), who fail to uncover a systematic relationship between drought or negative rainfall deviation and the risk of civil war. Accordingly, our results counter those of Hendrix and Glaser (2007) and Miguel, Satyanath, and Sergenti (2004), who report that unusually dry years lead to a higher conflict risk in the subsequent year. The source of this incongruence can be found in the way drought is measured. Earlier studies that find support for the general ES proposition apply drought variables that measure the proportional change in precipitation from one year to the next. This is unfortunate as the resulting value is conditional on both the current and the previous-year values. Ciccone (2010) shows that such a trivial misspecification results in findings directly opposite to those produced when rainfall is measured properly (though any statistical association disappears once extreme outliers are left out of the estimation).

Does this mean that there is no linkage between renewable resource shortages and violent conflict? We believe it would be premature to draw such a conclusion at this time. Contemporary statistical research suffers from limitations in data, methodology, and research design that restrict inference, and there are often-ignored disconnections between the case litera-

ture and large-N research that need to be addressed. In the next section we discuss some of the many challenges that face future quantitative research in the field.

2.5 Challenges and Opportunities for Future Research

The patchy empirical support for the general ES proposition is indicative, but far from evidential, that resource scarcities are of limited relevance for the general risk of armed conflict. The fact is that the extant quantitative literature suffers from several shortcomings that should be addressed in future research. There are at least four issues that need attention: level of analysis, type of violence, trigger versus underlying causes, and conditional effects.

2.5.1 Geographic Disaggregation

Most quantitative studies of the environment and civil war apply the country as the unit of analysis (e.g. Burke/Miguel/Satyanath et al. 2009; Hendrix/Glaser 2007; Miguel/Satyanath/Sergenti 2004; Theisen 2008; Urdal 2005). Yet, as illustrated by the eastern Ethiopian drought in 2000, resource availability may vary significantly across space – within states – and armed conflicts too tend to be discriminatory in their spatial impact on conflict-ridden countries (Buhaug/Lujala 2005). Conventional country-level research designs are not well suited to tap such nuanced patterns. Acknowledging this deficit, there has been a surge in disaggregated studies of civil war in recent years, focusing on the particulars of the areas where conflicts break out or take place (e.g. Buhaug/Rød 2006; Østby/Tadjoeddin/Urdal et al. (2011); Raleigh/Urdal 2007; Theisen/Holtermann/Buhaug 2010; Urdal 2008). Some of these high-resolution studies do suggest a violence-inducing effect of local resource scarcity under certain conditions, as Østby, Tadjoeddin, Urdal et al. (2011) argued for the case of Indonesia and as in Urdal's (2008) sub-national analysis of India. Time will show whether these associations also apply to other cases.

The disaggregation trend contains great potential for offering additional and more precise insight into the systematic covariation between environmental factors and conditions and violent behaviour. Such spatially focused sub-national studies should not be seen as a replacement for country-level analyses, however. Some theories of political violence and civil war focus

10 The interactions between our battery of drought measures and the share of a country's revenues that come from agriculture were also tested, without significant results. It should be noted that the agricultural income data suffer from substantial missing observations, which might affect this result.

on state-wide features that carry little meaning at a local level, including central political institutions, export structure and the national economy, international trade patterns, commodity prices, etc. However, when theory predicts local mechanisms and characteristics conducive to violence, such as political discrimination, economic marginalization, and, crucially, high or increasing environmental degradation, a disaggregated research design should be adopted.

2.5.2 Widening Understanding of Conflict

To date almost every empirical investigation of the drought–conflict nexus deals with large-scale state-based violence, most typically civil war. While larger-scale violence may be less likely to result from short-term resource scarcities caused by organizational and financial factors (Wolf 1998), there are sound reasons to expect that other, less severe forms of violence might be more closely related to environmental factors. Writing on the violence in Darfur in the late 1990s, Suliman (1999) argues that local conflicts between groups competing over scarce renewable resources such as water and land in areas where there are no free eco-zones to migrate to are the most relevant in a scarcity–conflict framework. Suliman further argues that the frequency of this kind of conflict is increasing, notably in the Sahel and Horn of Africa regions. Unlike national conflicts over state power or regional warlord competition, these conflicts take the form of local violent resource competition between marginalized groups. In a similar vein, Raleigh (2010) suggests that if climate variability were to play a role in violent conflicts the lens should be directed towards groups without political leverage at the national level and whose choice of alternative livelihoods outside agriculture or pastoralism is limited. These groups are often regarded as the most vulnerable to climatic shocks, and, particularly in contemporary weak African states, these groups are often left to fend for themselves in areas with little effective state control and/or interest. This can result in violence as a form of mediation of access to resources and economic goods between groups.

A related point refers to conflict dynamics. So far, little attention has been paid to the nature and severity of conflicts within the context of resource scarcity and harsh environmental conditions. What are the immediate implications of drought or climatic shocks for ongoing conflicts? Do increasing scarcities and loss of livelihoods contribute to intensifying prevalent conflicts or do they increase the prospect for peaceful

resolution? Are conflicts likely to take on other forms (e.g. a shift from communal violence to riots and government-directed assaults) when environmental conditions deteriorate? These are only three of the many possible research questions related to conflict dynamics that are yet to be addressed in a rigorous, comparative manner.

2.5.3 Trigger vs. Background Effects

The ES literature is generally rather vague as to how scarcities and environmental shocks translate into elevated conflict risk. Much of the recent climate security discourse seems to assume that environmental change primarily contributes to increasing the underlying, or latent, conflict risk. Catchy phrases, such as ‘threat multiplier’ (CNA 2007) and ‘consequences of consequences’ (Smith/Vivekananda 2007) point to the indirect, long-term security implications of climate change. A cumulative slow-moving effect is also reflected in the academic literature, most notably in Homer-Dixon’s (1999) concept of *ingenuity*. Resource scarcity, Homer-Dixon argues, is an important prime mover behind much mal-development and resulting violence in developing countries today. Although it interacts with a multitude of social factors, the social outcome is to a substantial extent determined by the resource base. In contrast, Burke, Miguel, Satyanath et al. (2009; see also Miguel/Satyanath/Sergenti 2004) claim a short-term, trigger effect of climatic variability, and speak of temperature or precipitation anomalies as ‘shocks’. While any factor relevant to armed conflict may affect both immediate and longer-term conflict risk, future research should invest more in specifying the temporal dimension of a causal relationship as this has implications both for designing the quantitative analysis and for prediction. Hendrix and Glaser (2007) provide a starting point by empirically assessing both measures of resource shocks and longer trends. However, much is left for future research since many of the claimed long-term effects of resource scarcity are said to be indirect, affecting conflict risk through slow or negative economic progress, increasing socio-economic inequalities, and institutional failure (Homer-Dixon 1999).

The empirical literature contains a wide range of alternative conflict specifications: some study the outbreak of conflict (e.g. Hendrix/Glaser 2007), others study the prevalence of conflict (e.g. Raleigh/Urdal 2007), while some limit their focus to the most severe war years only (Burke/Miguel/Satyanath et al. 2009).

There is little reason to expect these differences to produce similar results (Buhaug 2010). Again, theory must be the guide for designing the most appropriate conflict measure and applying the most appropriate time lag (if any) to the environmental indicators. Moreover, the quality of environmental data is still rather poor; most measures are given as country aggregates only and complete time-series estimates are rare. That said, recent years have seen a rapid increase in high-resolution data, aided by remote sensing and satellite imagery that enable much-needed indicators of environmental conditions at the local level.

2.5.4 Conditional Factors and Context

While environmental security scholars (Homer-Dixon 1999; Kahl 2006; Baechler 1999) claim an interactive effect between resource scarcities and various societal factors, the underlying empirical evidence is based on too few observations to suggest a general relationship. Obtaining generalizable knowledge in this context is challenging as conventional statistical estimation techniques have their limitations when the theoretical framework implies several simultaneous conditional factors. In effect, current empirical large-N studies are limited to testing approximations of ES theory. This has fostered criticism that quantitative analyses are too simplistic to capture key causal processes (Schwartz/Deligiannis/Homer-Dixon 2001; Kahl 2006) while quantitatively oriented researchers have argued that case-based research fails to produce interesting findings (Levy 1995). One alternative method to investigate complex relationships between multiple independent variables is the use of Boolean logic (Ragin 1987, 2008). However, as with any other method it requires good data on environmental and social factors, which up to now are quite limited. In any case, empirical investigations should strive to test the contextual effects suggested in the literature. Factors such as ethno-political exclusion and poverty are obvious candidates for inclusion (Homer-Dixon 1999; Kahl 2006).

An important aspect for human security in a broader sense is the impact of conflict on social vulnerability to climate change. Armed conflicts often inflict considerable environmental and infrastructural damage. Furthermore, conflict can lead to migration, loss of livelihood, and lowered health levels, factors that in turn increase conflict risk (Collier/Hoeffler 2004; Fearon/Laitin 2003; Salehyan/Gleditsch 2006) and potentially destabilize regions for a longer time span by generating a 'conflict trap' (Collier/Reynal-Querol/Hegre et al. 2003). Consequently, a drought

or a flood is generally thought to constitute a much greater hazard in a conflict-ridden area than in a peaceful region (Busby/Smith/White et al. 2010). Determinants of human vulnerability to climate change are now gaining academic attention. Much like Sen's (1981) seminal insight that press freedom and institutional openness reduce hunger risk, good governance and empowerment of marginalized sections of society are crucial in reducing vulnerability to climate factors (Busby/Smith/White et al. 2010; Raleigh 2010; Ribot 2010).

Research on environmental vulnerability to date has either been in the form of case studies or cross-national analyses looking at national and static aggregates. Busby, Smith, White et al. (2010) argue that such studies might miss important variations in vulnerability, temporally and spatially, and that this strand of research has much to gain from applying sub-national and dynamic explanatory variables. While we agree with this observation, good data are not enough if the underlying logic and assumptions are wrong. There is a tendency in the literature to take drivers of environmental vulnerability for granted or to present causal models without proper empirical validation. Yet any claim of a causal relationship should be subject to rigorous empirical testing before firm conclusions can be drawn.

2.5.5 Concluding Remarks

The true relationship between environmental change and armed conflict remains unresolved. So far, there is little solid evidence of a systematic connection, and the regression analysis presented above substantiates this non-result. This suggests that other factors, such as poor governance, large heterogeneous populations, societal inequalities, poor economic performance, and a conflict-prone neighbourhood are more important in explaining variations in conflict risk. Yet the relevant empirical literature is still in its infancy and many challenges lie ahead. In this chapter four such challenges have been discussed. Geographical disaggregation, replacing crude country-level aggregates and research designs with sub-national data, is already well under way and promises more nuanced assessments of local-level correlations between the environment and conflict. Applying a more inclusive understanding of conflict will allow the forms of organized violence arguably most plausibly linked to adverse environmental conditions to be studied, namely low-intensity social unrest, communal violence, and urban riots. Moreover, a better specification of facilitating

conditions, possible trigger effects, and indirect causal dynamics, theoretically as well as methodologically, should greatly increase the precision of regression estimates and improve our ability to make projections of future insecurity hot spots. It is hoped that future research will be able to address each of these issues in a satisfactory manner.

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3 Climate Change, Societal Stability, and the SID Project

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3.1 Introduction

Beginning in the last third of the 20th century, a number of scholars have argued that adverse human effects on the environment pose an important threat to human security. Indeed, several have issued alarming claims about the potential for violent conflict (Homer-Dixon 1999: 3,4; Schwartz 2003: 2,3 15; Bächler 1999). With increasing scientific evidence of climate change and growing public awareness of the problem, concerns about its security implications reached a new level after the turn of the 21st century. Two recent Nobel Peace Prizes (2004, 2007) have been awarded for work related to environmental change and peace. A number of government-sponsored reports about the effects of climate change on resource scarcity, the main link between climate change and conflict, have painted a troubling picture of the future (BMU 2002; Stern 2006; IPCC 2007; WBGU 2007). Various observers have attributed armed conflicts in Rwanda, Kenya, Assam, Chiapas, and Sudan to the effects of climate change. Moreover, several reputable groups have produced thoughtful and in-depth reports assessing the potential security threats of climate change (Campbell 2007; CNA 2007).

Despite the increasing attention given to the security dimension of climate change, the empirical basis for this concern is highly tenuous, as several observers have noted. Barnett (2003), for example, concludes

It is necessary to be cautious about the links between climate change and conflict. Much of the analogous literature on environmental conflicts is more theoretical than empirically driven, and motivated by Northern theoretical and strategic interests than informed by solid empirical research (Gleditsch 1998; Barnett 2000). This in part reflects the long-standing difficulties in finding meaningful evidence of the determinants of violent conflict and war at the international and subnational levels. On the basis of existing environment-conflict research there is simply insufficient evidence and too much uncertainty to make anything other than highly specula-

tive claims about the effect of climate change on violent conflict, a point that both policy makers and climate scientists should not lose sight of (Barnett 2003: 10).

Theisen reviews the leading ‘large-n’ statistical studies of the link between climate change and security that were published between 1998 and 2007. He concludes that only one quantitative study (Hauge/Ellingsen 1998) “found substantial support for eco-scarcity theory” (Theisen 2008: 801). However, Theisen is unable to replicate the results of that study. He concludes that the results of his attempt at replication “lend little support to a purported link between resource scarcity and civil conflict, whereas it replicates earlier findings on the importance of poverty, instability and dependence on fuel export” (Theisen 2008: 801). Compounding the implications of Theisen’s inability to replicate Hauge and Ellingsen’s results, Buhaug, Gleditsch, and Theisen (2008: 5) note an important paradox that raises profound questions about the hypothesized link between climate change and security: while the physical and human processes affected by climate change have only begun to emerge over the past fifteen years, that time frame has been characterized by a significant reduction in the overall incidence and severity of armed conflict. In the final analysis, Buhaug, Gleditsch, and Theisen concur with Barnett’s earlier assessment (see chap. 2 by Buhaug/Theisen). They note that while several case studies have concluded that resource scarcities associated with climate change contribute to violent conflict, statistical analyses have “failed to converge on any significant and robust association between resource scarcity and civil war” (Buhaug/Gleditsch/Theisen 2008: 2). At best, factors associated with climate change are ‘threat enhancers’. That is, these factors will only affect security if they interact with other factors (ethnic tensions, political instability, poverty, etc.).

Since these reviews were conducted a handful of more ambitious and sophisticated analyses of the relationship between climate change and conflict have appeared. However, they simply provide poignant exam-

ples that support the conclusions of Buhaug, Gleditsch, and Theisen (2008). Zhang, Jim, Lin et al. (2006) examine the relationship between climate change and conflict for the last millennium in China. Tol and Wagner (2009) replicated the analysis of Zhang, Jim, Lin et al. (2006) for Europe. Both employ far more sophisticated analyses than prior researchers. However, they find that increases in violent conflict are related to colder temperatures rather than warmer temperatures. Tol and Wagner also find that the relationship varies over time. Confounding these results is an equally sophisticated analysis by Burke, Miguel, Satyanath et al. (2009). They examined changes in temperatures in Africa for the period from 1981 to 2002 and assessed their impact on battlefield deaths. They find that conflict is positively related to temperature and predict an additional 390,000 battlefield deaths by 2030. This estimate is conservative, they argue, because it takes into account likely increases in economic growth and the spread of democracy, both of which suppress the incidence of violence. These bold conclusions notwithstanding, the research that supports them has been the subject of a withering methodological critique that calls them into question (Buhaug 2010).

The failure of existing research to generate a clear, empirically-based consensus in this area is hardly surprising, for several reasons. First, this field of inquiry is in its infancy and its central concerns are challenging to address in an empirically rigorous manner. Second, the causal chains between climate change and conflict are remarkably long and complex, and they may vary across different national contexts and regions of the world – as the contradictory findings from China, Europe and Africa suggest. Finally, the analyses to date have employed very coarse measures of conflict, which do not capture many plausible effects of climate change on human security.¹ Recogniz-

1 Human security is a relatively new and highly ‘contested’ concept that has been used since 1990 with many different meanings in policy debates and in scientific discourses. For a survey and assessments of the rethinking on security since 1990 see e.g. the three volumes of the *Global Environmental and Human Security Handbook for the Anthropocene*, published in the Hexagon Book Series, with 270 peer-reviewed chapters by 300 authors from 100 countries, offering a topical and comprehensive overview of the global debate on the reconceptualization of security since 1990 (Brauch/Oswald Spring/Mesjasz et al. 2008; Brauch/Oswald Spring/Grin et al. 2009; Brauch/Oswald Spring/Mesjasz et al. 2011).

ing the infancy of this field of inquiry, and the profoundly important nature of the questions with which it is concerned, Buhaug, Gleditsch, and Theisen (2008: 37) argue that the greatest challenges lie with “generalizable, statistical research”. Moreover, they offer a number of recommendations for improvements to this approach. Among the most important are for researchers to focus on: the plausible catalysts of conflict (i.e., the risk factors that enhance the impact of climate change); the agency of actors (i.e., provide individual level explanations, examine why some effects generate conflict while others do not); and the role of natural disasters in generating conflict. They also argue for developing time-varying measures of resource availability; gauging the effect of climate change for ongoing conflicts; and widening the definition of conflict to include low-level violence that does not necessarily involve state actors. Equally important is that researchers should develop disaggregated research designs, account for regional (i.e., spillover) effects, and combine research traditions to test complex relationships in a systematic and generalizable manner.

This chapter introduces the *Societal Infrastructures and Development* (SID) project, which has the potential to address several of the suggestions made by Buhaug, Gleditsch, and Theisen (2008). Extending SID to this area of inquiry will enhance the understanding of the destabilizing potential of climate change because it provides the capacity to:

- assess the impact of climate change on a more refined set of dependent variables that are likely to be affected by climate change;
- incorporate a wide variety of time-varying factors that affect the vulnerability and adaptability of societies to the effects of climate change; and
- implement a variety of more sophisticated and disaggregated research designs to study the destabilizing effects of climate change.

This chapter will be organized as follows. The first section briefly introduces the SID project, with a particular emphasis on its scope and relevance for research on the societal effects of climate change (3.2).² Most of this section, however, focuses on one component of SID, the *Social, Political, and Economic Event Database* (SPEED) project (3.3). SPEED is most relevant here because it generates data on small-bore civil unrest events that are temporally and spatially referenced. The second section illustrates how SPEED

2 More information on SID can be found at: <<http://www.clincencenter.illinois.edu/research/sid-project.html>>.

data can be used to provide succinct insights into societal stability (3.3). The third section describes how SID and SPEED data can be used in different research designs to examine the destabilizing effects of climate change (3.4).

3.2 The Societal Infrastructures and Development Project

The SID Project is the signature initiative of the Cline Center for Democracy. Its goal is to create a knowledge base to enhance the understanding of how institutions (political, legal, and economic) and contexts (wealth, educational attainment, structure of socio-cultural cleavages, natural resource endowments, etc.) mesh to affect societal well-being. Towards that end SID has developed a highly integrated data warehouse that joins together a number of existing databases (e.g., World Bank data, UN data, Penn World Tables, Correlates of War project, etc.) with data from a number of original research projects. Two of these were broad, cross-cutting projects: SPEED and the Comparative Constitutions Project.³ There were also a number of more targeted projects that were initiated to fill specific knowledge voids (legal infrastructures, educational attainment, natural resource endowments, etc.).⁴

Various components of the SID archive are relevant for studying the destabilizing effects of climate change. For example, cross-national measures of democracy and the rule of law are relevant because they are thought to affect both the level of instability within a society and its capacity to adapt to the disruptive effects of climate change, particularly its long-term effects. SID efforts to extend and refine national data on educational attainment have created an independent measure of adaptability. Also relevant are SID data on per capita GDP, agricultural production, natural resource production, and environmental quality. Finally, in the future the SPEED project will generate unique measures of the nature and depth of social cleavages, which will be useful in capturing the differential effects of similar climate-induced changes.

3.3 The Social, Political, and Economic Event Database Project (SPEED): An Overview

SPEED is a technology-intensive effort to generate a comprehensive body of global event data for the post-WWII era. In generating these event data SPEED leverages tens of billions of dollars that have been invested in compiling news reports from throughout the world. SPEED is a protocol-based system that extracts information on events that fall within an event ontology embedded within carefully designed protocols. The protocol most appropriate for examining the destabilizing effects of climate change is SPEED's *Societal Stability Protocol* (SSP). While there are a number of highly regarded event data projects throughout the world that focus on some aspect of civil unrest, SPEED's SSP is unique in a number of respects.⁵ The most important of these are: (1) the temporal and spatial reach, and richness, of its news archive; (2) the comprehensiveness of its destabilizing event ontology; (3) the use of technologically sophisticated search procedures to identify relevant text; (4) the breadth of event data collected; (5) the ability to reference events to the city-day; and (6) the capacity to link related events.

To design an event data project with these distinct attributes the authors had to address several basic challenges. The responses to five challenges were particularly important. First, we had to assemble a comprehensive archive of digitized news reports for virtually every country in the world for the entire post-war era (3.3.1). Second, a comprehensive destabilizing event ontology was constructed that would structure the search for relevant events within the news archive (3.3.2). Third, electronic search procedures were constructed to identify relevant news reports within the news archive and relevant textual passages within the news reports (3.3.3). Fourth, (a) it had to be decided what type of event-specific information was needed (and available) to advance the understanding of civil unrest (3.3.4), and (b) efficient and reliable procedures had to be created for extracting that information from news reports (3.3.5). Fifth, training and quality control procedures had to be developed that would foster the generation of high-quality data

3 The Comparative Constitutions Project, at: <<http://www.comparativeconstitutionsproject.org/>> involved the assembly, translation, and digitization of every written constitution in the world since 1789, including amendments.

4 For more information on other SID projects can be found at: <http://www.clinecenter.illinois.edu/research/sid-project.html>.

5 A detailed comparison between SPEED and several of the more prominent event data projects can be found at: <<http://www.clinecenter.illinois.edu/research/publications/SPEED-Comparison-With-Other-Projects.pdf>>.

(3.3.6). The approach to each of these challenges is discussed below.

3.3.1 Global News Archive

To meet the information needs the authors had to assemble a comprehensive set of global news sources for the post-1945 period. Since 2006 the project's SEARCH programme has been crawling across news websites (over 5,000 news feeds in 120 countries) several times each day, scouring and storing all newly posted articles; daily this adds 100,000 articles to the archive. To acquire news sources before 2006 we secured the complete, digitized historical archives of the New York Times and Wall Street Journal for the period 1946–2006 as well as microfiche and microfilm records for two Western intelligence agency news services: the *Foreign Broadcast Information Service* (FBIS) and the *Summary of World Broadcasts* (SWB). These contain millions of news articles and broadcasts that were translated into English from scores of languages. These reports were derived from tens of thousands of news outlets and cover every country in the world (Leetaru 2010).

3.3.2 Destabilizing Event Ontology

The event ontology underlying the SSP was developed during a multi-year pre-test involving the analysis of tens of thousands of news reports. There are five tier-one categories that structure this ontology: political expression events, politically motivated attacks, disruptive state acts, political power reconfigurations, and mass movements of people. Each of these has at least one tier of categories below the first tier (figure 3.1).⁶

3.3.3 Classifying News Reports: The BIN Module

An archive of over 40 m. news reports requires automated techniques to identify reports with information about events that fall within the ontology summarized in figure 3.1. The research team developed an automatic text categorization program (BIN) that uses statistically based algorithms based on key words, word correlations, and semantic structures to identify and categorize relevant reports. BIN generates statisti-

cal probabilities that a news report is relevant to the ontology; a report gets 'binned' if that probability is sufficiently high. BIN's algorithms were developed by using thousands of human-categorized reports to train the computer; it has proved to be very robust. Repeated tests examining random samples of discarded news reports (i.e., those not deemed relevant to the ontology) suggest that BIN has a false negative rate of 1 per cent.

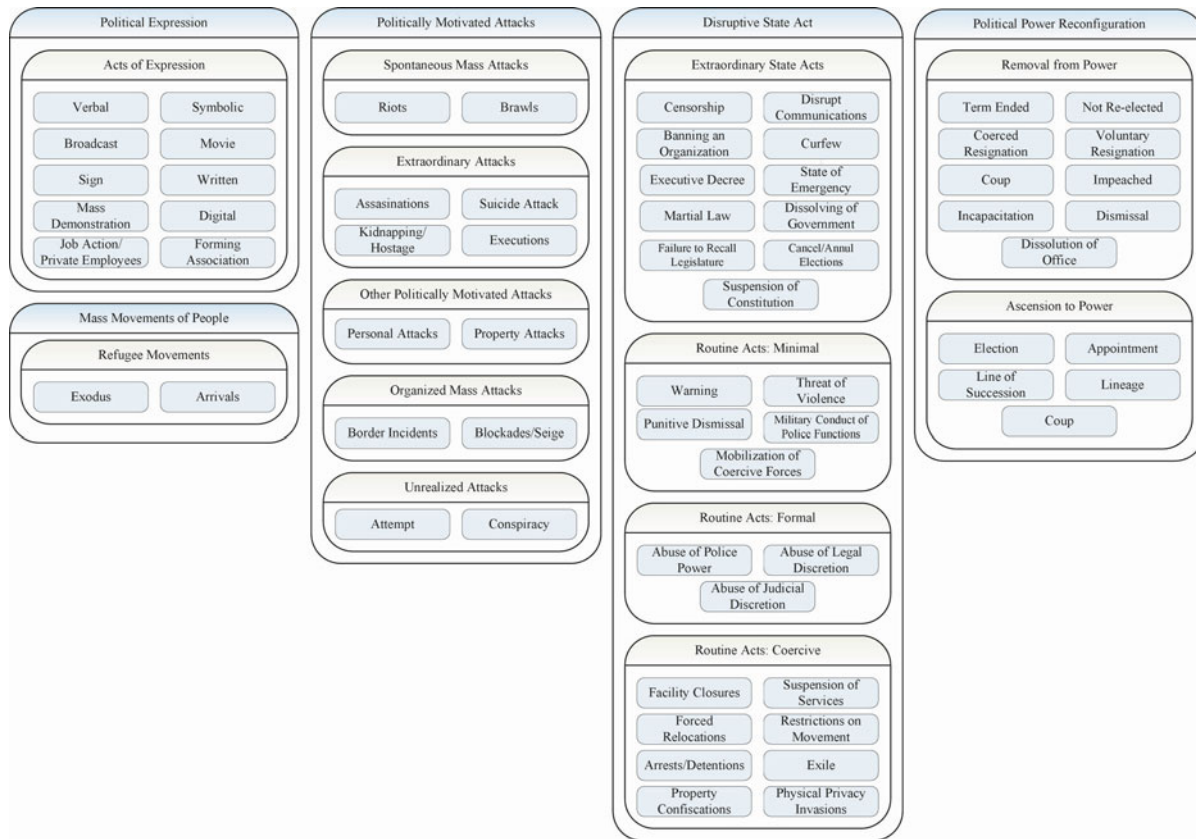
3.3.4 Text Annotation within Binned Reports: The EAT Module

Even with perfectly binned reports the huge amount of text contained in hundreds of thousands of news reports presents imposing cognitive challenges. To meet these challenges the research group has developed an *event annotation tool* (EAT) that employs a variety of procedures rooted in the field of *natural language processing* (NLP) to highlight text that contains relevant information about events belonging to a specific event ontology. Training data coded by humans educate the computer as to the type of information that is relevant. When properly calibrated, the EAT annotations will greatly enhance the efficiency, accuracy and reliability of information extraction within SPEED.

3.3.5 Information Extraction: Data Compiled in the SSP and the EXTRACT Suite of Programmes

The Societal Stability Protocol (SSP) is composed of six substantive sections. These question sets are designed to provide information on *who* (initiators, targets, victims, etc.); *what* (event type, human and societal impacts, consequences for initiators, reactions, etc.); *how* (weapons used, mode of expression); where (latitude, longitude, etc.); *when* (date); and *why* (societal context, event origins). To aid human coders in capturing the information in the SSP we developed EXTRACT, a suite of programmes that facilitates the work of human operators. At the core of EXTRACT is a set of category-specific protocols and a web-based interface that integrates the digitized news reports and the protocol. EXTRACT contains several modules that extract key informational items (data, location, actor names, etc.) efficiently and accurately; its LINK module links related events.

6 A document detailing the operational definitions of the event in this ontology can be accessed at: <<http://www.clinecenter.illinois.edu/research/publications/SPEED-Definitions-of-Destabilizing-Events.pdf>>.

Figure 3.1: Societal Stability Event Ontology. **Source:** The authors and the SPEED research team.

3.3.6 Training and Testing Procedures

As SPEED uses human operators working with an elaborate protocol, it is crucial to ensure that operators are highly trained and that they operate proficiently. To achieve these objectives a detailed training regime has been developed, one that culminates in a series of tests that gauge the ability of operators to implement the protocol. All operators must complete this regime and pass these tests. After they begin to generate 'production data' EXTRACT provides for ongoing quality control: it feeds pre-coded 'test' articles to all operators and generates reports on the accuracy and reliability of operators.

3.4 SPEED Data on Civil Unrest: Demonstration Data from Pilot Studies

The richness of the SSP event data, when combined with its encompassing ontology of small-bore destabilizing events, can play an important role in advancing our understanding of the destabilizing effects of cli-

mate change. Indeed, without the type of *spatially and temporally referenced, small-bore indicators of civil unrest* produced by the SSP it will be difficult to generate empirically-based advances in this field. If climate change does affect instability, its effects are more likely to be manifested through mass protests, politically motivated attacks, and state repression in locales affected by climate-related factors than in civil or international wars. While the impact on the latter cannot be discounted, the chains of causality are simply tighter with respect to small-bore events. Indeed, the link between climate change and organized armed conflict (civil or international) may become clearer by examining the unfolding of small-bore unrest.

This having been said, the scope of the effort required to generate SSP data raises an important question about their utility. To wit: how can data from a protocol with 317 fields derived from a destabilizing event ontology with over 100 categories be used to study the destabilizing effects of climate change? The next two subsections address this concern. The first uses data from a pilot study that used SPEED's SSP to extract information on 30,000 destabilizing events

from randomly selected articles in the New York Times between 1946 and 2006. These data are used to construct and display four intensity measures of civil unrest, as well as to demonstrate how they can be integrated with other SSP data. Two of these measures capture citizen-initiated instability; the other two capture state-initiated instability. The second section focuses on a measure of political violence and draws data from a “saturation” study (i.e., a study that extracts SSP data for all “binned” news reports in a country) using SWB reports from 1979 to 2009. This analysis will illustrate how the civil unrest data can be used to capture the unfolding of civil unrest over time within a spatially delimited area – an application that is crucial to studying the destabilizing effects of climate change.

3.5 Intensity Measures of Civil Unrest: A Parsimonious Approach to Gauging Instability

3.5.1 Non-state Actors

Citizens primarily manifest their discontent using peaceful (political protests) or violent means (political violence). Because political protests (speeches, symbolic acts, demonstrations, etc.) differ markedly from political violence (shootings, car bombings, suicide attacks, assassinations, etc.), it is neither desirable nor possible to collapse them into a single measure of citizen unrest. As political protests can be precursors to violent attacks, having separate measures can be useful for analytic purposes. Even were this not the case, it is not possible to construct a single composite measure using conventional data reduction techniques. While the generic categories of intensity indicators for protests and violence are similar (i.e., they relate to what was done, who did it, how it was done, and what impact it had on others), preliminary factor analyses revealed that different variables are relevant for capturing differences in intensity across these two types of destabilizing events. For political protests the key intensity indicators are: mode of expression (speech, symbolic act, forming an organization, mass demonstration/strike, and riot), number of participants, whether a weapon was involved, and whether anyone was injured. For political attacks the key indicators are: the type of attack (e.g., whether it was against persons or property), the lethality of the weapons employed (none, crude weapons, small arms, explosives, military grade weapons), the number in-

jured, and the number killed. The factor analyses employing these variables produced two composite measures: the Intensity of Political Protest and the Intensity of Political Violence.⁷

3.5.2 State Actors

To provide for civil order most modern states have been vested with a wide array of extraordinary powers, including the ability to declare a state of emergency or impose martial law. Modern states also enjoy a monopoly on the use of coercive force as well as the power to conduct a range of routine activities that are essential to the smooth functioning of society. In turn, they are expected to be judicious in the exercise of those extraordinary powers, to exercise coercive force with restraint, and to perform routine activities in compliance with the letter and the spirit of the law. However, regardless of how judicious the state is in exercising certain extraordinary powers (e.g., invoking martial law, suspending the constitution, dismissing the legislature) their invocation will almost certainly be disruptive. The use of these powers will produce anxiety and resentment, as well as generate uncertainty about the future. Moreover, state actors often discharge their routine duties in ways that exceed their legitimate authority and violate their fiduciary responsibilities. While these abuses vary across countries and over time, they undermine the human and political rights of citizens and interfere with normal human interactions, thereby generating instability.

The differences between the two broad categories of government actions (extraordinary, routine) make it impossible to construct a single composite measure of disruptive state actions. Extraordinary acts of government are often invoked by high-level state actors (chief executives, general officers, monarchs, etc.). Moreover, they have unknowable effects on large swathes of people (often entire nations) that extend for uncertain periods of time. In contrast, the routine acts of government that may be used repressively are performed by bureaucrats, legal officials, police officers, and soldiers. Moreover, they often have direct and immediate effects on discernible individuals. Finally, the vast majority of actions categorized as extraordinary state acts (censorship, disbanding associations, dissolving government, etc.) are inherently

⁷ Details on the derivation of the intensity measures can be found on the Cline Center website at: <<http://www.clinecenter.illinois.edu/research/publications/SPEED-Gauging-Intensity-of-Civil-Unrest.pdf>>.

disruptive. In contrast, routine state acts are essential to maintaining public order. They only become disruptive when state actors violate their fiduciary obligations. Thus, two measures of destabilizing state actions were constructed, the Index of Disruptive State Acts and the Intensity of State Repression.

The Index of Disruptive State Acts is an ordinal measure with three ranks. Events that impede political rights (censorship, interfering with electronic communications, banning of civil associations) are assigned a score of '1'. Those that restrict more fundamental civil rights (curfews, states of emergency, martial law) are assigned a score of '2'. Finally, events that interfere with the normal governing processes (dissolving the legislature, failing to convene the legislature, cancelling elections, suspending the constitution) are assigned a score of '3'. In contrast, the Intensity of State Repression composite was constructed using factor analysis. While preliminary factor analyses revealed that the same types of factor were relevant as were used in the political protest and violence composites (what, who, how, etc.), the derivation of the state repression measure was considerably more complicated.⁸ This notwithstanding, it was possible to create a single composite variable capturing state repression using four variables: the type of state action;⁹ the lethality of the weapon used; the existence of a soldier-initiator; and the number of individuals harmed.

3.5.3 Global Trends in Civil Unrest

To demonstrate the capacity of these intensity variables for producing succinct insights into trends in instability, data from the randomly generated events from the New York Times archive are displayed in [figure 3.2](#) for non-state actors and in [figure 3.3](#) for state actors. To generate these graphs each of the intensity measures was summed, by year, to capture the relative magnitude of civil unrest for each year from 1946 to

2006.¹⁰ The utility of graphs such as [figures 3.2](#) and [3.3](#) is that they embody and succinctly depict a large amount of rich information and facilitate the identification of important temporal trends. For example, [figure 3.2](#) clearly demonstrates that political violence begins to increase steadily in the early 1950s. In contrast, the Intensity of Political Protest measure is relatively stable for the early part of this time frame. The upward trend in political violence continues unabated until the mid-1980s. Then, after a brief respite, the trend in political violence begins to increase again; in 2005 it approaches its post-war high. This point is important in light of the observation that organized conflict is declining at about the time that the destabilizing effects of climate change should become evident (Buhaug/Gleditsch/Thesisen 2008).

[Figure 3.3](#) depicts the global trends in the two measures of state-initiated instability. Interestingly, the Index of Disruptive State Acts manifests a highly volatile but fairly constant trend line for the first half of this period. Then around 1976 it increases precipitously, at about the same time that the trend in political violence begins a steep increase. After 1982 its annual volatility declines significantly but it ebbs and flows considerably. Indeed, it reaches its low point in 2006. In contrast, the Intensity of State Repression Index follows the trends in political violence and protest – at least until 2002. In 2003 this measure begins to decline to a level not seen for over thirty years. While these parallels and trends are suggestive, much more data needs to be compiled and analyzed at the country level in order to move beyond speculation about their meaning. What is clear, however, is that these intensity measures constitute refined and sensitive measures that can contribute significantly to the study of climate-change destabilizing effects.

Additional insights into the dynamics of civil unrest can be gained by integrating these intensity measures with data on event origins. The insights that can be gained from this integration are important because many view climate change as a “threat enhancer”. Thus, its impact on civil unrest may be greatest when social tensions over class-based or socio-cultural animosities are already high. Moreover, the destabilizing effects factors related to climate change may be realized through heightened class tensions or socio-cultural animosities. This would have different policy implications if, for example, the destabilizing effects of

8 A discussion of the challenges in creating a refined repression measure is provided on the Cline Center website at: <<http://www.clinecenter.illinois.edu/research/publications/SPEED-Gauging-Intensity-of-Civil-Unrest.pdf>>.

9 The type of state act variable was constructed as follows: Minor state acts (threats, intimidation, the mobilization of force, etc.) were assigned a '1'; events involving the indiscriminate use of legal powers (proactive arrests, prosecutions, trials, etc.) were assigned a '2'; the use of coercive force (facility closures, forced relocations, trespasses, property confiscations, etc.) were assigned a '3'; violent state attacks were assigned a '4'.

10 [Figure 3.1](#) depicts a moving average of the aggregated intensity scores for the entire world (excluding the US), by year.

Figure 3.2: Indices of Violence and Protest Intensity. **Source:** The authors.

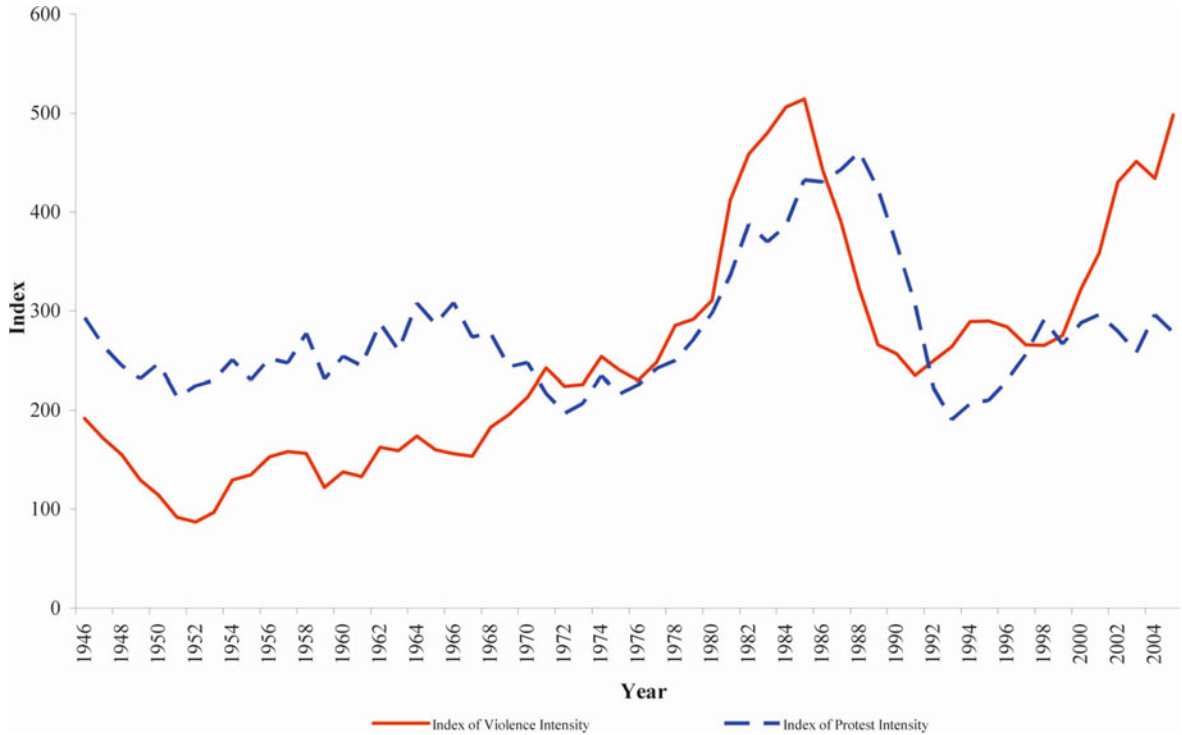
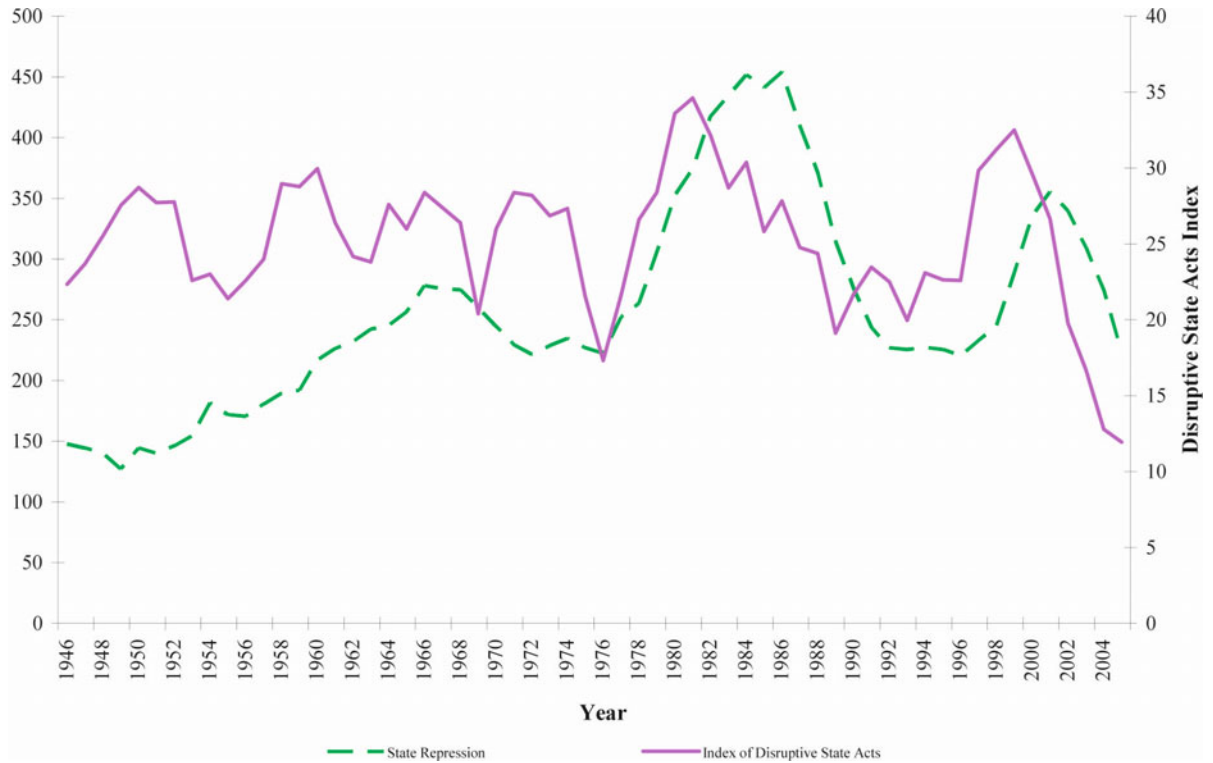
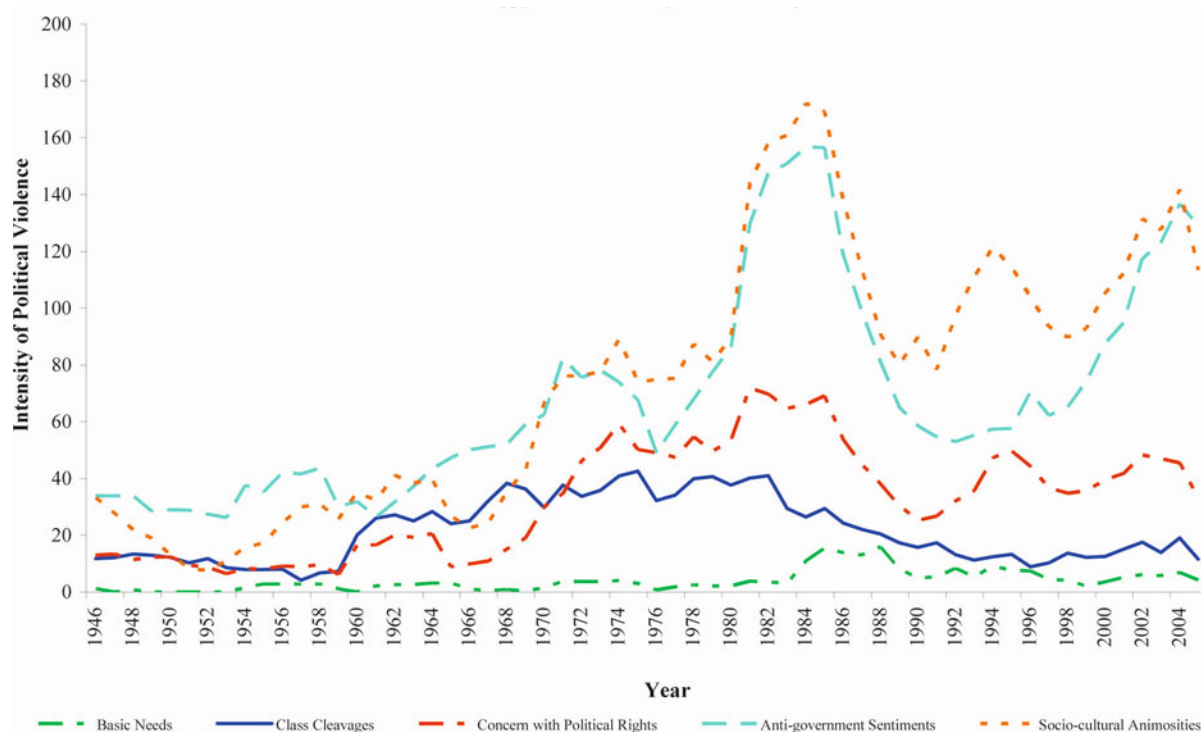


Figure 3.3: Indices of State Repression and Disruptive State Acts. **Source:** The authors.



climate change were rooted in the government’s failure to respond effectively during humanitarian crises.

An analysis of the origins data in the pilot study used to produce figures 3.2 and 3.3 uncovered five

Figure 3.4: Intensity of Political Violence by Origin (five-year moving average). **Source:** The authors.

principal origins of civil unrest initiated by non-state actors. These were: anti-government sentiments, socio-cultural animosities, class-based concerns, desire for political liberties/independence, and concerns over basic human needs.¹¹ Using the same summation procedure described above, figure 3.4 depicts the relative importance of these different origins, by year, for the political violence measure. figure 3.4 shows that much of the sustained increase in political violence reported in figure 3.2 is due to two factors: anti-government sentiments and socio-cultural animosities. Socio-cultural factors begin a marked increase around 1968 and skyrocket for a period after 1980. They drop significantly in the mid-1980s but then increase markedly in the early 1990s. In contrast, class-based factors begin to decline by the mid-1970s. The desire for political rights also declines in the early 1980s, but evidences a modest surge again in the 1990s. Concerns over basic needs rise in the early 1980s; while they decline somewhat beginning in the 1990s, they never drop to pre-1980 levels.

The data depicted in this section illustrate the potential of SSP event data to advance our understanding of the destabilizing effects of climate change. To realize this potential, however, it is necessary to demonstrate how these reduced and integrated data can be used to study specific time frames and locales. The most direct and destabilizing effects of climate change are likely to be most severely felt in areas that are subject to such things as storms, floods, drought, desertification, etc. Moreover, much of the contemporary research on civil unrest, which is being reconceptualized within an integrative and dynamic conceptual framework for studying “contentious politics” (Aminzade 2001; McAdam, Tarrow et al. 2001; Tilly 2003), asserts that it is episodic in nature; that is, it ebbs and flows over time and diffuses across space. This is important because, to facilitate intellectual progress, it is essential to integrate the study of the destabilizing effects of climate change into a broader framework in order to gain an understanding of how citizens and state act, and interact, in ways that disrupt the normal functioning of societies. The modes of analysis described in the next section introduce some ways to facilitate this integration.

11 Details on the derivation of the event origins categories are provided at: <<http://www.clinecenter.illinois.edu/research/publications/SPEED-Origins-of-Destabilizing-Events.pdf>>.

3.6 Country-specific Distributions of Civil Unrest

The utility of examining temporally and spatially concentrated distributions of the intensity measures discussed above is illustrated in the next two sections by using data derived from saturation codings from the SWB news archive for four countries: El Salvador, Nicaragua, Sierra Leone, and the Philippines, for the period from 1979 to 2009.¹² The first section demonstrates the raw data on the intensity of civil unrest; the second section lays out how the data can be used for identifying and gauging episodes of civil unrest, which has important implications for efforts to gauge the destabilizing effects of climate change accurately.

3.6.1 Raw Distributions of Civil Unrest

Figure 3.5 (a-d) displays the monthly sums of three intensity measures: the intensity of political protest, violence, and state repression (the Index of Disruptive State Acts is not depicted for ease of presentation as it has a very different scale). It is clear from the data displayed in these figures that, as expected from the literature on contentious politics paradigm, the incidence of civil unrest events is episodic (i.e., clustered in distinct time frames). The utility of identifying and accurately gauging these episodes is clear from a cursory glance at the data. They suggest that the duration and spacing of episodes varies across countries – as well as the mix and sequencing of political protests, political violence, and state repression. Consider the political violence measure. The Philippines is an extreme outlier (figure 3.5 (d)) has a markedly different scale from the others). Indeed, the sum of the intensity of political violence measure for the entire period suggests that the level of violence in the Philippines was 25 times as great as in El Salvador, 13 times as great as in Nicaragua, and 5.5 times as great as in Sierra Leone. In contrast, the level of state repression in the Philippines was only 2.8 times as great as in El Salvador, 4.2 times as great as in Nicaragua, and 2.8 times as great as in Sierra Leone. In addition, the level

of political protest in the Philippines is only 4.2 times that in El Salvador, 4.5 times that in Nicaragua, and 4.2 times that in Sierra Leone.

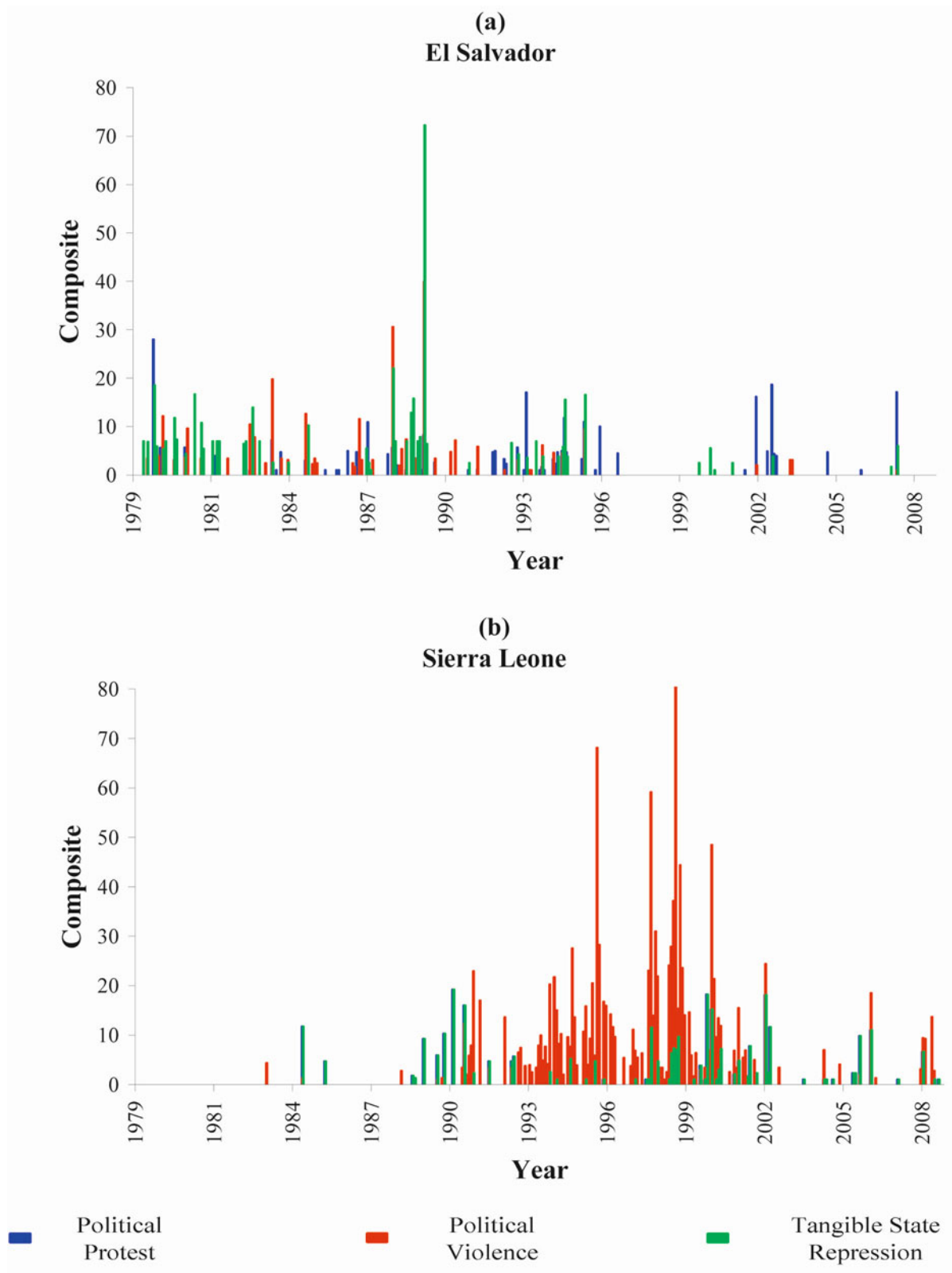
3.6.2 Identifying Concentrations of Civil Unrest

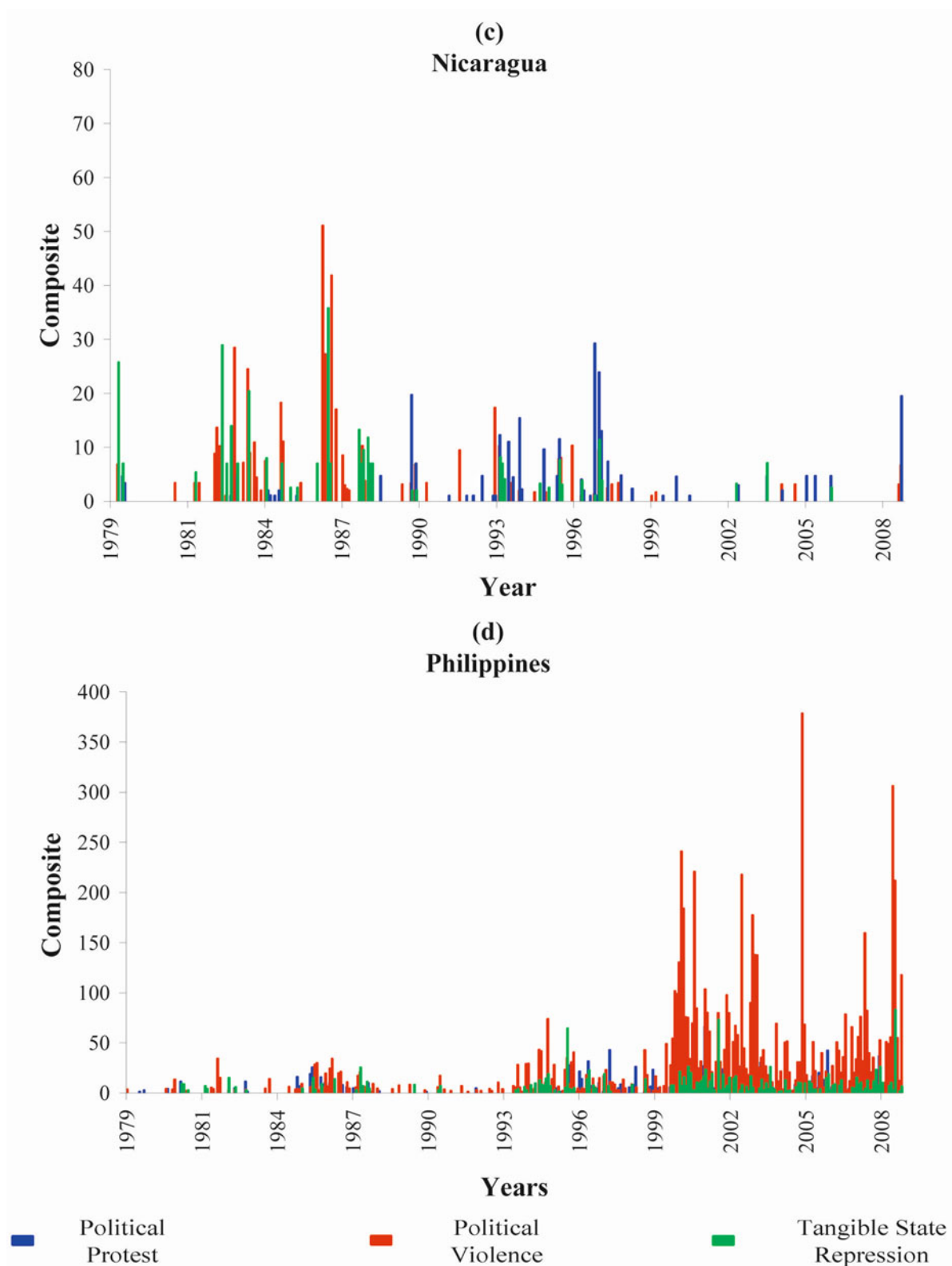
While the temporal displays depicted in figure 3.5 (a-d) are useful for illustrating the spatial and temporal distribution of the intensity measures, the granularity of the data is such that one risks losing sight of the “big picture”. We have therefore begun to develop procedures and tools that rigorously and uniformly identify temporal concentrations of civil unrest within a country. This approach, and its potential, can be illustrated using the Intensity of Political Violence measure. An examination of the time-series data on this variable depicted in figure 3.5 (a-d) reveals that these concentrations are manifested as both eruptions and episodes. Eruptions differ from episodes in both intensity and duration. Eruptions are isolated, relatively short bursts of intense unrest, while episodes are longer periods of sustained unrest. Our approach to identifying these concentrations is to first capture these eruptions and then make a second pass through the data to detect episodic unrest. Our technique for identifying and quantifying episodes employs the Hilbert transformation of the interval time series to derive the amplitudes and frequencies of the series, and calculates their averages and standard deviations over a moving four-month average. We then apply a thresholding technique to detect continuous sequences of those windows that lie within specific threshold limits. We use bootstrapping techniques to calculate confidence intervals for our identified episodes.

Our techniques are highly effective in identifying concentrated periods of intense violent unrest, which is important for enhancing our ability to identify time frames and locales that merit further research. For the saturation samples used to construct figure 3.5 (a-d), which included 1800 country-months, there were sixty-six country-months that were identified as eruptions (3.5%), and 404 country-months that were identified as episodes (22%). The eruptions account for 7% of all summed political violence scores, while the episodes account for 90%. Thus, we capture 97% of all political violence with less than 25% of the time frame. The distributions of these eruptions and episodes are depicted in figure 3.6 (a-d). As is evident from even a casual perusal, the depictions in figure 3.6 delineate the periods of unrest more crisply than

12 These data were collected and analyzed as part of a collaborative agreement, entitled “Natural Resources, Climate Change and Societal Stability: the Role of Human Interventions”, with the U.S. Army Construction Engineering Research Laboratory; Great Rivers Cooperative Ecosystems Studies Unit Agreement No. W9132T-10-2-0014. Data were extracted for a fifth country (Guatemala), but it is excluded here for ease of presentation.

Figure 3.5: Sum of Intensity of Civil Unrest Events, by Month. **Source:** The authors.

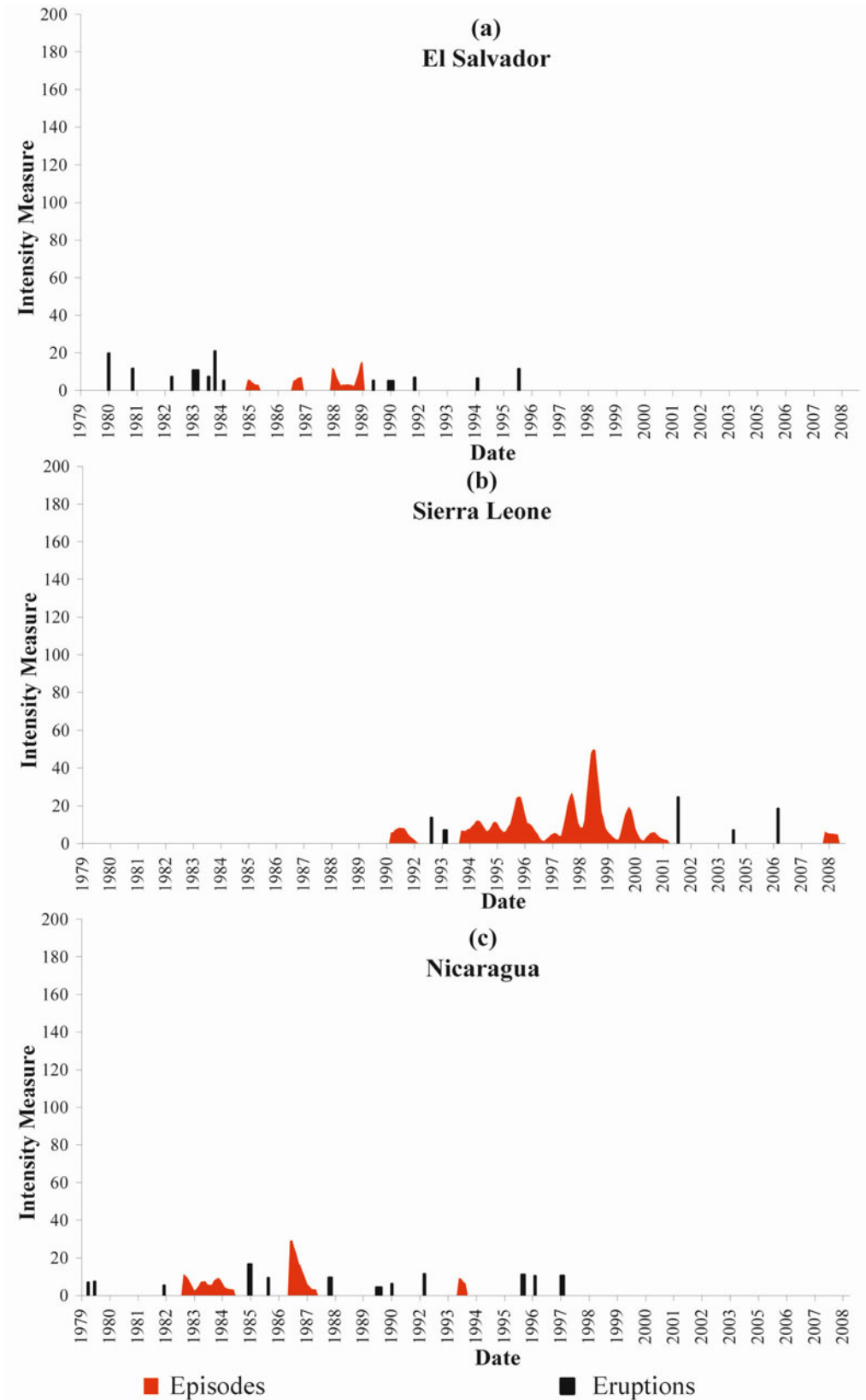


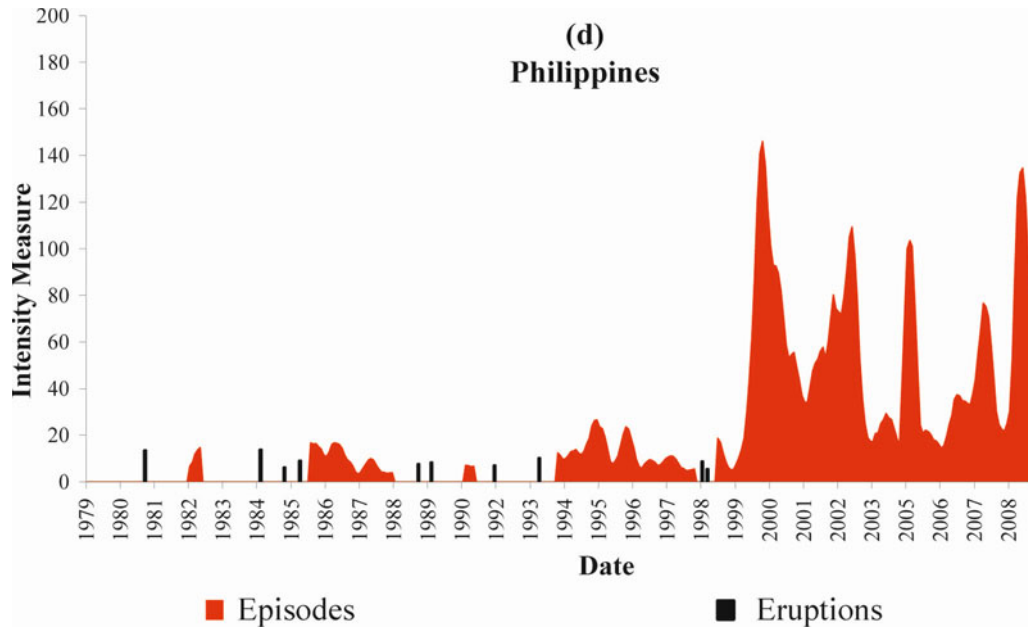


those in [figure 3.5](#).¹³ [Figure 3.6](#) also provides a clearer view of the distribution and contours of episodic vio-

lence, which can be exploited to generate refinements in ways of thinking about the destabilizing effects of

Figure 3.6: Distribution of Eruptions and Episodes. **Source:** The authors.





climate change and how to capture them accurately. The clearer depictions in figure 3.6 notwithstanding, it should be stressed that the presentations in this section only represent preliminary efforts at aggregation. Future efforts will almost certainly lead to modifications in the parameters used and/or the design of the approach. For example, future work will take advantage of the fact that SPEED data are both spatially and temporally referenced. Joining these dimensions can lead to the specification of more refined sets of episodes and more informative ways of displaying and analyzing them. Consider, for example, figure 3.7. It displays, for the Philippines, the location of politically motivated attacks for the three largest episodes depicted in figure 3.6 (d). Figure 3.7 reveals that the spatial distribution of political violence varies both within and across episodes, which suggests that some of the concentrations depicted in figure 3.6 (d) may be distinct episodes, and this would lead to more precise analyses of the factors that affect the intensity of violence.

3.7 Studying the Destabilizing Effects of Climate Change with SID Data

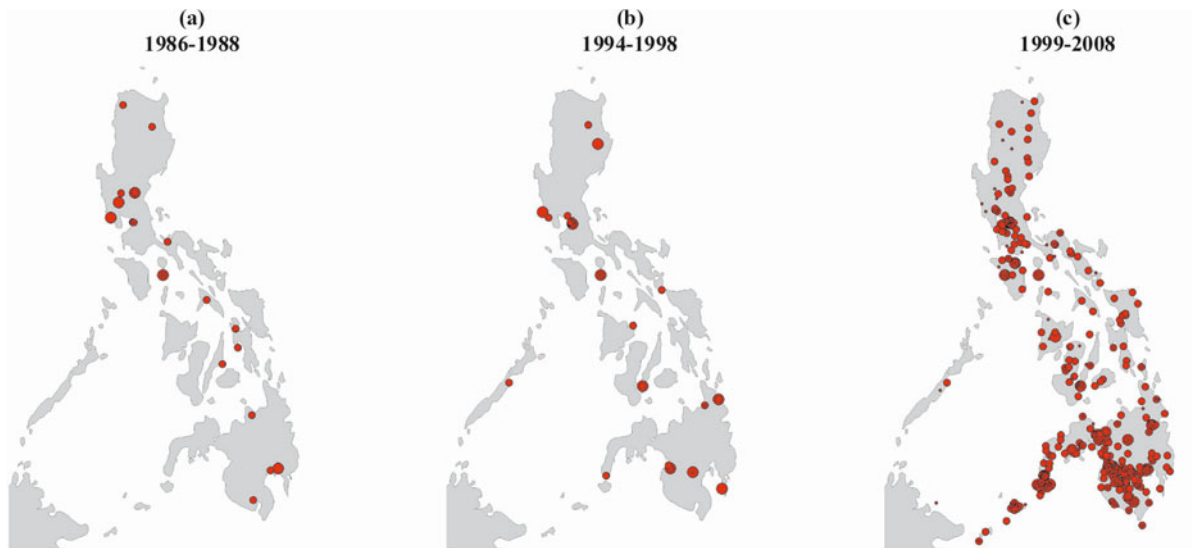
Most empirical research that has been carried out on the security dimension of climate change has looked at the effects of slowly developing phenomena (e.g., changes in temperature, precipitation changes, and water availability). The methodological sophistication of these studies has varied significantly, as many have noted (Nordas/Gleditsch, 2005). But even the most sophisticated current studies have not generated clear-cut, consistent results.

Correspondingly, existing research has not provided a great deal of guidance to policymakers. Moreover, as Buhaug, Gleditsch, and Theisen (2008) note, there is a need for research on the security implications of natural disasters associated with climate change (floods, tsunamis, epidemics, etc.). The types of abrupt and catastrophic effects that these natural disasters can have on human communities are significantly different from the effects of incremental developments like changes in temperature, rain, and water levels. Correspondingly, they call for different types of research strategies in order to generate policy-relevant insights.

No single research strategy, including SID-based efforts, will ever be able to resolve definitively all of the issues that impede our understanding of the destabilizing potential of climate change. The causal chains are too long and complex and their confounding effects are enhanced by a number of mediating factors

13 The trend lines within the episodes depicted in figure 3.6 and subsequent figures are the result of a moving average transformation applied to the political violence variable after the episodes were identified.

Figure 3.7: Spatial dispersion of political violence in the Philippines, selected episodes. **Source:** The authors.



and contextual differences that can generate different outcomes from similar developments. But the SID project has the potential to advance this very critical area of research. SID data can be integrated with climate-related data to design sophisticated research strategies to address key questions and issues. Moreover, SID-based research can be used in tandem with more intensive case study methods to provide more in-depth analyses of key historical episodes. For example, using SID-based analyses to identify examples of similar climate-related developments that led to fundamentally different outcomes can aid in the design of case studies that clarify the role of interventions, contextual factors, and institutional designs.

To illustrate SID's potential in this area of inquiry two examples are offered. The first concerns cataclysmic events related to climate change. The second addresses the analysis of incremental climatological developments.

3.8 Gauging the Effects of Climate-related Disasters on Civil Unrest

A potentially important source of destabilizing effects related to climate change derives from the societal impact of abrupt developments such as floods, storms, fires, epidemics, droughts, etc. If mainstream models of climate change are correct (WBGU 2007: 3.2.2; 5.2.3; 6.4), these cataclysmic events will occur with greater frequency and intensity than in the past. Indeed, Buhaug, Gleditsch, and Theisen (2008:6) expect “sudden or unexpected climate-induced events, such

as flash floods, tropical storms, and droughts to constitute a larger threat to human security than gradual reductions in resource availability.” It will be useful for policy development and planning to gauge the potential effects of these developments well before climate change begins to affect their frequency and intensity. While there have been a handful of rigorous empirical studies that have examined these effects (Brancati 2007; Nel and Righarts 2008; Slettebak and Soysa 2010), the small-bore events embodied in SSP data can make some unique contributions. These data will, however, have to be integrated with historical data on the incidence and magnitude of cataclysmic events. Combining SSP data on the intensity of unrest with SID data on national institutions and contexts will enhance those insights; it would also be beneficial to supplement these quantitative data with in-depth case studies.

One of the most powerful research designs appropriate for the analysis of these abrupt effects is some form of intervention analysis. This design would use the abrupt, climate-related development as the intervention and compare the intensity levels of civil unrest in an appropriate pre-intervention period with the levels in an appropriate post-intervention period. It is possible to conduct these analyses because data on the date, location, and magnitude of most climate-related disasters is available for most of the post-WWII era from the Centre for Research on the Epidemiology of Disasters (CRED), a WHO collaborating centre.¹⁴ In using the CRED archive it is important to select only natural disasters that are related to climate change and have clear start dates (e.g., floods, storms

rather than droughts). Also, the natural disasters to be studied from CRED's archive should be randomly selected in order to avoid a common problem associated with early studies of climate change and security (Levy 1995; Gleditsch 1998): selecting on the dependent variable.¹⁵ Once these cataclysmic events are selected it is possible to integrate them with SPEED data on civil unrest events.¹⁶ SSP data on dates and location would make it possible to assign individual events to the pre and post periods and determine their proximity to the disaster; intensity measures would provide a refined basis for making pre and post comparisons.¹⁷

Intervention analyses that integrate CRED and SSP data can be valuable here because the causal chains between climate change and civil unrest are remarkably long and complex. While the "before and after" comparisons that are at the heart of intervention analysis may not be able to unravel these causal linkages, they do provide a direct and effective way to discern and gauge the destabilizing effects of the natural disasters (i.e., to determine whether there are any there'). This notwithstanding, challenging methodological issues must be addressed. These issues stem from empirical realities that confound efforts to generate valid empirical results from intervention analyses based on a random sample of climate-related disasters; they derive from the distribution of both the cataclysmic events (the independent variable) and civil unrest (the dependent variables).

Whilst it is of the utmost importance to randomly select climate-related disasters with clear temporal boundaries in designing intervention analyses, this leads to difficulties at the analysis stage. These problems are caused by the occurrence of serial disasters in highly vulnerable countries. To illustrate the complications this problem causes consider the SID-based

pilot study cited above (Nardulli/Leetaru 2010). That study was based on forty-five floods and storms randomly selected from the CRED data archive; it initially was based on eighteen-month pre- and post-test periods. Puzzling results for these forty-five sets of periods led to an examination of the CRED archive for the country-years affected. This examination led to the identification of other comparable disasters in both the pre and post periods. Indeed, over 300 comparable natural disasters occurred in the forty-five aggregated pre periods, killing over 95,000 and affecting over 2 billion people; 309 comparable disasters occurred in the aggregated post periods, killing almost 105,000 and affecting 1.7 billion people. On average each episode had seven comparable disasters in both the pre and post periods. Thus, the forty-five randomly selected floods and storms constituted little more than a ripple in a turbulent sea of natural disasters, which complicated efforts to gauge the destabilizing effects of the randomly selected disasters.¹⁸

The problem with the distribution of the civil unrest variables can be discerned from figures 3.4 and 3.6 above. Civil unrest is relatively infrequently rooted in "basic human needs" that would arise from climate-related disasters (figure 3.4). Moreover, there are many other factors that drive major eruptions and enduring episodes of civil unrest (figure 3.6). There is no guarantee that climate-related disasters would not fall within one of the major episodes that, for example, defined Philippine society in the post-1985 era. The peaks and valleys that characterize those episodes - which may have nothing to do with climate-related developments - will confound efforts to use intervention analysis. Analysts must be aware of where the cataclysmic events fall within the episodes of civil unrest and use that information to generate refined estimates of their destabilizing effects. This may lead analysts to conclude that climate-related disasters have the capacity to generate an episode of unrest, at least under certain conditions. Or this awareness may lead them to conclude that these disasters merely affect the magnitude of the peaks and troughs within an episode - either tempering or aggravating the intensity levels. Failure to consider the episodic nature of unrest in estimating the effects of climate-related disasters, however, has the potential to generate misleading results.

14 See at: <<http://www.cred.be/>>.

15 Selecting only highly visible episodes of weather-related developments for empirical analysis can provide misleading conclusions about the destabilizing effects of climate change (King, Keohane, and Verba 1994).

16 News reports in the Cline Center's global news archive have header information on dates and SPEED's GEOCODER module has the capacity to identify the country in which the event occurred. This makes it possible to create country-specific queues that relate to specific cataclysmic events. These queues would be populated with news reports identified by the BIN module as having information on destabilizing events.

17 For a pilot study employing this design see Nardulli and Leetaru (2010).

18 The post-hoc solution to this problem was to estimate 'normal' levels of unrest and to use a series of post periods (30, 60, 90, and 120-days) to gauge the effects of the natural disasters.

The solution to the methodological issues noted above is not to avoid the random selection of disasters or countries plagued by serial disasters, or to ignore the episodic nature of civil unrest. Rather the solution lies in the use of a more complex sampling design. That design would utilize all CRED data on climate-related disasters and use these data to rank nations on their vulnerability to these disasters. A random sample of these nations would then generate a representative sampling of nations that varied in their vulnerability to climate-related disasters. Data on civil unrest would then be collected for an extensive period of time for the post-war era (1950-, 1960-, 1970-, etc.). These data would then be used to identify eruptions and episodes of civil unrest on a country-by-country basis. These eruptions and episodes of civil unrest could then be joined with the data on climate related disasters. This type of design would exploit the cross-country variance in vulnerability to identify the effects of serial disasters on overall levels of unrest. But it would also provide for an assessment of the impact of these disasters on the peaks and troughs that seem to characterize most enduring episodes of civil unrest. Thus, to gauge these effects in a methodologically sound way will require a longitudinal cross-sectional analysis that includes both a long time span and a large number of nations.

3.9 Disaggregating the Study of Incremental Effects of Climate Change

As noted earlier, a good deal of the empirical research on the destabilizing effects of climate change has focused on incremental developments such as changes in temperature, precipitation, sea-level rise, and water availability. It is argued that these slow-moving, climate-related changes produce long-term stresses on human environmental and social subsystems that impinge upon basic human needs and desires. Central to this body of work is the assertion that human reactions to these impingements will generate issues and disputes that can destabilize the functioning of core societal processes and institutions. The destabilizing effects of these reactions, it is argued, make it more difficult to produce goods and services, govern, and maintain civil social intercourse; they may also lead to violent conflict. For instance, increased temperatures and/or decreased precipitation may lead to water scarcity and soil degradation, which could lead to declines in agricultural yields and diminished food sup-

plies. This, in turn, could lead to increased competition for arable land and scarce food and water supplies – especially in poor nations with rapid population growth. Moreover, these climate-related developments could aggravate existing social cleavages. Thus, where poverty, social cleavages, and other contributing factors co-exist, climate-related stress could lead to the erosion of social order, economic decline, violent conflict, and governmental crises. This instability could also spread to neighbouring states, through refugee flows or ethnic links.

As ominous and threatening as these developments appear, they are based more on hypothetical scenarios than solid empirical evidence (WBGU 2007). Integrating SSP data on civil unrest with SID data on national institutions and contexts, as well as data on environmental and climate change, could provide policy-relevant empirical insights into these hypothetical scenarios. The breadth and reach of the SPEED project's cross-sectional, longitudinal design (165 countries, post-1945 era) make it possible to observe how instability unfolds over a long period of time across a variety of contexts and institutional settings, as illustrated in [figure 3.6](#). Because this design begins before the potential effects of climate change would have been realized, and includes countries only marginally harmed by climate change, a SID-based analysis provides benchmarks against which the destabilizing effects of climate change can be evaluated. To connect changes in civil unrest with climate-related developments, the intensity measures would have to be integrated with climate data (temperature, precipitation) using a common grid system. Also valuable to include in such a grid system are remote sensor data on changes in water availability, desertification, and deforestation.¹⁹ Finally, long-term data on sea-level rise for low-lying countries with extended coastlines could also be integrated.

The unique contributions of the SSP data on civil unrest to the study of climate change's incremental effects lie in: (1) the small-bore nature of the destabilizing events it captures; (2) the availability of a set of refined, composite intensity measures; (3) the availability of data on event origins; and (4) the fact that SSP event data is temporally and spatially referenced to the city-day. Having data on small-bore instability events is important because these types of happenings are more likely to reflect the incremental destabilizing effects of climate change than large-bore indicators

¹⁹ See e.g. NOAA at: <http://edc.usgs.gov/guides/avhrr.html>.

(civil wars, regime change, refugee crises). Small-bore indicators are also more likely to appear before large-bore events take place, providing some early warning of more ominous developments. The existence of a set of refined intensity measures is valuable because these measures incorporate a good deal of information that efficiently captures meaningful differences in destabilizing events. These composite measures make it possible to analyze succinctly the temporal interaction between political protests and political violence, as well as the give and take embodied in exchanges between state and non-state actors. Such analyses can produce valuable insights into the dynamics of unrest. Being able to augment these analyses with information on event origins will further enrich them, as many argue that climate change is a threat enhancer that will compound pre-existing cleavages. Finally, SPEED's capacity to reference events to the city-day is important because climate-change effects are not likely to be uniform across a country. Thus, this capacity maximizes the value of integrating disaggregated climate data with data on civil unrest.

Another valuable attribute of the SSP data is the ability to integrate them with SID data on national institutions and contexts. This is important because the long-term effects of incremental climatic changes on human subsystems are neither inevitable nor well understood. Even if climate changes unfold as predicted, differences in vulnerability and adaptability will affect their societal impact. Because of societal differences in such things as wealth, economic structure (e.g., agricultural, industrial, service), natural resource endowments, educational attainment, and the depth and nature of social cleavages, similar climatic changes will affect basic human needs and desires differently. These differences will also structure the interaction between state and non-state actors. The destabilizing effects of the steady deterioration in human welfare will also be mediated by institutions, which can both enhance adaptability and provide for the non-violent resolution of conflicts. SID-based research can enhance our understanding of how contexts and institutions mediate the destabilizing effects of climate-related changes in a variety of ways. Two research strategies will illustrate its potential utility.

The first is a rigorous, 'macro-level' strategy that employs a cross-national longitudinal approach very similar to that suggested above with respect to analyzing the effects of cataclysmic events. In this context, however, it would require a different sampling strategy. Countries should be selected in order to maximize variance on key dimensions of incremental cli-

mate change (e.g., temperature, precipitation, sea-level rise). Such a country sample could be used to conduct two core analyses that would greatly advance our understanding of the long-term destabilizing effects of climate change. The first would be to model the effects of five broad sets of variables on the SSP intensity measures of civil unrest. The five sets of variables are designed to capture the complex causal paths that link climate change to instability; they include: (1) the climate variables noted above (e.g., temperature, precipitation, sea-level rise); (2) environmental variables (e.g., soil degradation, water availability, deforestation); (3) social stress variables (e.g., economic growth, agricultural productivity, health indicators); (4) triggering mechanisms (e.g., extreme weather events, mass movements of refugees, resource-related social movements); and (5) mediating variables (e.g., contexts, institutions). If this analysis demonstrated that incremental climate change had a positive effect on the intensity of civil unrest, then it would be important to conduct a second analysis. It would focus on the relationship between the small-bore intensity measures and large-bore indicators (civil wars, irregular transfers of power, refugee crises, etc.). This two-stage analysis will provide a refined understanding of the linkages between human responses to climate-related factors and the operation of core societal processes and institutions across a range of national contexts.

If the macro-level strategy outlined above revealed that incremental climate change had destabilizing effects, even if only conditionally, it would be useful to conduct a set of "micro-level" analyses. These analyses would examine the structure and dynamics of episodes of climate-related instability (i.e., the sequence of events, their longevity, intensity levels, diffusion patterns, etc.). The aim of these analyses would be to enhance our understanding of how incremental climate changes are transformed into destabilizing episodes such as those depicted in [figure 3.6](#). This is important because it could provide insights into how these episodes can be avoided or defused. To optimize the return on this research strategy, countries should be selected that experienced *similar* levels of incremental climate change but *different* levels of civil unrest. Moreover, the quantitative data on civil unrest, contexts, and institutions would have to be augmented with rich case studies of the individual countries and episodes. This type of research strategy would yield insights into such things as pivotal events and path dependencies that generated different levels of unrest despite similar levels of stimuli (i.e., similar

levels of climate change). It could also produce insights into the impact of intervention strategies (negotiation efforts, international aid, peacekeeping forces, etc.) on instability, as well as how, and when, the intensity of civil unrest results in large-bore instability.

3.10 Conclusion

The study of the potential of climate change to destabilize a wide swathe of nations in the upcoming decades is an important and exciting field of study. While it is a relatively new field that has had a relatively narrow empirical focus, it is ripe for important advances. However, before the destabilizing potential of climate-change research can be fully understood, researchers must begin to study the type of small-bore destabilizing events discussed here. Human reactions to climate-induced stresses are most likely to be manifested through such things as demonstrations, riots, political attacks, state repression, etc. – if only because these happenings are so much more common than large-bore developments. Moreover, these small-bore events are likely to be precursors to large-bore developments. It is possible to integrate these small-bore events into the study of the impact of climate change on human security because there has already been much investment in the data development needed (e.g. the CRED archive; various global efforts to measure temperature, precipitation, and sea levels across time and space; SID, SPEED, and the SSP, etc.). These prior investments make it possible to generate marked advances in this important field of inquiry with relatively modest additional investment. The returns from these investments will not be optimized, however, without careful attention to the design of the research efforts that leverage them. These efforts should be informed by theoretical developments in fields like the study of contentious politics. They should also be structured in light of some of the empirical realities discussed above (the episodic nature of civil unrest, the serial nature of climate-related disasters, the links between different types of unrest, etc.). These empirical realities must be reflected in the research designs if those designs are to generate empirically sound insights into the destabilizing potential of climate change. Finally, it will be most productive if future research is conducted by teams of diverse scholars (climatologists, social scientists, information scientists, security analysts, etc.) whose complementary areas of expertise are needed to address the challenging issues in this field of study.

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4 Climate Change, Conflict, and Fragility: Getting the Institutions Right

Dan Smith and Janani Vivekananda

4.1 Introduction

The impact of climate change and climate variability is not determined by natural changes alone. The impact upon people of changed timing of the monsoon, shifting patterns of typhoons, and longer dry and more intense wet seasons is determined also by a number of complex and interacting factors and conditions. These factors centre around the capacity of affected communities to adapt, which may itself be influenced by degrees of poverty and inequality; or by the quality of governance, which may itself be shaped by the legacy of past conflicts, the development trajectory, political instability, and ethnic fault lines. We have argued that, as climate change interacts with other features of the social, economic, and political landscape, many countries face a high risk of political instability and violent conflict (Smith/Vivekananda 2007). The risk of conflict both adds to the burdens faced by deprived and vulnerable communities and makes it harder for them to reduce their vulnerability by adapting to climate change. In sum, climate change and variability are not climate issues alone.

Faced by the uncertainties surrounding the impact of climate change, the political contestation that accompanies this uncertainty, and the complex environment in which impacts must be addressed, this chapter concludes that the most productive path of inquiry is to focus on *resilience*: that is, the capacity of a system to withstand shocks and to rebuild and respond to change – including unanticipated change. ‘Resilience’ is a more flexible, broader, and therefore useful term than ‘adaptation’. The latter tends to focus on adjustments to specified climate effects, whether actual or anticipated – that is to say, it focuses on actions while resilience focuses on the social capacity that makes it possible to act.

Resilience, however, is most difficult to achieve where it is most needed – in fragile states, which are those that display characteristics combining arbitrary

power with limited reach, so that law, authority, and security are neither consistent nor accountable. Fragile states are barely capable of performing key state functions and display only very limited governance capacities. Post-conflict states such as Nepal, crisis situations such as Afghanistan, or states in precarious positions economically (Burundi), environmentally (the Philippines), and politically (Kyrgyzstan) may lack the capacity to adequately respond to environmental shocks. Furthermore, where governance is already weak and the relations between citizens and the authorities are stretched, inappropriate responses to climate change also have the potential to do harm inadvertently.

Policy discussions about the consequences of climate change are beginning to acknowledge the conflict, security, and governance implications. These concerns, however, are not being properly taken on within the complex negotiations for new international agreements and financing mechanisms for responding to climate change. In the negotiating context, the discussion focuses on how much money should be available for adaptation and how that money will be controlled. It pays scant attention to the complexities of adaptation, the need to harmonize it with development, or the dangers of its going astray in fragile and conflict-affected states and thereby failing to reduce vulnerability to climate change.

In order to shape adaptation policies to best effect, it is necessary to go beyond the most immediate natural impacts of climate change and look to the broader dimensions of *resilience* such as power, safety, and access to justice, which make up an individual’s or community’s resilience. It is also imperative to understand the context in which its impact will be felt. It is the interaction between the natural consequences and the social and political realities in which people live that will determine whether they are resilient to climate change. This means addressing the realities of the system of power, politics, and economics

in fragile and conflict-affected societies, structures that often systematically exclude the voices of all but a privileged few.

This chapter aims to discuss the institutional changes that are needed to address these linked problems. One characteristic of both analysing problems and proposing solutions in this context is to focus on the linkages. We are not looking at climate change alone, nor conflict or governance alone, nor at issues of poverty and livelihood alone, but at each in combination with all. In doing so, we have to acknowledge the inadequate track record of development assistance in achieving coherent sustainable development across different sectors. Some approaches have worked; others promote discrete and conflicting responses. Policymakers need to be aware of these lessons and apply them when planning policies and structures to respond to climate change, to avoid repeating the mistakes of ineffective development over the past 20 years.

Based on the exploration of the challenges involved in building resilience to the double challenge of climate change and conflict, this chapter identifies some areas for institutional reform. The proposals reflect not so much on what is to be done but on *how* things should be done – namely with conflict sensitivity, more flexibility, and greater communication across sectors. This chapter concludes that whilst being indisputably challenging, effective climate change adaptation in fragile states is possible as long as key choices are correctly made about the institutions and approaches. This calls for an honest evaluation of existing policies and institutions and the courage to make fundamental changes to ensure that these institutions and their approaches are fit to face the complex challenges ahead.

4.2 The Links Between Climate Change, Conflict, and Peace

4.2.1 Conflict Risk

The impact of climate change will reduce the resilience of people and communities to varying degrees. In some situations it will cause extreme disruption with which people simply cannot cope as it overwhelms them and renders their homes and livelihoods unviable. If the governance structures that the community looks to as safeguards are not up to the task, climate change will weaken confidence in the social order and its institutions and damage the glue that

holds societies together. In some contexts, this can increase the risk of instability or violence. This is a particular problem in fragile states where governance structures and institutions are often weak, regardless of climate change.

But the direct link between climate change and violent conflict that appears in the media and some political discourses to date has little substantiated empirical evidence. Even when presented in an analytical way much of the literature is speculative and based on either anecdotal evidence or possible future scenarios that are difficult to prove or test. Where a link between climate change and conflict is mentioned in Intergovernmental Panel on Climate Change (IPCC) reports, it is weakly substantiated with evidence. The *Stern Review's* references to how conflict 'may' occur as a result of climate change are mostly based on second-hand sources of the same nature as those used by the IPCC (Stern 2006). Some recent econometric work on the relationship between internal conflict and rainfall changes (as a proxy for economic instability) is also cited, but the implications of this work are not discussed at any length (Buhaug/ Gleditsch/Theisen 2008, 2008a; see chap. 2 by Buhaug/Theisen).

It is important to state that this lack of empirical evidence to date does not mean that there is no link between climate change and security. The nature of climate change necessarily means that the future will not look like the past. As such, analysis grounded in positivist social science approaches bounded by evidence of what has happened has a necessarily limited salience. Further, whilst there is still a need for more evidence on the role of environmental factors as drivers of political instability, there is also good amount of evidence that we can already draw on from other sectors.

Sectors that will be largely affected by climate change and which could potentially put additional strain on state-society relationship include water, agriculture, energy, health, migration, and urbanization (Smith/Vivekananda 2007). What complicates matters in fragile states is that political and economic elites are organized in such a way as to give themselves privileged access and control over resources and opportunities. Climate change impact could provide opportunities for elite groups to further tighten their grip on resources and/or manipulate adaptation funding to their own benefit through patronage and clientelism with contracts for adaptation projects providing both licit and illicit money-making opportunities. Indeed, in some countries, the impact of climate change may be severe enough even for some sections

of the elite that they will be virtually compelled to divert adaptation resources their way as the sole means of maintaining their grip on their privileges.

In other words, ill-informed climate change adaptation policies and interventions by donors, governments, and non-governmental organizations in the form of technical solutions that do not take into account the broader sociopolitical and cultural contextual realities can unwittingly reinforce existing tensions, engendering greater poverty, human rights abuses, and conflict, rather than build resilience. Some might go as far as noting that mal-adaptation impact could be worse than climate change impact itself.

Yet specialists in climate change are not generally well informed about conflict risks, and although development specialists universally agree that those in fragile contexts are amongst the worst hit by climate change, they have not resolved how to deal with the issue of state fragility in their climate adaptation programming. It is essential to address the issue, but necessary to do so carefully. The potential conflict implications are among the most compelling arguments for rich states to take action against climate change, but we must be wary of oversimplified direct causal relationships between climate and conflict, for these will generate inappropriate responses.

To develop a response to this challenge means focusing on the social, economic, and political consequences of climate change – and recognizing, equally, that social, economic, and political issues influence the impact of climate change on people's lives. This is relevant to but wider than the discussions on the post-Kyoto deal. It is relevant for all engagements in states vulnerable to climate change. It means going beyond questions about how to raise funds for climate adaptation and mitigation, to thinking about how the money should be used and what governance and institutional changes must be made. It means considering the role in these issues of a wide range of actors from the development and peace-building communities and the private sector.

It is impossible and unhelpful to offer generic scenarios of how climate change will interact with other variables to increase conflict risk, since impacts will always depend on context. That said, it is possible to trace out some broad knock-on consequences that serve to illustrate some of the risks that may arise.

Water is a key resource for agriculture, industry, and daily use, and not only ensures the survival of people and the natural environment but is a critical resource for regulating the earth's temperature. Varia-

tions in the earth's climate are compounded by the challenge of tackling the world's explosive population growth which has ushered in changing consumption and production habits, particularly in middle income countries where meat consumption is high and on the rise. These factors have culminated in a surge in demand for limited freshwater reserves. In 2009, the world's population stood at 6.8 billion, an increase of over 80 million from the previous year. By 2025, the global population is projected to increase to a staggering 8.1 billion¹. Worldwide, 500 million people already live in countries where supply is chronically short (Clarke/King 2004); the IPCC predicts these numbers will rise as climate change affects surface water levels that depend on rainfall and glacial melting. The availability of water will decrease in absolute terms as a result of global warming. By mid-century some regions, including the Middle East and North Africa region and southern Africa will see a decline of between 10 and 30 per cent (IPCC 2007: 5, 183).

There are several sources of conflict risk if water supply is inadequate. A key problem is poor management that either wastes water or politicizes the issue and seeks a scapegoat to blame for shortages. Conflicting claims to water resources have generally not led to violence between states – the record of settling disputes is largely positive, in fact – but there remains a considerable risk of conflict within states as different groups contend for diminishing water resources. Even where these do not lead to open armed conflict, they may well feed pre-existing tensions and exacerbate the fragility of state institutions. Tensions over water can be also worsened by privatizing control of the resource without looking after the rights of the poor.²

Further, it is worth noting that, at first glance, it would appear that some inter-state agreements on water management favour one side disproportionately – the side that held the greater power at the time the agreement was enacted. As circumstances change – economically and politically as well as the circumstances of nature – it could be that water management regimes that have been tolerable despite being unfair may become unsustainable and a source of tension.

1 Population Reference Bureau, 2009, World Population Data Sheet (2009); at: <prb.org/pdf09/09wpds_eng.pdf>.

2 Levina (2006) states on the experience of privatization of water in Latin America that the “Cochabamba Water Wars” took place in Bolivia between January and April 2000 due to privatization of the municipal water supply, see at: <<http://ipsnews.net/news.asp?idnews=35418>>.

Working through inter-state water agreements to assess their viability in different scenarios of natural, economic, and political change is a worthwhile future research project.

Directly related to the issue of water is agriculture. Disruption in the agricultural sector can quickly affect food security, especially for the poorer sections of society. As poor communities seek new ways of securing food supplies, there are often clashes with the needs of other communities. In Africa's Sahel region, desertification is reducing the availability of cultivatable land, leading to clashes between herders and farmers. In northern Nigeria, Sudan, and Kenya, the state is unable or unwilling to contain and manage the conflicts and these clashes have become violent (Hussein/ Sumberg/Seddon 1999).

Climate change will pose significant risks to human health. Some regions are likely to have a higher incidence of water-borne diseases such as cholera. Increased natural disasters such as storms and cyclones will lead to increased casualties, putting pressure on already stretched medical resources. Heatwaves and water shortages will have an adverse impact on safe drinking water and sanitation, with disproportionate effects on the poorest and most vulnerable. Increasing food insecurity may also result in changes of diet that have an adverse effect on health and resistance to disease.

Failure by the state to provide for basic water, food, and public health erodes the social contract between state and citizens. A declining capacity to meet such basic needs is an indicator of increasing fragility – witness the cholera epidemic in Zimbabwe in 2009. A general decline of public confidence in state authorities, whatever its proximate source, increases the risk of instability and conflict escalation.

As these challenges unfold, the issue of migration arises. There is wide consensus that climate change will interact with other issues which inform a migrant's decision to move³. There is also consensus that climate-related migration will be a significant conflict risk.⁴ Migration in itself need not be a destabiliz-

ing factor; it often benefits both those who move and the communities and countries where they arrive. But there is often great difficulty in accepting immigration, especially when newcomers are seen as an unwanted burden, which is especially the case when groups in search of new livelihood options move to areas that are themselves barely viable. Their arrival can compound social pressures, as in Assam and Bangladesh (e.g. Bächler 1999; van Ireland/Klaasen/Nierop et al. 1996). In this way, migration can transfer conflict risk from one location to another; the risk travels with the people.

A significant if unpredictable proportion of this migration will be to urban centres. While even rapid and major urbanization in prosperous, stable countries can be accomplished without violent conflict (think of Japan, for example), the process is more difficult in poor and unstable countries. Migration pushed by climate change will in some places increase the extraordinary strains of trying to maintain livelihoods in mega-cities and sharpen the conflict risks driven by those pressures. Further, many mega-cities are in low-lying coastal areas at long-term risk from sea-level rises.

4.2.2 Climate Change in Fragile States

This brisk look at risk transmission shows that adapting to the consequences of climate change will require social adaptation to social consequences. This means policy responses must look beyond climate change impacts to look at how societies are organized, and especially at the question of power.

In countries that are conflict-prone and marked by state fragility, it is not really possible to analyse the problems of climate change or figure out what to do about them without addressing how power is organized. While recognizing that the vocabulary and concept of state fragility are both controversial and hard to define crisply at the margins, we find the term useful as a way of discussing widespread problems in development, conflict, and environment. Until a better substitute comes on the scene, the concept of fragility has become a useful point of reference, even for those who have reservations about it or actively object to its use.

Fragile states are characterized by very limited governance capacity where the state is barely capable of performing key state functions such as security of citizens, protecting property rights, providing public goods to enable the functioning of the market, and providing social services, particularly education, health,

3 For a few lead examples from the current debate see at: <http://www.iisd.org/pdf/2008/migration_climate.pdf>; <hdr.undp.org/en/reports/global/hdr2009/.../title,18734,en.html>; and <http://www.ciesin.columbia.edu/documents/clim-migr-report-june09_final.pdf>.

4 As well as the Stern (2005) review see, *inter alia*, Buhaug, Gleditsch and Theisen (2008); German Advisory Council on Global Change (WBGU 2008); Norwegian Refugee Council (2008); Piguet (2008); King and Walker (2008: 90–91, 161).

and sanitation. The term includes post-conflict and crisis states as well as those facing economic and political instability.

Responding to climate change in fragile situations needs to be rethought and redefined, recognizing a number of crucial issues. A central characteristic of fragile states is that the political and economic elite is organized so that it has privileged access to economic and political opportunity – so it can keep power, in other words. This predominates over the principle that society's leaders should provide for the most basic needs for their poorest citizens. It also complicates the received wisdom in development practice that prioritizes putting development assistance funds into the hands of recipient state governments. It is, therefore, important to look at what effect climate change will have on the ability of social elites to retain or capture economic and political resources.

Climate change will generate fluctuations in the supply of key resources such as water and that in turn will affect land values. Both these effects present money-making opportunities to the rich and resourceful. Adaptation to climate change will be implemented through the provision of goods and services, for which there will be contracts funded by government, providing plenty of opportunity for money-making, both licit and illicit. In other words, as far as the crucial issue of natural resource management is concerned, climate change offers further opportunities for elites to continue what is essentially business as usual.

This has a major effect in shaping the impact of climate change. Neither the physical effects nor the knock-on social and economic consequences of climate change will be randomly or 'fairly' distributed across the population. It is almost a truism to say that climate change will hit the poorest hardest – and this is because of the way societies are organized. For example, the most marginalized and least powerful members of society end up living on the least viable pieces of land such as river banks or farmland furthest from a water source. As a result, government authorities may be less likely to react in timely and constructive ways to the increasing pressure on the resilience of these politically weak communities.

Even in democratic societies, the ability of the elite to dominate political debate means that the concerns of more marginalized members of society are regularly pushed to one side. In less democratic societies, that happens to a much larger degree. So if the social and political elite are doing all right amid cli-

mate change, the incentive for the government to take far-reaching measures will be weak to non-existent.

Thus, the issue of governance comes into focus. Failures of governance lead to failures in adaptation to climate change, from which the poor and the marginalized suffer most. State fragility both makes this disregard of the common good more likely and means that there is little or no social safety net to ease the effects of failing to adapt to climate change.

Out of this interaction between state fragility and resource capture by elites comes heightened conflict risk. The case that there is a greater risk of violent conflict in poor countries is well established (Collier/Elliott/Hegre et al. 2003). The reason for this is not simply that poor people are more desperate and more easily recruited into armed groups. Key parts of the reason are the marginalization of the poor, their lack of voice, and lack of an accessible institutional framework for handling and settling conflicts and disputes. Poverty, state fragility, and a propensity to violent conflict make a vicious circle, full of negative feedback: each feeds on the others.

4.3 Agenda for Action

Against the background of the analysis above, the authors stress that responses to climate change must seek to build resilience to climate change (and broader political and economic risks) even where there is state fragility or conflict risk. This will likely require local and national action with international financial and technical support. This chapter does not go into the details of the actions required to reach this goal, but rather focuses on key requirements and core aspects of the approach that are necessary.⁵

4.3.1 Ensuring the Right Approach for Action

The lead-up to the 2010 Conference of Parties to the *UN Framework Convention on Climate Change* (UNFCCC) has seen a good deal of discussion about how to harness sufficient funds and technology to assist developing states with adaptation to climate impacts. This is the right objective, but achieving it will be a good deal more complicated than it sounds because adapting to climate change is essentially about adapting development. The question is not 'how can

⁵ For a more detailed exploration of the policy objectives required to fulfil this policy goal, see Smith and Vivekananda (2009).

institutions as they are presently organized meet the challenges of climate change?’ but rather ‘how should institutions be organized in order to meet these challenges?’. This calls for a rethink of development in a carbon-constrained and increasingly fragile world. The reasoning behind this call rests on three key concerns.

The *primary* concern relates to aid effectiveness. Vast amounts of money will be spent on adaptation over the coming years. It is imperative then that this money is used in ways that, by encouraging the necessary cooperation across sectors and between different actors, address the problems in interlinked ways, supporting adaptation, peace, good governance, and development simultaneously.

Policy development on the intersection between climate, conflict, and state fragility is at an early stage among those few donor governments that are addressing the issues.⁶ Many governments are currently re-calibrating their policies, both domestic and international, to address climate change.

This is right in principle; in practice, the issue is often addressed too narrowly, focusing on delivery and disbursement mechanisms, which can best get vast tranches of funding into state coffers. In fragile states, direct access to large-scale adaptation funding combined with low capacity and high corruption within government will limit the effectiveness of how funds are used. It is highly likely that funds will be diverted into the hands and pockets of one faction or another in the political elite. With public awareness of these funds coming in, people’s expectations for support - for example compensation for flood victims - are rising, and where they are not met, we are likely to see an increase in protests and political instability. In Nepal’s Koshi basin, recent experience shows that community protests are easily hijacked by political and criminal gangs who promote violence for their own ends. Misuse of funds may thus be the primary factor exacerbating instability.

The *second* and related concern for rethinking development relates to linked sectoral approaches. It is essential that the mechanisms for the financing and disbursement of climate change adaptation do not lock in policy responses that look at climate change impacts in isolation. A measure that is addressed at a specific physical vulnerability related to climate change - improved water management, for example - must be shaped by the understanding of not just wa-

ter systems, but also of systems of power and equity. Water can be managed so that all have equal access, or so that the rich have access and the poor do not. Without bearing these implications in mind, a scheme for improving water management could, depending on its details, exacerbate conflict in a fragile state. Recognizing this, those who are planning water management should be drawing everybody who stands to lose or gain, including marginalized groups and the private sector, into a discussion about the best way forward. Such an approach goes against the political grain in fragile states so it will need effort, coordination, and political will amongst donors and, where possible, recipient governments to make it work. Simply throwing money at the problem is not a solution.

Linkages are profound and profuse. The water problem cannot be solved by focusing exclusively on water. The same is true of agriculture, livelihood, disease, and migration. Addressing them in isolation from their context is not an option. What is needed is not just a case of linking activities between traditional development sectors such as water, food, health, and education, but the connecting up of development sectors with environment, trade, peace-building, and post-conflict sectors.

The *third* concern for rethinking development is about institutional mechanisms - namely deep linkages between what are presently discrete sectoral approaches. Peace-building must be shaped by the requirements of adaptation, the approach to which is shaped by the needs of state-building, and so on. This requires a shift in policy and practice, for example by creating the right incentives for applying conflict sensitivity to climate change adaptation processes, conducting climate change impact assessments to post-conflict reconstruction projects, and readjusting notions around post-conflict sequencing to ensure climate change is factored in throughout.

A shift in practice on this scale will necessitate institutional innovation. All other things being equal, if existing organizations are asked to work in new ways on new tasks, they will make only those changes in their behaviour that are easy to absorb. To get institutions to do things differently means getting them to be different; as institutions they need to change in order to take on very new agendas.

4.3.1.1 Conflict-sensitive Adaptation

Measures taken to adapt to the effects of climate change need to be conflict-sensitive. As a general term, conflict sensitivity means being aware of the causes of potential conflict in a given location; it in-

⁶ Source: Interviews with key interlocutors in donor agencies.

volves understanding the operational context and the effects of working in it, and on that basis, developing a capacity to avoid negative impacts and maximize positive ones.⁷ For example, where water resources have to be managed because they are otherwise insufficient, the process must respond to the needs of the people, involve them in consultation, and avoid pitting groups against each other. The provision of technical assistance to one group can increase tensions over equity and resource allocation amongst this group and between it and other groups. Since violent conflict has such a crippling effect on communities' and governments' abilities to adapt to climate change, these unintended consequences have a doubly negative impact: they increase vulnerability to both conflict and climate-change impacts.

Over the past decade the international community has increasingly recognized the need to minimize the potential negative impacts of its work and has slowly begun to act on the basis of that understanding by adopting what is known as a 'do no harm' approach. Slowly, some development agencies are beginning to adopt a conflict-sensitive approach which involves scrutinizing the potential positive and negative impacts of their work on the conflict context and vice versa. Similarly, agencies responsible for programmes of adaptation to climate change should take steps to ensure that at a minimum they do no harm and, ideally, have a positive impact on the contexts in which they work.

The challenge of conflict-sensitive adaptation, however, goes further than this; what matters is not just ensuring that specific activities are designed with awareness of the context but, more ambitiously, working out how to reshape the context to offer fertile ground for peace. For this to be possible, responses should actively contribute to the system of governance and the relationship between citizens and state. As such, adaptation measures must be based on a rounded analysis that addresses not only the climate challenge, but also the difficulties that arise from conflict risk and state fragility.

4.3.1.2 Climate-proofed Peace-building

Peace-building needs to be climate-proofed. If adaptation has to be conflict-sensitive, the other side of the coin is ensuring that peace-building is designed with sensitivity to climate change. For example, re-integrating ex-combatants in society is an enormously com-

plex task requiring that people transform their identities from fighters to citizens and members of families and communities (International Alert 2006). At the same time, internally displaced peoples and refugees may be returning from camps, seeking to pick up the strands of their interrupted lives and needing secure livelihoods. Where agriculture is a key element of this – either as a form of livelihood, or as the basis of a community, or simply as the means of providing food – it is essential to know from climate projections whether specific agricultural produce is likely to be viable in the long term. If not, the result will be further disruption in a context made volatile by the frustrations of recent ex-combatants, the fears of those who were recently victims, and the difficulties of social and economic reconstruction. So planners and implementers of peace-building and post-conflict activities need to have the relevant knowledge and capacity to integrate climate-change considerations into programming.

4.4 Ensuring the Effectiveness of Climate Change Adaptation

4.4.1 Dealing with Uncertainty

Current approaches to adaptation can be seen to take two lines: one focuses on creating response mechanisms to specific impacts, and the other on reducing vulnerability to climate change through building capacities that can help deal with a range of impacts (McGray/Hammill/Bradley 2008). Risk, uncertainty, and interaction are key aspects of the policy challenge. The challenge that faces policymakers is to manage rather than overcome the uncertainty. On that basis, it would be a mistake to focus policy responses on specific actions aimed at meeting the challenge of particular events, or even developing specific technical capacities. In the uncertain climate future, what happens if unforeseen events occur while expected ones do not?

In development and peace-building in the face of climate change, it is perhaps better to be vaguely right than to risk being precisely wrong. Science does not give an exact forecast of future climate change. It will never be able to. But it is wrong to conclude that no action on adaptation can be taken. Uncertainty is different from ignorance: it is something that confronts all decision makers, not only in the field of climate change. Companies have to take strategic decisions despite high levels of uncertainty about future mar-

7 See at: <www.conflictsensitivity.org>.

kets. Parents make decisions in raising their children without knowing exactly what effects they will have. We constantly have to make decisions without having enough validated information. To judge uncertainty – its magnitude and origins – requires thorough analysis and scenario planning. Climate research simply provides the relevant information. It is ultimately the responsibility of the decision-maker to draw on relevant tools.

There are several reasons for uncertainty about climate change information. The key reason is that we can't be sure of future greenhouse gas emissions, and since these hypothesized levels are the groundings for the different 'emissions futures' outlined in scenarios by UN scientists, this makes judging the socio-economic effects of climate change rather precarious. However, some areas contain more uncertainty than others. For example, on some variables such as temperature change there is a broad consensus amongst different climate models. Where there is less certainty, it is possible to compare models to get an indication of the expected direction of change. Often, uncertainty is due to lack of information at the hands of policymakers. Yet there is a considerable amount of accessible information now available for the purpose of informing relevant stakeholders outside the climate community.⁸ One step is to ensure that those responsible for planning and implementing development programmes in climate sensitive contexts know how to access climate change information, interpret the information to feed into their analysis, and communicate this to field level where necessary.

In terms of practical responses to uncertainty, where there is just a low level of uncertainty it will be possible to address tangible impacts such as flood defences against glacial lake outburst flooding. When facing more uncertainty, it is advisable to focus on increasing adaptive capacities through 'no regret' or 'low regret' activities (ideally a win-win-win situation for adaptation, mitigation, and peace), for example higher efficiency of water usage during the threat of possible drought.

8 For example, Adaptation Country Profiles provided by the UNDP, the World Bank Climate Portal, UNDP Impact maps of climate change, WBGU, and *Assessments of Impacts and Adaptations to Climate Change* (AIACC) multiple region and 24-country data sets.

4.4.2 Enhancing the Knowledge Base

There are five sides to the knowledge problem. *First*, the natural science knowledge about climate change is unevenly distributed and used. The UK can access and compare 60 different models of climate change to gain a sense of where the consensus lies; Bangladesh can utilize a single model; Nepal has not properly used one at all.⁹

Second, the social science of climate change is in its infancy and needs to catch up. The appropriate policy response to both problems is a sustained effort both to draw on research capacities in the developed countries so as to strengthen research capacities in developing countries, and to encourage research cooperation between think tanks and universities in developing countries.

Third, adaptation policy should begin by focusing on planning and implementing measures at as local a level as possible. This is partly to hedge against uncertainty and to take the opportunity to pilot new initiatives on a relatively modest scale. It is also because it is at the local level that it will be most possible to understand the societal impact of climate change. This gels with key governance considerations.

Fourth, information should be disseminated in ways that ordinary people can understand. Too much analysis is expressed in forms that are alienating and disempowering, so that those who are affected by climate change and caught up in the web of social consequences are far from aware of the risks and the challenges. But they often have a considerable knowledge derived from experience that can help design adaptation. There is a need to bring natural science, social science, and local knowledge together into a dialogue. This will help equip citizens for their side of the governance contract. And it will steadily strengthen not just local but national and international capacity to find imaginative solutions to common problems.

Lastly, there is the age-old institutional problem of siloed knowledge within sectors. Climate change is still seen as an environmental issue and thus understanding climate impacts is seen as something for climate experts, not for development practitioners, policymakers in post-conflict reconstruction, conflict prevention and early warning experts, or humanitarian actors. An institutional shift is necessary for adequate understanding of climate change impacts to become part of the knowledge base of all actors

9 Source: Conversations with several interlocutors in South Asia.

engaging in countries that will be affected by climate change.

4.4.3 Sequencing

Discussions about interlinkage between different problems and policy areas routinely raise the question of sequencing – what comes first? These discussions often fall victim to the false assumption of linearity – first one thing, then the next. When thinking about post-conflict peace-building, for example, Paddy Ashdown argues that the priority task on day one of a peace operation is to dominate the security space (Ashdown 2007: 69, 71–73, 76–80, 94–95). But along with that he argues it is also necessary to establish the rule of law and get the economy kick-started. It seems important to take decisions about sequencing but the truth is that states and peace are not built sequentially.

Response to climate change offers the same dilemmas. Establishing the rule of law will not be easy if the people feel that the authorities are failing to protect them from flooding. Nepal is in the front line of climate change because of glacial melting and changes in the timing of the monsoon, both building on climate variability that is already extreme. With severe flooding in 2007 and 2008, it seems Nepal should begin by improving its response and recovery capacity. Yet that would have only short-term effects unless, at the same time, efforts were in hand to strengthen the country's basic resilience and to protect the vulnerable. To do that, however, it is necessary to find ways of handling the legacy of the recent civil war. Often bitter party rivalries that dominate all public issues and relations between the parties can make or break any and all policy initiatives and actions by the state.

There is not much of a record of effective sequencing on which to draw. A review of early recovery arrangements found little that could be thought of as best practice – few efforts in any aspect of recovery from war that managed early on to lay foundations for long-term sustainable peace (Chandran/Jones/Smith 2008). The review implies that sequencing is established more on the basis of available resources than on the basis of need.

A viable approach to sequencing has to acknowledge the importance of meeting immediate needs, fixing immediate problems, and preventing or preparing for the next disaster. At the same time it has to imagine a desirable end-state and identify the necessary conditions for making progress towards it. In different circumstances the combination of priorities will be different. The lessons of experience suggest there

will not be a single key initial task but, rather, several equally important early tasks.

4.4.4 Enhancing the Governance Contract

Responsive and responsible states are not created just by increasing capacity in government departments but by a contract between citizens and state. This swings on the balance of power between the elite and the rest of society. Development of a rich network of citizens' organizations contributes to state-building and to the practice of good governance because it encourages transparency and accountability, and accordingly efficiency and responsiveness. But its influence is resisted by the social and political elite who, if they are strong and self-confident enough, may reject civil society influence altogether and close down the space it needs to work in.

Implementation of the policy objectives set out above must begin with local needs and capabilities, with provincial and national governments meeting needs for which local capabilities are not sufficient, often coordinated with other regional governments, and with international funding and other support as necessary. This effort will have to be designed and carried out despite the obstacles mounted by irresponsible members of the state apparatus and grasping elites. Removing these obstacles will partly be about providing incentives for elite groups and governing authorities to support far-sighted approaches to adaptation, peace and good governance.

Such an approach will therefore stress the engagement of citizens in understanding, deciding and implementing the measures that need to be undertaken to face the multiple challenges of climate change. In order to make this possible, policy should be implemented at as local a level as possible, so as to optimize its visibility and accessibility while making the institutions implementing policy as transparent and accountable as possible to ordinary citizens.

This is not a kind of good governance that is specific to climate change. It draws on general thinking about governance frameworks in development, which sees responsive state-building as offering a virtuous circle of basic functional effectiveness, transparency, social participation, and inclusivity (Whaites 2008; Ibrahim 2008). In the international development community, this argument has been fairly widely accepted in principle, theory, and policy – it is the practice that lags.

The reasons why the practice lags lie at the heart of the power relations in developing societies. In con-

flict-affected and fragile contexts, both governance and the economy tend to favour a relatively small elite group. This is a clientelist system of governance, in which the goods and services provided by the state are not available universally but only selectively, according to how politicians see their advantage.¹⁰ These are typical features of “limited access social orders”.¹¹ For there to be a shift towards more open access, or, in different terminology, for responsive state-building to begin (Whaites 2008), a significant fraction of the social, economic, and political elite must see adequate incentives.

Climate change issues may offer such an incentive, especially if international discourse and policy shifts across the board and the climate consensus include major governments that have hitherto stayed outside it. The stakes involved are enormous and far-sighted elites will adjust because of that. Further, as many observers have noted, issues of the natural environment can be effective platforms for dialogue and identifying shared interests (UNEP 2008). However, this is only the case if the right incentives are in place. It would not be reasonable to expect a quick or comprehensive transformation. But in some states, aspects of better governance will emerge alongside and in competition with other, unreformed governance practices. And in some countries, civil society groups will be able to engage with parts of the state and the elite.

4.4.5 Getting the Institutional Structures Right

This is an ambitious policy agenda. To ensure its potential is realized, we have to look not just at the policy requirements, but also at the institutions that will have to carry them out. And the theme of risk, uncertainty, and interlinkages is unsettling when we come to think about institutional responses. Institutions are not always so good at dealing with such challenges.

In the last decade, international development actors have learned some hard lessons about the difference between actions that are effective in achieving development objectives and those that fail to be truly supportive of poor and vulnerable communities. Key

among these are about how difficult it is to ensure institutions are able to do development effectively in countries with poor governance, state fragility, and the effects of violent conflict. It will take more than a few tweaks to existing processes. It requires a wholesale rethinking of institutional structures, the incentives that govern them, and the rules by which they operate.

The major focus of the adaptation debate at the UNFCCC remains on how this money will be raised.¹² However, it is vital that discussions on the governance arrangements and priority area identification surrounding the disbursement of climate funds are not postponed until after the financing questions are answered. This process cannot occur in a linear fashion. Adaptation is already occurring and more will need to occur and in the absence of any global consensus under the UNFCCC, donors are increasingly going it alone in bilateral agreements with developing states.¹³

There are of course questions as to how this level of finance can be absorbed in some low-income economies. In conflict-affected and fragile states, governance systems and resource management often favour a small group of elites. The UNFCCC’s Adaptation Fund aims to ensure that recipient countries will decide their own priorities on how funding will be spent. Noble in principle, this aim is fraught with practical difficulties in fragile states, where it is impossible to overlook issues of corruption, lack of adequate structures, and lack of transparency.

This raises the question of whether existing institutions are fit for purpose, such as the World Bank and the Global Environment Fund which have de facto assumed a role as climate fund administrators. Despite a 2012 sunset clause on two major World Bank climate funds, the reality is that they are unlikely to disappear.¹⁴ These institutions are driven by internal systems, prescriptions, and norms, which often

10 See the discussion of power in fragile states in E. Bell (2008: 16–17).

11 See the ground-breaking discussion of social orders, violence and development advanced by North, Wallis, and Weingast (2009). An earlier briefer treatment covering the same theoretical issues without so much evidence base is available in North, Wallis, and Weingast (2006).

12 Projected requirements for adaptation fall between US\$75 billion and US\$360 annually by 2030, whereas the total climate finance for developing countries for both adaptation and mitigation is US\$10 billion a year at the time of writing.

13 For example, the UK’s Environmental Transformation Fund, Germany’s International Climate Initiative and Japan’s Cool Earth Fund.

14 Lisa Friedman, “Still no money for developing nations, new G-20 documents show”, in: *The New York Times* (11 September 2009); at: <<http://www.nytimes.com/cwire/2009/09/11/11climatewire-still-no-money-for-developing-nations-new-g-20933.html>>.

conflict with sensitivity to how fragility affects operations and how operations affect fragility. A look at these institutions reveals three concerns.

Their guiding principles are inappropriate for the task in hand. Working in fragile states requires different operating principles from normal. Guiding principles for development such as ‘country ownership’ may work in states that have a relatively stable and accountable governance structure but they can be very damaging in fragile states. The World Bank, for example, which is presently managing the Climate Investment Funds, including the multi-donor Pilot Programme for Climate Resilience, is guided by principles of alignment which do not explicitly acknowledge that sometimes the state itself is part of the problem. Efforts to minimize transaction costs mean that the principle of country ownership is implemented simply by putting things in the hands of a small elite group. Country ownership and government ownership are not always the same thing. Nor does getting the buy-in of one or two national ministries such as the Environment Ministry or National Planning Commission equate to national alignment. Failure to acknowledge that state fragility requires institutional principles fit for the context will significantly impair the effectiveness of efforts to build resilience in fragile states (Bell 2008: 10).

The second concern is whether these institutions have appropriate internal incentives. The emphasis and incentives at the Bank and GEF are frequently based around meeting quantitative targets such as amount and speed of money disbursed and number of projects completed, rather than qualitative issues that might put a higher value on adopting conflict-sensitive approaches or supporting broad participation in decision-making processes (Bell 2008: 10).

And thirdly there has to be concern about institutional mandates, since political and social considerations are sometimes regarded as beyond the mandate of these organisations. The Bank’s Articles for Agreement, for example, have a clause stipulating that “proceeds of any financing are used ... without regard to political or other non-economic influences or considerations”. There is of course a fundamental difference between avoiding the politicization of aid and ensuring that development commitments are based on a solid understanding of political economy and social factors. Whilst individuals within the organizations in question may understand this point, the vague policy formation means it is often misinterpreted, resulting in superficial and unsustainable outcomes.

Design of the instruments under the new climate change architecture needs to ensure an understanding of the social issues and the political economy of fragile contexts. They must also be free of institutional constraints that impede flexibility, or it will be impossible to respond to changing circumstances. And, reflecting the importance of qualitative outcomes, they should promote qualitative indicators rather than simply relying on assessing quantitative outputs (or, even worse, quantitative inputs such as money spent). Institutions such as the World Bank and the UN system which will undoubtedly play a major role in disbursing climate change funds and implementing climate adaptation projects urgently need to get their house in order. This requires a move away from inflexible structures grounded in sectoral ‘silos’, counterproductive incentive systems, patchy knowledge bases, and inadequate consideration of governance in any meaningful sense.

Below, some areas for institutional reform are considered that apply to the policy approach to be realized. They reflect not so much on what is to be done but on modes of implementation.

4.4.6 Enhancing Institutional Flexibility

The combination of climate change, conflict and state fragility, and the substance of the most promising policy responses places tough demands on the functions of national and international institutions alike. One such function is analysis and monitoring of risk. Related to that is, on the one hand, the rapid dissemination of information and, on the other, adjusting to a changing terrain of risk, perhaps by adjusting existing policies, or maybe by generating new ones. This may well include the need to respond to the proverbial ‘black swan’ – an event that is so different from the norm that it is not simply unexpected but falls right outside the framework of what is believed to be possible.¹⁵ Institutions capable of fulfilling these functions will be forward-looking, thought-led and evidence-based, innovative and resilient.

The *first* question, amid the pressures of pragmatic political consideration both in national governments and in inter-governmental organizations, is whether it is feasible to establish such institutions. There are two reasons for doubt. The first is that they will be established by decisions taken within institutions that themselves all too often lack the necessary

15 The term has been introduced into the discourse by a market analyst, Nassim Nicholas Taleb (2007).

qualities. The second is that these institutions will be dealing with matters that are often politically sensitive. It is not hard to envisage coalitions of the unwilling blocking urgently needed institutional innovation. For both these reasons, a clear-sighted and determined political alliance is almost certainly required to get things moving, either with regard to national or to international institutional change.

The *second* question is how to establish rules, norms, guidelines, and incentives so that a capacity for innovation is rewarded, rather than being bottled up, as is often the case in complex, high-profile institutions. One thought is that establishing and running institutions that can meet the challenge of climate, conflict, and state fragility will be easier in some national settings than in others, and easier than at the international level. The conclusion here may be that where such institutions can be established they should be, with an international mission despite a national foundation.

The emphasis on institutions can sometimes lead policy design astray if it is forgotten that institutions are made up of people. The rules, guidelines, and norms in an institution may all be exemplary, but the people who work within it must be able to rise to those standards. Ensuring that the human capacity is up to the task is as important as getting the functions and structures right. This is a matter of staffing policies that are aligned with the mission and the value placed on flexibility and innovation. It is, at bottom, a question of nurturing the talent needed meet the institution's goals.

4.5 Conclusion

The consequences of climate change, violent conflict, and the corrosive effects of state fragility are all major problems. To take them on together is to take aim at a very difficult target. But it is necessary because these problems are not isolated from each other. Policies for adapting to the effects of climate change have to respond to these complex realities or they will not work. For a start, adaptation in fragile situations needs to be rethought and redefined, recognizing a number of crucial issues:

- Fragility is associated with constant flux and there is little agreement on its definition and the complexity of contributing factors, let alone what should be done.

- Fragility means that the state cannot or will not shoulder responsibility to protect lives and livelihoods.
- Fragile states cannot apply most of the conventional development tools used or demanded by the international community.
- Climate change adaptation plans set very ambitious targets and checklists for what governments 'must' do, with little relevance to what fragile states can manage.

At the same time, the field of development itself will have to adapt in order to face the challenge of climate change. Neither development nor adaptation nor peace-building can be regarded as a bolt-on to either one of the other two. The problems are linked and the policy responses must be integrated.

The fact that they are linked problems helps identify linked solutions that benefit from synergies and that have an impact on several targets at once. Starting with the irreducible uncertainties of how the interlinkages can be expected to operate, this chapter has set out a policy goal, backed up by two policy requirements that should underlie all planning and programming in fragile states:

1. Adaptation to climate change needs to be conflict-sensitive. In fragile and conflict-affected contexts, all interventions must respond to the needs of the people, involve them in consultation, take account of power distribution and social order, and avoid pitting groups against each other.
2. Peace-building needs to be climate-proof. For example, post-conflict reconstruction and the reintegration of ex-combatants into their villages must take account of the long-term viability of the land and natural resources available for lives and jobs.

These requisites are supplemented with modes of implementation that draw on the best of development practice. By briefly illustrating how this would look in practice, this chapter has attempted to communicate a sense that these tasks are feasible – demanding, certainly, but distinctly achievable. In essence, they require two fundamental shifts: in the way institutions are organized, and in the way interlinkages are addressed.

First, institutions responsible for climate change adaptation – be they under the UNFCCC architecture, international financial institutions, development agencies, or peace-building organizations – need to ensure that their internal systems and structures promote adaptation even where there is state fragility or

conflict risk. In these complex and delicate situations, adaptation must do no harm, and ideally help the goal of peace along its way. For this to be possible, institutions must restructure in such a way as to maximize the participation of ordinary people and build accountable and transparent public institutions.

Second, strategies must adapt to meet the combined challenge of climate change, conflict risk, and state fragility. It is wrong to imply that henceforth there will be old-style development with adaptation on top. It may be that there will be a continuum from development activities that are not affected by climate change to development activities whose entire purpose is adaptation (McGray/Hammill/Bradley 2008: 18–22), but overall policy and strategy will present a new form of development. That means development assistance will need to adapt too.

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5 Theories and Models of Climate-Security Interaction: Framework and Application to a Climate Hot Spot in North Africa

Jürgen Scheffran, P. Michael Link, and Janpeter Schilling

5.1 Introduction¹

In its Fourth Assessment Report (AR4), the *Intergovernmental Panel on Climate Change* (IPCC) addresses serious risks that could undermine the living conditions of people all over the world (IPCC 2007). Impacts on food and water availability, flood and storm disasters, and large-scale events such as loss of the monsoon, breakdown of the thermohaline circulation, polar ice melting, or sea level rise could affect a considerable fraction of the global population. After publication of this report a number of studies suggested that the struggle for food and water, the impact of natural disasters, and large-scale migration could pose security risks that would destabilize social systems and aggravate existing conflicts. These concerns inspired a debate on the securitization of climate change (Wæver 1995; Brauch 2009b). The IPCC reports did not focus on the links between climate change, security, and conflict (IPCC 2007; Nordås/Gleditsch 2009), although statements by IPCC Chair Rajendra Pachauri upon acceptance of the Nobel Peace Prize suggest such a linkage. In its planned fifth assessment report, the IPCC will include a chapter on the human security dimensions of climate change.

The security implications of climate change are very complex and cover highly uncertain future developments, precluding simple predictions. While statistical analysis of a large number of cases can provide guidance about possible linkages, additional theoretical efforts are required to reconstruct the causal relationships and pathways connecting climate change and conflict in individual case study regions. The great unknown is how human beings and societies will respond to the expected consequences of climate

change. Will the social stress they are likely to experience lead to more security risks and conflicts or rather contribute to the solution of the problems and strengthen cooperation, improving societal stability?

A systematic and integrated assessment of the climate-security link is still lacking. There is a need to design interdisciplinary and theoretical approaches to improve the understanding of how actors adapt to climate change and whether potential security implications can be avoided. Besides lack of theory, there is very little modelling of the link between climate change and conflict, contrasting with the extensive modelling and simulation carried out by the climate research community. To bridge this gap, theoretical approaches and modelling tools are presented here to analyse the complex relationships and possibly provide guideposts for future research. An integrated assessment framework is introduced to analyse the causal chain between climate change, natural resources, human security, and societal stability. The aim is to provide a deeper understanding of the links between climate and security and their potential to induce destabilizing effects, affect tipping points, and trigger conflicts.

Within this framework the authors explore the key linkages and sensitivities between these variables and systems as well as possible pathways of interaction, with reference to theories and models that are applicable and relevant in this context, without aiming for an extensive survey of the modelling literature. While the natural science aspects only receive minor attention, there is a particular focus on the role of human responses, actions, and interactions affecting natural and social systems. The impacts of and responses to climate-induced stimuli are evaluated in the context of an adaptive agent model of action and interaction. Conceptual issues of vulnerability, risk, security, stability, and adaptation are touched upon only as far as necessary (for a more detailed discussion of terms see Scheffran 2011). The macro-level global analysis is exemplified and specified by a micro-level analysis of a climate hot spot in North Africa for the water conflict in the Nile River Basin.

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5.2 Empirical Assessments and Pathways of Climate Conflicts

A number of studies express concern that climate change could overwhelm the adaptive capacities of societies and contribute to their destabilization, possibly leading to security risks and the use of violence along various pathways, including resource capture, mass migrations, and armed conflicts between countries (for an overview see Brauch 2009b; Brzoska 2009; Buhaug/Gleditsch/Theisen 2010; Carius/Tänzler/Maas 2008; Maas/Tänzler 2009; Scheffran/Battaglini 2011).

In addition to these more policy-oriented studies and statements, there is a significant scientific debate on the climate-conflict link which highlights some of the critical research issues (Barnett 2003; Barnett/Adger 2007; Dabelko 2009; Nordås/Gleditsch 2007; Raleigh/Urdal 2007). Several quantitative studies and databases² provide empirical material together with statistical analysis to test hypotheses about the relations between climatic variables (temperature, precipitation) and conflict-related variables (number of armed conflicts and casualties). Empirical studies do not provide a clear picture yet, which may be due to lack of data or to the fact that climate change is an issue of the future. Some indications can be acquired by looking at historical cases which suggest that the rise and fall of civilizations was affected by a changing climate (Fagan 2004). Recent studies have found significant statistical correlations between a changing average global temperature and the frequency of wars, e.g. during the Little Ice Age (Zhang/Zhang/Lee et al. 2007, Tol/Wagner 2010). However, Buhaug, Gleditsch, and Theisen (2008) argue that a simple relationship between temperature change and the number of armed conflicts cannot be justified over the last

two decades because the number of such conflicts has declined after the end of the Cold War, while temperature has increased (figure 5.1).

One possible explanation is that climate change so far has not directly affected large-scale conflicts such as war and will more likely cause small-scale events of societal instability and low-level conflicts. The latter have tended to increase in recent decades, as suggested by the Heidelberg Conflict Barometer which distinguishes five conflict intensities, from latent conflict to war (Heidelberg Institute for International Conflict Research 2010). Gathering data about small-scale events such as protests, riots, low-level violence, crime, and police action is an important task of ongoing research (chap. 3 by Nardulli/Leetaru). A challenge for future research is to expand and combine databases on various environmental, conflict, and socio-economic variables in order to identify security syndromes in regional climate hot spots. Additional information could be acquired through news services, local surveys, interviews, focus groups, and stakeholder dialogues in order to enhance the understanding of local perceptions and human response patterns.

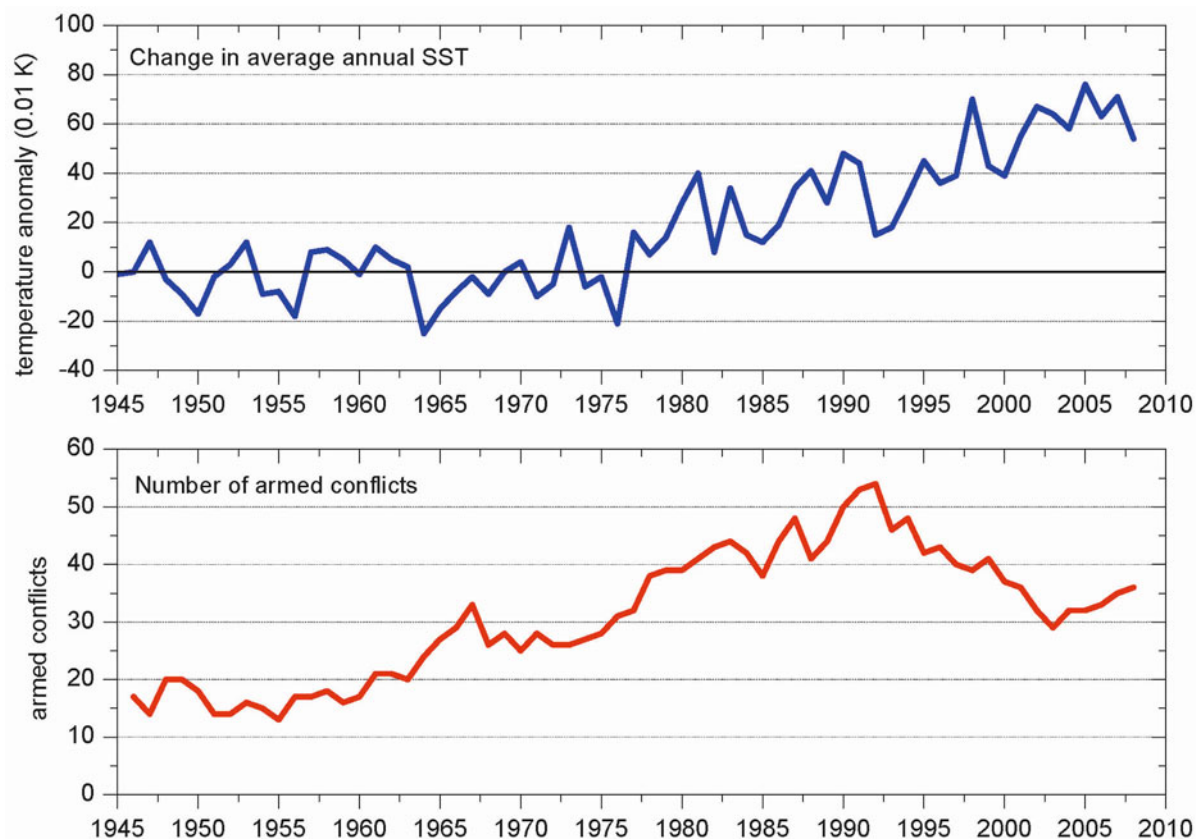
Until more data are available, it is promising to look at regional case studies of environmental conflicts, which are important for exploring the relationships in detail.³ During the 1990s, several research groups have examined how the scarcity of natural resources such as minerals, water, energy, fish, and land affects violence and armed struggle. These include the Toronto Project on Environment, Population and Security (Homer-Dixon 1991, 1994), the Swiss Environment and Conflict Project (ENCOP; Baechler 1999), the International Peace Research Institute in Oslo (Gleditsch 1997), the Woodrow Wilson Center's Environmental Change and Security Project (Dabelko/Dabelko 1995), Ecologic (Carius/Lietzmann 1999) and adelphi research in Berlin (Carius/Tänzler/Maas 2008). The review of 73 empirically recorded environmental conflicts that occurred between 1980 and 2005 shows that these had a regional scope and did not present a serious threat to international security (Carius/Tänzler/Winterstein 2006).

Using a multivariate analysis, Hauge and Ellingsen (1998: 299) suggested that "factors like deforestation, land degradation, and scarce supply of freshwater, alone and in combination with high population density, increase the risk of domestic armed conflict,

2 These include but are not limited to: Peace Research Institute Oslo (PRIO) data on armed conflict; Uppsala Conflict Data Programme Non-State Conflict Dataset; Correlates of War Project at the University of Illinois; KOSIMO database of the Heidelberg Institute for International Conflict Research; Inventory of Conflict & Environment (ICE); American University of Washington; Armed Conflict Location and Event Data (ACLED). Sources on disasters are the Emergency Disasters Database (EM-DAT) of the Centre for Research on the Epidemiology of Disasters, Louvain (CRED), WHO Collaborating Centre for Research on the Epidemiology of Disasters. The Cline Center for Democracy at the University of Illinois operates an event database on societal instability indicators (chap. 3 by Nardulli/Leetaru).

3 See the studies prepared for WBGU (2008) that can be accessed at: <<http://www.wbgu.de/en/publications/flagship-reports/flagship-report-2007-security/>>.

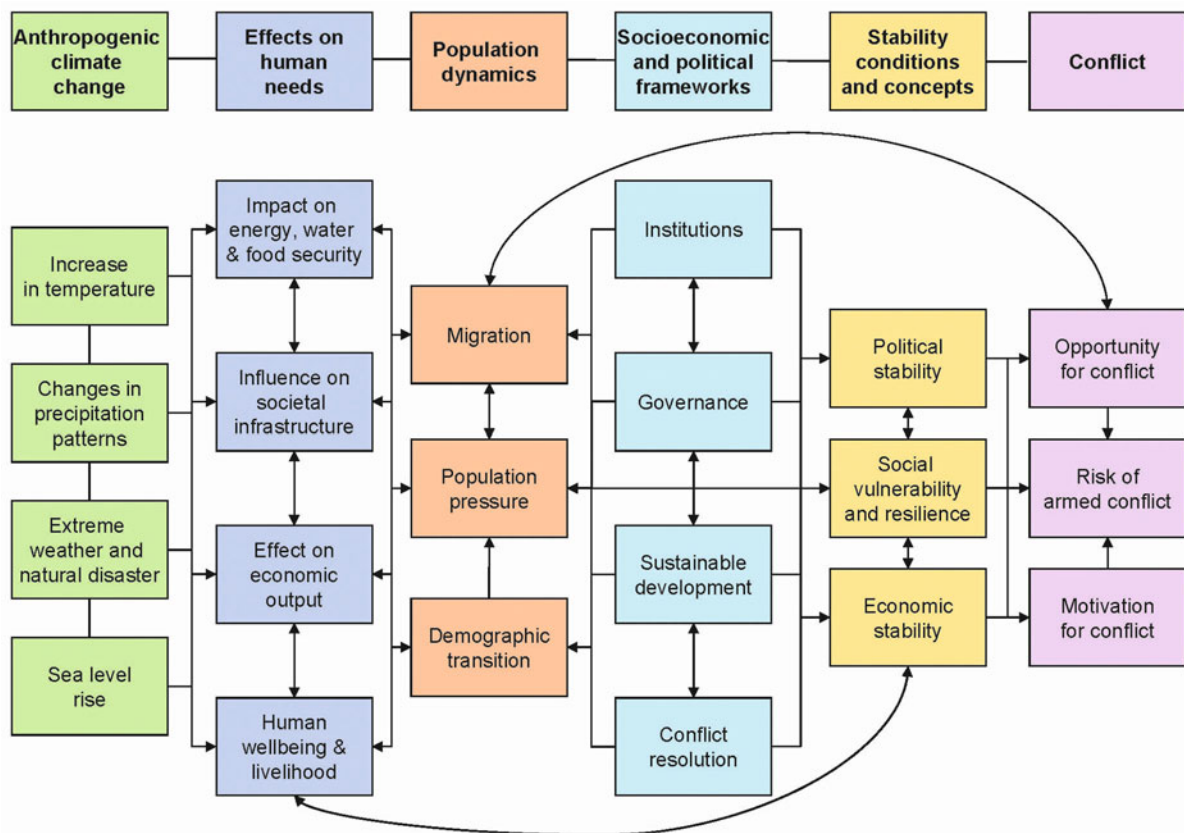
Figure 5.1: Global anomalies in sea surface temperature (SST) with respect to the period 1951-1980 (above) and the number of armed conflicts (below) for the time period 1945-2008. **Sources:** Drafted by the authors based on data by NOAA (2009) above and PRIO (2009) below.



especially low-level conflict.” Others have challenged this result, and Theisen (2008) could not even replicate Hauge and Ellingsen’s published results with the data posted. According to Gleditsch (1998), the meaning of ‘environmental conflict’ is often not clear, and important variables are neglected. Some models are virtually untestable; the causality of the relationship is sometimes reversed; foreign and domestic conflict is not distinguished. Barnett (2000) argues that the environmental conflict hypothesis is more theoretically than empirically driven. Other studies point out that it is not the scarcity of natural resources that is driving conflict but rather their abundance (Collier 2000; De Soysa 2002; Le Billon 2001; Peluso/Watts 2001), suggesting that the influence on conflict depends on the type of resource. In some cases the income from the capture of valuable resources (e.g. diamonds) can be used to buy arms or pay soldiers, which would further fuel existing conflicts. This may be less the case for vital renewable resources that are affected by climate change, which rather makes resource scarcity a factor contributing to conflict.

To provide a more detailed background about the range of empirical results concerning the statistical correlations between climate change and conflict, [table A.1](#) (in Appendix) highlights some of the results from previous research since 2000, without being comprehensive or exhaustive. The statements suggest that there is a wide range of possible pathways between environmental changes and conflict-relevant trends, making it difficult to deduce general conclusions. The integration of the potential complex pathways provides a blueprint for further climate-security analysis and points to possible cause-effect relationships as well as to relevant factors for avoiding risks and conflicts ([figure 5.2](#)).⁴ Effects of anthropogenic climate change interact with individual human needs to have an impact on the underlying social dynamics. Depending on how welfare is affected and what the prevalent socio-economic boundary conditions look like in the region, such changes can have a lasting consequence for the given social structures. If the societal implications are negative, the risk of conflict may increase as a function of the motivation and opportu-

Figure 5.2: Possible pathways from climate change to conflict. **Source:** The authors' own representation, modified and expanded from Buhaug, Gleditsch, and Theisen (2008).



nity for conflict. Any rise in the risk of armed conflict will then reflect back on the social dynamics and socio-economic boundary conditions as well as on individual human needs.

Due to non-linear effects, an increase in average mean temperature above a certain threshold (such as 2 °C) may result in disproportionately strong impacts, such as a reduction of water availability and agricultural output in climate hot spots of Africa, Central and South Asia, or Central and South America (Hare 2006; Schellnhuber/Cramer/Nakicenovic et al. 2006). Food insecurity in one country may further increase competition for resources and drive parts of the population to migrate into neighbouring coun-

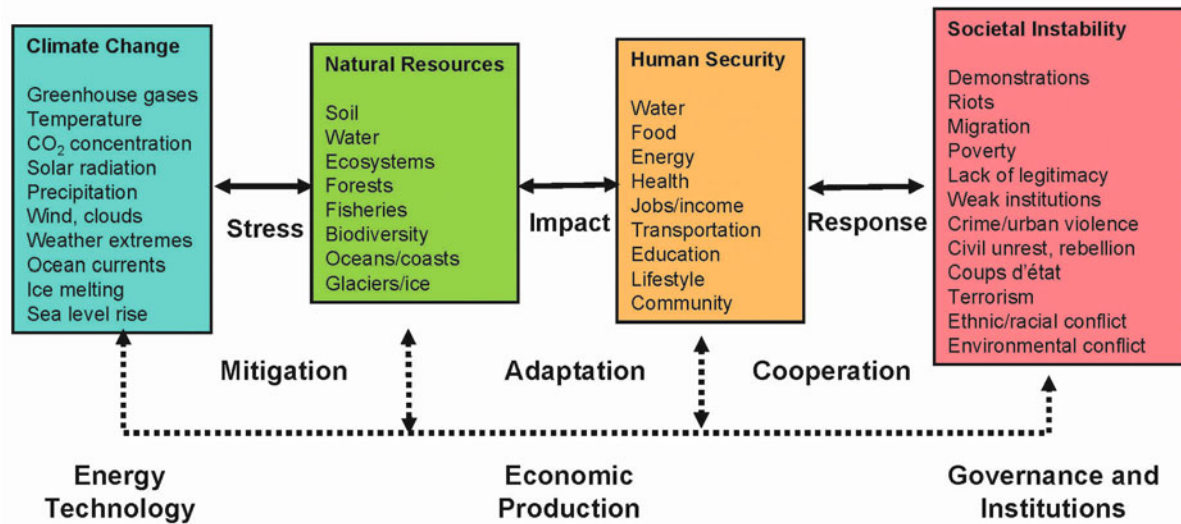
tries. It is important to understand how levels of security and risks of potential conflict are affected by rising temperatures in a particular region, and how human and societal responses influence that development. To further study these relations, the possible pathways need to be embedded into an integrated framework of climate-society interaction, which is described in detail in the following section.

5.3 An Integrated Assessment Framework of Climate-Society Interaction

Given the discussion above, it is important to treat the security implications of climate change not as isolated phenomena but in their societal context. As figure 5.2 indicates, there are various possible pathways between climate change and conflict that are influenced by a number of contextual conditions, intermediate variables, and intervening responses. Furthermore, the societal and political levels are not only affected by climate change, but they affect it in turn, indicating

4 The arrows represent an impact between two factors, without indicating its sign or strength. Some of these linkages are subject to empirical research; others may be hard to test, either because the variables are not clearly measurable or because there are several intervening factors. The main purpose of this complex framework is to show the limits of simple statements and to identify crucial factors that could stabilize possible roads to conflict.

Figure 5.3: Causal relationships between climate change, natural resources, human security, and societal impacts.
Source: Adapted from Scheffran (2011).



that circular feedback is relevant. This serves as a motivation to develop an integrated perspective that takes the complexity of the issues into consideration from the start. While the authors do not expect to come to a conclusion with regard to the methodological challenges in this chapter, they look to contribute to addressing the challenge in a systematic manner and indicating pathways for research that could possibly frame the future debate. Rather than searching for empirical links like needles in a haystack, it is essential to make it clear that empirical investigations into the key linkages should consider the theoretical context. If, as a hypothetical example, climate change triggered violent conflict in some cases and cooperation in other cases, then on average climate change might not have any measurable impact on conflict. In attempting to identify the conditions under which conflict is triggered or not, statistical analysis of previous cases can provide some clues, but it reaches its limits when it comes to complex, uncertain, and long-term future processes. Due to the circular relationships between the variables, each pair of variables could be connected through multiple pathways, and this means particular care must be taken when selecting dependent and independent variables. Developing a conceptual framework to analyse these pathways could thus be of added value for empirical investigations.

Within this context, the analysis needs to be embedded into an integrated assessment framework of climate-society interaction that represents the causal links between climate change, natural resources, and

environmental stress, human values and needs, and the societal consequences and instabilities (figure 5.3):

1. Changes in the climate system such as increases in greenhouse gas concentration, temperature, and altered precipitation patterns affect environmental systems and natural resources (e.g. soil, water, ecosystems, forests, biodiversity) through a sequence of complex interactions.
2. Changes in natural resources can have adverse impacts on human values and capabilities, which may provoke human responses that can affect social systems.
3. Depending on the degree of vulnerability, socioeconomic stress increases as a result of water and food insecurity, health problems, migration, economic degradation, the weakening of institutions, diminishing economic growth, and eroding societies.
4. Interdependencies between these factors may lead to societal instability that can manifest itself in violent forms such as riots, insurgencies, urban violence, or armed conflict.
5. A feedback loop allows human beings and societies to adapt to the changing situation and mitigate climate stress through strategies, institutions, and governance mechanisms that may apply technology or human and social capital to adjust the economy and the energy system to the altered environmental conditions.

The significance of the impacts of climate change on society and security can be deduced from the links be-

tween the variables and how events spread along the causal chain, which is a function of the sensitivities between variables. Examples of events could be an increase or a drop in temperature and/or precipitation, the loss of species, the occurrence of disasters, an action by human beings, or collective action by a group of people, such as riots or war.⁵

According to the IPCC (2007: 881), sensitivity in the context of climate change is the

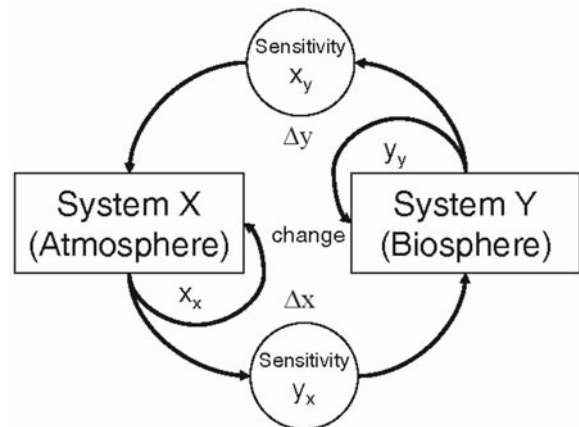
degree to which a system is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea level rise).

A prominent example is climate sensitivity, i.e. the temperature change induced by a doubling of CO₂ concentration in the atmosphere. While climate sensitivity is essential for determining the impact of climate change, its measurement is associated with high uncertainty, despite considerable research into the underlying natural processes. This indicates that the nature of the sensitivities is not deterministic but probabilistic, and this is even more the case in relationships involving human responses.

Since several intermediate variables are involved, estimates are needed for each of the individual sensitivities that in combination yield the overall sensitivity. An example is the interaction between variables in the atmosphere and biosphere systems (figure 5.4).⁶ Many more of these linkages are possible. Estimates of the

sign and magnitude of these relationships can be presented as impact graphs that serve as an analytical framework for describing the network of connections between the variables and the associated spread of events.

Figure 5.4: System-system interaction, exemplified by atmosphere and biosphere systems. **Source:** Modified from Scheffran (2011).



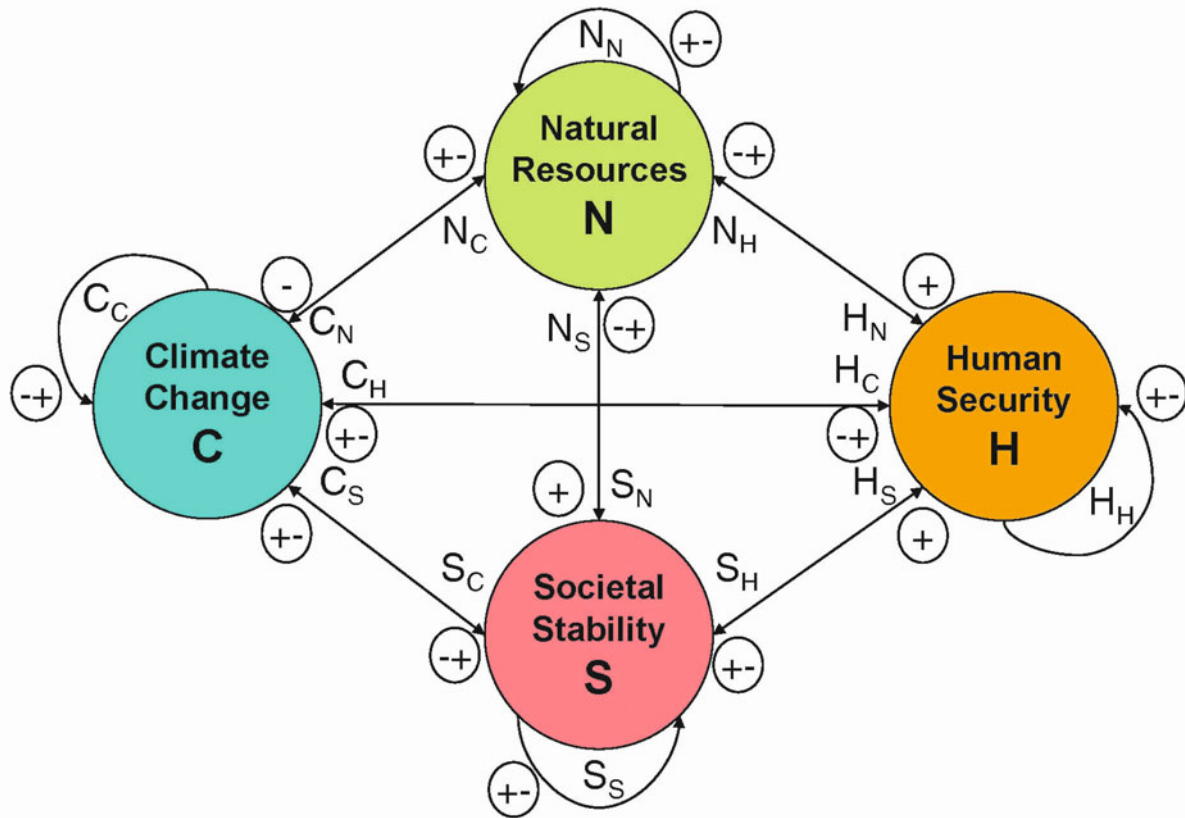
The possible causal chain from climate stress to societal instability can be constructed through a series of links in which the couplings between the variables are represented by their sensitivities (figure 5.5). Changes in the *climate system* (*C*) affect *natural resources* (*N*). Environmental changes will influence *human security* (*H*) and can ultimately trigger impacts and events that affect the (*S*) (for a specification of these systems and impacts see the following sections). Since each of these systems is characterized by a vector of variables, the links between the variables of each system can be represented by a sensitivity matrix (X_Y) that indicates how sensitive a variable in vector *X* is with regard to a variable change in vector *Y*.⁷ Statistical multivariate analysis of data makes it possible to estimate the sensitivities based on data, although in reality some of the sensitivities may be highly uncertain and/or difficult to measure.

Key sensitivities are the stress induced in natural resources by climate change (N_C), the impact of environmental change on human security (H_N), and the societal consequences of changes in human living conditions (S_H). The coupling between climate stress and societal instability (S_C) captures the direct connection

5 Events are represented by changes Δx in a system variable x , which may induce a change Δy of another variable y , expressed by a functional relationship between both variables $\Delta y = y_x \Delta x$. Here y_x is the sensitivity of changes in y with regard to changes in x (mutual impact), which can either represent a positive coupling ($y_x > 0$) or a negative one ($y_x < 0$). Similarly, a change in x can affect its own dynamics (self-impact x_x) which determines whether an increase in variable x leads to further growth ($x_x > 0$: exponential growth), or to a decline ($x_x < 0$: exponential decay). For a functional relationship between the variables and sufficiently small variable changes, sensitivity can be approximated by first-order partial derivatives of the respective variables; for larger variations higher orders need to be included. In general, the sensitivities are not constant but may depend on the system variables, including space and time.

6 Here x_y measures the sensitivity of carbon Δx extracted from the atmosphere to build biomass Δy in trees. Accordingly, y_x could be the impact of anthropogenic carbon emissions Δx on forest growth Δy through the effect of global warming.

7 Small letters (x_y) represent sensitivities of variables, capital letters (X_Y) represent sensitivities of systems of variables or vectors.

Figure 5.5: Sensitivities in climate-society interaction. **Source:** The authors.

between climate change and societal stability. Other linkages are also relevant here, such as the coupling between human security and climate change H_C , between societal and environmental change S_N , and the reverse couplings (impacts on climate change) C_N , C_S , C_H , and so on. Since there are dynamics within each of these systems as well, there are also internal couplings of variables denoted by matrices C_C , N_N , H_H , and S_S (figure 5.5).

In addition to the direct links, there are indirect links between each pair of systems through other systems, e.g. the impact of climate change on society through environmental and human impacts. The overall impact of climate stress on societal stability can be represented by the various pathways through which climate-related events can spread, including those shown in figure 5.2.⁸ The question is how societies respond to a loss of stability induced by climate change. A more stable society is better equipped to mitigate climate change, but a reduction of stability due to climate change would send the system into a feedback loop, aggravating the problem.

Since C , N , H , and S represent large systems that comprise sets of variables, the interaction becomes

more complex if all links between the individual variables are taken into consideration. As mentioned above, key climatic variables are greenhouse gas emis-

8 For instance, a temperature increase $\Delta T > 0$ can lead to a loss of natural resources $\Delta N = N_T \Delta T < 0$ if sensitivity $N_T < 0$ is negative. This resource loss can have a negative impact on human security $\Delta H = H_N \Delta N < 0$, provided natural resources are positively related to human security ($H_N > 0$). If human beings respond to this loss in a way that undermines the values of other social actors, it can reduce the stability of society $\Delta S = S_H \Delta H < 0$, assuming that stability is positively related to human security. It may, however, also lead to human responses that foster collaboration between people to compensate for the loss, in which case societal stability may rather be increased $S_H > 0$. The combined effect of temperature change ΔT on societal stability along the full pathway $C \rightarrow N \rightarrow H \rightarrow S$ would be $\Delta S = S_H H_N N_T \Delta T$, which is the product of the sensitivities along this pathway. It is also possible that societal stability is directly affected by temperature change via $C \rightarrow S$ (e.g. by a disaster or heatwave), and indirectly by the pathway $T \rightarrow H \rightarrow S$ and $\Delta S = S_H H_T \Delta T$. Finally, temperature change could directly affect societal stability $T \rightarrow S$ if a severe disaster destroys the infrastructure of society, thus the change along this pathway is $S = S_T \Delta T$ (figure 5.5).

Table 5.1: Typical sensitivities in relationships between causes (vertical) and effects (horizontal) of climate-society interaction. **Source:** The authors.

Cause → Effect	Climate change	Natural resources	Human security	Societal stability
Climate change	[C_C] Despite a natural removal of carbon from the atmosphere that dampens climate change (-), increased carbon emissions can trigger rapid climate change through positive feedbacks and the crossing of tipping points (+).	[N_C] Although in some areas biomass may grow better with higher atmospheric carbon concentrations or temperature (+), climate change reduces the carrying capacity and productivity of many natural resources (-).	[H_C] Changing climate negatively affects human wellbeing and security, e.g. through disasters and adverse climatic conditions (-); in some cases benefits are possible (+).	[S_C] Natural disasters and large-scale climate change can weaken societal structures (-) or trigger transformation processes that stabilize society (+).
Natural resources	[C_N] There are some feedback mechanisms from natural resources that aggravate climate change, e.g. depletion of fossil fuels or loss of biomass releasing more carbon (-).	[N_N] Many natural resources grow exponentially (+) or logistically when reaching limits (still +) but may also break down at certain thresholds (-).	[H_N] Since human needs depend on natural resources (+), their decline may lead to a loss of human security.	[S_N] Since various socioeconomic structures depend on the exploitation of natural resources (+), their decline affects these structures.
Human security	[C_H] Decline in human security may lead to less production, consumption, and emissions (+) or provoke responses such as increased deforestation or use of fossil fuels that aggravates climate change (-).	[N_H] An increase in human security can lead to an expansion of the exploitation of natural resources (+) or to its decline (-).	[H_H] Depending on individual responses, a loss in human security can lead to a downward spiral (+) or to counteractions that improve the situation (-).	[S_H] Threats to human security can provoke human responses that undermine societal stability (+); effective strategies would stabilize societies (-), e.g. through cooperation.
Societal stability	[C_S] Wealthier and more stable societies may either increase emissions (+) or reduce emissions (-).	[N_S] Social development can lead to an expanded exploitation of natural resources (+) or to sustainable resource use (-).	[H_S] More stable societies are better suited to satisfy human needs (+).	[S_S] Within a particular stability range societies tend to stabilize themselves (-); outside of this range destabilizing tendencies may prevail (+).

sions and concentrations, global temperature, precipitation, sea level, etc. Natural resources are water, food, or biodiversity. Human security rests on a wide range of human values and capabilities, and societal stability relies on a number of indicators regarding the type of destabilizing events such as riots, violent attacks, or wars (see [figure 5.3](#) and the discussion in the following sections). Accordingly, there is a vast range of possible combinations and thus pathways. In addition, the internal dynamics within each of the systems have to be considered as well. The same holds for the relations between the different compartments, e.g. between temperature and precipitation in the climate system, between water and food as natural resources, the relationship between different human values, or societal interaction patterns. The whole setup is not a

deterministic system because human beings as well as societies can respond in different ways that are shaped by social behaviour, policies, and institutions, all of which are affected by uncertainties.

A discussion of the sensitivities in [figure 5.5](#) is given in [table 5.1](#), based on qualitative considerations. In general, the sign is not predetermined and depends on various conditions and variables. In the following sections, the sensitivities and linkages of climate change to each of the other three systems (natural resources, human security, and societal stability) are discussed in greater detail. Possible tools for modelling their interactions are also considered.⁹

5.4 Climate Stress on Natural Resources and Resilience of Ecosystems

In a narrow sense, the climate system comprises the earth's atmosphere, in a wider sense it includes the natural processes to which it is connected, including land and oceans, the biosphere, the cryosphere, and the pedosphere. Natural resources are based on natural processes and may be renewable (e.g. sunlight, water, trees, fisheries) or non-renewable, i.e. they do not re-grow or come back in a relevant period of time (e.g. fossil fuels or minerals).

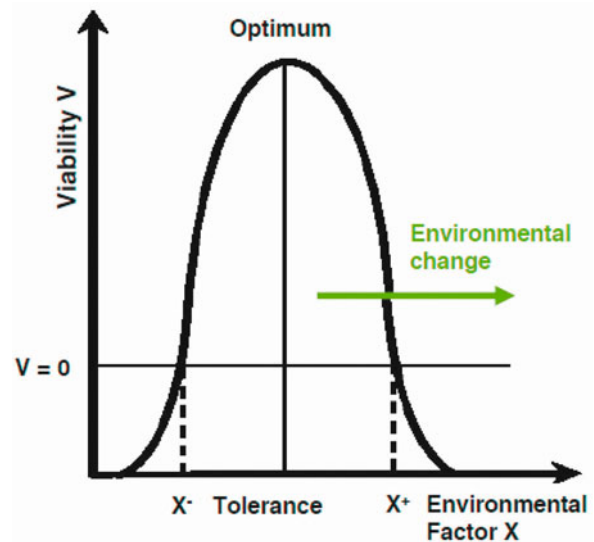
The interaction between climate change and natural resources is determined by the laws of nature and can be thus represented by a set of system variables that are mutually interconnected. The degree of environmental change is indicated by the sensitivity of environmental variables, organisms, and ecosystems to the stress caused by climate change events, such as global and regional temperature change; a drop in precipitation; the increase in floods and storms; or a rise in sea level. The rise of global temperature and its variability alters many natural processes and cycles, including precipitation patterns, ice formation, and biological systems and their distribution.

Climate change has a multitude of potential impacts on the natural environment which are closely interrelated. For instance, reduced water availability affects ecosystems and soil conditions; sea level rise threatens many coastal regions. Extreme weather events, such as hurricanes, flooding, and heatwaves, are expected to increase in frequency and strength and can be highly destructive where they hit. Large-scale events such as the loss of the monsoon, the melting of the Greenland or West Antarctic ice sheets or the shutdown of thermohaline circulation can trigger irreversible 'tipping elements' in the climate system (Lenton/Held/Kriegler et al. 2008). Where natural resources are at a critical stage, global warming may degrade the environment as a source or as a sink of natural resources.

9 Since the purpose is not to provide a literature review but to develop an integrated model framework expanding previous work by the authors, we seek to minimize rather than maximize the references to other publications. We refer here to some publications that cover several of the models used in this context: Sprinz and Wolinsky-Nahmias (2004); Billari, Fent, Prskawetz et al. (2006); Scheffran (2006a); Kropp and Scheffran (2007); Lempert, Scheffran, and Sprinz (2009).

Many natural systems are vulnerable to climate change and have limited adaptive capacity; examples are glaciers, coral reefs, mangroves, and wetlands, or arctic and mountainous ecosystems. Some of the ecosystems may experience irreversible change and lose biodiversity; others are more robust against external influences. Resilient ecosystems are able to adapt and preserve their existence through feedback cycles that maintain stability. A related concept is viability, which in this context is the ability of an organism or ecosystem to live, grow, and develop. Viability is possible within the limits of environmental conditions, outside which viability becomes negative, threatening the existence of living systems (figure 5.6). If the feedback cycles are disturbed as a result of climate change, and the tolerable domain of viability is left, catastrophic changes may occur, leading to the loss of valuable functions of the ecosystem. The stability and resilience of the ecosystem indicates whether these functions can be preserved against likely disturbances.

Figure 5.6: The impact of environmental change on the viability of living systems, using a stylized shape of the viability function. **Source:** The authors.^{a)}



a) The bell-shaped curve represents the qualitative property that viability becomes negative outside the tolerance limits and reaches a maximum somewhere between these limits. For specific systems the shape can be less smooth.

Figure 5.6 shows that a change in environmental factor x has quite different impacts on the viability V of a natural resource, depending on the actual state of the environmental factor. Below the optimum, the viability increases, above the optimum viability declines.

This implies a switch in sensitivity from positive to negative values at the optimum. Since natural systems are often adapted and ‘optimized’ to particular environmental conditions, this means that with climate change the sensitivity to temperature increase becomes negative if the level of the environmental factor exceeds the optimum.

To specify the interactions between natural systems and environmental factors, statistical methods and simulation models are the primary means of understanding the long-term behaviour of the climate and other natural systems. Computer simulations and dynamic systems theory study the evolution of climatic variables over time, as represented by differential or difference equations. These describe local changes for given initial conditions and constraints. Mathematical tools help to identify the equilibria and stability conditions of dynamic systems, as well as phenomena such as order and disorder, chaos, self-organization, and phase transitions. Stability theory deals with the methods of sustaining essential system properties and equilibria against disturbances over a given period. Examples are models of weather, climate, and water cycles, and of the growth of forests and fisheries. Dynamic competition models (such as the Lotka-Volterra model) describe interactions and potential conflicts between actors and populations, often with regard to scarce resources. Scenarios can be constructed by typical parameter choices in computer programs in order to explore possible futures in virtual experiments. This can help to identify key control variables that allow steering the dynamics in the desired direction.

Ecological growth models are used to describe the dynamics of natural resources N . Biological organisms and populations often follow an exponential growth function, or they grow logistically if the environment has a maximum carrying capacity above which the stock declines or even collapses.¹⁰ Growth may be modified by other factors, e.g. by precipitation as a source of water flow or solar radiation as a source of energy, which may be affected by climate change. For instance, droughts due to increasing temperature

could significantly reduce water supply or soil replenishment. A higher temperature may stimulate plant growth due to higher carbon concentration but at the same time could reduce the growth rate of an organism or the carrying capacity of ecosystems (with the overall result $N_C < 0$).

Variables and relationships in natural systems are subject to uncertainties that preclude deterministic approaches and require statistical methods and models, including computational algorithms that rely on repeated random sampling (Monte Carlo methods). If there is a lack of data, qualitative modelling can help to analyse the causal structure between uncertain and fuzzy variables and complex relationships. Rather than requiring the precise measurement of variables, it is sufficient to only estimate the direction or sign of couplings between such variables. Qualitative cause-effect relationships have been applied in an integrated assessment framework (Eisenack/Lüdeke/Petschel-Held et al. 2007). The syndrome approach is based on qualitative modelling and is suitable for classifying dynamic systems and finding solutions with similar properties. A syndrome linked to climate change is the Sahel syndrome, which is characterized by over-cultivation of marginal land leading to negative effects such as soil degradation, desertification, and loss of biodiversity (WBGU 1996).

The various impacts on the climate system are ambiguous. There is the natural decay rate of greenhouse gas concentrations G in the atmosphere ($G_G < 0$), largely due to the uptake by oceans and soils. On the other hand, increased atmospheric carbon concentrations trigger a rise of temperature T ($T_G > 0$), which can intensify through positive feedbacks and the crossing of tipping points. The increasing depletion of the fossil energy stock further drives emissions. Increasing the renewable energy generation still causes some additional emissions though at a significantly lower rate than fossil fuels for the same energy unit. Various natural systems and processes such as biomass and soil formation absorb carbon ($G_N < 0$), even though they are re-emitted from biomass once plants and soil decompose. If decomposition is isolated from the atmosphere (e.g. in soils or underground) plants can be used to reduce or delay climate change. Although in some areas biomass may grow better with higher carbon or temperature ($N_G > 0$), climate change generally reduces the carrying capacity and productivity of many natural resources ($N_T < 0$). The loss of biomass then releases even more carbon.

¹⁰ Exponential growth of resource N is represented by dynamic equations of the form $\Delta N = g(N) = r N$, with growth rate r (corresponding to self-induced increase $N_N > 0$ in accordance with figure 5.5). If the environment has a maximum carrying capacity N^* for the resource, the growth function $g(N) = r N (N^* - N)$ represents logistic growth, which tends towards zero at the upper resource limit. Exceeding the natural limit can lead to the decline of the resource system ($N_N < 0$).

5.5 Climate Impacts on Human Responses

5.5.1 Human Values and Needs

Climate change affects human values in multiple ways and in various dimensions. Values represent the preferences of human beings concerning certain courses of action or outcomes, including anything that is usable or valuable for humans (represented by the term ‘utility’ in economic theory). Values tend to influence attitudes and behaviour. While rational actors select actions that increase or even optimize their values, there are circumstances that restrain the freedom and rationality of choice, including dependency on established action paths or the influence of the social environment that shapes individual actions. Among human values it is important to distinguish human wants from human needs essential for living a healthy life. A deficiency in fundamental needs could have severe consequences such as dysfunction or death. While wants can be infinite and insatiable, needs are few, finite, and classifiable.¹¹ What specifically constitutes a need is controversial, as it is subject to individual preferences and social processes. Distinguishing between human wants and needs may be essential when facing climate change. While restraints on wants are experienced as a loss by individuals and lead to dissatisfaction, impinging on fundamental needs threatens the survival of people and thus leads to more drastic responses that directly affect human security, including migration or violence (see section 5.7.2 below).

Potentially affected by climate change are systems and processes that provide human needs, including water, food and energy supplies, agriculture and land use, health, and urban life. Human values and needs can be directly affected by climate-related phenomena such as extreme events and natural disasters, or indirectly through gradually changing environmental conditions. This concerns the following major pathways of impact:

- Climate-induced stress affects human health and life, indicated by the direct sensitivity of human value to climate change (corresponding to $V_T < 0$). Life-threatening extreme weather events and disas-

ters are expected to increase in frequency and strength. Storm and flood disasters endanger large populations, e.g. in southern Asia.

- If natural resources and ecological systems are vital for human life, their degradation through climate change undermines human wellbeing ($V_N < 0$). For instance, the melting of glaciers could jeopardize water supply for people in extensive areas, e.g. in the Andean and Himalayan regions. Through lack of clean water or food, people may become ill or die of starvation.
- If the provision of human needs is dependent on the functioning of social systems ($V_S > 0$), climate change or resource degradation influencing the stability of these systems also affects people, e.g. through a weakened economy, infrastructure, or institutions. This destabilization of society ultimately also affects wealthy people who might have the individual capability to survive but may feel threatened if everything around them falls apart. In the extreme case, climate change increases the likelihood of armed conflict costing many people’s lives.

5.5.2 Vulnerability and Risks

The impacts of climate change on human values and needs are related to people’s vulnerability. There is a range of different interpretations of vulnerability (Adger/Lorenzoni/O’Brien 2009; Brauch 2005, 2006b, 2011). According to Blaikie, Cannon, Davis et al. (1994: 275), vulnerability is the “characteristics of a person or group in terms of their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard”. For Ionescu, Klein, Hinkel et al. (2009: 1) vulnerability depends on (1) the entity that is vulnerable, (2) the stimulus to which it is vulnerable, and (3) the preference criteria for evaluating the outcome of the interaction between the entity and the stimulus. Regarding climate change, the IPCC (2007: 883) defines vulnerability as the “degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes”. And further, vulnerability “is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity”.

The vulnerability of systems to hazards affects the risks they pose in terms of estimated losses and their associated probability (usually risk is the product of these two variables). Each of the pathways from climate change to human impacts is associated with a

11 The school of ‘Human Scale Development’ has developed a taxonomy of fundamental human needs that includes subsistence, protection, affection, understanding, participation, leisure, creation, identity, and freedom (Max-Neef, Elizalde, and Hopenhayn 1991).

risk that is specific to the people affected. There is a sequence of probabilities along the causal chain: the probabilities for certain emission scenarios, atmospheric stabilization levels, global temperature change, climate change in each region, the harm for each affected system, and finally the probability for each of the possible responses. A practical approach is to focus on the essential pathways and develop aggregated risk indicators to measure how actors are potentially affected by climate-related stimuli, including the loss of lives, health, money, or natural resources, ranging from moderate to catastrophic risk.

While risk assessments often deal with systemic contexts regarding technical or natural systems and claim a certain degree of objectivity, threat perceptions often refer to intentional acts that combine the capability to threaten with the motivation to threaten. Various sources have extended the threat terminology to climate change, e.g. by the term ‘threat multiplier’ (CNA 2007; European Commission 2008; IPI 2009). Since everyone is contributing to climate change and everyone is affected by it, we would all pose threats to ourselves. However, the asymmetry between those who predominantly cause global warming and those who are largely affected by it adds to the existing injustice between the rich and the poor.

Within the integrated assessment framework, vulnerability can be expressed as the loss of value $\Delta V = \nu_x \Delta x < 0$ to a climate-induced event Δx , where sensitivity ν_x is the specific vulnerability connecting the event with its respective value. The same event may affect some value dimensions but not others. The risks and threats of climate change are quite heterogeneous and influenced by a number of factors and circumstances, including the timing and the geographical location of the event, the people affected, and their social environment. Risk assessments also depend on human knowledge and perception, which in reality are bound by a window of attention and its limited information. Impacts and events outside this window receive less attention than the ones inside.

5.5.3 Human Capabilities and Actions

The impacts of climate change on human beings and societies depend on their responses and actions, which are affected by their values and capabilities. Some responses could help to adapt and minimize the risks, others may cause additional problems. For instance, migration is a possible adaptive response not only to poverty and social deprivation but also to environmental hardships. What human actions can do

or not do depends on the magnitude of climate change. For existential challenges affecting fundamental human needs the spectrum of effective responses is restrained, possibly increasing temptations to switch to non-legal and violent acts. Alternatively, challenges could also induce people to work together to improve the chances for survival through collective action that reduces social vulnerability.

Actions can only be taken if the capability to act exists. Thus, capability is commonly understood as “the ability to execute a specified course of action” (Wikipedia 2010), which includes any means of giving people the ability to change their natural and social environment.¹² If actions are directed at producing something of value, capability is often associated with the ‘capital’ used to create goods and services (Bohle 2009; Bourdieu 1983). In economic theory, the most common dimensions of capital are natural capital (usable resources of an ecosystem), physical capital (assets made by humans for production), and financial capital (monetary wealth). Increasingly, human production factors are included, such as human capital (workers’ skills and abilities), social capital (such as social networks), political capital (instruments and institutions in political decision-making), and cultural capital (knowledge, skills, education status, and personal advantages).

In the context of human development and welfare economics, the capability approach has been developed in the 1980s by Amartya Sen (1985) and has served as a basis for the *human development index* (HDI). In distinction to other economic approaches that focus on utility, income, or access to resources, Sen emphasizes functional capabilities or substantive freedoms that are of value to people, such as the abilities to live a long life, engage in economic transactions, or participate in political activities. Deprivation of capabilities is understood as poverty which can, for instance, result from ignorance, government oppression, or lack of financial resources. A related concept is ‘livelihood’, which comprises the “capabilities, assets (including both material and social resources) and activities required for a means of living” (Carney 1998). ‘Livelihood’ deals with the opportunities people have and what they do with their resources (such as money, labour, land, crops, livestock, knowledge, and social relationships).

12 From now on, C indicates capability rather than climate change. Specification of capability and its measurement depends on the respective area of application.

The risks of climate change may undermine the livelihood of people by affecting value or capability or both. To reduce climate risk, a system needs the capacity to respond and adapt to climatic stimuli and to take actions that either diminish harm or compensate for it by establishing positive values. This is in accordance with the IPCC understanding of adaptation as the “adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities” (IPCC 2007: 869). By using adaptive capability, the implementation of adaptation measures comes at a cost that should not exceed the magnitude of the benefits they produce.

To operationalize the vulnerability concept, indicators can be developed to measure the intensity of climate change, its value impact on various systems, and the effectiveness of capabilities and adaptation measures to reduce harm. Vulnerability would then be the ratio between relative value loss, which can be reduced by adaptation efforts, and the intensity of climate change. The relationship between stimuli, losses, and adaptive efforts depends on the response functions of the respective actors. While in some cases linear responses may be selected, in others non-linear functions may be adequate, such as damped, logistic, or threshold responses, or bell-shaped curves (Scheffran 2011).

A key question is whether those affected by climate change have enough capability to counter the value losses from environmental change.¹³ If such change exceeds the available capability, an actor is no longer able to prevent or fully compensate for the risks of climate change. This demonstrates that for significant environmental change actors with low capability are not able to adapt to the changing environmental conditions and associated value losses. Powerful actors may not be able to adapt either if the

magnitude or speed of environmental change exceeds their capability to adjust. An alternative is to rely on systems with low specific vulnerability v_x and with efficient capabilities v_c . The implications of environmental change become even more significant and long-lasting if they not only affect value but also reduce capability itself ($\Delta C = c_x \Delta x < 0$), which in turn then affects the ability to respond. An example is the buses or hospitals in New Orleans flooded by Hurricane Katrina, factors which diminished the overall societal capability to adequately help affected people.

Environmental change not only influences human values and actions, it is also affected by it. Any human activity that applies capability requires natural resources and causes greenhouse gas emissions that change the environment. The question is how the induced direct value change from these efforts relates to the indirect value changes from the resulting environmental change and the responses taken against them, considering that due to depletion and pollution of the environment the costs and risks are increasing disproportionately beyond a certain threshold. The ecological footprint concept measures human demand on the earth’s ecosystems and compares human demand with the planet’s ecological capacity to regenerate, given by the biologically productive land and sea area needed to regenerate consumed resources and to absorb the waste (Wackernagel/Rees 1996).

5.5.4 Rules for Decision-making and Adaptive Control

To respond to a changing climate, actors adjust their capabilities to pursue values and avoid risks, selecting among a range of action pathways according to rules, preferences, and criteria. Decision tools can help to rank and select the options. Rational decision-makers choose the most preferred or optimal option, usually maximizing utility functions. Benefit-cost analysis seeks to find climate pathways that balance high benefit, low cost, and minimal risk. In globally aggregated optimal growth models, a production function represents the flow of economic output, depending on capital, labour, and technology, assuming a global decision-maker with complete knowledge who selects an optimal time-discounted control path for the planet or for a nation. Such an approach is hard to establish for long-term climate change because there are many factors and interactions that are highly uncertain and beyond control. Furthermore, the complex socio-economic interaction among multiple actors undermines predictability (see 5.7 below).

13 Translating the qualitative assessments into formal relationships, a key question is whether those affected by climate change have enough capability C to take actions to counter value losses $\Delta V = v_x \Delta x < 0$ from environmental change Δx , where v_x is the specific vulnerability (sensitivity) of value regarding variable x . By using capability (effort) ΔC actors induce a positive value change $\Delta V' = v_c \Delta C > 0$, where v_c is the value gain per capability unit. Then capability may compensate for a value loss if net value change is at least zero ($\Delta V + \Delta V' = v_x \Delta x + v_c \Delta C = 0$), which requires a minimum compensation effort $\Delta C = \Delta x (v_x/v_c)$. If during action a fraction γ of the capability is lost, this equation needs to be adjusted accordingly to $\Delta C = \Delta x v_x / (v_c \cdot \gamma)$.

Viability theory provides an alternative decision framework for keeping a dynamic system within viable constraints, defined by objective limits or value-based judgments (Aubin/Saint-Pierre 2007). Mathematical methods can be used to confine actions to these boundaries (compare 5.4), e.g. given by a tolerable window of greenhouse gas concentrations and global temperature change (Petschel-Held/Schellnhuber/Bruckner et al. 1999). An important question is whether the intensity and speed of climate change exceeds the viable limits of natural and social systems, and which control mechanisms can be applied to limit carbon emissions to avoid dangerous climate change, as required by the *UN Framework Convention on Climate Change* (UNFCCC). The challenge is to identify admissible guard rails for action within which climate policy can manoeuvre, taking into consideration vulnerabilities and adaptive capacities as well as critical thresholds for disasters and extreme events.

While viability theory still rests on a central control mechanism, adaptive control implements actions based on locally updated information and decision rules for each actor responding to the changing state of a system. Actors decide and act on the basis of incomplete knowledge, restrained to a spatial and temporal window of information. Adaptive control adjusts to a changing environment, including the actions of other agents, to reach given targets. In climate policy, adaptive control approaches provide guidance on how to constrain and adjust greenhouse gas (GHG) emissions towards a viability domain of the climate system (e.g. a specific range of carbon concentration or global average temperature change). A possible decision rule is to invest capability in emission reductions when future projected emissions exceed a critical temperature threshold. To estimate whether current trends can be perceived as tolerable or require changing the course of action, updated information is needed about the difference between the current state and critical temperature thresholds, taking the rate of change into consideration (Scheffran 2008a). For large climate uncertainties, short-term actions may focus on low-hanging fruits, i.e. accessible actions with high benefit-cost ratios. Time plays a crucial role as there are considerable inertia and time lags in natural and social systems, in particular regarding the replacement of infrastructure and technology. Decision-makers need to consider a future time horizon and compare the consequences that occur at different times.

Figure 5.7 shows the main elements of an adaptive control approach for a single actor who applies part of the available capabilities (C) to given action paths

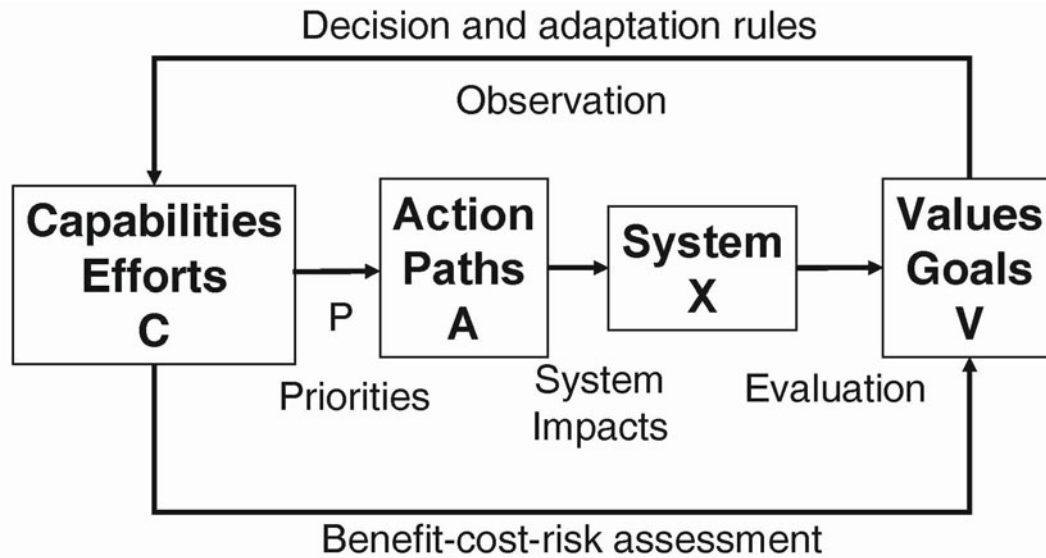
(A) to change a system environment (X). The observed impacts are evaluated based on the actor's values and goals (V), which are a function of the benefits, risks, and costs of the actions. In repeated feedback and adaptation cycles, the actions are adjusted according to decision rules in response to environmental changes and their evaluation (both for the natural and the social environment).¹⁴

The actions taken by one actor as part of the adaptive dynamics affect the natural and social environment and provoke responses from these systems that have an impact on the actor as well. This depends on the type of action chosen, which may be considered as beneficial or damaging by other actors, and the interaction emerging from their responses.

Within this framework of human action the following sensitivities exist that relate the impacts on climate change, natural resources, and societal stability to each other:

- Interaction between human values and capabilities (H_H): if increasing effort ($\Delta C > 0$) is beneficial to value ($\Delta V < 0$), positive self-impact ($H_H > 0$) occurs. Provided the result of human action is a value loss $\Delta V < 0$, this may require more effort $\Delta C > 0$ to pursue a value goal V^* , leading to a downward spiral if the action path remains unchanged ($H_H < 0$). Learning can change the action to improve the situation and compensate for the losses. Alternatively, an actor can change the value goal to avoid the negative side effects.
- Impact of human action on GHG concentration (G_H): human actions may lead to increased deforestation and use of fossil fuels or to responses that reduce emissions, e.g. by decreased production. In both cases there is an increase in concentration G ($G_H > 0$), though at different scales that can be limited to the natural decay rate $\Delta G < 0$. A net reduction may be achieved through CO₂ extraction from the atmosphere and other climate engineering measures.
- Impact of human action on natural resources (N_H): the traditional course of human develop-

14 A fundamental type of adaptive decision rule is $\Delta a = \alpha(a^* - a)$, which describes a change in an action variable a towards a target action a^* , with an adaptation speed α (for $\alpha = 1$ adaptation occurs in a single step). In particular, the decision rule can represent the adaptation of capabilities $\Delta C = \alpha(C^* - C)$, where $C^* = C(V^*)$ represents the capability needed to achieve a target value (goal) V^* . For instance, the target value could be to compensate for a value loss caused by climate change.

Figure 5.7: An adaptive cycle of human action. **Source:** The authors.

ment is resource-intensive, i.e. higher value and capability require more natural resources ($N_H < 0$). The Environmental Kuznets hypothesis states that beyond a certain level of per capita income the environmental deteriorations begin to decline (see the discussion in Lempert/Scheffran/Sprinz 2009). Sustainable development seeks a development that does not deplete the natural resource stocks by better protection ($N_H \geq 0$).

- Impact of human action on societal stability (S_H): human efforts in pursuit of human values have a vast range of consequences for society. One possible assumption is that societies are more stable if more human beings are satisfied regarding their values ($S_V > 0$). In return, significant threats to value could undermine societal stability, which may however be compensated by containing the value losses and revising human actions through institutions and governance mechanisms. This is subject to further analysis, in order to identify under which conditions human efforts are directed at an intensification of conflicts or at cooperative action paths that have opposing impacts on societal stability (see the discussion of the stability concept in section 5.6.).

5.6 Social Interactions and Instabilities

5.6.1 Environmental Change and Social Change

Human responses to climate change are embedded in a social environment that includes the social interactions and networks in which humans participate as well as institutions and governance structures. Environmental conditions provide constraints and opportunities for the development of social systems, which in turn exploit, pollute, and manage natural systems. A changing climate that significantly alters these conditions will cause stress to social systems and have an impact on human life and livelihood. Whether societies are able to cope with the impacts will depend on individual and collective responses to climate change and their abilities to adapt to or solve associated problems. Finding new rules and mechanisms that adapt to environmental change is a major challenge.

Understanding these interactions is particularly relevant when addressing the potential security risks and instabilities of climate change. Global warming may lead to security risks and social instability if it outpaces social adaptability. In this context, key issues are the extent of climate change to which societies can adapt and how effective and creative they are in developing capabilities and strategies to deal with altered environmental conditions. The resulting network of interactions can be examined with regard to

its stability in order to identify possible cascading events and tipping elements.

5.6.2 Changing Security Contexts and Conceptions

With the end of the Cold War and increasing globalization, the meaning of security has significantly changed, and many actors and factors have been shaping the security discourse in a complex way (Scheffran 2008b, 2011). Comprehensive security concepts now comprise economic, political, social, and ecological dimensions (Brauch 2009a). In a negative sense, security means the ability to protect against danger, threat, and doubt. In a more positive sense, security aims for the preservation of core values. Combining both aspects, security is the difference between chance and risk. A system facing threats can take measures to protect its core values and avoid harmful interference with its structure. To operationalize and specify security, it is important to determine the subject whose security is of concern, the values that are affected, the causes of risk, the vulnerability to harm and fear, and the capability to protect against risks and threats.

Climate change affects the various dimensions of security in multiple ways, which excludes simple statements that suggest a direct causal relationship between climate change and security. Actually, climate change could lead to either fragmentation or further unification of humanity. In developing a more coherent understanding of climate security it is promising to refer to and build on related concepts, such as *common security* (common responses to common threats), *ecological security* (environmental problems as security risks), and *human security* (shielding and empowering people against acute threats).

In this definition of human security (Commission on Human Security 2003: iv), the first task of ‘shielding’ aims at protecting value against risks, and the second task of ‘empowering’ seeks to build the capability to handle future situations – this relates to the capability approach explained in 5.5.3. Broader concepts of human security consider potential losses of human life from a variety of sources (King/Murray 2001–2002; Owen 2004) and narrower ones focus on interpersonal violence in crime, terrorism, and armed conflict (Human Security Report Project 2010). While armed conflict remains relevant because of its potential for the destruction and disruption of societies, not all forms of ‘downside’ risks for lives and livelihoods are covered (Brzoska 2007). In this way it is also possible

to deal with the argument that human security is a vague concept (Paris 2001).

If the impacts of climate change provoke responses that affect the entire society, the consequences may also become an issue of national, international, or global security, and contribute to the securitization of the climate debate. Some impacts may cause governments and the military to take action, e.g. for disaster management, in response to massive refugee flows, or in conflicts induced by environmental stress. Security risks and conflicts are closely related though not inseparable. Some impacts of climate change could undermine the security of nations or people without leading to major conflict, while certain low-level conflicts do not turn into threats for national or international security (cf. sections 5.2 and 5.7.2).

In the debate on climate security, quantitative approaches and measures have so far only played a marginal role. Risk indicators could measure the degree to which countries are affected by weather-related loss events. For instance, the *Climate Risk Index* developed by Anemüller, Monreal, and Bals (2006) uses the number of deaths and the amount of overall losses in US dollars. Security diagrams couple climate-related environmental stress with the susceptibility of societies and the occurrence of ‘crises’, using expert opinions and fuzzy set theory to facilitate the interdisciplinary assessment of climate change impacts (Alcamo/Acosta-Michlik/Carius et al. 2008; Alcamo/Endejan 2002).

5.6.3 Societal Instability and Resilience

During the bipolar East-West conflict, stability was a prominent concept in international security and arms control, as expressed by the concepts of crisis stability, arms race stability, and strategic stability. In the complex world (dis-)order in the aftermath of the Cold War, various instabilities emerged (Scheffran 2008b), affecting economic, political, and social systems from local to global levels. In a general sense, stability implies that “minor disturbances are not magnified into a major disturbance but are instead dampened to have only a small and disappearing impact” (Ter Borg/Tulp 1987). Stability refers to a change in qualitatively different systemic conditions, such as a transition from peace to war, from conflict to cooperation, or from environmental destruction to sustainability. Apart from the security concept that aims at system preservation by individual actions, the stability concept considers the dynamic interaction with the

system's environment, including interaction with other systems and agents. With regard to the societal implications of climate change, three stability notions are particularly prominent (for a more thorough discussion see Scheffran 2011).

5.6.3.1 Stability of the Climate System, Ecosystems, and Economic Systems

Article 2 of the *UN Framework Convention on Climate Change* (UNFCCC 1992) demands the stabilization of atmospheric greenhouse gas concentrations at levels that “prevent dangerous anthropogenic interference with the climate system”. This objective is to be realized in a time frame that guarantees three viability conditions (ecosystems adaptation, food security, and economic sustainability). While the first requires an assessment of the stability boundaries of ecosystems within which they can adapt and beyond which they break down, the last two provide socio-economic stability conditions that have to be maintained to avoid disruption of society and the economy (Ott/Klepper/Lingner et al 2004).

5.6.3.2 Stability against Escalating Threats

In a multi-actor environment, a perceived loss of security for one actor may provoke reactions leading to a loss of security of other actors. Their responses may further result in the spread of insecurity. For instance, the individual actions taken by countries to protect their national security interests by military means may provoke instabilities because they do not adequately take into account the responses from other countries. This ‘security dilemma’ was prominent in the arms race of the Cold War, but similar phenomena may be triggered by climate change if threat perceptions are increased in times of crisis. The concept of crisis stability reduces the motivation to use violence and to take pre-emptive actions. If the degradation of natural resources puts the survival of people at stake, this may provoke the use of violence to protect key resources against competitors. Instead, a peaceful approach would seek to strengthen mutually beneficial cooperation (win-win solutions), e.g. by resource sharing and joint risk management.

5.6.3.3 Human, Societal, and Political Stability

Societies require rules, regulations, and institutions that maintain social order and ensure that cooperation is beneficial, effective, and predictable. Societal structures that lose credibility and support from the citizens become weak and unable to maintain order.

Individuals who experience existential personal losses of life, income, property, job, health, family, or friends may become vulnerable to violating established rules, in particular if there is a low risk of punishment. Thus, personal instability at a larger scale can induce political instability. Societies that are already on the edge of instability are especially at risk. This is particularly the case in failing states that cannot guarantee the core functions of government such as law and public order, welfare, participation, and basic public services (e.g. infrastructure, health, and education), or the monopoly on the use of force. Climate change may undermine the ability of governments to satisfy the needs of citizens and to provide opportunities for wealth and prosperity, and could aggravate other problems such as growing populations, inadequate supplies of fresh water, strained agricultural resources, poor health services, economic decline, or weak political institutions (e.g. chap. 29 by Saha). The marginal impact of climate change challenges the problem-solving capacity of societies in climate hot spots, potentially contributing to their collapse (Kahl 2006; Smith/Vivekananda 2007, 2009).

Rapid or drastic climate change could overwhelm the adaptive capacity of social systems and lead to periods of instability. A key question is what degree of climate change (measured by the intensity and speed of change in climatic variables) societies can survive and how effective and creative they are in developing coping strategies that translate environmental change into new social rules and structures, thus avoiding or minimizing a transitory period of disorder and related migrations of people who have lost their livelihoods. Societies that are fragile are particularly vulnerable to climate change, as it can lead to a complete failure of the established social order.

To operationalize the stability concept in climate-society interaction, it is useful to refer to the sensitivity concept as explained above (5.3). If a system is more affected by changing conditions (and thus more sensitive), it will more likely become unstable if there is no correcting mechanism that maintains its stability. On the other hand, high sensitivity is a precondition for timely responses if appropriate strategies are chosen. A network of interconnections between the various system variables (figure 5.5; table 5.1) can then be constructed using these sensitivities, which can be analysed in order to understand the impacts of climate events on society.

The sensitivities between key systemic variables and human responses can be combined in an interaction matrix which itself can represent a stable or un-

stable set of interactions (and can be analysed by mathematical stability analysis).¹⁵ With this setup it is possible to assess the impacts of triggering events (e.g. mass migrations, extreme weather events, social movements) and to find cascading sequences and tipping points (see section 5.6.5). It is also possible to estimate the probability of future destabilizing events occurring under specified conditions, which can be used to develop an early warning system.

There are many factors influencing societal stability. Adverse developments can trigger the failure of once functioning social systems. Such failures can in turn relate back to the other main compartments of the model framework. For instance, climate change is an issue that the wealthier societies are generally in a better position to handle because of their higher adaptive capacity. They have a choice of either increasing their emissions for their own benefit or reducing emissions for the greater good, while in poor societies survival of the individual usually plays a more important role than environmental conservation. The same holds for the degradation of the environment in the context of the exploitation of natural resources. Nonetheless, the stability of a society is of fundamental importance for the fulfilment of individual human needs. Rules and regulations that guarantee the peaceful coexistence of individual citizens are generally a characteristic of a stable society.

Concepts of resilience can strengthen the social capability of people in their creative and collective efforts to handle the problems associated with climate change (e.g. Adger 2003). In a resilient social environment, the social actors are able to cope with and withstand the disturbances caused by environmental change in a dynamic and flexible way that preserves, rebuilds, or transforms their social order as necessary to retain their livelihood. If these stabilizing mechanisms fail, societies become prone to internal failure, with negative implications for all individuals.

15 In our modelling framework, the interaction matrix contains the sensitivities x_y between two variables x and y , and its stability is given by its eigenvalues, which are indicators of the exponential magnification or dampening of the dynamics. For a two-variable interaction with positive self-impacts $x_x > 0$ and $y_y > 0$ and negative mutual impacts $x_y < 0$ and $x_x < 0$, stability depends on the indicator $x_x y_y - x_y y_x$ which is the difference between the exponentially driving self-impacts and the dampening mutual impacts. With different signs for the sensitivities and additional variables, the mathematical condition can differ (see Scheffran/Hannon 2007).

5.6.4 Models of Social Interaction: Networks, Cascades, and Path Dependency in Collective Action

Climate change is a macro phenomenon that could simultaneously affect and challenge social systems all over the world, possibly inducing a wide range of individual and collective responses. While integrated assessment models often rely on a single rational decision-maker optimizing a global welfare function, the world is shaped by numerous actors who act according to their own interests, capabilities, and rules. Multi-actor settings are increasingly relevant when multiple regions, countries, businesses, or citizens are affected by climate change and make individual or collective responses that lead to social interaction. At the global level of decision-making, the main actors are governments of nations or groupings among them. At the local level, individual citizens and consumers are key players who affect or are affected by climate change. The multi-level process between local and global decision-making is connected through several layers of aggregation (from billions of citizens to a few diplomats representing their countries), with each layer having its own characteristic decision procedures for setting targets and implementing them as real actions (Scheffran 2008c).

In a multi-player setting, game theory provides an optimizing framework for analysing interdependent decision-making and negotiations among players with respect to climate change. In a dynamic (repeated) game situation the players mutually adapt their targets, values, and actions to those of other players in order to change the outcome in their own favour (Scheffran 2002). For multiple criteria, a conflict may occur if these criteria and the preferred actions are not compatible. Conflicts can be diminished by pursuing compromising actions that improve all criteria (win-win) without being optimal in all criteria. While game-theoretical solution concepts are adequate in environments with only a few players and control variables, they are difficult to apply in settings of multiple options and players with bounded rationality. In the case of multiple value functions, multi-criteria decision-making derives solution concepts such as Pareto optimality, seeking the set of combined actions that does not allow further joint improvements for all players.

Various tools have been developed in complex systems science that can be applied in analyses of social phenomena in climate policy (Scheffran 2006a). In particular, these help to assess the impact of human

responses to environmental change and the social interactions that result from these responses. For a large number of homogenous actors, methods and concepts from statistical physics and non-linear dynamics have been used to describe phenomena of complex adaptive systems such as self-organization or micro-macro phase transitions.¹⁶

Agent-based modelling (ABM) analyses patterns of collective action emerging from large numbers of agents following particular rules of behaviour. Depending on stimulus-response mechanisms at the micro level, complex social patterns emerge in virtual landscapes of artificial societies at the macro level. ABM is often useful in situations where the future is unpredictable and traditional analytic methods for decision-making are least effective.¹⁷ Applications range from moving crowds and traffic systems to urban, demographic, and environmental planning. Unlike game theory, in which the selection of options is determined by the rule of optimizing utility, ABM faces the difficulty of selecting among a large number of possible rules to adequately describe real world decisions. To avoid the problems of both approaches, it is sufficient to combine dynamic games and ABM, with value functions and decision rules co-evolving. Multi-agent models have gained increasing interest in social modelling, including environmental management and climate policy.¹⁸ They permit the coupling and embedding of social interaction into environmental models, taking into account the adaptive, disaggregated nature of human decision-making as well as collective responses to changing environments and management policies.

Social network analysis (SNA) describes the connectivity of nodes and links between actors and is appropriate for the structural analysis of social interaction. SNA has been increasingly applied to the study of conflict (Flint/Diehl/Scheffran et al. 2009; Maoz 2010) though less so in the context of climate change. Models of network diffusion that have been developed to analyse the spread of diseases can be used to study the spread of social behaviour patterns, and this is relevant to describing the proliferation of violence and conflict as well as the diffusion of technical inno-

vations and social practices for climate mitigation and adaptation.

In pursuing their individual interests, multiple actors could run into a “cascading sequence of events where an action taken by one actor provokes more intense actions by other actors” (Scheffran 2008b: 19). Tipping elements in the climate system could induce a sequence of instabilities that trigger other tipping elements in social systems. Along the pathways in our integrated framework, seemingly ‘minor’ events could provoke major qualitative changes of the system, which is characteristic for chaotic systems. A self-reinforcing chain reaction could increase the potential risk of social cascades that could put the whole system at risk.

Informational cascades occur “when it is optimal for an individual, having observed the actions of those ahead of him, to follow the behaviour of the preceding individual without regard to his own information” (Bikhchandani/Hirshleifer/Welch 1992: 992). Likewise in a cascade agents learn from the behaviour of other agents and follow them in the way they act (Bikhchandani/Hirshleifer/Welch 1998), thus leading to a collective transition to a qualitatively new social structure. Real-world examples of informational cascades can be found everywhere, from the stock market and voting patterns to the fashion industry. One explanation of why humans pay so much attention to choices made by others is that “imitators may have as high a long-run ‘fitness’ as optimizers” (Conlisk 1980: 275), which however only works if the imitated behaviour is successful. Richerson and Boyd (1992) showed that in many instances social learning is preferred by natural selection. If the choices and actions of others influence our own decisions, then with an increasing size of the population tipping points in collective interaction are more likely and undermine the stability of the whole system. An example was the financial crisis of 2008, in which reckless lending practices by financial institutions in the United States contributed to a global economic downturn. Similarly, the interaction between rating agencies and governmental decisions regarding the crisis of confidence in the creditworthiness of Greece and other countries has challenged the stability of the eurozone since 2010. In early 2011, a series of riots in North African countries, partly related to a rise in food prices, challenged the stability of this region.

In the future, climate change could add to these interactions and trigger a cascading sequence of climate-related events (e.g. extreme weather events, food insecurity, mass migrations, and social movements).

16 For instance, Helbing (1995); Weidlich (2000); Schweitzer (1997).

17 Axelrod (1997, 1984); Cedermaun (1997); Ostrom (2000); Janssen and Ostrom (2006).

18 Weber, Barth, and Hasselmann (2005); Weber (2004); Patt and Siebenhüner (2002); Billari, Fent, Prskawetz et al. (2006).

On the other hand, this approach may also be suitable for studying collective and cooperative interactions in a sustainability transition induced by climate change.

The theory of cascades and social networks can be related to path dependency (Beyer 2005; Kominek/Scheffran 2011). This concept implies that social actors are locked in certain pathways of action that are self-enforcing and hard to change individually. While former approaches did concentrate more on historical analysis of event sequences (thus looking backward), the approach of ‘path creation’ argues for more forward-looking research that considers the beginning of an evolving path and the options for shaping it deliberately, particularly relevant for transformations induced by climate change. An extended approach would connect the macro-level phenomenon of path dependency (such as coalition building or institution formation) to the micro-level effects of actor behaviour and how path dependency shapes the decision-making processes of individual actors (Kominek 2009, chap. 6 in this volume), using concepts from social psychology. Cascades triggered by catastrophic events can be shaped by institutional responses in one way or the other. In natural disasters international aid may help a large group to survive and thus stabilize the social system. On the other hand, aid in times of crisis may lead to competition or even struggle among those in need, something which has happened in the case of several natural disasters (WBGU 2007).

To address the security risks, it is crucial that the world’s key players cooperate in finding solutions to the climate challenge, managing the transition from individual competition to collective action. For instance, cooperative approaches include the international transfer of investments and technologies so as to shift the composition of the energy system towards emission reductions (Ipsen/Rösch/Scheffran 2001). In negotiations, agents adapt to each other and seek common solutions leading to mutual benefits, reduced costs, or diminishing risks. To avoid the prisoners’ dilemma that blocks cooperation between two players because of short-sighted individual behaviour, states need binding and verifiable agreements.

The collective action problem is to agree on emission paths that avoid dangerous climate change and make sure that cumulative emissions by all human beings will not exceed this limit. Assuming that there is an agreed cap on aggregate emissions, it is a challenge to find institutional mechanisms to guarantee that individual limits are assigned to each actor and that their compliance is ensured to avoid the tragedy

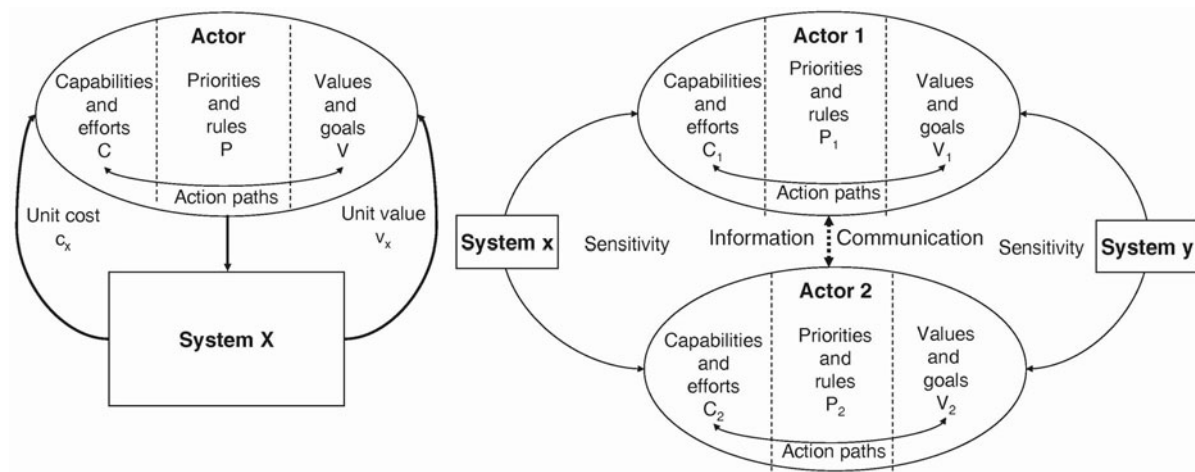
of the commons. Sustainable development strategies often fail due to their inability to adequately take social interaction such as conflicts, dialogues, negotiations, coalition formation, and institution building into consideration. Joint action could rather preserve natural resources and support a sustainability transition if individuals cooperate and coordinate their actions for an effective and fair share of the resources. To address the underlying social dilemmas, new rules, norms, and innovations need to evolve. Which form of interaction prevails depends on the rules of communication and the institutional settings as well as on the tools available before, during, and after the interaction. Coalition formation describes the transition from individual to collective action as a bargaining process, in which the probability of joining a coalition increases with the value actors expect from it.¹⁹

The integrated assessment framework highlights the importance of human responses and social interactions as key variables for analysing the impact of climate change on security, societal stability, and conflict. They are a major reason for the circular and endogenous character of the framework, and they have a significant impact on climate-society interaction and its stability. Whether the impact of climate change or natural resources on the human and societal sphere (given by the sensitivities C_S , S_C , N_S , and S_N) is positive or negative depends on the preferences and strategies of people and can be quite different, even under similar circumstances. This is an expression of the non-deterministic behaviour of human societies and their freedom of choice. In particular, the consequences of climate change may tempt some people to use violence while others work together more closely, depending on individual preferences and capabilities shaped by previous rules and experiences.

Rapid or drastic climate change can challenge the stability of social systems, requiring new rules and responses, but it may also create new opportunities for development. Fragile societies are particularly vulnerable to climate change, which can lead to a complete failure of the established social order if there is no capacity for adapting and maintaining stability. In this context it is relevant to know how fast and how intense the responses are compared with the speed and intensity of climate change. Provided that societies develop effective and creative coping strategies, climate change may also offer opportunities for constructive

¹⁹ Göbeler and Scheffran (2003); Scheffran (2006b); Eisenack, Lüdeke, Petschel-Held et al. (2006).

Figure 5.8: Interaction between a single actor and a single system (left) and between two actors and two systems (right). **Source:** The authors.



societal change. The following issues are of key importance in this context:

- Alternative approaches could build on participative concepts of sustainable development and peace-building that support people in regions affected by climate change in their creative efforts to sustain their livelihoods.
- Adaptive strategies could be designed to restore livelihood and maintain resilience under changing climatic conditions, e.g. by utilizing existing natural resources more efficiently, growing and producing new types of natural resources, providing a sustainable energy supply, and improving disaster management.
- Technological change plays a key role in human-environment interactions. No less significant are innovative social mechanisms that are more effective in facilitating the livelihood people need, including governance and institutions.

In the following section, we will sketch a model framework for the analysis of social interactions in the context of climate change. Rather than delving into the mathematics of the model, we will discuss the basic relations in more qualitative terms.

5.7 Model Framework of Social Interaction and Conflict

5.7.1 The Dynamics of Social Action and Interaction

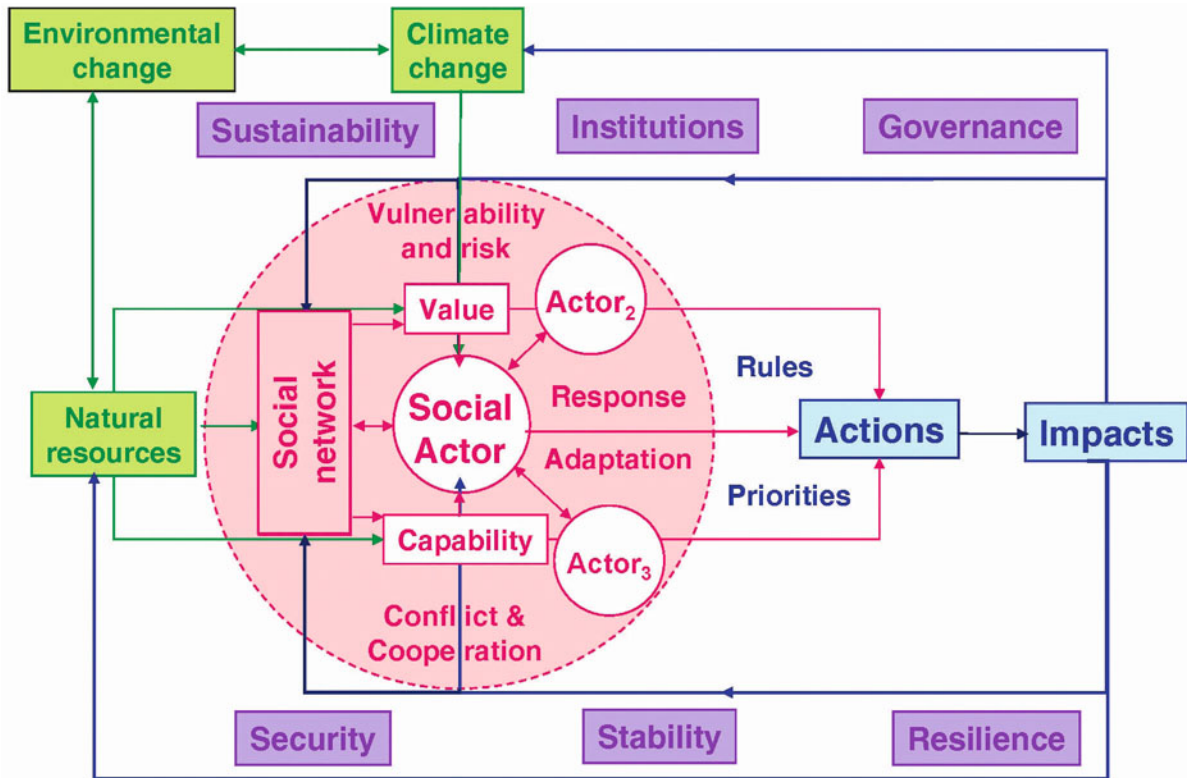
In the following, we expand the action cycle described in figure 5.7 towards a model framework of social action and interaction. Social actors respond to climate change within a natural and social environment according to decision rules used to select action paths depending on their values and capabilities. Thus, the social actor is characterized by the following elements (figure 5.8):

- capabilities and efforts (C) available to the actor that can be used in actions;
- priorities and rules (P) of the actor for selecting among possible action paths;
- values and goals (V) to evaluate the impacts of actions and define targets for future actions.

Once an action is realized from the interplay of these variables, it affects the system environment X of the actor. This in turn has an impact on the actor's values and capabilities.²⁰

Based on the key model elements, the authors will in the following refer to the model as the VCAPS (*Values and Capabilities of Action paths and Priorities in System environments*) model. This model can be

²⁰ The respective couplings are given by the key sensitivities: unit values $v_x = \Delta V / \Delta x$, unit costs $c_x = \Delta C / \Delta x$, and the value-cost ratio $v_c = v_x / c_x = \Delta V / \Delta C$ of environmental change.

Figure 5.9: Framework of interaction between a social actor and the natural environment. **Source:** The authors.

used to describe the interaction between multiple actors i , each with their values and goals (V_i), capabilities and efforts (C_i), action paths (A_i), and priorities and rules (P_i). The action paths selected by each actor affect their system environment, which in turn has an impact on other actors (figure 5.8b for a two-actor interaction).²¹ These impacts are critically dependent on the action paths selected, and thus on the respective priorities and rules of behaviour. The actors are also interconnected directly through communication processes for exchanging information, which can be also treated as actions (e.g. ‘speech acts’).

The impact of climate change can now be expressed within this framework of human action and social interaction (figure 5.9). Since climate change influences the natural environment and the availability of natural resources, it has an impact on the capabilities, values, and actions of social actors. In response to and to adapt to the changing environment, a social

actor selects among potential actions paths according to decision rules that incorporate his/her values and goals (including risks avoided and expected benefits), the capabilities to take these actions, and the priorities shaped by personal and social experiences.

There is a variety of actions that social actors can take in response to climate change. Some of these measures may cause additional problems (e.g. biofuels, nuclear power, climate engineering, migration, violence) that increase the likelihood of resistance and conflict. To minimize adverse consequences, concepts of stability, security, resilience, peace, and sustainability are taken into consideration. Adaptive responses to climate change are shaped by the social context in which social actors live, including livelihood, social networks, institutions, and governance. Human beings are facing the risks of climate change not as isolated individuals but as members of social groups that can help protect individuals against risks. Furthermore, they can mutually enhance their capabilities through social adaptation mechanisms that lead to reduced social vulnerability (Mearns/Norton 2010).

The development of social vulnerability and adaptation depends on the mutual impacts on other actors and how the social actors respond to each other according to their rules. The action-reaction dynamics

21 This impact can be measured as the value change $\Delta V_i = vc_{ij} \Delta C_j$ for actor i induced by the capability ΔC_j used by actor j (effort) along the respective action path. The mutual impacts vc_{ij} are key sensitivities that determine how the value of one actor is affected by the effort of other actors.

could lead to complex social interactions with the natural environment and between the social actors in their social environment, including security risks and conflicts. Since social systems have had to go through a social evolution process in the past, the priorities and rules have also evolved and have been shaped by societies and their path dependencies.

5.7.2 Conflict and Cooperation

Conflict often emerges from incompatible actions, values, behavioural rules, and priorities of actors who fail to reduce their differences and tensions to tolerable levels. The actions taken may undermine each other's values and provoke responses that generate further losses. A conflict escalates if actions by the parties in conflict aggravate the tension and intensity of the conflict, corresponding to an inherently unstable interaction. If unresolved, conflicts consume a considerable amount of resources, pushing parties in conflict towards extreme actions such as the use of violence, until the capability to act by some actors is exhausted or destroyed if it is not replenished by some processes. Conflict resolution can help reduce the conflict tension and stabilize the interaction by involving actors in learning and adjusting their actions until agreement is reached. Cooperation is a process in which actors adjust their goals and actions to achieve mutual benefits. The transition from conflict to cooperation requires adaptation towards common positions and mutually beneficial actions that stabilize the interaction. Whether this transition is successful depends on the governance capacity of societies to prevent or manage conflicts.

Also, it is difficult to assess whether and under which conditions climate change contributes to conflict because it depends on the factors described in previous sections. Furthermore, there is a range of possible kinds of conflict related to climate change:

1. dispute over scientific predictions and the uncertainties of climate change;
2. conflicts induced or strengthened by the risks of climate change;
3. conflicts over selecting effective mitigation strategies;
4. conflicts over adaptation to and damage limitation of climate change;
5. conflicts between emitters and victims over the fair distribution of the costs, risks, and benefits of climate change;
6. conflict over the impacts of climate protection strategies such as nuclear power, bioenergy, and climate engineering.

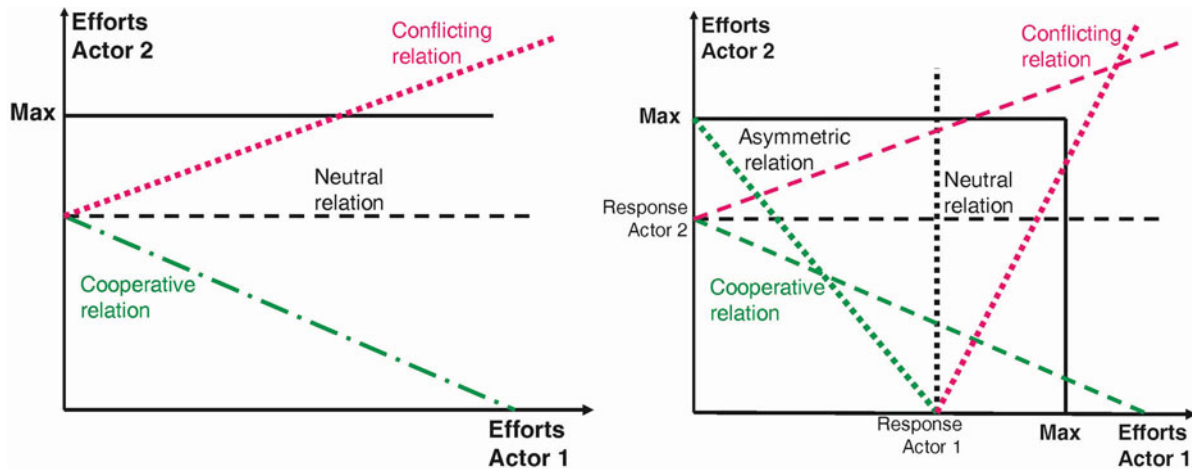
In all conflicts, actors can apply a number of capabilities in their actions, with violence as the most extreme form of action. While the second category of conflict caused by climate security risks only occurs when climate change happens at a relevant scale, the other five may be already imminent at earlier stages because they deal with the anticipation of and possible responses to climate change. Regarding the conflicts caused by climate security risks, four 'conflict constellations' are particularly prominent: degradation of freshwater resources, decline in food production, increase in storm and flood disasters, and environmentally-induced migration (WBGU 2008). Others may however be no less significant (e.g. biodiversity loss, rise of sea level). The underlying assumption is that climate change reduces critical resources and infrastructures that are essential for the provision of human needs and thus undermines societal stability (along the chain $\Delta N < 0 \rightarrow \Delta H < 0 \rightarrow \Delta S < 0$). However, the WBGU (2008) also notes that climate change could unite the international community in setting the course for a dynamic and globally coordinated climate policy.

Whether conflict or cooperation prevails depends on the responses of each actor. These are represented by decision rules and action priorities and by the actor's potential for learning and adaptation. From a social network perspective, the mutual impacts (linkages) between actors matter:²²

1. If two actors are disconnected, they are independent and have no impact on each other's values. In this neutral relation the required effort is not influenced by other actors and thus is kept constant as long as each actor's own value goal does not change.

²² In our interaction model, the combined impact of all actors' efforts ΔC_j on the value $\Delta V_i = \sum_j v_{c_{ij}} \Delta C_j$ of actor i strongly depends on the couplings $v_{c_{ij}}$. These are measured by the couplings $v_{c_{ij}}$ between a pair of actors i and j , which can be positive, negative, or zero. If actors pursue particular value targets (e.g. the goal is to compensate for climate-induced value loss $\Delta V_i = -\Delta V_i^*$), this defines a set of linear equations for the respective capabilities as a function of the capabilities of other actors that determine the responses of efforts by the actors to each other. Adaptation rules for the application of capability (effort) of actor i typically have the form $\Delta C_i = a(C_i^* - C_i)$, i.e. capability C_i is adjusted to targets C_i^* , provided this is possible within a given capability limit.

Figure 5.10: Conflicting and cooperative relationships between two actors. Both actors use their efforts to reach their individual value goals on the basis of given action rules that depend on the effort of the other actor. In a conflicting relationship efforts mutually increase, in a cooperative one they mutually decline. In asymmetric cases one actor provokes conflict while the other maintains cooperation. A neutral relation implies that the effort of one actor does not depend on the other. The response functions shown are for efforts of (a) actor 2, (b) both actors. **Source:** Modified from Scheffran and Hannon (2007).



2. In a competitive or even hostile relationship, effort needs to be increased to compensate for the effort of the other actor, which is experienced as a loss.
3. In a cooperative or friendly relationship, both actors benefit from each other and may reduce their own efforts accordingly to realize their common goal.
4. In a mixed case, one actor cooperates and the other does not, which in some cases may still be better than mutual conflict.

In a competitive case a state of mutual satisfaction is still possible, but the question is whether that state is within the admissible range of efforts. If an agreement is not possible even with maximum effort, there is an unresolved conflict unless actors acquire more or different capabilities or change their own goals. Alternatively, one or both actors can change their behaviour by switching to other action paths that make their actions more efficient and less threatening to other actors, thus increasing the likelihood of reaching an agreement.²³

Whether actors are able to achieve their goals not only depends on the impact of climate change and the actions of others but also on the self-impacts, i.e. how much the effort of one actor affects his or her own values. Very powerful (high capability) and efficient actors (high positive self-impact) are able to digest the impact of climate change or the adverse impact of other actors but only within the limit of their

own capability and sensitivity. Using the sensitivities, it is possible to determine the structure of the social network as well as the social dynamics between multiple actors which are connected to the overall environmental system dynamics.

An example is illustrated in figure 5.10. Two actors share a common resource such as energy, land, or water that is important both for its value and capability. The more effort one actor invests in acquiring the resource, the less is available for the other actor, who may then also have to invest more to maintain given resource needs. In this conflicting relationship, the question is whether there is an agreement point of resource sharing within the capability boundaries. In a

²³ In mathematical terms, let sensitivities $vc_{11} > 0$ and $vc_{22} > 0$ be the positive “self-impacts” of the efforts of actors 1 and 2 regarding their own values, and $vc_{12} < 0$ and $vc_{21} < 0$ be the negative mutual impacts on each other's values. Then this would be a competitive interaction. A switch to cooperation would require that the mutual impacts become positive, thus switching from an adverse to a friendly relationship. Even under conditions of competition, it may be possible to move the satisfaction point into the admissible range of efforts by increasing the self-impacts, e.g. by improving efficiency. For an unstable conflict, given by the instability condition $vc_{11}vc_{22} - vc_{12}vc_{21} < 0$, an agreement point does not exist and the conflict escalates to utmost efforts unless actors change their goals. For more than two actors the stability of the more complex interaction matrix can be determined based on eigenvalue analysis.

situation of unresolved conflict, one option is to use violence to either grab a higher resource share or to destroy the capability or resource access of the competitor, thus making the impact on the competitor even more negative. The situation may be further aggravated by climate change affecting the reproduction of natural resources and so moving the required efforts of both actors and the agreement point further upwards.

As an alternative, actors could improve resource efficiency (represented by increasing positive self-impact), thus achieving value goals with fewer efforts, shifting the response curves downward (figure 5.10). If in this process actors help each other by investing in each other's resource efficiency, this would be a switch towards a cooperative relationship. Furthermore, actors may reduce their required value goals to facilitate agreement, but this is not feasible if the existential minimal thresholds of fundamental human needs have been reached. Finally, climate change may diminish the available maximum capability and restrain the action spectrum, which can make any agreement point impossible to reach even with cooperative relationships and changing goals, and may possibly lead to a struggle for survival by some of or all the actors.

This framework allows the assessment of possible conditions and scenarios of conflict and cooperation under climate change based on assumptions of the various sensitivities for actions.

5.7.3 An Extended Interaction Model of Production and Conflict

While the VCAPS interaction model introduced in the previous section is able to explain in qualitative terms some of the issues in climate-security interaction, there are some aspects that need to be incorporated in an expanded version of the model to represent important dimensions of reality. In particular, these refer to economic production and consumption processes, including natural resources and the accumulation of wealth and capital, the use of violent force in conflict, human population and migration, and the role of technology, as well as political processes such as negotiations, governance, and institutions. While the basic structure of the VCAPS model with its dynamic interaction of values, capabilities, and action paths is maintained, several additional specifications are now included.

- Social actors can represent any social entity, from individuals to the world, such as countries, busi-

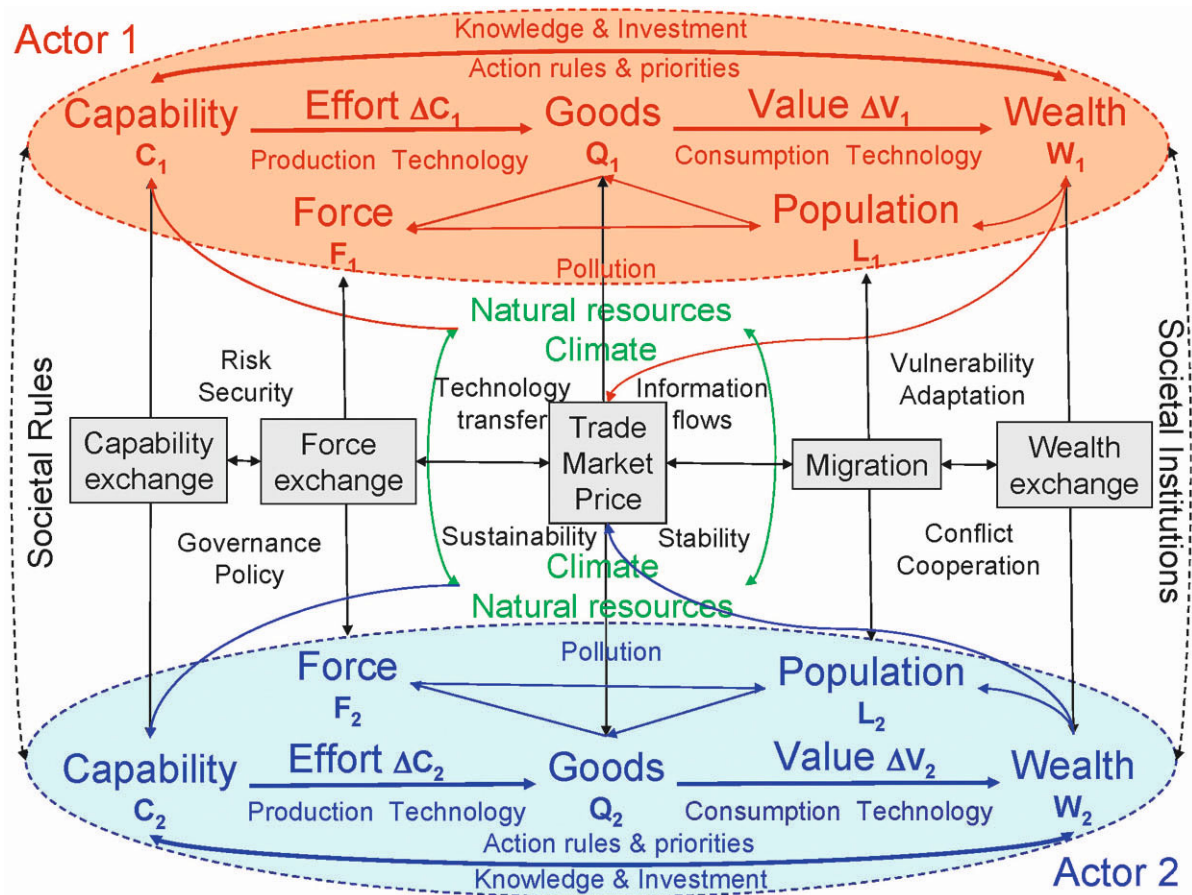
nesses, communities, or coalitions. Population L measures the number of individuals associated with the social actor, e.g. through membership, nationality, work, or financial support. For a country it comprises its citizens, for a business the people employed (labour force).

- Capability C includes the productive capital belonging to the social actor, including the controlled natural resource stock N (decaying or regenerated by natural processes), physical capital K (including technical devices and facilities), human capital H (knowledge and skills), and social capital S (social networks and structures).
- In the production process through the use of capability ΔC (effort) additional value ΔV is generated that can be either consumed or reinvested in capability-building to compensate for its depletion or support its growth. Alternatively, value can be accumulated (saved) as wealth W for consumption or investment at a later time. Part of wealth ΔW may be invested in capability-building or used to buy goods produced by other social actors for a market price.

While value, effort, and investment are flow variables for a given time period, resources, wealth, and capability are stock variables that can grow and decay over time. The system environment of the social actor is characterized by the following elements that determine the possible action paths (P):

- In the production process, goods Q comprise all produced items, including commodities and services for consumption. Producing goods requires a production capability C , which is partly used to cover production costs and efforts ΔC , including labour, salary, and other production factors. Production may also be increased through higher capital efficiency. For instance, agricultural production is a function of agricultural land, water use, labour, and other production factors (capital, machinery, energy, fertilizers). Key limits to production are the available land and water that can be extended by improving land productivity and water efficiency.
- Destructive forces F are not produced for consumption or regeneration but are designed to threaten or damage other actors, to capture or destroy their key assets (such as capability, wealth, goods, population, or force), or force them to take certain actions beneficial to the attacker. Such benefits are important to justify the costly use of force. Whether this strategy is successful depends

Figure 5.11: The extended two-actor interaction model. **Source:** The authors.



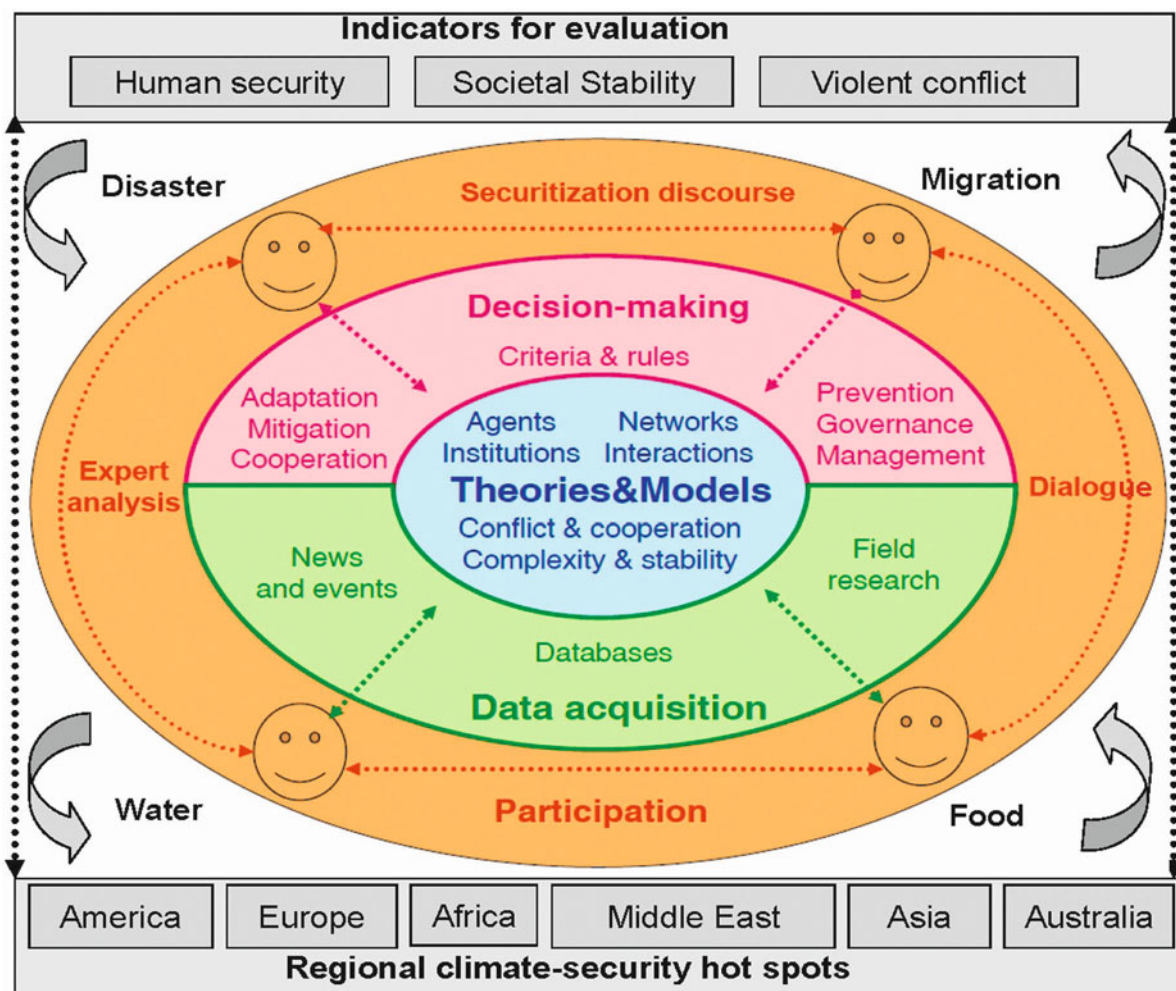
on the force exchange between the actors. Some systems and technologies associated with force may be dual-use items.

- Natural resources ΔN extracted (harvested) from the available natural resource stock N add to production capability. Environmental pollution ΔG is the amount of emitted substances that may accumulate in the environment as pollution stock G . Greenhouse gases act as a driver of temperature increase and thus climate change, affecting capability and wealth. Sustainability concepts define limits for resource extraction and pollution that respect the natural reproduction rates.
- Part of the human population may migrate (M) into areas of other social actors and add to labour and human capital there if they are adopted. Migration could also add to scarcity and conflict, in particular if it strengthens existing conflict lines (e.g. along ethnic differences). The decision to migrate depends on judgement regarding the migrants' capability and motivation in their target areas compared with their areas of origin, including

possible risks of conflict or environmental change avoided, or values gained through higher income, mobility, and transportation capacity along the migration pathway. While some models cover partial aspects of human migration, there is still a need for more research to understand the complex phenomena associated with migration (Piguet 2010).

The interaction between these processes is shaped by a number of intervening factors that may be used to control these dynamics:

- Technology is a key source of innovation for production or destruction affecting the linkages and sensitivities in the model by favouring certain pathways of action towards higher efficiency.
- Knowledge, information, and communication are which are important for providing social actors with an understanding of the state of the system variables and their interaction, essential for taking appropriate actions.
- Governance and institutions play a key role by restraining the adverse risks of social interaction

Figure 5.12: Scheme of a laboratory for climate-security analysis. **Source:** The authors.

(such as pollution and conflict). They also organize collective action to make decision-making, production, and market processes more efficient and effective. Furthermore, they maintain, stabilize, and protect social and political order. Global governance can organize the coordination of capabilities, values, and action paths for multiple actors across the multi-level process of climate policy.

The main causal linkages are represented in [figure 5.11](#) for an interaction between two actors. The complexity of this graph reflects various issues that have not been integrated in previous models. The framework allows for assessing the relationship between climate change, natural resources, economic production, and the use of violent force. Several impact chains and feedback loops are relevant here; only a few are mentioned here by way of example:

- production cycle: $C \rightarrow Q \rightarrow V \rightarrow W \rightarrow C$
- climate change: $C \rightarrow Q \rightarrow G \rightarrow N \rightarrow C \rightarrow Q \rightarrow W \rightarrow C \rightarrow L$
- climate-migration link: $G \rightarrow W \rightarrow L \rightarrow M$
- use of force against production: $Q_1 \rightarrow F_1 \rightarrow C_2 \rightarrow Q_2 \rightarrow W_2$
- exchange between actors (X : capability, goods, wealth, labour, technology): $X_1 \rightarrow X_2$.

More complex chains can emerge from connecting them (e.g. climate change and the production cycle, use of force and migration, production and cooperation). Assessments of these resulting chains make it possible to study the dynamics of certain decision rules that cause pathways to be selected in a multi-actor setting. For instance, there is a wide range of goods that can be produced (including force) and various actions that can be taken (including migration and the use of force). Freedom of choice may be re-

strained if actors follow predetermined decision rules and paths. Most prominent is an optimization rule in which investments and efforts are chosen to maximize value (utility) or minimize risk. Other rules adapt control variables to certain goals or dominant pathways in a society, leading to path dependency (chap. 6 by Kominek).

While the full model demonstrates the complexity of the interaction, sub-models may cover partial aspects such as economic growth, market processes, natural resource extraction, or force exchange and violent conflict. To connect to real-world phenomena, the modelling framework is to be embedded in an interactive laboratory for climate-security analysis that combines data analysis, modelling and simulation, decision support and strategy development, regional participatory assessment, and stakeholder involvement (figure 5.12). Including experts and stakeholders from the regions of concern is essential for a participatory assessment of climate impacts (Stoll-Kleemann/Welp 2006; Scheffran/Stoll-Kleemann 2003). ‘Mediated modelling’ (van den Belt 2004) could identify the key links and variables and generate new data to draw impact graphs and risk maps as well as develop possible solutions that could be incorporated into adaptation and planning processes.

The full model framework developed in this section and schematically depicted in figures 5.11 and 5.12 is a tool that does not yet exist in this form. Therefore, current research deals with the setup of the individual segments in partial models that can subsequently be combined to achieve the goal of a comprehensive model of climate-security interaction. While full realization and implementation of this conceptual framework is a task for future research, in the following section we will relate some of the theoretical concepts to a particular example.

5.8 Case Study: The Nile Conflict

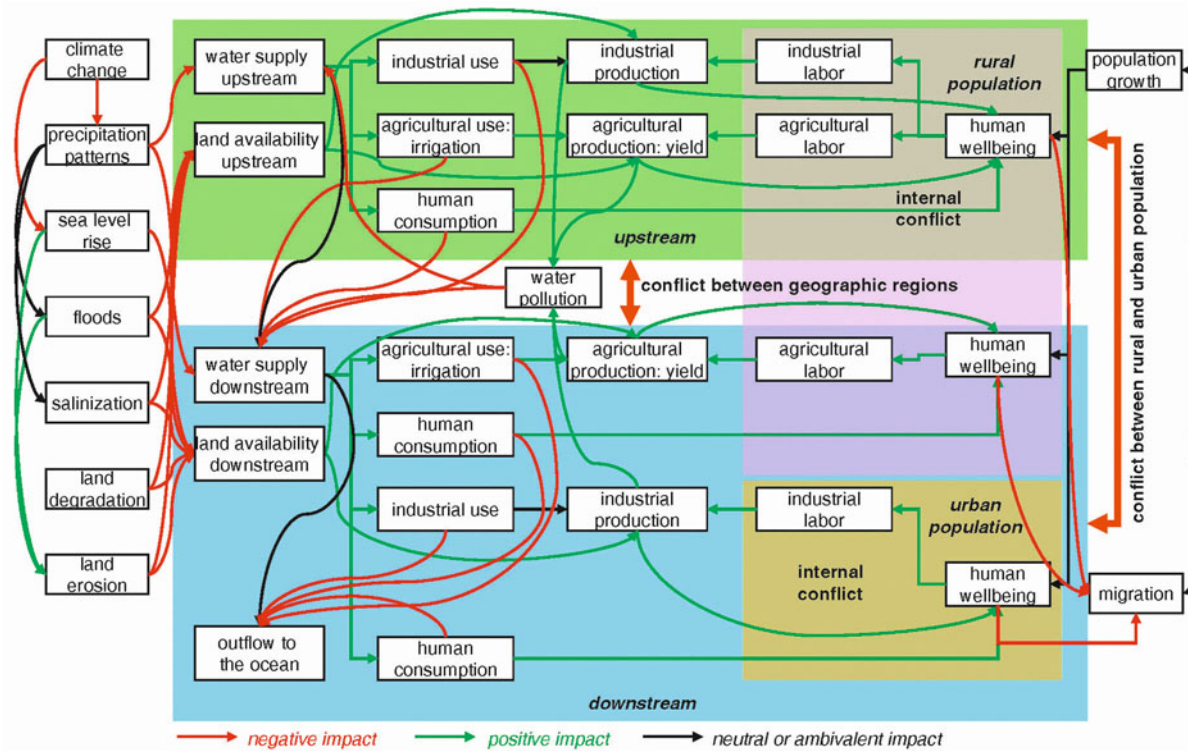
To specify and exemplify the general assessment and model framework, climate-security interaction will be discussed for the larger Mediterranean region with a particular emphasis on the water conflict in the Nile River basin. A reduced form of the model is used to describe key features of the conflict and the potential dynamic interactions among major actors. A more detailed assessment will be subject to future research.

5.8.1 Resource Conflicts in North Africa, the Middle East, and the Mediterranean

The larger Mediterranean region (southern Europe, North Africa, and the Middle East) will be severely affected by global warming. Rising temperatures are expected to exacerbate existing pressures on limited water resources because of altered rainfall patterns and loss of snow and glacial meltwater. This adds to the existing problems of desertification, water scarcity, and food production (Brauch/Liotta/Marquina et al. 2003; IPCC 2007). Water scarcity has a negative impact on agricultural and forestry yields and limits the output of hydropower. Heat waves and forest fires compromise vegetation cover and add to existing environmental problems. Ecosystem change affects soil quality and moisture, the carbon cycle, and local climate. Population pressure and water-intensive activities such as irrigation already impose a considerable stress on water supplies. This poses dangers to human health, ecosystems, and the national economies of countries. Within the Mediterranean region there are significant differences with regard to vulnerability and problem-solving capacity. Southern Europe is characterized by relatively high economic and social capabilities, which can be further backed up by support from the EU (Brauch 2006a, chap. 37). In contrast, the environmental situation in North Africa is significantly worse. There, climate change interacts with the region’s other problems including high population growth, a substantial dependence on agriculture, and weak governance (Schilling/Scheffran/Link 2010).

The Middle East is plagued by deeply-rooted violent conflicts and by a lasting water scarcity (Shuval/Dweik 2007). The arid climate, the imbalance between water demand and supply, and the ongoing confrontation between key political actors intensify the water crisis, but exaggerated statements about ‘water wars’ have to be questioned. Competition over shared resources has been observed for the rivers Nile, Euphrates, and Jordan. The Jordan river basin has been considerably contested between Israel, Jordan, Lebanon, Syria, and the Palestinians. The region’s conflicts are largely determined by political differences, and water-related problems represent an additional dimension that may contribute to either an intensification of conflict or a change in behaviour towards cooperation. Besides technical and economic solutions that will increase the supply or decrease the demand of water, a resolution of the water crisis can be most effectively achieved by offering joint management, monitoring and enforcement strategies, and by

Figure 5.13: Schematic overview of systemic factors and interactions in the water conflict in the Nile River basin. **Source:** The authors.



a greater transparency of transboundary water data (Medzini/Wolf 2004). However, the long history of conflict has resulted in deep distrust in the region, impairing the chances of cooperation (Brown/Crawford 2009).

5.8.2 Water Conflicts in the Nile River basin

Reduced water supply over an extended period carries a conflict potential for the countries in the Nile River basin (Mason 2004). Egypt depends on the Nile for 95 per cent of its drinking and industrial water and could feel threatened by upstream countries that deplete the water resources from the river (Piontek 2010). While this increases the chances for political crisis and violent clashes (Brauch 2006a), it also increases the need for agreements to regulate water distribution. Lack of usable land and water resources adds to impoverishment and forces people to move from rural areas to cities. The agriculturally quite productive river delta is at risk from sea level rise and salinization.

Egypt and especially Cairo are highly vulnerable to various impacts of climate change. It is estimated that Egypt could experience a severe loss in agricultural

productivity as a result of water scarcity and land degradation induced by climate change. Wheat and maize production in Egypt could significantly drop by the middle of the 21st century. Even without the mounting demographic pressure, this may intensify competition over the remaining arable land. The capital's infrastructure is already under pressure due to the city's rapid growth, especially with respect to water availability, hygiene, waste disposal, and housing. Climate change is likely to worsen existing problems. A 0.5 m rise in the sea level of the Mediterranean could displace between two and four million Egyptians (FoEME 2007), most of them seeking refuge in Cairo's suburbs. Water scarcity and lower agricultural productivity in the Upper Nile area also add to pressure to migrate from the rural areas to Cairo and contribute to the degradation of sanitary conditions and increasing social unrest.

The interactions and causal relationships between the various driving factors influencing societal stability can be visualized in an impact diagram that represents the systemic factors and interactions in our VCAPS model framework.²⁴ Figure 5.13 depicts the essential variables and relationships of the water conflict in the Nile region. It shows the key quantities and their interactions that need to be taken into account

when the underlying model framework is converted to a concrete numeric model of water allocation decisions in this geographic region. Changes in climatic conditions influence water and land availability, which in turn affect economic production. Human welfare and consequently societal stability depend on wealth; any deterioration of the economy has negative implications for society as well.

Since water availability and thus the conditions for agricultural production depend on water use further upstream, two main geographic regions (upstream and downstream) are distinguished. Also, there is a differentiation between the population of rural and urban areas along the Nile, as economic activities differ substantially and the effects of climate change vary accordingly. Any large-scale change in the structure of society caused by migration or population growth triggers feedbacks that affect the economic output and subsequently the distribution of the remaining land and water resources.

Conflicts between the various actors can arise on different levels. First of all, there is tension between geographic regions. Increased use of resources in the upstream region diminishes water supply and the conditions for successful agricultural production downstream. Also, tensions may build due to the distinctly different structure of the populations in the rural and urban areas. These may increase in intensity if migration between these areas or particularly large population growth leads to greater competition for the limited resources available. Such conflicts are by no means confined to tensions between regions but could also manifest themselves in internal conflicts within a particular part of society (for a more extensive treatment of the Nile basin conflict, see Link/Piontek/Scheffran et al. 2010).

5.8.3 Model Framework for the Assessment of Conflict and Cooperation

Building on the setup shown in the scheme in [figure 5.13](#) and the VCAPS model framework for multi-agent conflict introduced in section 5.7, the interactions

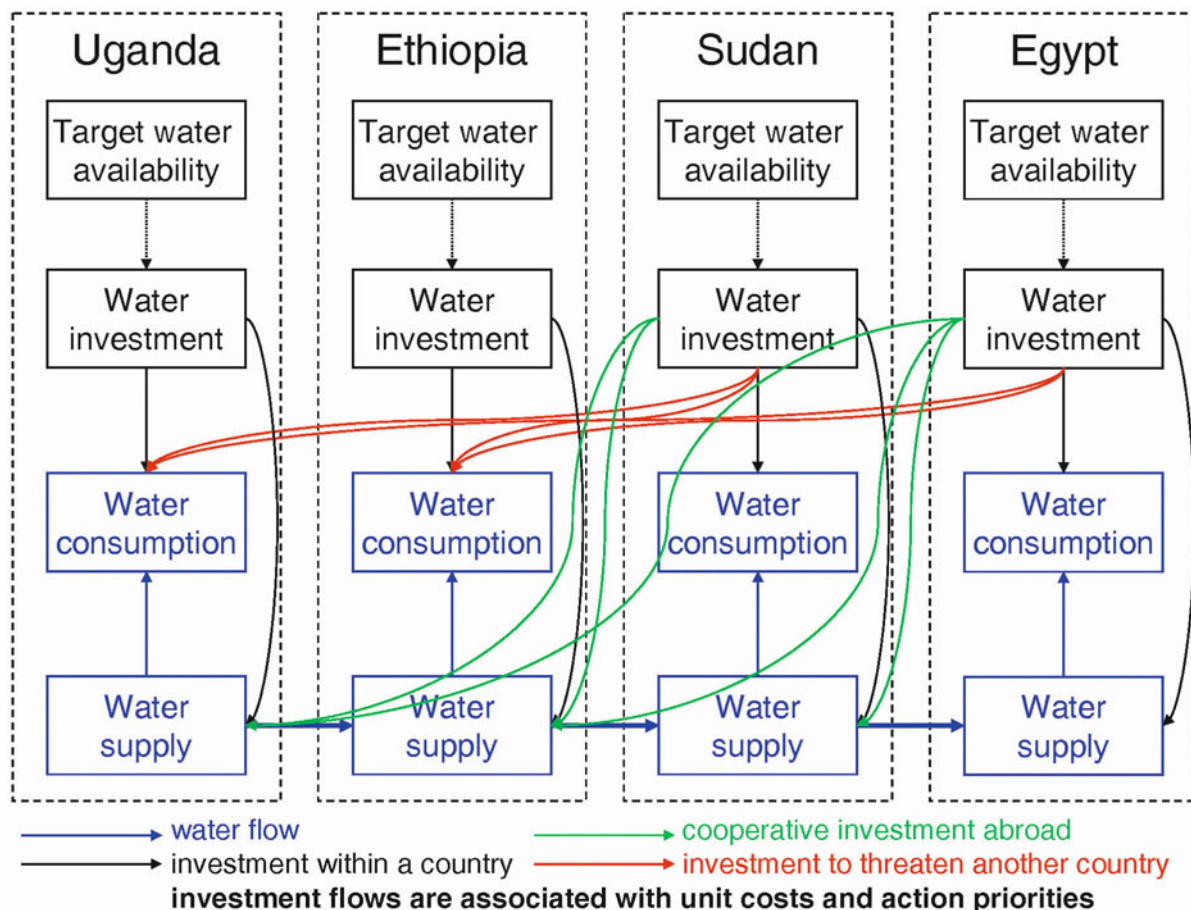
between water use and availability in the Nile basin and the impacts of climate change are reviewed. For the four major riparian countries (Egypt, Sudan, Ethiopia, Uganda), the options of each country for investing in water use and supply, either within their own national borders or in a neighbouring country, are discussed. Additionally, countries can use their investments to threaten each other in order to prevent or enforce certain actions by the other country. A schematic representation of the interactions of the countries in the model is shown in [figure 5.14](#).

Investments in water resources depend on a target water supply in each country. This target water supply is determined on the basis of a desired development in per capita water consumption and projections of overall population development. There is also a maximum amount that each country is willing to invest in the development of water resources. This maximum amount depends on the overall economic conditions as directly related to *gross domestic product* (GDP). The change in water use and supply not only depends on the total investments made, but also on the unit costs and the fractions (priorities) of investments allocated to each action path. Each country is assumed to invest in at least one of the following action paths:

1. national water consumption without exceeding actual water supply;
2. increase in national water supply;
3. collaboration on water supply with an upstream country in order to benefit from increased external supply;
4. threat to or pressure on an upstream country not to reduce the transboundary water supply by increased water consumption, or resistance to threats by a downstream country.

While the first two are unilateral measures, the third requires cooperation and the last drives conflict between countries. Total change in water availability is the result of water-related investments by all countries (corresponding to the invested capability in the general model framework) and their associated impacts, which also determine how the countries interact. We assume that the countries pursue certain future targets to satisfy their water needs which serve as value goals. These result in the target investments (efforts) by each country that drive water availability, in order to pursue national water goals according to dynamic adaptation rules.²⁴ Water availability in each country is affected by that country's own allocation of investments to the action paths as well as by all other countries' investments. The actual allocations depend on

24 A green arrow indicates a positive impact (sensitivity), i.e. an increase of one factor causes an increase in the factor that is affected (indicating a positive sensitivity). A red arrow represents a negative impact, which implies that an increase in a particular variable leads to a decline in the variable that is affected. For a black arrow the impact is ambivalent. No arrow implies that no relevant impact is considered.

Figure 5.14: Interactions between four Nile basin countries in the simulation model. **Source:** The authors.

the unit costs and allocation priorities for each action path. This interaction is represented by an adaptive dynamic system of difference equations with a temporal resolution of one year.²⁶ It describes the dynamic interaction of the riparian countries that adjust their investment levels and control the dynamics by the speed of their response and by their priorities. By allocating the investment shares to the alternative action

paths, the countries can influence the direction of their response.

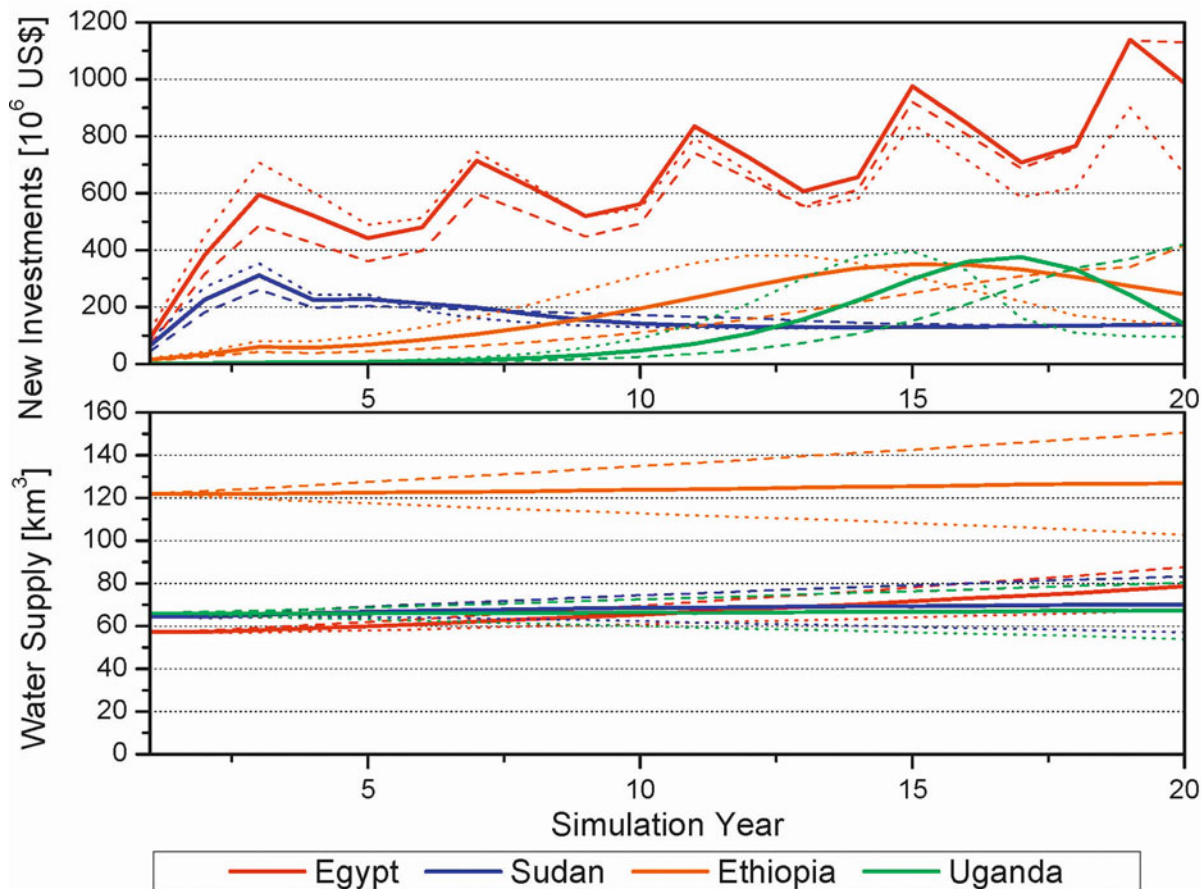
5.8.4 Results of Model Simulations

In the simulation runs, each country starts with a typical initial Nile water consumption and supply. Then each country defines a target path for the change in water availability for a future period (in this case 20 years). This target path is based on population projections to satisfy the water needs of that population and on the development of per capita water consumption. It is assumed that each country is willing to apply a certain maximum investment in water availability, which is a given percentage of GDP that is not to be exceeded. Investments in water resources are initialized on the basis of actual water consumption in each country. They then adjust investment to the self-defined water availability within the investment limits, as described above.

25 Translating the problem into the VCAPS model framework, efforts ΔC are represented by water investments, value goals V^* are given by targets for water availability, and action paths A are the four investment paths given above. The term “availability” is used here to indicate the sum of water consumptions and supply. Action priorities p are the fractions of investment to each path which are adjusted according to decision rules as a function of unit costs c .

26 While hydrological variability is shaped by seasonal developments, the unit of one year is chosen to reflect annual investment decisions.

Figure 5.15: Development of investments in water supply (top) and the resulting water supply (bottom) in each country. The solid lines denote a reference scenario without climate change. Dashed lines denote the case of a climate-change-induced overall increase of water resources of 20 per cent by the end of the simulation period, the dotted line a decrease of 20 per cent. **Source:** The authors.



The water unit costs for the different action paths are selected to represent a situation in which the unit costs for investing in increased water supply are considerably higher than the unit cost for water consumption, as long as the latter remains at a level below the water supply. Domestic unit cost in Egypt is higher than in upstream countries, making it beneficial to also invest in upstream countries. Putting pressure on an upstream country has a low unit cost if the neighbouring country gives in to this pressure, but has the highest unit costs if this country resists, either by counter-pressure or by taking other non-cooperative action (including the possible use of force).

We analyse two scenarios of climate change, reflecting the wide projected climate variability (for more details see Link/Piontek/Scheffran et al. 2010). In the first case, climate change reduces water supply in the Nile basin by 20 per cent by the end of the 20-

year simulation period, in the second case there is an increase by 20 per cent over the same time.

Investment in acquiring additional water resources to satisfy the growing demand for water is generally initially highest when the water becomes scarcer, i.e. if there is a negative climate impact (figure 5.15). Countries have to invest more money as there is less water naturally available to them. The particularly strong increase in investments in Egypt in the scenario with growing overall availability of water has to do with the fact that the intended expansion of water availability in this country leads to a rise in consumption costs within the increased supply limits.

Furthermore, the oscillations in Egyptian investment in new water resources can be attributed to the fact that the country experiences switches between periods in which its strategy of threatening upstream countries is resisted and others in which the pressure is accepted by the other country (figure 5.15). Since in-

vestment costs are much higher in phases of resistance, this diminishes the incentive to threaten and increases incentives to cooperate, leading to a cyclic switch between phases of conflict and cooperation, as given by the boundary case shown in [figure 5.15](#). If the difference in costs between resistance and non-resistance were larger than in the case shown, the countries would refrain from threatening their neighbours as the strategy becomes too costly in the long run.

The development of the water supply in the countries considered in the model coincides with the climate scenarios. Without any climate change influence, there is only a slight expansion of water supplies as investments are made in new sources. However, this strategy is quite expensive. The climate change influence dwarves these efforts, as the supplies grow considerably if there is more water available naturally and shrinks much more than can be offset by investments if water becomes scarcer as a consequence of climate change. Due to water consumption goals considerably higher than initial consumption in the countries of the Nile River basin, fair amounts need to be invested. In Egypt water consumption is close to the supply level throughout the simulation period. Whether the strategies that are predominantly chosen are cooperative or conflictive depends on the relative unit costs involved in choosing the respective strategies. In our example, only Egypt has a relevant incentive to impose pressure on its neighbours, while the other countries usually fare best if they rely on investments in domestic infrastructure to improve their own consumption and supply levels.²⁷

This model of water allocation decisions in the Nile basin in the context of climate change is a simplified first piece of a compulsory model of climate-society interaction in this region. It looks at only one aspect, albeit a very important one, that affects societal interaction in this watershed. Current model results may still be explained intuitively but non-linear effects are likely to show up when more important features of societal interaction in this region are added. Despite the simplifications embodied in the specific simulation results, the analysis supports the notion that the hydro-hegemony status of Egypt is increasingly being challenged by upstream states who need water

and hydropower for their own development and who question previous legal water arrangements that favour Egypt. Instead, they promote a new institutional setting that provides a new balance between upstream and downstream states that Egypt so far hesitates to accept. To address these challenges and to find a possible institutional framework for cooperative water management, a special security architecture in the North African - Middle Eastern - Mediterranean region can play an important role. Close cooperation between Europe and North Africa over water and food security, energy, and climate security can be beneficial for the entire region, can increase adaptive capacity, contribute to emission reduction especially in the power sector where North Africa can offer significant solar energy resources, and can create the preconditions for long-term stability (Brauch 2010, chap. 37).

5.9 Discussion and Conclusions

In many ways, anthropogenic climate change may affect natural resources and human needs, posing a potential risk for human security and for the stability of societies in many parts of the world, e.g. by a rise in the number of weak states, increased risks for economic development, and international conflicts over resources. These interactions between different spheres of the climate-society relationship are complex and difficult to predict from historical data. Many of the sensitivities of the individual systems are ambiguous or difficult to quantify.

Particularly challenging is the adequate representation of human behaviour using the assessment tools of climate-society interaction. On the macro level, game theory may be used to analyse interactions of limited complexity, while at the micro level multi-agent approaches can better describe processes of pattern formation among a large number of actors following particular rules of behaviour. Consequently, phenomena such as path dependency and cascading effects are relevant in describing how large groups of individuals can influence the decisions of entire societies.

Despite these challenges, it is possible to devise a modelling framework that includes not just the fairly well-understood processes of climate change and its impacts on the natural environment. The framework presented in the previous sections of this chapter extends further to comprise also the realms of human wellbeing and societal stability. It can be shown how

27 While some of these results could be achieved by qualitative considerations, the model simulation allows varying parameters and the determination of boundary conditions for a qualitative change of model behaviour, e.g. the transition between conflicting and cooperative behaviour by Egypt.

it is possible to obtain information on the stability of a given system in qualitative terms even if there are not enough underlying data available to completely solve a model setup numerically.

The last section of this chapter has introduced an application of the model framework to an expected future climate hot spot. Based on an assessment of the water-related conflict between countries in the Nile River basin with their asymmetric capabilities and adaptive capacities, the way in which the impact of climate change on water availability and conflict constellations in this region could affect the behaviour of key riparian countries towards each other has

been discussed. In the multi-actor model, the countries invest in water supply and consumption to reach water development goals, depending on the unit costs of the action paths and a natural limit of water availability due to climate change. The analysis suggests that the countries compete for the Nile water by increased investment, with Egypt temporarily putting pressure on upstream countries, but that cooperation provides a strategy to achieve water goals at reduced cost. The application of the model framework is an example of the possibilities of simulation tools to expand understanding of climate-society interaction.

5.10 Appendix

Table A.1: Main findings and statements on the empirical links between environmental and conflict variables since 2000. Page numbers are given in brackets. The column "Link" denotes whether there is a clear relationship between the variables (y) or not (n) or whether the study finds that the relationship is ambivalent (a)

Main findings / statements	Link	Reference
"Climatic factors do influence the risk of conflict incidence [in Kenya], wetter years are less safe than drier ones." (25)	y	Theisen (2010)
"Our results do not show a clear-cut picture: We present some evidence that periods with lower temperatures in the pre-industrial era are accompanied by violent conflicts [in Europe]." (77)	a	Tol/Wagner (2010)
"In great contrast to popular conceptions ... the empirical foundation for a general relationship between resource scarcity and armed conflict is indicative, at best; and numerous questions remain to be answered regarding the exact nature of the proposed causal association between climate change and conflict." (93)	a	Buhaug/Gleditsch/Theisen (2010)
"climate variability is a poor predictor of armed conflict. Instead, African civil wars can be explained by generic structural and contextual conditions: prevalent ethno-political exclusion, poor national economy, and the collapse of the Cold War system." (16477)	n	Buhaug (2010)
"There are three times more killings during rainy season than during the dry seasons. This indicates that in northern Kenya raids-related violence is influenced by climatic fluctuations, which also implies that climate change will have an effect on (in)security." (536)	y	Witsenburg/Adano (2009)
"Climate change is one of a range of factors causing natural resource scarcity; while natural resource scarcity is one of a range of factors causing conflict [in Kenya]." (6)	y	Campbell/Dalrymple/Rob et al. (2009)
"We find strong historical linkages between civil war and temperature in Africa, with warmer years leading to significant increases in the likelihood of war. When combined with climate model projections of future temperature trends, this historical response to temperature suggests a roughly 54% increase in armed conflict incidence by 2030, or an additional 393,000 battle deaths if future wars are as deadly as recent wars." (20670)	y	Burke/Miguel/Satyanath et al. (2009)
"The data-driven modeling of behavior has shown that environmental resources can result in disproportionately large variations in the frequency of conflict and cooperation [in Kenya]." (7)	y	Kennedy/Hailegiorgis/Rouleau et al. (2008)
"In the North East Nigeria, like most parts of the northern axis of the country, environmental scarcity occasioned by lowering amount of rainfall has caused tremendous damage to human life through incessant conflict in the quest for scramble and domination of scarce existing land resources." (322)	y	Obioha (2008)

Main findings / statements	Link	Reference
"The effect of climate change on armed conflict is contingent on a number of political and social variables, which, if ignored by analysts, can lead to poor predictions about when and where conflict is likely." (315)	a	Salehyan (2008)
"We ... roundly conclude that large scale community relocation due to either chronic or sudden onset hazards is and continues to be an unlikely response." (iv)	n	Raleigh/Jordan/Salehyan (2008)
"disasters are thought to exacerbate conflict risk primarily through reduction in the supply of livelihood resources, economic loss, and weakened government institutions, particularly in societies with pre-existing tensions ... Moreover, disasters attract lootable aid (food, transport equipment, etc.) and facilitate rebel recruitment through increasing numbers of orphans." (19/20)	a	Buhaug/Gleditsch/Theisen (2008)
"A high level of land degradation is the only factor that significantly increases the risk of civil conflict, although this result should be interpreted with caution. The general conclusion of this study is that scarcity of natural resources has limited explanatory power in terms of civil violence, whereas poverty and dysfunctional institutions are robustly related to conflict." (801)	n	Theisen (2008)
"It appears from this disaggregated analysis that demographic and environmental variables only have a very moderate effect on the risk of civil conflict". (689)	n	Raleigh/Urdal (2007)
"Climates more suitable for Eurasian agriculture are associated with a decreased likelihood of conflict, while freshwater resources per capita are positively associated with the likelihood of conflict."(695) "... interannual variability in rainfall is a more significant determinant of conflict than our measures of climate, land degradation, and freshwater resources." (710)	a	Hendrix/Glaser (2007)
"This paper has argued that climate change undermines human security in the present day, and will increasingly do so in the future." (651)	y	Barnett/Adger (2007)
"Results show that warfare frequency in eastern China (its southern portion in particular) significantly correlated with the Northern Hemisphere temperature oscillations. Almost all peaks of warfare frequency and dynastic changes occurred in cooling phases." (403)	y	Zhang/Zhang/Lee et al. (2007)
"While it is possible that climate change may lead to more conflict in the future, it has not so far caused a reversal of the current trend towards a more peaceful world." (635)	a	Nordås/Gleditsch (2007)
"Environmental migration crosses international borders at times, and plays a role in conflict. Environmental migration does not always lead to conflict, but when it does, the conflict intensity can be very high, including interstate and intrastate wars." (668)	y	Reuveny (2007)
"... the extent to which climate change triggers 'a succession of new wars' in Africa ... depends more on governance and governments than on the strength of the climate 'signal' itself. This being so, using projections of climate change in isolation from other factors is probably a poor way to predict future conflict." (1153)	n	Brown/Hammill/McLeman (2007)
"...higher levels of accumulated consumption of renewable resources (the so-called ecological footprint) is associated with a lowered risk of civil conflict." (345)		Binningsbø/de Soysa/Gleditsch et al. (2007)
"A shared basin is positively and significantly related to conflict, while a river boundary is not. Support for the scarcity view of conflict is somewhat ambiguous. ... wealthier countries can afford to compensate for scarcities by technological substitution or innovation The analysis ... suggests the existence of an environmental Kuznets curve – shared river basins increase the risk of conflict more for middle-income countries than for low-income countries." (378/379)	a	Gleditsch/Furlong/Hegre et al. (2006)
"sharing a river basin appears to have at least some positive impact on overall cooperation in a dyad, but ...several other factors such as scarcity, region, and regime type affect this relationship." (1)	a	Brochmann/Gleditsch (2006)
"Countries experiencing high rates of population growth, high rates of urbanization, or large refugee populations do not face greater risks of internal armed conflict. There is some indication that scarcity of potential cropland may have a pacifying effect. However, where land scarcity combines with high rates of population growth, the risk of armed conflict increases somewhat." (417)	a	Urdal (2005)

Main findings / statements	Link	Reference
"Using rainfall shocks as instrumental variables for economic growth, we find that growth shocks have a dramatic causal impact on the likelihood of civil war: a five-percentage-point negative growth shock increases the likelihood of a civil war the following year by nearly one-half." (746)	y	Miguel/ Satyanath/ Sergenti (2004)
"Per capita wealth is significantly negatively associated with conflict. The size of the population and population density are positively associated with conflict." (397) "...densely populated rural societies with access to greater per capita renewable resource wealth tend to have more conflict, a result that is highly significant statistically." (410)	y	de Soysa (2002)

Variables in the framework of climate-society interaction

C	climatic variables
G	greenhouse gas concentration
H	human security as a function of capability, values, and resources
N	natural resources
S	societal stability
T	temperature

Variables in the VCAPS model framework

A ^k	action paths
C	capabilities
F	destructive forces to threaten, damage, or capture assets
G	pollution stock (e.g. atmospheric carbon concentration)
H	human capital
i, j ... n	index of actors
K	physical capital
L	population size of social actor
M	migrating or displaced population
N	natural resources
P	action priorities
Q	goods produced in the production process
S	social capital
V	values
V*	goals
W	wealth
X	system environment variable
ΔC	efforts
ΔG	environmental pollution
ΔN	changes in natural resource stocks
ΔP	action rules
ΔW	invested wealth

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6 Global Climate Policy Reinforces Local Social Path-Dependent Structures: More Conflict in the World?

Jasmin Kominek

6.1 Introduction^{1, 2}

Climate change is a global phenomenon and there are an increasing number of attempts to discuss and solve related problems at a global level. This increasing emphasis on, and empowerment of, global institutions can have side effects on local power structures. The following analyses indicate that increasing global institutionalization can lead to an intensification of local conflicts around the world. This conclusion follows from an application and extension of the concept of path dependency. Examples are given of how local self-reinforcing structures can be used in a positive way to smoothly trigger an increase in mitigation and adaptation capacities.

Decisions on climate policy at the global level affect the options for policies at sub-global levels. If, for instance, it was decided at the global level that all countries around the world should build more nuclear power plants, then national, regional, and local social structures would be affected as well. On the one hand, large building companies, energy groups, and related political parties might use the legitimization of such policy to forward their own interests and to increase their revenues. On the other hand, opposing groups such as green parties, village groups potentially affected by radioactivity in the vicinity of a newly-built nuclear power plant, and civil society groups worried about possible contamination of the environment and increasing security risks would probably join large demonstrations, and organize actions to blockade construction work. The actions of one of the coalitions in this confrontation can cause the opposing groups to entrench their positions and

strengthen their power structures, and vice versa. In this scenario, a recursive self-reinforcing phenomenon is triggered and enhanced by actions at the global level. The scenario described demonstrates that decisions reached at the global level can influence local structures. The importance of the global level can also be extended to political dynamics prior to decisions, e.g. when these provide legitimacy for the positions of local agents.

The link between the global and the local level can be described using an extended path dependency theory. This approach is useful for analysing how dynamics are triggered and increased within existing social structures in a self-reinforcing way. Independently of content, certain structural dynamics can be described that shape people's behaviour. These are also relevant for considering the side effects of policies responsible for climate change, as well as policies for its prevention, mitigation, and adaptation.

Firstly, and based on the different steps in a problem-solving process, a formal scheme is presented. This scheme distinguishes between the overall problem-solving process (6.2), situational analysis (6.3), modelling and evolving strategies (6.4), and situational intervention (6.5). Using this structure, in each section each step is explained in greater detail and the theoretical background is presented, expanded, and developed. This leads to the concluding hypothesis that global climate policy can lead to an intensification of local conflicts around the world (6.6).

As political negotiators are likely to be affected by path dependency, this phenomenon is defined and its theoretical background explained in the section considering the overall problem-solving process (6.2). In the following section, the theory is expanded in order to draw conclusions from the macro-level phenomenon for micro-level agents, and to assess possible changes in individual decision-making resulting from path dependency. Next, a formal multi-agent model is presented to show that with the increasing effects of

1 I would like to thank Jürgen Beyer, Michael Brzoska, P. Michael Link, Jürgen Scheffran, and the anonymous referees for their valuable input and proofreading.

2 Keywords: climate change, violence prevention, path dependency.

path dependency, the variance of the actions by people affected tends to be reduced. Furthermore, people increasingly see only a narrowing set of possibilities as the basis for their actions. Finally, situational intervention and the implementation of chosen strategies are discussed.

Examples are given of how the self-reinforcing character of path-dependent processes can be deliberately used to trigger dynamic action processes that are directed at mitigation and/or adaptation. These processes are chances to positively apply knowledge of social dynamics by enhancing non-conflicting measures. Meanwhile, the perceived or actual narrowing of options through political processes at the global level in turn generally exacerbates national and local conflicts, leading to their amplification. A conclusion briefly summarizes the insights gained from the path dependency perspective and underlines the necessity of including it in considerations of global climate-change-related policy.

Path dependency is a concept used in many areas of social analysis. It can be expanded to explain micro-level behaviour as well as the dynamics of the interaction of agents on different levels (Kominek 2009b). This chapter aims to apply this approach to the question of climate-change-related actions. The particular question addressed is the effect of path dependency on conflict. It is argued here that there are structural dynamics, described by path dependency theory, which can lead to an intensification of already existing national and local conflicts triggered by global climate politics. This provides the theoretical underpinning of the scenario used in the opening section of this chapter (nuclear power plants).

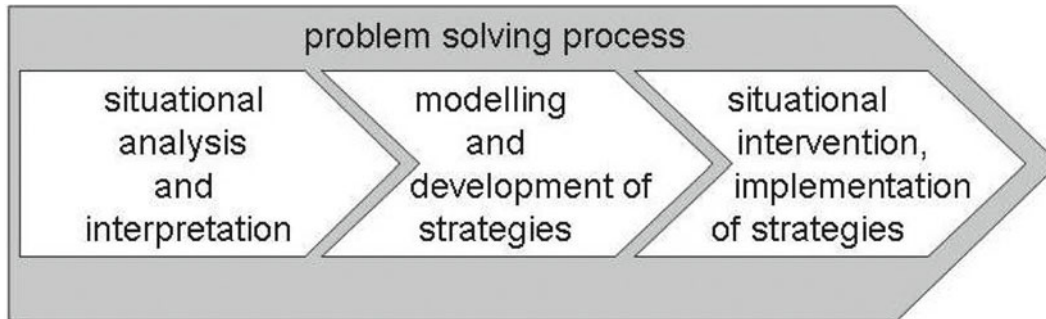
The importance of path dependency theory is often questioned (Liebowitz/Margolis 1995; Alexander 2001). It can be asserted, for instance, that revolutions can disrupt macro-level structures and politicians and societies may suddenly act in completely different ways. However, contrary to this it can be argued that basic behavioural routines can survive a revolution and can actually reinforce structures in an even more powerful way (Kominek 2009a). Analysis of how path dependency affects a single agent at the micro level helps us understand such findings. These considerations are presented in the section on situational analysis and interpretation (6.3, 6.6).

6.2 The Overall Problem-solving Process

Climate-change-induced degradation of freshwater resources, climate-change-induced decline in food production, climate-change-induced increase in storm and flood disasters, and environmentally-induced migration are the four “typical causal linkages at the interface of environment and society, whose dynamic can lead to social destabilization and, in the end, to violence” (WBGU 2007: 2-3). In the light of these facts, a high willingness to prevent climate change and mitigate negative effects on society and the environment can be assumed.

However, a person living in a rented apartment cannot easily change wooden window frames or change the heating system to reduce carbon emissions. It is hard to estimate, when buying an apple or a T-shirt, how much its particular storage, production, or transport costs in carbon emissions or water. An agent could try to reduce her power usage, but embedded in social networks as she is, the necessity of staying available requires a certain minimum use of electronic devices in the modern world. Thus, even though we have discovered that climate change occurs and we may have developed preferences about how to reduce carbon emissions or emissions from soot aerosols or how to conserve fresh water, these preferences are to some extent kept from directly influencing our actions by the institutions or social structures that surround each one of us. This behaviour can be described as a path-dependent behaviour in contrast to a primarily rational one, which would mean reflecting on and optimizing our preferences and acting accordingly. If even the everyday behaviour of any single agent needs to be described in terms of path dependency, every agent involved in negotiations about climate change policy, every agent who is affected by climate-change-induced disasters, and those who try to intervene in situations, are likely to be to some extent influenced by the surrounding structures instead of being driven by rational preferences only. Therefore, the problem-solving process itself needs to be considered in detail, so as to gain an impression of the unintended structural side effects, and to increase the chance of avoiding conflict resulting from effects directly related to climate change.

Figure 6.1: The formal scheme of a problem-solving process. A problem-solving process consists of four parts: the overall problem-solving process, in which political negotiations can occur, the sequence of analysis and interpretation, followed by modelling and simulations, and finally the implementation of strategies for a solution. **Source:** The author.



6.2.1 The Formal Scheme of a Problem-solving Process

To provide an analysis of the underlying mechanisms, the overall problem-solving process can be divided into a first part consisting of analysing and interpreting the situation, a second part consisting of modelling and the deduction of strategies, perhaps by use of simulations, and a final part consisting of intervention in real situations through implementation of the strategy (figure 6.1).

In each of these steps agents can be assumed to be present, e.g. debating on the overall problem-solving process, trying to decide politically who is most competent, who is most affected, who is responsible, and who needs to pay how much and when. In situational analysis it is important to make assumptions about how the observed agents reach their decisions in order to be able to interpret their behaviour and the present state of social dynamics they are in. Who decides rationally about economic goals? In which situations might people affected by climate change panic and simply fight for survival? And in which situations does survival depend on the decisions of institutionalized power structures instead of individual agents' other preferences?

The same behavioural decisions are also important in modelling and in the resulting strategies, where the political agents who negotiate strategies are influenced by micro-politics as well as climate-change-induced issues. In the final analysis, the type of situational intervention is decided upon by political agents, and these agents are present in executing the strategies in real situations in society, where, for example, agents affected by climate-change-induced issues live and act. If all these agents are shaped and affected in

their behaviour by the social structure surrounding each individual, then what is the result?

6.2.2 Path Dependency

If we consider the path of producing high emissions and another theoretical path of producing only low emissions, the combination of mechanisms that make us stick to the high emission path and prevent us from simply switching to the other (preferred) one can be described in terms of path dependency.

Path dependency is a phenomenon that implies that present decisions depend on former ones or on historical events. From a macro perspective, these sequences of decisions and the resulting actions are lined up, forming a path. There are different areas of society, technology, and science in which path dependency can be observed. Some authors argue that, in the case of technology, the selection of some technologies rather than others is made through efficiency criteria and is the result of perfect market selection mechanisms; in other fields such as politics there is less debate that path dependency occurs, and it is likely that paths will be manifested that inhibit correcting mechanisms and thus lower the chances for different actions to be taken in the future (Liebowitz/Margolis 1995).

In the case of the high or low emission paths in the previous example, bureaucracy and institutionalized processes can be made responsible for preventing the tenant of the apartment from switching to a lower emission path. In the case of consumption, opacity prevents markets from selecting sustainable products to succeed. And in the social network example, dependency on instant information, frequent communication, and global social networks as manifested habits and reinforcing social structures prevents agents

from switching to low emission paths. So that existing theory can be used from the outset and expanded later, the current state of research into path dependency theory will be outlined first.

6.2.3 The QWERTY-Keyboard: An Example of the Phenomenon of Path Dependency

The notation of path dependency used in a sociological context was originally coined in economics (e.g. Beyer 2005; Arthur 1989, 1994; David 1985, 2000, 2007). In a narrow sense, a process is considered to be path-dependent if it is a self-reinforcing process with the potential for a lock-in (e.g. Sydow/Schreyögg/Koch 2005, 2009). A broader understanding allows the use of path dependency more as ‘history matters’, which means that past events influence present and future actions (going back to Arthur 1989; David 1985). The most popular example for understanding and describing path dependency is the case of the QWERTY-keyboard. Present (English language) computer keyboards (still) usually have the keys QWERTYUIOP in the topmost row of letters, which is why they are called QWERTY-keyboards. The questions may be asked as to why this appears to be resilient against change and why the keys were placed on a QWERTY-keyboard in the first place.

The key placement in exactly the layout we know today resulted from different optimization processes to prevent former type bars from clashing and jamming. But the final key placing of the letters in the topmost row occurred because the first production line of typewriters was called TYPE WRITER and the company wanted their salesmen to be able to type the brand name quickly in product presentations (David 1985). So they ensured that all the letters in TYPE WRITER could be found in the topmost row. And even though those reasons have long since disappeared, today’s keyboards look just the same although there are different alternatives available for improving keyboard ergonomics or completely changing the method of entering text in an electronic device. The QWERTY-keyboard still is widespread, used, bought, and applied even on smartphones that do not have keys at all.

The agents engaged in production and purchase decisions in today’s keyboard market are not the prisoners of custom, conspiracy, or state control. But while they are, as we now say, perfectly ‘free to choose’, their behavior, nevertheless, is held fast in the grip of events long forgotten and shaped by circumstances in which neither they nor their interests figured (David 1985: 333).

Applying this summarized description to the case of high or low emission paths, you get statements such as the following: while apartment leasers, consumers of apples and T-shirts, and members of modern global society involved in social networks are free to choose, their behaviour is shaped by former events manifested in the structures surrounding them that were shaped by former circumstances where carbon emissions and climate change did not matter.

6.2.4 Debate on the Concept of Path Dependency

Pierson (2000) summarizes the characteristics of path-dependent processes (relating to Arthur 1994: 112–3) with the terms unpredictability, inflexibility, non-ergodicity, and potential path inefficiency. At the beginning of a path its final state cannot be predicted, in the lock-in it is difficult to change paths, small events at the beginning of the path may have large effects through positive feedback mechanisms, and “in the long-run, the outcome that becomes locked in may generate lower pay-offs than a foregone alternative would have” (Pierson 2000: 253). While it seems difficult to actually use a concept based on processes that are characterized as unpredictable, it is used in various ways.

In organizational sciences, Sydow, Schreyögg, and Koch use the narrower notation of path-dependent processes, which characterizes them as self-reinforcing processes with the potential for a lock-in: they suggest a 3-phase model to describe a path-dependent process, where in phase 1 contingency is present, in phase 2 self-reinforcing mechanisms more and more restrict actions until the lock-in occurs, and in phase 3 action changes at most incrementally (Sydow/Schreyögg/Koch 2005, 2009). Relating them to various fields of science, Beyer (2005) lists seven mechanisms that can be characterized as containing the logic of assuring continuity. And Page (2006) analyses different clusterings of mechanisms that affect whether processes become path-dependent, and assesses the characterizations of path-dependent processes in mathematical modelling. Using stochastic processes, Page expands Arthur’s models.

Pierson (2000) states that every institution in political science is path-dependent. In contrast, Alexander (2001) argues that politicians do not make decisions in an entirely rational way, so the economic definition of path dependency is not applicable without restrictions. On the other hand, Mahoney (2000) transfers the context of path dependency to the social

sciences and points out that the phenomenon cannot be sufficiently explained using economic approaches such as utility theory, because trying to explain inefficiency with a concept that does not allow any other result than efficiency is a paradox.

North (1990, 2005) describes institutions as locked-in (and thus in terms of path dependency) when they can be only incrementally changed by organizations. And at a theory-combining level, processes of institutionalization can be described as self-reinforcing processes and thus with the terminology of path dependency (Kominek 2009a, referring to Giddens 1984; Berger/Luckmann 1979). Liebowitz and Margolis (1995) present a characterization of path dependency phenomena consisting of three categories differentiated by the degree of inefficiency they produce, but they still argue whether the QWERTY-keyboard is actually an example of inefficiency, and thus market failure. Because, if the QWERTY-keyboard were the best solution for agents' local needs, the market would prove it was working well in selecting the QWERTY-keyboard as dominant technology.

What all these approaches have in common is that they more or less describe path dependency by focusing on the phenomenon: they try to discover paths on which path dependency acts in empiricism, characterizing path dependency using the attributes unpredictability, inflexibility, non-ergodicity, and potential inefficiency. They also distinguish paths in phases, cluster mechanisms around them, compare and cluster path-dependent phenomena, and try to describe them using mathematical models. But as Garud and Karnøe (2001) point out, although agents are central to the process of path dependency, a theory of agency is still not available to characterize them.

Thus, if path dependency shapes social structure and the actions of agents through institutions, what would happen if a climate-change-induced disaster destroyed institutional infrastructure or if a revolution broke the paths and changed the contents? And what if agents just deliberately acted differently?

Even if social structures were suddenly blockaded or vanished at the institutional (macro) level, the previous impacts that path dependency had had on the decision-making processes of each affected agent (at the micro level, as deduced in the following sections) would still shape their behaviour. That way, new path-dependent processes and structures are likely to be created (Kominek 2009b) through the back door, which would influence the involved agent's action even more intensely (due to primary-like socialization, Kominek 2009a). Of course, as long as agents do not

act entirely path-dependently, they should be able to deliberately act differently. Still, from the mere fact that paths actually affect agents in their decision-making and shape their behaviour to a degree that may be assumed, some predictions can be made.

6.3 Situational Analysis and Interpretation

As just discussed in detail, one characteristic description of how path dependency affects agents' behaviour is that their decisions and actions are shaped by past events which had no relevance to their present preferences (David 1985: 333). While for example politicians debated whether it was useful to rebuild New Orleans after Hurricane Katrina in a more secure way to prevent future disasters, to enrich the lifestyle of the inhabitants of the city, or to design the new houses in a more appropriate way, local residents acted in an obvious way: "The actual decisions and rebuilding undertaken to date, the so-called 'facts on the ground', clearly demonstrate the rush by the residents themselves to rebuild the familiar" (Kates/Colten/Laska et al. 2006: 14659). Trajectories of recovery can be identified that predict that a recovery generally follows the pre-disaster trajectory, with the disaster even accelerating previous trends (Kates/Colten/Laska et al. 2006: 14658).

When you look at the current situation, interpret the agents' actions and assume that path dependency is affecting their behaviour, the present goals of these actors cannot necessarily be deduced, because instead of striving to reach their goals, they may more or less simply stick to paths. Just the same, if asked they may answer that they actually feel free to choose what they want to do and they are happy with what they do all the time anyway. And they perhaps could even name a worse alternative to justify their action. One example could be that imported food is preferable to local food because local storage and refrigeration over time would produce more carbon emissions than an optimized transportation system from abroad. Or the other way round, local food could produce fewer emissions because transport distances are shorter, even though it might happen that each agent drives to the nearest farm by car. Other agents may not be happy with what they do and perhaps just do not feel free to choose differently, as they do not see any viable alternative for them. A suitable example for this is the wooden window frames or the heating system,

which a tenant of an apartment cannot decide upon by herself.

Furthermore, if asked to state their individual goals, e.g. to reduce carbon emission, it can be difficult to deduce from the agents' answers whether the goals mentioned are mere justification or have a real basis and are evidence for rational choice. Some agents might even answer that they do not have any special preferences or goals or that they do not know them. This may be true in some cases because when choosing between perhaps only one or two obvious alternatives it is not necessary to have a large variety of goals in order to pick one particular path. Therefore, more interesting and relevant than analysing the agents' goals and motivations is analysing how agents' behaviour is influenced by surrounding paths.

6.3.1 Ideal Type Path-Dependent³

So, what exactly happens if an agent is affected by path dependency – what does it mean for an agent to decide path-dependently? Because path dependency cannot be entirely explained by utility theory alone (Mahoney 2000), it can be concluded that a path-dependent decision cannot be described as substantially rational (Simon 1976) or as an 'ideal type rational-calculative' one (Esser 2005). This is true even though actions can usually be rationalized, which means that they can be explained *ex post facto* in terms of a rational decision as to why for example one T-shirt is better than another, while sustainability arguments just cannot be monetized or are weighted with a coefficient of zero and consequently do not show up in the final result of the observable action. So an agent's rationality is bounded (Simon 1976) by the individual horizon and the surrounding environment evokes decision frames that shape the resulting action.

Esser (2005) describes a model of frame selection as an expansion of classical rational choice theory. In this chapter, a similar argument is presented using fewer assumptions. Nonetheless, these are sufficient for subsequent analyses, resulting in an 'ideal type path-dependent' that can be used as the basis for a multi-agent agent-based model that describes agents' behaviour when optimizing emission reduction or simulates local agents' behaviour with regard to their reaction to climate-change-induced events.

6.3.2 The New Model Frame

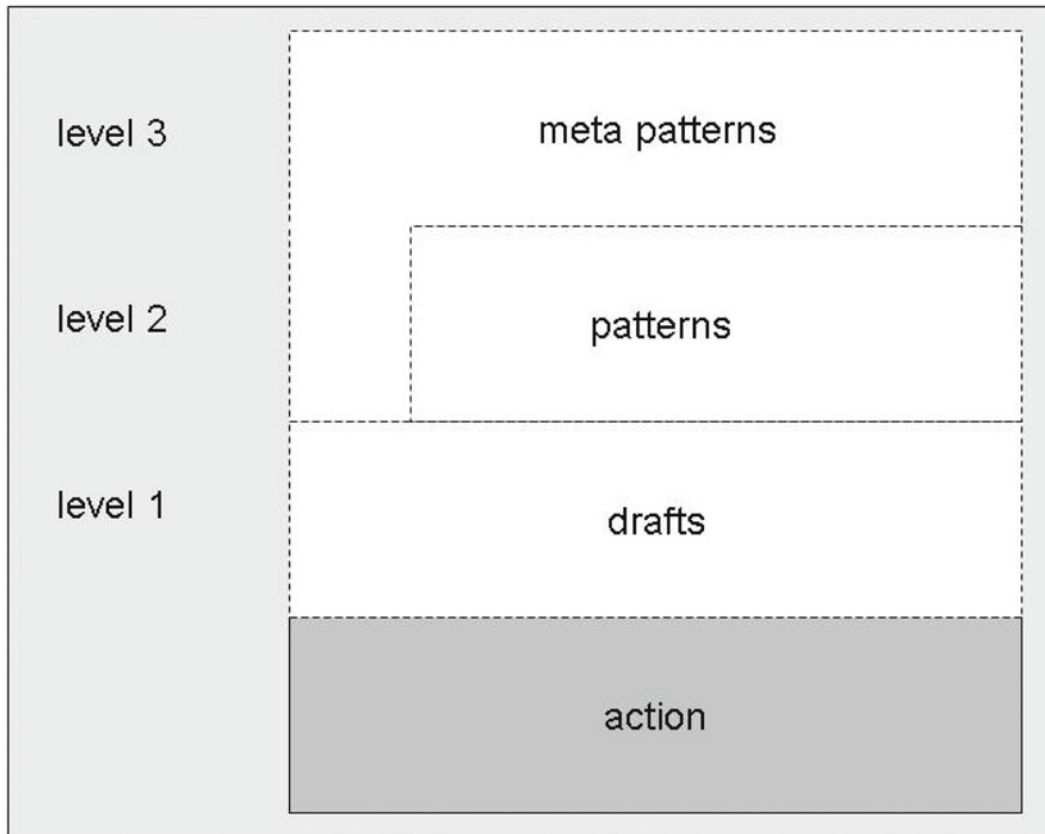
If a path can be monitored at the macro level, there must be some similarity in the observed actions that makes them appear as if they were lined up forming a path. This similarity implies that some part of actions that are taken stays the same over time, which means it can be described as some form of constancy or routine. So, if one were living in a rented apartment, one routine could be to simply use the existing heating system instead of arguing each day about changing the heating system, before warming the bathroom in the morning.

In the following model, this least-effort principle is not implemented as a deliberate rational choice, which would also be possible. It is even applicable on a more basic psychological level, such as in social psychology when scientists describe how the brain works. In social psychology (e.g. Chaiken/Trope 1999) it is usually assumed that a real executed action is preceded by an activated cognitive action draft. Therefore, level 1, the level of drafts in the model frame (figure 6.2), is the level of action drafts, where exactly one draft needs to be chosen and activated prior to the real action. To describe an automatic-spontaneous action with this model frame, the lower two rows would be sufficient (figure 6.3). The action decision-making process is therefore initiated on level 1, the level of action drafts. If more than one draft can be chosen that can be considered to be comparably practicable, or if no single draft can be chosen as perfectly matching on this level, a further decision process is necessary to solve this inner conflict (cf. Chaiken/Trope 1999). Consequently, one model assumption is that only when an automatic-spontaneous decision is deemed impossible or infeasible are other decision criteria added to the decision process and thus a decision process different from an ideal type automatic-spontaneous is started.

To map whether such a decision process is different from the ideal type automatic-spontaneous one, two more levels are added to the model frame, level 2 and level 3. Level 2, the level of patterns, contains decision criteria such as moral values, goals, norms, abstract models, prejudices, and other knowledge or information that are evoked, rejected, or enriched when considered in decision processes. Level 3 contains meta-patterns that control the inner process of decision making. With regard to the level of inner stress, routines, or agents' individual decision making, they let the decision process run shorter or more slowly, expand or flatten it, and make it more or substantially

3 The term *ideal type path-dependent* is deduced from the terms ideal type *rational-calculative* and ideal type *automatic-spontaneous* (Esser 2005; cf. Kominek 2009b).

Figure 6.2: Model framework of the new action model. The decision process can be separated into different levels of consciousness that can be applied. The process is initiated on level 1. Levels 2 and 3 are only used if necessary. The dashed lines indicate that no further chronology is fixed, but contents of all three levels could be combined. **Source:** Kominek (2009b).



less rational or controlled by anxieties, goals, or values.

However, as the dashed lines indicate, the use of levels can be interactively and flexibly combined.⁴ The differentiation between levels 2 and 3 only allows a clear arrangement and indication of two fields of analyses, one concentrating on the content (level 2) and one on the process (level 3). These two ways influence the decision process and possibly also the decision result and therefore have an impact on the resulting action. Consequently, the suggested model merely offers a framework for subsequent analyses.⁵ Using this

4 This is different from Esser's model of frame selection where a clear chronology is assumed, in which different levels are passed with the steps of a modus selection in between. In a modus selection the agent decides more or less consciously whether the partial decision on the next level would be chosen in an automatic-spontaneous or rational-calculative way (Esser 2005).

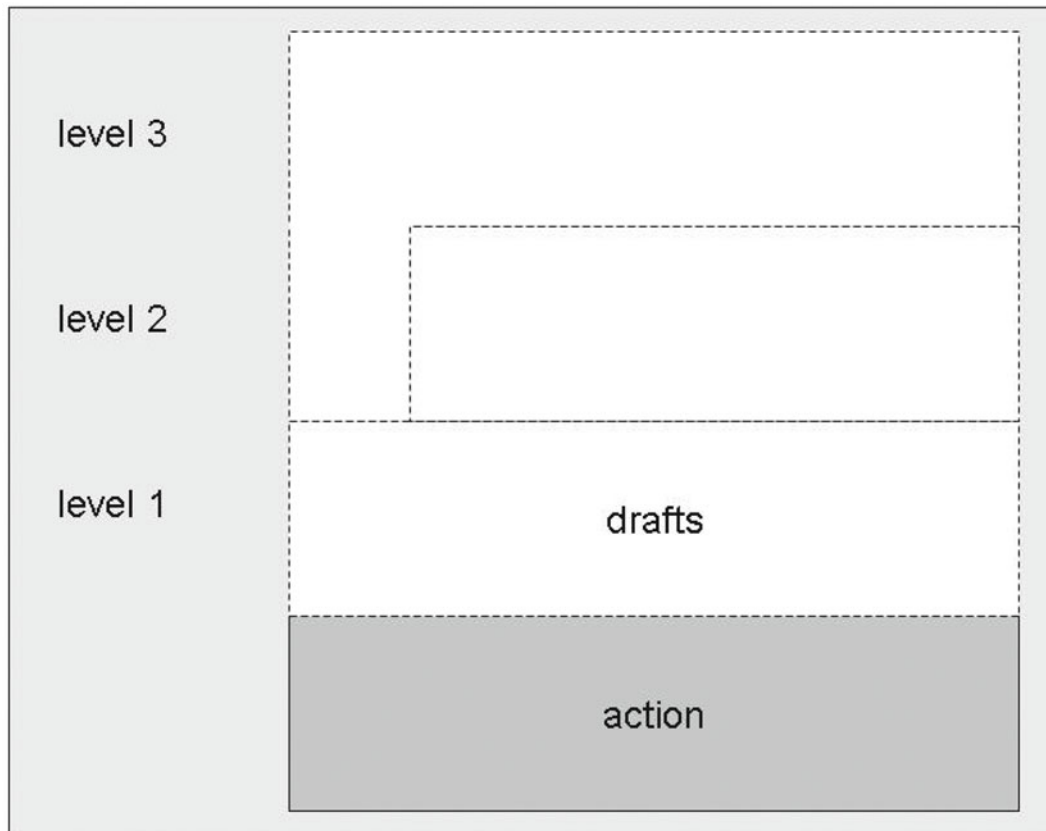
framework, the ideal type rational-calculative can be described (figure 6.4).

6.3.3 Deductions from the Macro-Level Path to Micro-Level Decisions

Emission paths of high or low rate are only observable at the aggregated macro level. But according to general path dependency theory it is not possible to predict outcomes before the lock-in. And in the state of lock-in any action is practically stuck and therefore predictable, and it cannot be flexibly changed anymore. Therefore, it is of particular interest to deduce the single agent's decisions at the micro level from macro-level information in order to predict dynamics that can then either be prevented, changed, or strategically intervened in.

5 An attempt is made to make the lowest possible number of assumptions, and in particular fewer than in rational choice models.

Figure 6.3: Decision framework of an ideal type *automatic-spontaneous* agent. Only the level of drafts is necessary for action. Prior to action, one particular action draft must be selected to be executed. **Source:** Kominek (2009b).

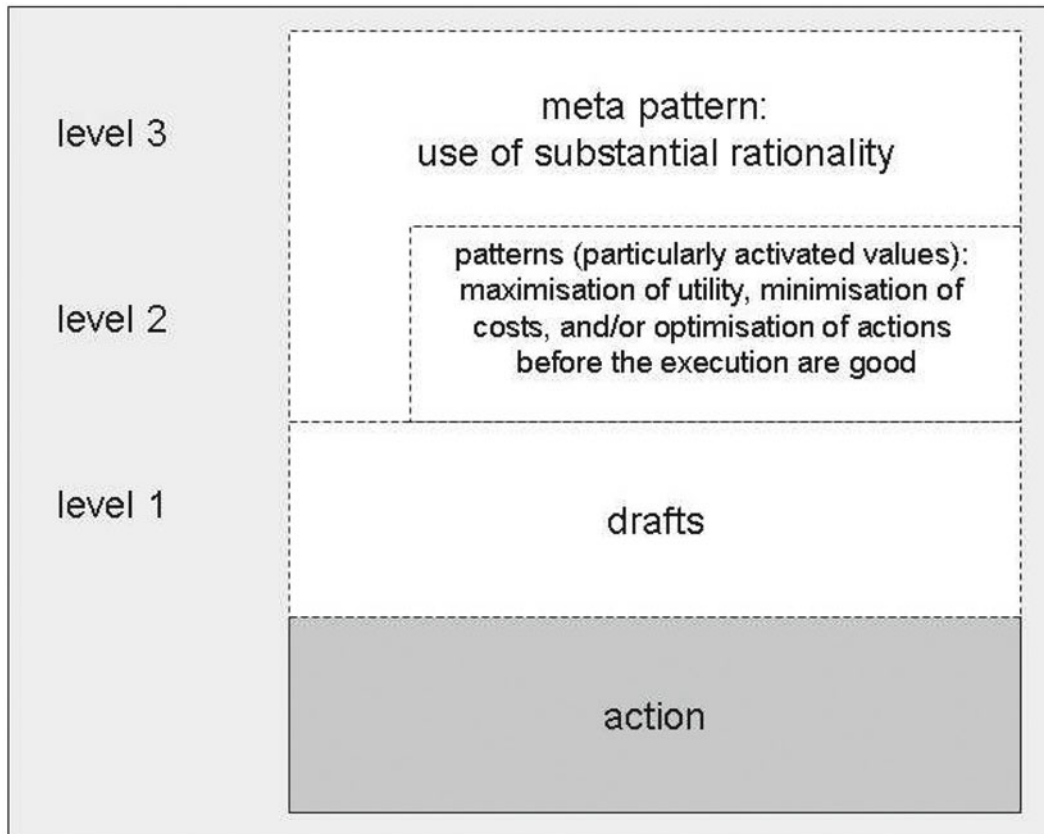


Whatever it is that causes similar actions that can be understood as the following of a path, that way of acting becomes more and more of a habit. It is possible to shorten a decision process by merely following a habit without thinking any more (on levels 2 or 3), or evoking further (or any) decision criteria. Because of the least-effort principle (in social psychology; Moskowitz/Skurnik/Galinsky 1999), this shortening of decision processes is what occurs if a path is followed for a longer period of time. Thus, the more path-dependent decisions an actor reaches, the more his process of decision-making is just a matter of following some routines or rules because the process of having and applying habits or routines has itself already become a habit (according to the least-effort principle; Moskowitz/Skurnik/Galinsky 1999). Of course, this is a very detailed description of a self-reinforcing process, because a habit or routine gets reinforced in the way described. But this psychological analysis is necessary to reach the conclusion that an ideal type path-dependent can be used in a way that

may be compared with an ideal type rational-calculative in order to expand multi-agent models.

What happens when this agent who acts path-dependently is confronted with a previously unknown situation, e.g. if the tenant of an apartment smells emissions from her switched-on heating system in the bathroom? The agent either simply continues to follow the same routine she always uses: to switch the heater on and to leave it on as long as necessary, or the agent does what she usually does when confronted with a new situation (which is almost like a routine on level 3): she turns the heater off again or leaves the room to return to a familiar situation. Alternatively, the agent needs a new routine to match the new situation, e.g. she could open the window. A quicker (or more successful) strategy for an agent than generating a new routine for herself is the adaptation of (successful) routines, rules, and standards from other decision instances, e.g. she asks a neighbour how to deal with the smelly heating system. The neighbour might suggest calling in the caretaker as an expert to fix it.⁶ So again, according to the least-effort

Figure 6.4: Exemplary decision framework of an ideal type *rational-calculative* agent. If an agent chooses rationally, the meta-pattern of using substantial rationality is activated and the decision process reaches conscious optimizations of available information. There is a choice between the various patterns to select the optimal draft for execution and subsequent action. **Source:** Kominek (2009b).



principle, the agent more and more tends to prefer this external adaptation of routines instead of generating them herself. This manifests itself in the inner decision process and in the decision criteria. It is even quicker to merely adapt drafts that only need to be executed than to adapt full routines, as it is not necessary to remember to always call the caretaker immediately when there is trouble with the heating, but the neighbour may suggest this action again if asked another time.

It can be concluded that agents who encounter a new situation, such as the one that is stimulated by climate change, are likely to rely on others in their behaviour, especially on locally available individual experts (Simon 1983). The likelihood for this behaviour depends on the intensity with which path dependency

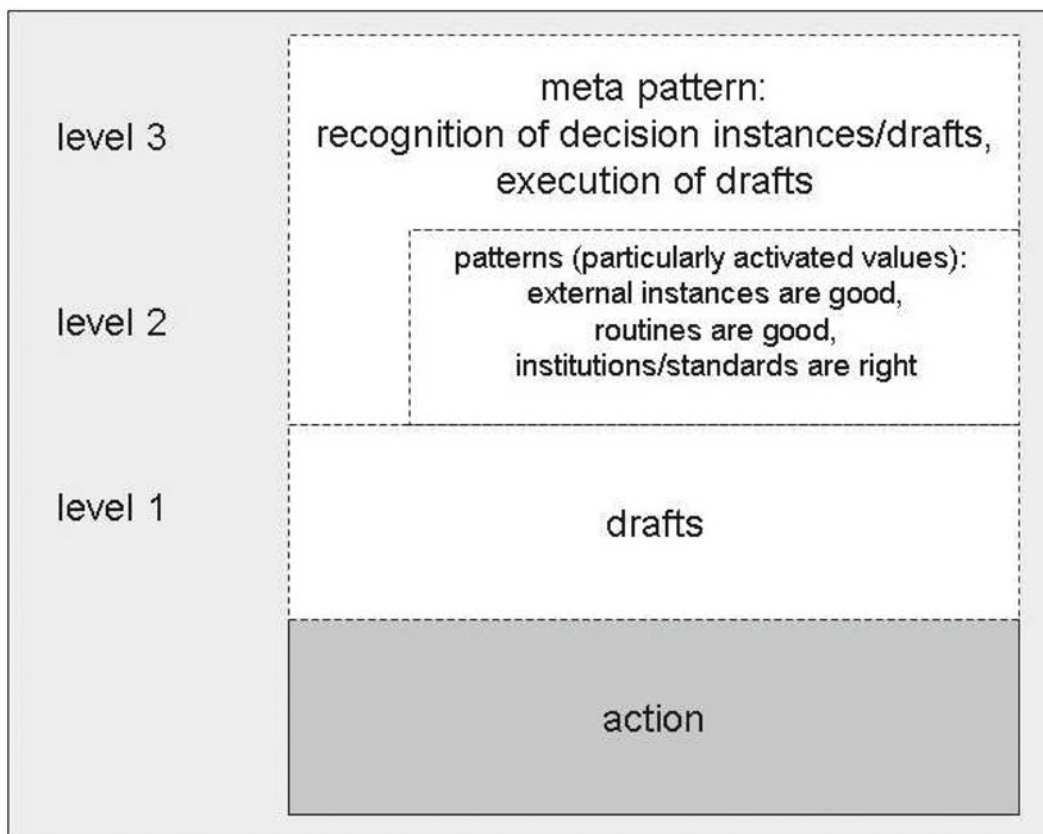
has previously affected the agent, e.g. through local social structures, routines, tradition, or culture. As a consequence of this analysis, an ideal type path-dependent can be defined. This means that the more an actor tends to decide and act path-dependently, the more his decision-making processes tend to resemble ideal type path-dependent behaviour (figure 6.5).

6.4 Modelling of Evolving Strategies

Now the characteristics of an ideal type path-dependent can be used to model scenarios or predict behaviour with the accuracy of people being affected by path dependency. Related to this topic, it can be stated that if global climate policy increases the institutionalization and thus the effect of path dependency on single agents (Kominek 2009a), it reinforces their tendency to act like an ideal type path-dependent. So, what social dynamics or group behaviour would result?

6 These effects can be monitored as complementary effects of path dependency or conformity tendency in e.g. organizational fields (Sydow/Schreyögg/Koch 2009).

Figure 6.5: Components of the decision-making process of an *ideal type path-dependent* agent activated (and created) by path dependency. The subsequent behaviour of individual experts can be described as the recognition of decision instances and the execution of a draft. If level 3 is reached in the decision-making process it refers back to levels 2 and 1 with the advice to follow routines and institutions and more or less simply execute the drafts. The final selection of the action draft occurs in a routine. **Source:** Kominek (2009b).



The following example describes how the ideal type path-dependent can be included in the expansion of an agent-based multi-level model to make predictions. The more the applied decision processes resemble those of an ideal type path-dependent, the more the agent under consideration tends to follow others instead of computing complex solutions himself, e.g. migrating where others migrate when affected by climate-change-induced flooding or water scarcity, or fighting those whom the others fight if local experts also do so. Such results, stemming from the behaviour of ideal type path-dependent agents, can be modelled. And then, using the probability of these agents being affected by path dependency, their action can be predicted. Simulations of social dynamics resulting from the behaviour of ideal type path-dependent agents can then be used to develop and optimize intervention or even prevention strategies.

6.4.1 A Multi-agent Model

To get an impression of group dynamics resulting from path dependency, some effects are now considered in a multi-agent model. The *value-cost-system* (VCX) model, a dynamic multi-agent interaction model, is used as the base model, considering single agent action (Scheffran/Hannon 2007).

With some mathematical notation it can be described as follows.

Each action takes place in a system environment x , where costs C_i invested by agents A_i produce values V_i . Considering a given time t , the present system state would be $x(t)$, present costs $C_i(t)$ and the resulting values related to the same point in time $V_i(t)$. Then a group of n agents A_1, A_2, \dots, A_n can be considered, in which each agent acts through investing costs and receiving values.

If agents have target values V_i^* that they try to reach and that therefore serve as goals, they can be

considered as learning in an adaptive way in order to approach their individual goals. When considering not only one point t in time, but stepwise action in a time sequence, the following point would be $t+1$, the subsequent one $t+2$ etc. (while the previous one would be $t-1$ and the one before that $t-2$ and so on). So, if one assumes that this group of agents decides and acts rationally, one can let the agents compute efficiency rates and decide to use the most efficient cost investment to address their next-step target values $V_i^*(t+1)$.

This basic model then can be expanded and applied in order to model conflict situations such as environmentally-induced fishery problems (BenDor/Scheffran/Hannon 2009), or arms races and international stability (Scheffran 2001; Scheffran/Hannon 2007). Furthermore, it can be used to model climate games, e.g. in the case of emission trading (Scheffran 2004). It is possible to calculate the implications of global emission goals for the regional or local levels, based again on the rationality assumption of each interacting agent.

Applying the previously described perspective of path dependency, the following behaviour of ideal type path-dependent agents is considered in an expansion of the VCX-model, and the effects of path dependency are analysed.

6.4.2 Inclusion of a Following Behaviour in an Expansion of the VCX-Model

Assuming transparency within the group considered, a single actor A_j may look at choices made by other actors during the previous time step and the results that they achieved. Then she follows the actor whose action would have contributed most to reaching A_j 's own goals. Thus, the decision rule is to do in the next step what the selected actor has done in the step before. This decision rule can be formulated for each agent A_j as follows:⁷

$$C_j(t+1) = C_{i_0}(t),$$

where i_0 is defined as:

$$\left| V_j^*(t+1) - V_{i_0}(t) \right| = \min_{i=1..n} \left| V_j^*(t+1) - V_i(t) \right|$$

⁷ If the agent has a longer memory than just one period, the term $V_i(t)$ could be replaced by $V_i(s)$ whereas s runs through former periods $t, t-1, t-2, \dots$ through each time period the memory lasts.

This particularly makes sense if costs are not only a monetary amount but a complex combination of resources, and the causal relationships between resource combinations and individual goals is not evident to the single actor. A consumer cannot know exactly which products or product combinations produce what amount of carbon emissions because companies may optimize some aspects of production such as transport in various ways without mentioning data on the associated emissions. Instead of testing the complex situation for successful resource combinations himself it appears to be more appropriate for the agent to also use others' experience as described above, because other agents might have had better information about which products produce more emissions than others.

This method of decision-making and acting can be described as a procedure that especially makes sense in complex real world situations when transparency between actors can be used to better address one's individual goals, rather than just searching for the best action by trial and error oneself. This is particularly true if the positive or negative outcome for the individual is only recognizable long after the actual action, as in the case of climate warming effects due to major heating systems or industrialization.

However, following this procedure has an important limitation: while theoretically each imaginable complex resource combination may be used for a different next-step action to address an agent's goals, in the procedure mentioned above only the previously-used combinations, that is, a finite number, are allowed for determining the next action. If all group members decide to follow this kind of procedure, the number of action options can only be reduced over time and not expanded. And the group may end up all doing the same thing. This can be good as the resulting action may be the best action locally available for each single actor to address their individual goals, such as the reduction of carbon emissions or the survival of a drought or a flood. But compared with the infinite number of possible actions it is likely that the action chosen is suboptimal and cannot be improved over time if the agents stick to the decision-making procedure described.

Of course, the procedure could be improved if an actor did not only consider copying what she herself or other actors did before. She could use these actions as a basis for computing new actions to best address her goals. Then there are still some limits as to how far she deviates from her former experiences or whether she sticks close to them, but at least new ac-

tions can improve group members' future actions. But if the action basis already consists of too many similar actions, even their combinations will remain similar (e.g. if all actors acted the same way, then the combinations of their actions would stay the same as well). Examples could be two types of preferred apples around the world that can be imported from different locations, or that people who use the same type of heating system might use it in smaller or larger versions and thus somehow optimize the production of carbon emission per apple or heating system. But depending only on those two types of apples and the one style of heating system would be a narrow frame for optimization and it is likely that emissions could be reduced far more effectively if further actions were considered, such as different local fruits or geothermic or photovoltaic solutions for heating.

6.4.3 Effects of Path Dependency

You can conclude from the former analysis that the more an agent is affected by path dependency the more his decision-making processes become similar to that of an ideal type path-dependent, that is, the more he decides and acts in routines, or follows institutions, standards, or external decision instances when applying action drafts.

Returning to the multi-agent example of decision-making, the process of following others can be enhanced with institutions, standards, or abstract decision instances, e.g. by the mass of agents that can be followed. This way it is possible to deduce that the more path dependency affects an agent, the more he fits his decision-making processes within the described multi-agent example. Thus, institutions, standards, and abstract decision instances can be added into the line-up of action options. This also holds for actions that oppose a standard or institution when mapping agents' behaviour. This may be quite a long line-up, but the single agent is still considered to be affected by path dependency. Therefore, whatever agent, institution, or abstract decision instance he chooses as a basis for his actions, the reselection of this type of decision basis for his actions (as described above in an abstract sociological way) becomes again a habit or routine and further reduces the range of his future actions.

For example, if a consumer intends to reduce carbon emissions she may follow the standard of purchasing organically grown products (biologically produced goods), hoping that they were produced in sustainable ways. She would therefore buy a bio-apple

or bio-T-shirt. Maybe a good friend of that agent would then tell her that the annotation 'bio-' does not necessarily include regulations on carbon emissions and that he or she would rather buy a locally produced apple or second-hand T-shirt. A colleague may then say that mass production tends to reduce carbon emission per product, because logistics and energy cycles can be optimized to a greater degree. And an NGO such as Greenpeace may suggest ignoring the products of a certain company to punish it for unsustainable behaviour. So, regardless of the decision instance the agent chooses as preferable (a bio-label, a personal good friend, a colleague, the mass of the population itself e.g. from nationwide statistics, or an NGO like Greenpeace), acting according to that preferred decision instance again becomes a habit.

The reduction of variety in executed action is observable not only in historical recollections. Furthermore, the agent's points of view are more and more reduced as his actions are shaped by routines and when focusing on only a limited number of relevant institutions or decision instances is necessary for his action.

It can be concluded that even though theoretically an infinitely large variety of actions is available, path dependency more and more makes agents act within a very limited range of actions, believing more and more that these are the only actions they can take. Thus, global climate policy can lead locally to a reduction of action variety and therefore an increase in polarization. And in this context, even further conclusions on the strengthening of hierarchical structures can be drawn.

6.5 Situational Intervention to Prevent Climate Change and to Enhance Mitigation and Adaptation: Implementation of Chosen Strategies

6.5.1 Political Structures Evolve and are Reinforced Through Path Dependency

It can be deduced from the previous sections that as long as agents are affected by path dependency, they tend to more and more follow routines or other decision instances in their actions, and even to focus their attention on them and disregard potential alternatives. This implies that agents who follow others pass on their negotiating power and legitimations to their (collective) master. In the previous example the agent

either follows the bio-label, the personal good friend, the colleague, the mass of the population itself, or an NGO. So whatever decision instance the agent chooses to allow his actions to be influenced by, by doing so he yields the power to influence his actions to that particular decision instance. The effects that result from following that decision instance acquire additional authorisation via path dependency, and consequently that decision instance becomes empowered to influence the agent's future actions as well. In this way, Greenpeace, for example, acquires negotiating power, social networks acquire a hierarchical structure, and traditions are reinforced. An increase in path dependency tends to reduce an agent's master options over time, and manifests social structures as hierarchies. Therefore, path dependency tends to increasingly prevent agents from taking rational decisions based on content issues, and makes them followers within the social structures instead. Through path dependency, micro-politics increasingly matter more than content.

Combined with the continued reduction of the range of alternatives under consideration caused by path dependency, path-dependent negotiating processes are likely to end up in political conflicts as they only focus on a small range of alternatives in the political debate, resulting in the situation that each party regarding the conflict usually only holds one particular view on an issue. Accordingly, global climate policy can reinforce national, regional, or local conflict structures and thus lead to an intensification of existing local conflicts around the world. And even more global conflicts could evolve as polarization increases and hierarchies are strengthened. But knowledge of path-dependent action not only allows for conflict prediction, it also can help intervention strategies to be applied more efficiently, using local structures and self-reinforcing dynamics.

6.5.2 Situational Intervention: Examples of the Implementation of Strategies

If strategies evolve and are to be executed, situational intervention needs to deal with social structures and dynamics that result from path dependency and to some degree affect the agents' future actions. It may happen that social structures prevent direct intervention, e.g. political systems prevent monetary aid from reaching affected agents because the money is spent to enhance existing political structures, something which might happen under totalitarian political regimes.

Other effects may be self-reinforcing learning effects within populations on how to best cope with floods or water scarcity. The Dutch are enlarging their dikes to adapt to a rising sea level resulting from climate change (Klein/Nicholls/Ragoonaden et al. 2001). Some coastal zones may use early warning systems to help people leave coastal housing in time to survive potential disasters (Adger/Hughes/Folke et al. 2005: 1038). They may also expand the knowledge of how to rebuild destroyed houses after a flood quickly, or how to move to more secure places at higher elevations. African pastoralists have the traditional knowledge to leave dry places and move on with their families and animals to oases where they still can expect to find some water (Berkes/Colding/Folke 2000). If all pastoralists share the same knowledge they will likely end up in the same places. Then the water may be insufficient to support all the people at the same time (chap. 24, by Njiru).

When people increasingly follow others, additional effects can occur. These could include cascading actions or mass migrations. People around the world see on TV or are told on the radio or by people who have travelled how other people live. And many would like to improve their living standards (e.g. India/Bangladesh). Others are affected by floods or droughts, and have lost their crops and/or homes (Kates/Colten/Laska et al. 2006). Depending on their own situation, families or villages either send out their most talented members to earn money elsewhere to ensure the survival of the collective (e.g. Mexico; cf. Lindstrom 1996), or they all migrate together if, for example, their entire land is lost (e.g. Pacific Islands; cf. Barnett 2001). And in less affected regions democratic behaviour can evolve and result in conflicts between parties who block early prevention even though technology and capital would have been available (Tol/van der Grijp/Olsthooen et al. 2003).

For this reason, it is desirable for intervening strategies to respect existing social dynamics rather than to work against them. Existing interests in improving living conditions could be enhanced to help people migrate and become educated in an integrative way. Travelling family members could be educated and helped to return home regularly so as to improve adaptive knowledge and the use of early warning systems, situational documentation, and aggregated local knowledge. And if collectives such as populations from the Pacific Islands migrate together, knowledge about their hierarchies, traditions, and spiritual celebrations may help to find or create integrative solutions for them (Böge 2008: 12).

The implementation of strategies is more promising when local agents are included instead of being excluded. So intervention strategies should be directed towards, for example, the destination regions of migrants, towards the enhancement of the variety or spread of best practice using modern scientific knowledge and best technology, or towards avoiding structural blockades. Thus, local and regional social dynamics that result from path dependency could be adequately considered and used to better mitigate and adapt to climate change. Nonetheless, the concepts of centralized global climate institutions should be handled with care because an increasing institutionalization at the global level affecting all agents around the world can intensify local conflicts.

6.6 Conclusion

The WBGU (2007) identified four major conflict constellations: climate-change-induced degradation of freshwater resources, climate-change-induced decline in food production, climate-change-induced increase in storm and flood disasters, and environmentally-induced migration, all of which are likely to cause conflict. But in addition to conflicts as the reactions of people who are directly affected by changes in environmental conditions, another level of potential conflict intensified by climate change, or rather policies addressing its causes and consequences, needs to be considered. Conflict may result as a side effect of debating, communicating, and implementing particularly policies aimed at the prevention, mitigation of, and adaptation to climate change.

This chapter has argued that global climate policy, which selects one particular strategy among many to address climate change, can lead to an intensification of national and local conflicts around the world. The argument is based on the assumption that path dependency shapes human behaviour. Using an expanded multi-agent model it has been demonstrated that, via path-dependency effects, decisions at the global level can result in a reduction of the variety of action applied locally. Furthermore, this perception of diminishing options can coincide with an increasing radicalization of positions and a reinforced strengthening of existing social hierarchies. If disturbed through climate-change-induced disasters or revolutions, path-dependent structures are likely to re-evolve in an even more intense way, which means that the people involved tend to act even more in ways that are best explained by path dependency.

This chapter has focused on expanding existing path dependency theory to include micro-level effects, outlining a theoretical model and giving a few supporting examples. More empirical work is needed to confirm this analysis by investigating whether individual agents decide and act as predicted by path dependency theory with regard to the topics addressed. If more empirical information about the importance of path dependency were available, this theoretical approach could be used to estimate the local side effects of global climate-related policy, such as the exacerbation of international, national, and local conflict. Furthermore, models that include path-dependent behaviour may help to optimize intervention strategies; they do this by considering the inception of self-reinforcing processes and thus the direction of leverage effects on peaceful dynamics that are generated in a particular way, and that aim at mitigation of or adaptation to climate change.

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Part III Climate Change and the Securitization Discourse

Chapter 7 Climate Change and the Environmental Conflict Discourse

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Chapter 8 Climate Change as a Driver of Security Policy

Michael Brzoska

Chapter 9 From ‘Securitization’ of Climate Change to ‘Climatization’ of the Security Field: Comparing Three Theoretical Perspectives

Angela Oels

Chapter 10 Critical Deconstruction of Environmental Security and Human Security Concepts in the Anthropocene

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Tore Rørbæk

7 Climate Change and the Environmental Conflict Discourse

Maria J. Trombetta

7.1 Introduction

This chapter explores how discourses about environmental conflicts have evolved and whether and how they have contributed to transforming security provisions and politics. It shows that the conceptualization of environmental security and the influence of the realist understanding of security have shaped the debate about environmental conflicts. Despite this initial framing, the debate has evolved and has contributed to bringing about a transformation of security practices in which preventive measures have gained relevance, even if traditional security narratives have reappeared, especially in the recent debate on climate change. This process is described through two dynamics: the securitization of climate change and the governmentalization of security. This chapter shows that the transformation of security practices can be conceptualized, adopting a broader understanding of securitization (see chap. 8 by Brzoska; chap. 9 by Oels; chap. 13 by Karafoulidis).

Over the last few years, the growing concern and consensus about global warming and its consequences have renewed the interest in the security implications of climate change, including the possibility of violent conflicts. This development has rekindled the debate on environmental security, which burgeoned in the 1990s but was marginalized in the context of the war on terror. The growing interest in the security implications of climate change is evident in the warnings of both scholars and politicians. In 2004, David King, the UK government's then Chief Scientific Adviser, claimed that climate change was a far more serious threat than international terrorism¹; while Margaret Beckett, as British Foreign Secretary, promoted the concept of climate security as a driver for UK and European foreign policy. In the US, a

report prepared for the Department of Defense on the effects of an abrupt climate change on US security (Schwartz/Randall 2003) created a great deal of concern when it was leaked to the press, which used headlines like “Now the Pentagon tells Bush: Climate change will destroy us”.² Films such as *The Day after Tomorrow* and *An Inconvenient Truth* further reinforced the representation of climate change as a threat and a security issue (see chap. 14 by Rørbæk).

Since 2007, when the UN Security Council held a special session on climate change security³ and the Nobel Peace Prize was awarded to Al Gore and the *Intergovernmental Panel on Climate Change* (IPCC 2007), an array of reports has been published on the security implications of climate change, and many of them have been sponsored by or prepared for governmental agencies (Schwartz/Randall 2003; Haldén 2007; WBGU 2008; Mabey 2007; chap. 33 by Kurtz).

This renewed interest poses a set of questions about the implications and opportunities of considering climate change as a security issue and as a cause of conflict. On the one hand, it is argued that the sensationalist tone of the media and of some politicians can contribute to “mobilizing political support and public and private funds for the post-2012 climate change regime” (Brauch 2009: 102). On the other hand, scholars have once again warned about the implications of bringing in the confrontational logic which is associated with security (Smith/Vivekananda 2009: 7; chap. 4 by Smith/Vivekananda) and the involvement of the military (Hartmann 2010).

Since this is not a new debate and discussions about the opportunities for considering environmental problems as a security issue have already character-

1 “Global Warming ‘biggest threat’”, BBC, 9 January 2004, at: <<http://news.bbc.co.uk/1/hi/sci/tech/3381425.stm>> (October 2009).

2 Townsend/Harris, “Now the Pentagon tells Bush: Climate change will destroy us”, in: *The Observer*, 22 February 2004; at: <http://www.bibliotecapleyades.net/sociopolitica/esp_sociopol_bush05.htm>.

3 See at: <<http://www.un.org/News/Press/docs/2007/sc9000.doc.htm>>.

ized discussions about environmental security for decades, dating back to Deudney's (1990) warning, it is important to analyse the implications of past discourses about environmentally-induced conflict and to explore whether and how they have impacted on security practices and provisions.

By reviewing the academic debate and various reports prepared by think tanks that are both policy-oriented and policy-orienting, this chapter provides an account of the evolution of the environmental security discourse and of the place which environmental conflict has had in it. It outlines the implications that these discourses have had for the research agenda and on advice to policymakers. By doing so, it shows how appeals to security within the environmental debate have not necessarily brought about the use of the confrontational logic which is often associated with security, but have contributed to new institutional arrangements and to different security practices.

The first part of the chapter provides a genealogy of environmental conflict (7.2). A genealogy is a history that considers the construction of discourses and objects of knowledge, and questions their apparent objectivity and sameness throughout different historical periods. According to this perspective, environmental conflicts are not objective phenomena, the characteristics and dynamics of which need to be discovered; they are the results of specific assumptions – such as the impact that the environment has on social dynamics, the link between scarcity and violence and so on – that make environmental conflict emerge as a problem in a specific historical context. The account provided in the first part of the chapter shows how the initial interest in a broad approach to global environmental change and security has been narrowed down to conflicts and more specifically to violent conflicts.

The second part of the chapter (7.3) outlines how this discourse has been challenged. It illustrates how research on environmental conflicts has shown little evidence of large-scale interstate violence, and revealed that cooperation rather than conflict is often an option in dealing with environmental scarcity. At the same time, security practices have shifted from reactive measures based mainly on direct state intervention to proactive ones based largely on public-private partnerships, insurance mechanisms, and regulations. The focus on conflict, which was central to considering environmental problems as an issue of national security, has turned into a call for the broader human security approach.

The third part (7.4) illustrates the recent debate on climate change. It reviews the main arguments regarding climate change and conflicts which have been put forward by a few reports sponsored by government bodies or issued by influential think tanks. It shows how various appeals to security and warnings about emergencies coexist with the call for precautionary measures.

The final part of the chapter (7.5) provides an account of these developments. De Larrinaga and Doucet (2010) have argued that contemporary dynamics in the security field can be described as a double process of securitization of global governance and governmentalization of global security. This framework can be applied to the debate on environmental conflicts in order to show how appeals to security coexist with the call for precautionary measures. It will be shown that these two aspects can be considered as complementary by adopting a broad understanding of securitization which argues that security practices are not fixed (and limited to the logic of exceptional measures) but they are subjected to social construction and negotiation. Adopting this perspective, appeals to security within the environmental sector, instead of spreading the logic of enemies and confrontation, can bring about different logics of security, including the one based on risk management, and new forms of governance. However, both developments can be problematic, albeit in different ways.

7.2 A Genealogy of the Environmental Conflict Debate

Discourses about environmental conflicts are not new phenomena, and so it is relevant to explore how they emerged and evolved. It will be shown that to a large extent these discourses and the research agenda behind them reflect the framing and the social construction of the linkage between global environmental change and security and its evolution.

The first attempts to consider environmental problems as security issues date back to the 1980s. They were influenced by the emergence of global environmental problems such as ozone depletion and global warming, and by the debate about resources scarcity, as outlined by reports such as *Limits to Growth* (Meadows/Meadows/Randers et al. 1972). Many of these attempts came from peace researchers who were warning scholars to focus on people's needs and priorities rather than on strategic issues.

Discussions about conflicts were largely excluded from the debate. On the one hand, this was a way to promote a non-confrontational, cooperative approach to security. During the Cold War, considering environmental issues as security issues and promoting cooperation to solve them was a way of promoting a non-zero-sum approach to security (Jahn/Lemaitre/Wæver 1987) and of contributing to the creation of trust and opportunities for dialogue. On the other hand, concerns over the environment and conflicts had been discussed in terms of protecting the environment during conflicts (Westing 1977; 1980) and these sensitive issues had been banned from international environmental negotiations.⁴

One of the first projects dealing with environmental conflicts was an initiative carried out by the *Peace Research Institute Oslo* (PRIO), originally prompted a collaboration with UNEP in 1988, on *Studies in Environmental Security*, and followed up by cooperation with the University of Uppsala on the project *Environment and International Security* (Hjort af Ornas/Lodgaard 1992). These projects dealt with the possibility of violent conflict but focused on a broader understanding of violence, using concepts elaborated by Galtung to suggest that violence is not only about direct, physical actions, but also about everything that limits the potential of human development (Galtung 1969). Furthermore they emphasized the possibility of cooperation and anticipated some of the issues that the human security approach addressed several years later.⁵

While global environmental problems were considered during the Cold War as a 'threat to global commons' and appeals to environmental security were seen as a way of promoting a common security perspective, in the aftermath of the Cold War, as soon as the enthusiasm for the implementation of a common security approach started to disappear, a new

discourse emerged. It focused on environmental conflict and its conceptualization as a 'threat to global order'.⁶ Drawing on neo-Malthusian considerations, it outlined the possibility that scarcity of resources induced by environmental degradation can trigger conflict, both directly, by pushing people to fight over the resources and indirectly as the result of migratory flows. Despite several objections, the argument gained relevance and attracted research funds. Several issues lay behind the success of this conceptualization. It seemed to provide a framework for conceptualizing the array of conflicts that were emerging in places such as Haiti, Rwanda and Somalia, and which could no longer be explained on ideological grounds (Matthew 2002: 116). It suggested a new role for the military in the post-Cold War environment, as the army seemed to have resources and capabilities that could have been deployed to protect the environment (Butts 1999). More relevantly, the focus on conflict reflected the dominant framing of the security problematic within international relations or, as Walt puts it, "the study of the threat, use, and control of military force" (Walt 1991: 212), and environmental issues were considered as a security issue since they can cause violent conflicts.

It is this understanding of what counts as security and of the means to provide it that makes it difficult to frame environmental problems as security issues in non-military or non-confrontational terms, and creates concern about the implications of doing so. The problem has been identified by several commentators. Rifkin has suggested that the modern conceptualization of security brought humankind to the verge of ecocide. He illustrated the evolution of the divide between the study of security, a prerogative of politics and social sciences, and that of the environment, a concern of natural sciences, and argued that this division contributed to downplaying the relevance of environmental problems for societies (Rifkin 1991). The point has been reinforced by Deudney (1999) who has suggested that social sciences, in the effort to provide social explanations for social events, have downplayed the relevance of environmental factors and naturalism, namely the approach that identifies natural aspects as causes of human and social behaviour, is often and incorrectly associated with determinism. In a similar vein, Lacy (2005) has shown how the environment has been excluded from the security tradition because the understanding of security has been nar-

4 During the preparatory work for the *United Nations Conference on the Human Environment* (UNCHE) held in Stockholm in 1972, which represented the first attempt to deal with environmental issues on a global level, for instance, the issue of conflict was deliberately excluded from the agenda of negotiations (Thomas 1992: 146).

5 See the *Global Environmental and Human Security Handbook for the Anthropocene* that offers a topical and comprehensive overview of the global debate on the reconceptualization of security since 1990 (Brauch/Oswald Spring/Mesjasz et al. 2008; Brauch/Oswald Spring/Grin et al. 2009; Brauch/Oswald Spring/Mesjasz et al. 2011).

6 See Trombetta (2005) for an analysis of the two discourses and their implications.

rowed down to the use of force and military threats, which can be the subject of a cumulative, verifiable, scientific knowledge. This created the field of expertise of strategic studies, in this way fixing and “securing the legitimate politics of security” (Lacy 2005: 11) or what is considered as a legitimate security issue and as the legitimate strategies for protection. In this perspective, environmental problems can become a security issue only if they can cause conflicts (or, to a lesser extent, if they have consequences that are comparable to those of a war). Considering environmental degradation and the conflict triggered by it as a threat to global order was in line with this framing.

As a result, despite the initial momentum and the broad scope of the environmental security discourse, the debate was captured by the discussions about environmentally-induced conflicts. The research project organized by Homer-Dixon in Toronto and Washington, which played a determinant role in shaping future research on environmental conflict, is quite explicit in narrowing down the debate on environmental security to one on conflicts, and more specifically on violent ones. Even if Homer-Dixon (1991: 76) justifies his choice on methodological grounds, suggesting that the debate on environmental security and even that on conflicts were too broad to be analysed and limited his research to the study of acute conflicts or conflicts involving a high probability of violence (Homer-Dixon 1991: 77), his move contributed to the increasing interest in the project and to the enlargement of the divide between the perspective focusing on violent conflict and a broader approach to environmental security.

Even if Homer-Dixon was careful in putting forward a straightforward connection between environmental degradation and conflict, his argument was popularized by the media and non-academic literature, including Kaplan’s article *The Coming Anarchy* (Kaplan 1994), which drew a grim picture of a future of human misery, population displacement, and violent conflict, labelling the environment as the “national security issue of the early twenty-first century”. For Kaplan, Homer-Dixon was developing the analytical framework that would have allowed an understanding of what was becoming a fundamental challenge to US foreign policy and global order.

The framing of environmental degradation as a threat to global order and the emphasis on the link between scarcity and violence had three sets of consequences. First, it shifted the focus of research outside the so-called “security communities” (Adler/Barnett 1998) or groups of countries in which resorting to war

is not considered to be an option in solving conflict. This made it difficult to undertake comparative analyses and to analyse the conflicts that climate change can induce in both developing and developed countries. In this way, the South was transformed into a ‘Barbaric Other’, as Barnett (2001), following Dalby (1992, 1999) has argued. The ‘threat to global order’ discourse has merged the normative concerns of peace research to investigate and eradicate the structural factors that contribute to violence with national security concerns, with the result of suggesting that “the poor and the marginal were threats to be controlled” (Dalby 2008: 124).

Second, it has also contributed to a divide between resource management and conflict studies. The former has been the prerogative of economics and management studies; the latter has been relevant for security studies and international relations, which were considered the disciplines with the appropriate conceptual tools to deal with violent conflict and war. Once again, this division, far from being an analytical one, made several assumptions about the possibility of cooperation and about the outbreak of violence, as well as on what is supposed to be a security issue and on who and what means are supposed to provide security. It was also a way of perpetrating a distinction between security in the international arena and its domestic dimension. The first, focusing on the state, was concerned with its survival as the prerequisite for all other forms of security, and was supposed to legitimize all kinds of exceptional measures. The latter was based on forms of social security, insurance mechanism and risk management.

The third consequence has been a marginalization of climate change. While climate change was prominent in early debates about environmental security, it has been marginalized in the debate on environmental conflict, in order to focus on localized effects and scarcities. As Dabelko has recently stated: “in the mid-1990s, climate change was often dismissed as a low-priority issue. It was commonly portrayed as a long-term and gradual process that would not play a direct role in triggering conflicts or state failure. Climate change took a back seat to more immediate links between population growth, environmental degradation, and violent conflict...” (Dabelko 2008, viii). This, in turn, was a way of transferring the problem to the South, often downplaying how localized impacts are connected to global dynamics and distant responsibilities.

7.3 Closing the Divide

Since the 1990s, the debate about environmentally-induced conflicts has evolved. Discourses about environmental degradation as a threat to global order and their emphasis on the link between scarcity and violence have been challenged, both by new research agendas and by the security provisions that have been implemented by policymakers. This has challenged some of the assumptions that were implicit in the security discourse that characterized Strategic Studies and International Relations as discipline. This development has been part of a broader process of transformation and questioning of the logic, meaning, and practices of security, and has opened the way for the human security perspective. More specifically it will be shown that the transformation of environmental degradation into a security issue and the conceptualization of environmental conflict as a threat to global order have not brought about the practices associated with the logic of war, enemies, and exceptions, at least on a global level. On the contrary, they have contributed to the implementation of a precautionary approach, and they have transferred some aspects of the precautionary principle, evoked by environmentalists, into security discourses and practices.

The evolution of the research agenda on environmental conflict is often presented as part of different generations (Ronnfeldt 1997) or phases (Brauch 2003; Dalby/Brauch/Oswald Spring 2009; Oswald Spring/Brauch/Dalby 2009) of environmental security research, an approach that suggests how a broad research agenda has been narrowed down to address more specific issues adopting a more 'scientific' approach. This perspective, however, suggests that environmental conflicts are trans-historical objects of research, independent from their discursive construction. The genealogical approach developed in this chapter suggests that the debate about environmental conflict reflects evolving concerns about what counts as a threat and how to deal with it. In this perspective, it is more relevant to analyse both the evolution of the research agenda and security practices as a result of the problematization of specific issues.

On the academic side, research has moved in two different directions. First, there has been the challenge to the bold statements about a causal relationship between conflict and violence. Second, there has been a convergence and cross-pollination between conflict studies, which characterized research from International Relations and Security Studies perspectives, and resource management approaches, which

characterized a more economics-oriented analysis. This in turn has challenged the divide between security within the state and in the international arena.

As for the first aspect, namely the challenge to the bold assumptions of a causal link between resources degradation and violent, large-scale conflicts, research has suggested that conflicts are likely to be sub-national and low-intensity. This is in line with Homer-Dixon's research, the result of which were more cautious than the picture put forward in his first article in *International Security* (1991) or popularized by articles like Kaplan's *The Coming Anarchy* (1994). These results have been reinforced by other major projects like those undertaken by Spillmann and Bächler (Bächler/Böge/Klötzli et al. 1996; Bächler 1999; Spillmann 1995).

The new research agenda that emerged has been the response to two sets of critiques: an epistemological one based on deterministic assumptions about social behaviour, and a methodological one concerned with the lack of empirical evidence and aimed at more accurate and extensive database and case studies. The charge of determinism and of perpetuating uncritically Malthusian assumptions about resource scarcity and violence has been moved to the majority of projects dealing with environmental conflict, and it is based on the consideration that accepting a causal relation between resource scarcity and the decision of people to fight takes for granted a set of assumptions about human behaviour, in a deterministic fashion. Research has tried to escape the trap of determinism by focusing on vulnerabilities rather than on violence (thereby recovering the original research perspective of peace studies) (Barnett/Adger 2007) or by adopting a broader but more contextualized perspective according to which the specificities of local episodes are related to global dynamics (Peluso/Watts 2001). The other critique, namely that of a lack of empirical evidence, has prompted several responses, from the positivist attempts to develop large case studies to the analysis of cases in which cooperation and not conflict was the result (Hauge/Ellingsen 1998). More recently, it has been argued that it is resource abundance rather than scarcity that determines conflicts (Berdal/Malone 2000). This is also in line with more recent research showing that instances of conflict and cooperation can coexist and that some forms of cooperation, far from being the ideal solution, can often mask episodes of domination and exploitation (Selby 2003).

All of these developments have moved the research agenda away from a narrow focus on violent

conflict towards a more comprehensive approach. This is in line with the second aspect of the transformation of the academic debate, namely the convergence of resource management and conflict analysis. The convergence of perspectives focusing on environmental conflict and those focusing on resource management is more evident and more frequently studied in the water sector, but there have been other attempts to move in that direction (Mason/Muller/Schnabel et al. 2008), especially in research on conflict transformation and prevention. Two instances have made the convergence more evident within the water sector. First, from the beginning there have been parallel analyses of instances of conflict (Gleick 1993) and cooperation, with the compilation of databases dealing with both (Yoffe/Wolf/Giordano 2003). Second, there has been a distinctive body of research on water management, which has had to deal with the problems of international river basin management and the conflicts that can arise. This approach, which originally was aimed at finding technical solutions, has been challenged by economic and political constraints that have determined the emergence of a broader perspective on water governance. On the other side of the debate, the literature on water conflict has dismissed the narrative of large-scale water wars to emphasize the localized level of the disputes and the negative effects of water disputes on development. This has led researchers, as well as security and development agencies, to move beyond intergovernmental conflict and agreements in order to focus on more specific water management challenges involving food security, poverty alleviation, water sanitation, and environmental issues (Luzi 2007: 7).

This convergence of resource management and conflict analysis is in line with the claim of political ecology, which – drawing on a variety of disciplines, including development studies, geography, and political economy – has tried to frame conflict within the broader context of the global economy. This approach focuses on the political economy of resources, considering economic transactions in their broader social and political context and linking local dimensions with the global commercial economy (Peluso/Watts 2001). From this perspective, conflicts are likely to occur where scarce resources are relatively abundant in poor societies (Dalby 2009). This line of research challenges neo-Malthusian assumptions while showing that several environmental conflicts are indeed violent (Dalby 2009).

This debate has contributed to a “a transition from the narrow concept of national security to the

all-encompassing concept of human security” (UNDP 1994: 22). The concept of human security shifts the focus from states to people and their vulnerabilities; it includes community, food, economic, environmental, health, personal, and political security. More attention is paid to the local context but also to the global flow of resources, including natural and energy resources. Human security suggests that insecurity stems more from intrastate conflicts and structural inadequacies than from wars, and this has led to development practices aimed at strengthening local institutions and governmental capabilities in order to promote stability. Research projects such as the *Global Environmental Change and Human Security* (GECHS)⁷ have been investigating environmental problems and the issue of conflicts in terms of human security since the 1990s, inheriting the ambition of peace research with its focus on positive peace and concerns for common security. More generally, environmental problems have begun to be considered as a threat to human security rather than, or in addition to, national security. In this way the debate on conflict which was central to transforming environmental issues into security issues⁸ has turned into a way of promoting the broader human security approach.⁹

7.4 The Return of Climate Change

In this debate climate change played a marginal role, and it is therefore relevant to explore the effects of its return to the security agenda and whether and how the terms of the debate and the advice to policymakers have been transformed by the ongoing debate about environmental conflicts.

The return of climate change to the security agenda since the early 2000s is certainly associated with the growing awareness and consensus which emerged with the 4th IPCC assessment report (IPCC 2007) or the Stern Report that warned of the economic cost of non-intervention (Stern 2006). How-

7 For a brief survey see: Barnett, Matthew, and O'Brien (2009); also the GECHS website; at: <<http://www.gechs.org>>. This project was concluded in June 2009 after ten years.

8 In volume IV of the Hexagon Book Series (Brauch/Oswald Spring/Grin et al. 2009) 16 chapters give a survey of the recent global debates on environmental security concepts and discourses.

9 In the same volume (Brauch/Oswald Spring/Grin et al. 2009) 23 chapters offer an overview on the scientific and policy-driven human security debates.

ever, it is the possibility of abrupt climate changes and the representation of climate systems as non-linear that has contributed to its representation as an urgent threat. Reports like the one prepared for the Pentagon (Schwartz/Randall 2003) and films like *The Day after Tomorrow* have contributed to helping to visualize the threat.

This has mobilized security experts, and a series of reports sponsored by government bodies have supported the representation of climate change as a threat and as a cause of conflict. These reports have developed scenarios that have captured the public imagination and the interest of policymakers.

A relevant example is the report prepared by the *German Advisory Council on Global Change* (WBGU, 2008) and jointly commissioned by the German Ministers of the Environment and of Development. The report, while using the title *Climate Change as a Security Risk*, actually focuses on the possibility of conflict.¹⁰ In showing that climate change is going to stretch the adaptive capacities of states, it recognizes that this can lead to either conflicts or cooperation, but then a set of conflict constellations – that are going to affect developing countries – are analysed. In this way, the report restates some of the assumptions about the supposed linkage between environmental degradation and violence that characterized earlier debates on environmental conflict (Bauer 2011). This echoes traditional discourses on national security, even if the report also dwells on human security and advises policymakers to use development assistance, promote institutional arrangements to increase resilience, and support mechanisms for conflict prevention and resolutions. A similar approach is adopted by the report prepared for the Swedish Defence Research Agency by Peter Haldén, *The geopolitics of climate change* (2007). The report argues that both climate change and the measures to deal with it can represent a threat to international security and cause violent conflicts, even if the possibility of cooperation is not excluded. This report deals explicitly with national security, but it recognizes that this means not just focusing on states but rather on a broader set of actors and on a variety of means.

10 This was triggered by an earlier report commissioned by the BMU (2002) that was primarily written by AFES-PRESS (Brauch 2002) and supported by several expert studies that may be downloaded at: <http://www.afespress.de/pdf/Brauch_ClimateChange_BMU.pdf>. The WBGU Report is downloadable at: <http://www.wbgu.de/wbgu_jg2007_engl.html>.

The persistence of the national security perspective and of neo-Malthusian assumptions is more evident in the reports prepared in the US, often by think tanks which are closer to the military and connected with people who played a relevant role in shaping the environmental security discourse during the Clinton administration.

The aforementioned report prepared by Randall and Schwarz increased the sense of urgency that contributed to the transformation of climate change into an existential, urgent threat, both because it focused on abrupt changes and because it was supposed to be confidential. It re-cast images of starving population, violent conflicts, and mass migration toward the US and European borders (Schwartz/Randall 2003).

Several reports followed in this wake. For the *Center for Naval Analyses* (CNA) a group of retired US generals and admirals under the guidance of Sherry Goodman, a former Under-Secretary of Defense for Environmental Security during the Clinton administration, issued a report on climate change and national security which considered climate change to be a threat multiplier (CNA 2007). Although the report focuses on protecting military infrastructures and greening defence, once again, the measures suggested are based on increasing resilience and reducing vulnerability.

For the *Center for a New American Security* (CNAS), a group of researchers led by Kurt Campbell explored the security implications of three scenarios, an expected one based on a global temperature increase of 2.3°F by 2040; a severe scenario based on a higher increase in temperature by the same date, bringing about potentially destabilizing global effects; and a catastrophic scenario based on an increase of 10.8°F by 2100.¹¹ The security implications include: an increased proliferation of diseases; tensions related to large-scale migration; and conflicts triggered by resource scarcity, particularly in Africa. While, according to the report, the chances of war are low, in several contexts violence is likely to occur.

Despite the fact that the language of these reports is informed by the national security narrative and neo-Malthusian assumptions, they suggest preventive measures and a broader approach to security which is attentive to various aspects of security and, to some extent, informed by some aspects of the human security debate. They suggest rethinking security policies

11 The results were published first as a report (Campbell/Gulledge/McNeill et al. 2007) and later as a book entitled *Climatic Cataclysm* (Campbell 2008).

in order to deal with contingencies and avoid crises, and imply that military notions of security need to be revised.

This is more evident in Mabey's (2008) report for the British *Royal United Services Institute* (RUSI). The report, like others of its kind, identifies three scenarios and their implications for security, but in this case, the image of a chaotic, non-linear climate change is ubiquitous. The first scenario is characterized by high-impact events that are reversible; the second by irreversible events; and the third depicts the nightmare option of runaway climate change. The report is relevant because it was prepared by an environmentalist for an institution that is at the centre of British foreign and defence policy. To some extent, he largely reiterates an old and contested argument that the military are the ones who are best equipped to deal with the worst-case scenarios, and invokes the responsibility to protect as part of the rethinking of the role of the military in protecting societies (Dalby 2009: 151). At the same time, the report emphasizes two correlate aspects: first, the importance of thinking ahead to anticipate and prevent potential conflicts; and second, the need to implement a low-carbon economy in order to reduce the impacts. In this way, the report uses the language of prevention. It argues against an understanding of security as being ready for emergencies and responding to crises; and it calls for an understanding of security which aims at preventing crises.

Commentators have seen these reports as a return to the Malthusian perspectives on environmental conflicts (Dalby 2009) and suggested that the debate seems to be a repeat of that which occurred in the early 1990s. They showed concern for a greater involvement of the military in development policy without any transformation of their role (Hartmann 2010). Others have considered environmental conflict as a marginal discourse within a broader emancipatory environmental security discourse, which has to be welcome because it can mobilize action (Detraz/Betsill 2009).

Scholars have criticized these reports for their lack of peer reviews and have called for more empirical analyses (Nordas/Gleditsch 2007). In a special issue of *Political Geography* on climate change and conflict, Nordas and Gleditsch have argued that reports on climate change and conflicts are not peer-reviewed or based on case studies, but that they tend to build scenarios on a set of taken-for-granted assumptions with the result that "statements about security implications have so far largely been based on speculation

and questionable sources" (Nordas/Gleditsch 2007: 628). Nordas and Gleditsch called for more detailed case studies and databases. Greater attention to conflicts was called for in the next IPCC report (Nordas/Gleditsch 2007), but once again scholars warned that more empirical evidence could translate into a greater acceptance of traditional security discourses and military intervention.

The debate once again shows the relevance of how environmental conflicts have been framed as an object of knowledge and how some of the assumptions behind that framing (such as the Malthusian assumptions or the link between environmental degradation and violence) tend to persist despite a twenty-year debate that has challenged them. On the other hand, the debate suggests that what is relevant is not the existence of a causal link between degradation and conflict, which remains highly contested, but the practices that are brought about by the acceptance of that link, or the construction of climate change as a threat and the measures that this process allows, legitimizes, and considers as necessary and natural.

7.5 Making Sense of These Developments

The representation of environmental conflict as a threat to global order can be considered as a process of securitization. Several claims have been made suggesting that climate change has been securitized, at least since 2007 (Brauch 2009), or showing that securitization provides a relevant framework for analysing the emergence of environmental problems and climate change on the security agenda (Buzan/Wæver/de Wilde 1998; Trombetta 2008).

The theory of securitization as elaborated by Ole Wæver and the so-called Copenhagen School argues that security is a speech act that constitutes a security issue and transforms the way of dealing with it (Wæver 1995, Buzan/Weaver/de Wilde 1998). By saying that something is a security issue "something is done (as in betting, giving a promise, naming a ship)" (Wæver 1995: 55). The transformation of an issue into a security issue, namely a successful securitization, requires someone - generally from an authoritative position - making a persuasive statement, and an audience accepting that claim. This transformation brings about exceptional measures and a set of practices legitimated by the logic of survival.

From this perspective, the existence of a causal link between environmental degradation and conflict

(that has characterized much of the debate on environmental conflict) becomes less relevant than the acceptance of that claim, or the truth effect of it. By focusing on the performative power of discourses, securitization shifts the attention from the analysis of apparently objective threats to that of the political communities and the values and interests that are supposed to be protected. In this way, securitization provides a relevant instrument for considering why some threats are considered to be more urgent than others and for analysing the assumptions behind their transformation into security issues.

The problem is that for the Copenhagen School the transformation of an issue into a security issue brings about a set of problematic practices allowed by the framing of a threat as an existential threat. Exceptional, emergency, illiberal measures are allowed. The logic of security is the logic of exception and war. A successful securitization is associated with exceptional measures; the breaking of otherwise settled and unchangeable rules and norms, including those related to the use of force and violence. For the Copenhagen School “any public issue can be located on the spectrum ranging from non politicized ... through politicized ... to securitized (meaning the issue is presented as an existential threat, requiring emergency measures and justifying actions outside the normal bounds of political procedure)” (Buzan/Wæver/de Wilde 1998: 23–24). These practices brought about by a successful securitization, for the School, are fixed and not open to negotiation. While securitization is a political process which is open to contestation and can be rejected, the practices it brings about are not negotiable.

This justifies the warnings against the consequences of considering environmental degradation as a security issue and echoes the arguments provided by Käkönen (1994) about militarizing the environment rather than greening security, by Deudney (1990) about the spread of nationalism and of an unproductive confrontational approach to environmental problems, and more recently by Hartmann (2010) about the colonization of the climate change debate by the military and intelligence community, with the risk of imposing an authoritarian approach, secrecy, and illiberal practices. For the Copenhagen School the suggestion is “less security, more politics!” (Wæver 1995: 56).

The problem is that, in the case of the environment, there is little evidence that appeals to security, even those related to violent conflicts and the representation of climate change as a threat to global order, have brought about exceptional measures and “actions outside the normal bounds of political proce-

dures” (Buzan/Wæver/de Wilde 1998: 24), either as military actions or as exceptional economic measures that could have been justified by appealing to emergency situations. In the case of climate change and conflicts the suggestion that climate change is a threat to security is associated with an appeal to precautionary measures and new forms of governance, even when those appeals are made from think tanks which are close the military.

De Larrinaga and Doucet (2010) have described a process that can provide relevant insights for characterizing the renewed interest in environmental conflict and the coexistence of appeals to national security with those for new security practices. Drawing on both the theory of securitization and the work of Foucault on governmentality, they argue that contemporary security dynamics are characterized by the interplay of a process of securitization of global governance and governmentalization of global security. This characterization is particularly appropriate in the case of environmental conflict since the recent debate combines the return of national security narratives and the call for precautionary measures which aim to increase resilience and reduce vulnerability.

In terms of securitization of global governance, the debate on environmental conflict shows how concerns for both the environment and development have become relevant for security debates and security professionals. This is more evident in the recent debate on climate and security with its emphasis on abrupt, catastrophic changes, but is part of a longer process that started with the debate on environmental security. Duffield (2001), for instance, has shown how development assistance has been securitized and how the security objectives of developed countries are connected with the deployment of aid.

Securitization justifies the return of the national security narrative especially when the link with security is investigated by the military and intelligence community. More generally, this tendency is evident in the relevance of environmental conflict within the security debate. The interest in conflicts as part of the threat to global order discourse reflects the security concerns of Western countries and is implicitly based on an understanding of security as a defence against an external threat, even if it accommodates peace research concerns about violence and how to eradicate it. Nevertheless the representation of abrupt, catastrophic change suggests the possibility of emergencies and opens up new spaces for the military as the institution which is best equipped to deal with the worst-case scenarios (Mabey 2008).

There are, however, no signs that these appeals have actually determined the practices associated with securitization, not only in the form of military actions but also in that of exceptional measures such as emergency economic actions which could be justified when dealing with an existential threat. Nevertheless, it would be problematic to dismiss those as failed securitizations because they have brought about new institutional arrangements, and the appeals to security call for sets of practices that distance themselves from the logic of emergencies.

This brings in the other aspect of the process, namely the governmentalization of global security. The concept of governmentality refers to a form of thinking about governing and exercising power which Foucault has described as emerging in the 18th century in Europe. For Foucault, governmentality refers to “the ensemble formed by institutions, procedures, analyses, and reflections, the calculations and tactics that allow the exercise of this very specific, albeit complex form of power, which has as its target population, as its principal form of knowledge political economy, and as its essential technical means apparatuses of security” (Foucault 1991: 102).

Governmentality is exercised on the population, rather than on a territory or individuals, as is the case with sovereignty and discipline. Dealing with population implies identifying its own dynamics and regularities in order to act on them and through them, using disciplines like statistics. It is about recognizing contingency and dealing with it. Governmentality takes into account how economic principles based on individual choice and maximization contribute to regulating contingencies. It is based on a technique of risk management and on various forms of insurance that can provide compensation and contribute to keeping a system working. Security is about maintaining the smooth functioning of the system, and promoting and maintaining the circulation of resources and services. These mechanisms are concerned with how to deal with contingent behaviour and maintain and steer regular patterns. Second, they are focused on the economic costs and the cost-benefit analysis of different policies. These mechanisms have characterized the development of the nation state and the way of governing and providing security within it.

The process of governmentalization of global security refers to the extension of governmentality to the global level. It suggests a transformation of the logic of defence, originally focused on external threats, and a fundamental transformation of the way in which international order is conceived and the technology through

which it is maintained. It suggests the application of the mechanisms and logic of security based on regulating flows, acting according to economic principles.

The second aspect of the governmentalization of security is a shift from geopolitics to biopolitics or a politics that is exercised on population and is concerned more with the health and welfare of population and the smooth functioning of the institutions governing it than with the protection of a territory, or better, that the protection of a territory is related to biopolitical strategies such as the improvement of living conditions so as to avoid immigration flows or destabilizing conflicts.

In terms of the debate on environmental conflict, this process explains the deployment of the political conditionality and good governance criteria attached to development and environmental aid, and outlines the importance of promoting adaptation to climate change in order to avoid destabilization. Underdevelopment and environmental degradation are considered as both the result and the cause of conflict – they are considered as dangerous and violence-laden; and this provides the rationale for acting to prevent and manage conflicts, suggesting new forms and a new logic of intervention. This is consistent with the promotion of human security and the deployment of the responsibility to protect as Duffield and Waddell have shown (2006), arguing that the way in which environmental conflicts have been conceptualized (namely that environmental degradation can cause institutional failure and promote localized but destabilizing conflicts) has played a relevant role in promoting the human security paradigm and legitimizing intervention.

While both securitization and the Foucaultian approach emphasizes the importance of discourses in framing the security problematic and the relevance of truth-telling stories about the existence of a link between environmental degradation and violence, the latter shows how statistical analysis and the databases on conflict and environmental degradation that have been developed over the years have become the instruments for identifying what is normal, and how to deal with the contingent, identifying, for instance, hotspots for conflicts or potentially dangerous patterns.

On the one hand, the debate on climate change and conflict informed the evolution of the early debates on environmental degradation and conflict. The progressive convergence of resource management and conflict management, the shift of focus from interstate to intrastate conflicts, the recognition that local conflicts are connected to the dynamics of the global economy, and the emphasis on preventing emergencies re-

flect a tendency toward the governmentalization of security. On the other, the securitization of the environment and of climate change has contributed to promoting action and to extending neo-liberal governmentality to a new range of issues. This suggests that a transformation of security practices is likely to occur through appeals to security rather than away from them.

This prompts a question: are the two dynamics compatible? On the one hand, securitization emphasizes the resilience of a specific logic of security. On the other, developments within the environmental conflict debate and changes in the security practices which are associated with the governmentalization of security challenge the assumption of the Copenhagen School that the practices of security are not open to negotiation and transformation.

The two approaches can complement one another if the practices associated with security are not considered to be fixed and unchangeable, and the context, the actor, and the strategies employed in a process of securitization are taken into account. This means adopting a broader approach to securitization in which the practices associated with security are open to social construction and the narrow focus on security as a speech act is integrated by argumentative elements.

Several commentators have noted the need to account for the development of new institutional arrangements as a result of appeals to security and the recognition that often such appeals open up the political debate instead of closing it by imposing exceptional measures and governing by decrees, especially when discussing environmental issues. De Wilde has suggested that securitization “triggers two debates: one about the underlying risk assessment, one about the strategic answer to it” (De Wilde, 2008: 596). In a different context Dunn Cavely (2008) has shown how securitization can open a window of opportunity for political decisions and new institutional arrangements.

This implies adopting a broader constructivist perspective on security in which not only are threats socially constructed but so are the ways of dealing with them. Securitization can be considered as a reflexive practice in which not only are issues transformed into security issues but also the practices associated with security are challenged and sometimes transformed (Trombetta 2008). Reflexivity accounts for the persistence and resilience of social practices, like those described by securitization theory, but also for the possibility of transforming those practices.

This means opening up securitization, considering it as a form of communicative action rather than as a

speech act that follows specific rules. Balzacq (2010) has shown how securitization depends more on the symbolic power that security has on the audience’s perception of a threat than on the rules of a speech act, and that different ways of formulating political arguments condition both the form and the content of securitization.

This reading of securitization is relevant because it accounts for how different arrangements are brought about by different actors, according to their capabilities, arguments, and visions.

7.6 Conclusion

This chapter has outlined how discourses about environmental conflict as a threat to global order have emerged in the aftermath of the Cold War, and their consequences. It has shown that the way in which security has been traditionally theorized within *International Relations* (IR) and specific ideas about what counts as a threat in the international arena have shaped the way in which environmental conflicts have become an object of knowledge. Since then, the debate has moved on. First, the academic debate has shown the low likelihood of international environmental conflict and the need to focus on institutional arrangements. Second, security practices are shifting from an approach based on dealing with emergencies to one based on precaution and resilience. Third, the human security approach has gained relevance.

The growing concerns for global warming including the possibility of an abrupt climate change, have rekindled traditional security discourses, warning of the potential for conflict. Nevertheless, the measures suggested by the various reports focuses on precautionary approaches, promoting adaptation and increasing resilience. Drawing on de Larrinaga and Doucet (2010), this double development has been described as the result of the interplay between a process of securitization of global governance and governmentalization of global security. The conceptualization of environmental conflict as a threat to global order resonates with traditional security paradigms based on national interest, but is also consistent with extending governmentality globally.

The double process of securitization and governmentalization makes sense if the logic of security and the practices associated with it are not fixed, as the Copenhagen School suggests, but open to a process of transformation.

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8 Climate Change as a Driver of Security Policy

Michael Brzoska

8.1 Introduction

Climate change has, within a few years, become one of the top items on the security agenda of many states and international organizations. After being a minor issue, in the years 2007/2008 the potential effects of climate change on the security of peoples and states became a major focus of attention. Security is now often seen by non-governmental organizations, states, and international organizations as one of the main future threats to the core values of individuals and societies. Using the analytical language of research for how an issue becomes a security issue (Balzacq 2010), a large number of 'securitization moves' have been made by relevant actors.

However, the framing of climate change as a security issue remains contested. The widening in the perception by many analysts and political actors of what security is about (Baldwin 1999; Buzan/Hansen 2009; Brauch 2009) is clearly reflected in the climate change and security discourse (Dalby 2009). There is neither a consensus that climate change is a security threat, nor agreement on what and who will be threatened by climate change.

A first contribution of this chapter is to add to the analysis of the climate change and security discourse by looking at a particular set of documents. The presentation of the climate change and security nexus is analysed in two types of national security documents - security strategies and defence planning documents. The first question is whether climate change is seen as a security issue. This is followed by an analysis of what kind of security climate change is said to endanger.

These two types of documents - sometimes conflated into one - can be found in many countries. They present fundamental statements on security policy and planned action, generally with an emphasis on security institutions. While security strategies generally set out principles and situate security forces within a broad understanding of threats to nations, defence planning documents outline the consequences of se-

curity strategies for armed forces. Questions which can be answered by analysing these documents include whether and how security elites have adopted the claim that climate change is a security issue, and what kind of measures and activities they are promoting as a consequence.

Analysing both types of documents not only answers questions about the framing of the climate change and security nexus in official national documents, but also responds to the question of whether talking of climate change as a security issue has led to concrete proposals for action. At a minimum, defence planning documents can be expected to discuss measures resulting from fundamental statements about security threats. But security strategies also often contain fairly concrete lists of priorities for action.

What types of measures are advocated in official documents of the types mentioned - mitigation, adaptation, strengthening the resilience of people to climate change? What consequences, if any, do they draw for the security forces, including the military? Can one detect signs of 'securitization' - in the sense of the Copenhagen School's exceptional measures or the Paris School's encroachment on climate policy by security actors (Brzoska/Oels 2011)?

This chapter focuses on the consequences that security elites in various countries have drawn from the framing of climate change as a security issue. After the analysis of relevant official documents, the chapter briefly discusses possible reasons for differences between various countries in their positions regarding the climate change and security nexus. A few hypotheses are presented, including the uncertainties of the effects of climate change, the power position of the countries, and the use of the climate change and security nexus as a tactical argument. Substantial answers to the question of why countries position themselves in particular ways in the climate change and security nexus discourse will, however, require analysis beyond the scope of this chapter.

8.2 Climate Change and Security Discourse: Earlier Studies

A number of studies have recently looked at the climate change and security nexus in different sets of documents, some focusing on understandings of security and others on particular security concerns, such as forced migration. A selection will be discussed here.

Detraz and Betsill (2009) analysed a set of 23 major documents emerging from the policy debate on climate change between the late 1990s and 2008 and found few references to keywords such as 'conflict' or 'security'. Where 'conflict' or 'security' was used, it was largely framed as a threat to the livelihoods of those affected by the consequences of climate change. They use the term 'environmental security' for narratives which introduce a "broad range of threats and vulnerabilities into their analysis of environmental change, focus on the negative effects to human populations, and envision a broad array of policy solution" (Detraz/Betsill 2009: 308). They find few references to an alternative narrative, which they call 'environmental conflict', which emphasizes conflict, "privileges the security of the state over human populations, and proposes a more limited set of policy solutions aimed at avoiding conflict over resources rather than eliminating the sources of resources scarcity in the first place" (Detraz/Betsill 2009: 308). Detraz and Betsill then compare this discourse with a debate on the implications for peace and security of climate change which took place at the UN Security Council on 17 April 2007. They found little evidence for a change in the discourse. The debate in the Security Council was also heavily informed by the 'environmental security' discourse, with 85 per cent of the speakers (representing 27 governments) who acknowledged a link between climate change and the threat of armed conflict doing so in the context of a broad understanding of security (Detraz/Betsill 2009: 311). Only 24 of the 55 speakers argued that the Security Council, which is given the mandate to deal with issues related to peace and security in the UN Charter, should be a forum for debating policies related to climate change, while 13 rejected this, and 18 took no position. While the majority of speakers from the global South was not in favour of Security Council involvement (the exceptions mostly made up of Small Island Developing States), 70 per cent of the speakers from the global North supported such a role for the Security Council (Detraz/Betsill, 2009: 312).

Gleditsch and Nordas (2009) have analysed the Third and Fourth Assessment Reports of the *Inter-*

governmental Panel on Climate Change (IPCC) (2001, 2007) with respect to references to what they call the 'climate-conflict nexus'. They find considerably more evidence than Detraz and Betsill for the 'environmental conflict' perspective (possibly because Detraz and Betsill only looked at the summary reports, and/or because Gleditsch and Nordas used a wider set of keywords). Their main concern in this study is to check the validity of the claims made in the IPCC reports. Their overall impression of the two reports is that "the link between climate change and conflict is ambiguous and when it is stated it is weakly substantiated" (Gleditsch/Nordas 2009: 19).

An earlier paper (Brzoska 2009) looked at a set of five documents emanating in 2007 and 2008 from reputable non-governmental and quasi-non-governmental (government-funded institutions) sources explicitly addressing the links between climate change and security. They were a central part of a surge of interest in the security implications of climate change in the years 2007 and 2008, found also in popular and mass media in the US and Europe at the time and exemplified by the success of former US Vice President Al Gore's movie *An Inconvenient Truth*. They added a particular 'academic' element to that discourse. Even though there was little 'new' scientific knowledge in these reports, they all contained competent reviews of the state of the academic literature concerning the relations between environmental change and violent conflict. All the reports had a notable immediate impact in the general media and have been widely quoted in later publications. Major findings from that study include:

- a.) Opaque and shifting arguments about the understanding of security, objects of security policy, and also core values. In line with the 'environmental security' narrative identified by Detraz and Betsill (2009), a broad set of threats and means to deal with these are introduced. At the same time, and corresponding to the second, the 'environmental conflict' narrative, armed violence, primarily in the regions most affected by climate change, is also discussed. In addition, a third narrative is noticeable, very clearly in the studies from the United States, which relates to security threats to the United States and Europe because of the consequences of large migration movements into these regions, armed conflict between militant forces and European and/or US militaries in regions strongly affected by climate change, and armed conflict among major powers (the scenario most frequently mentioned was resource conflict

in the Arctic). This might be called the ‘environmental threat’ perspective. These three understandings of security are seen in the studies analysed to be different views of an inherently interconnected complex of insecurities.

- b.) An emphasis on climate change mitigation policies, regardless of the primary frame taken in the study. Even in the study most unabashedly taking the environmental threat perspective, coming from the Center for Naval Analysis in the US (CNA 2008), the clear emphasis in the recommendations is related to drastic reductions in greenhouse gas emissions. While the studies also contain suggestions for adaptation and conflict prevention, they clearly do so as second-best measures. Only exceptionally do the studies contain recommendations for security sector actors. The CNA study, for instance, recommends that the US military review its planned acquisitions and assess implications of climate change for low-lying military bases (CNA 2008).

Oels (2009, 2010) has analysed both the recent scientific discourse as well as a number of core documents coming from a variety of sources, using the Copenhagen School’s analytical framework. She diagnoses a shift in the way climate change is problematized as a security problem. While up to about 2006 the prevailing view was that climate change could be contained at levels which would not raise major security problems, this has changed. In her assessment, a discursive shift has taken place, with the prediction of major climate change even in a fairly optimistic political scenario becoming dominant. One element of this is the shift away from questions of the *causes* of climate change and responsibilities towards the analysis of the associated risks and relevant contingency planning. With respect to policies, mitigation has lost out in relative importance to adaptation and, in particular, to contingency measures.

Based on a cursory analysis of a mixture of documents, including IPCC, United Nations, and reports from Non-governmental organisations, Hartman (2010) emphasizes strong links between the climate change and earlier environmental security debates, which also were marked by what she calls a “neo-Malthusian degradation narrative”. Environmental degradation, migration, and conflict are “naturalized” and the economic and social causes are “masked” (Hartman 2010: 234–235). She argues that the persistence of this, and related, narratives in the climate change debate is “tied to their usefulness to a variety of interests” (Hartman 2010: 239).

In particular she identifies the US military and the Pentagon, who have sponsored a number of studies and scenario exercises, and argues that this needs to be seen “in the context of larger orchestrations of US national security policy” which are marked by a “strategic shift in defence thinking towards a focus on stability operations and the taming of ‘ungoverned spaces’” (Hartman 2010: 240). She sees the UN military command for Africa, AFRICOM, as the primary example of a new approach that mixes military and civilian elements, and she notes that this fits, “coincidence or not”, with the focus of the climate conflict discourse on Africa: “Meshing climate conflict as a particularly African security threat meshes well with these objectives” (Hartman 2010: 241).

8.3 Climate Change in National Strategy Documents

This chapter contributes to the analysis of the discourse on the climate change and security nexus by asking whether and how it has found its way into official documents which purport to authoritatively state threats and means of security policy.¹ Furthermore, the question is raised as to what concrete measures emerge from framing climate change as a security issue.

The documents analysed here are often called national security strategies, White Papers, or the like. Coming from governments, they are reflections of the national security discourses and foundations for national security policies. Referent objects of such security policies are generally the populations of the relevant states. In a few cases, the state itself or the state territory are also mentioned as objects to be secured. There is generally little discussion on the values which are to be protected by security measures in these documents, as it is generally assumed to be self-evident that what is to be protected is identical with the referent objects of the population, state, and territory.

These documents are therefore generally different in tone and substance from those studied by Detraz and Betsill (2009). As statements by governments on

1 The document search was limited to the internet. Identified documents were searched by the following keywords: climate change, environment, mitigation, adaptation, disaster. Sequences of text containing these keywords are extracted and interpreted (see the appendix). Some documents which discuss both the foundations of security policy and defence planning issues are included in tables 8.1 and 8.2. Research assistance by Daniela Kost is gratefully acknowledged.

Table 8.1: Climate change as threat and means to counteract in national security strategies. **Source:** Based on the appendix as developed by the author.

Government	Year	Climate change listed as a threat?	Means to counter the threat?	Type of discussion
Poland	2003	Natural disasters	Disaster management	ES
Indonesia	2003	-	-	
Albania	2004	Minor, addition to disasters	Mitigation	ES
Hungary	2004	-	-	
Uganda	2004	-	-	
Germany	2006	Potential threat multiplier	Humanitarian relief, disaster management	ES
United States	2006	Disasters minor threat	Military strength, disaster management	ES, ET
Armenia	2007	Minor, within disasters	Mitigation	ES
Azerbaijan	2007	Minor, within disasters	Disaster management	ES
Jamaica	2007	Potential major threat	Disaster management	ES
Poland	2007	Natural disasters, also man-made	International cooperation, mitigation	ES
Romania	2007	Potential threat	Military strength	ET
Ukraine	2007	-	Disaster management	ES
Brazil	2008	-	-	
Czech Republic	2008	Potential threat	Mitigation, disaster management	ES
Russian Federation	2008	Emerging threat	-	ES, EC, ET
United Kingdom	2008	Potentially very large threat	Mitigation, energy policy, resource management	ES, EC, ET
France	2008	Growing threat	International cooperation; disaster management	ES
Lithuania	2008	-	Disaster management	ES
Serbia	2009	Growing threat	Disaster management	ES
Australia	2009	Potentially large	Mitigation, potentially more military power; disaster management	ES, ET
Finland	2009	Major threat	Mitigation, adaptation, crisis management	ES, EC
United States	2010	Major threat	Mitigation, conflict prevention	ES, EC
United States (NSS 2010)	2010			
Chile	2010	-	International cooperation	ES
Switzerland	2010	Danger but no threat	-	ES

Legend: ES: Environmental security; EC: Environmental conflict; ET: Environmental threat.

security and defence priorities, they are generally based on a national security perspective, even though in many cases non-traditional threats such as failing states and poverty are seen as the main dangers. In some cases, however, the documents reveal a focus on external violence as a threat to the lives and interests of the state and its citizens. As Detraz and Betsill

(2009) did not find such a traditional perception of security in their sample, a third category for the classification of the climate change and security nexus was added in this study. In addition to environmental security – with human security concerns dominating – and environmental conflict, where climate change is predominantly seen as increasing the likelihood and

intensity of violent conflict, environmental threat is used here to describe cases in which climate change is seen as originating or contributing to the danger of the use of violence against the nation in question and its citizens. This includes soldiers sent abroad on peace and stability missions. Obviously, even in these cases, the security threat does not come from climate change itself, but rather follows on from its consequences on societies and individuals. The emphasis, however, is not on the suffering of those predominantly affected by climate change or on the likelihood of violent conflict in volatile regions, but on the knock-on effects, e.g. through migration or the contagion of violent conflict to other regions, which lead to threats of physical violence to citizens of states adopting such a perspective.

Table 8.1 summarizes the information found in these documents with respect to the salience given to climate change as a security issue, the measures proposed to deal with the dangers of climate change, and the characterization of the climate change and security nexus (for more details see the appendix).

A number of interesting observations can be made. The first is that it has become mainstream to see climate change as a security issue. This is a fairly recent phenomenon. While there were few incidences of climate change as a security issue in relevant documents prior to about 2006,² the number of governments which include climate change as a security issue has grown considerably (table 8.1). The year 2007, which was marked by a number of widely-received reports and debates on the potential security implications of climate change, may not have changed the orientation of the primary frames of argument in the climate change and security discourse, as argued by Detraz and Betsill (2009), but it certainly increased the visibility of that discourse and its weight in official documents on the foundations of security policy, and therefore the character of that discourse (Brzoska 2009). From 2007,

most relevant documents examined here contain references to climate change as a security threat. Not following this trend in the sample analysed here are Ukraine, Brazil, Lithuania, Chile, and Switzerland.³

Secondly, even those governments which list climate change as a threat differ greatly with respect to its severity. In some cases, climate change is seen as a minor threat compared with others. In several cases, a direct link is made to environmental disasters, whose frequency and intensity is expected to rise with climate change. A few governments stand out as seeing climate change as a potentially very large (UK, Australia) or major (US, Finland) threat.

Thirdly, there is some overlap between power status and the classification of climate change as an environmental security threat. Governments with major military capacities, including power projection capabilities beyond immediate neighbourhoods, tend to see climate change as a major or at least emerging threat. In the list in table 8.1, these are the US (in 2010), Russia, France, and Australia. Among governments without such capabilities, only Finland and Serbia saw climate change as a growing or major threat.

Fourthly, disasters stand out as the main danger of climate change in these documents both in terms of their negative consequences for the security of peoples and states, and as the priority concern for security institutions to address climate change as a security issue. This is particularly so for documents prior to 2007, where the mentioning of climate change generally occurs within a discussion of disasters, if at all.⁴ But even after 2007, disaster management remains a major focus of policy measures, though, in contrast to the period before, often supplemented by other means.

Fifthly, in addition to disaster management, a wide range of policies to deal with the consequences of climate change are mentioned in national security strategy documents. Mitigation is also mentioned frequently. It can be found in seven of the 24 documents; one government (Switzerland) also lists international cooperation, presumedly on mitigation. Other policies mentioned include a broad “strengthening military capability” (Romania, USA 2006, Australia), adaptation, crisis management, and conflict prevention.

2 US National Security Strategies have mentioned environmental problems as issues that needed to be addressed since 1988. Climate change was added to the list in the National Security Strategy of 1992. National Security Strategies published during the Clinton administration mention, in addition, international and national policy efforts to reduce greenhouse gas emissions (Mildner/Richert 2009: 8–9). For an analysis of all major US national security documents from 1990 to 2010 see Brauch (2011) with detailed references to the relevant references to climate change in the Quadrennial Defense Review 2010 (February 2011) and in the National Security Strategy 2010 (May 2010) by the Obama administration.

3 In the Security Council Debate of April 2007 the representative of Brazil spoke against drawing a connection between climate change and international peace and security, while Switzerland and Ukraine spoke in favour. Chile and Lithuania did not take the floor (United Nations, 2007a, 2007b).

4 An exception has to be made for US documents, see note 2 above.

Sixthly, in terms of classifying the way in which the climate change and security nexus is framed, information on the means of addressing the threat is generally more informative than text passages addressing the consequences of climate change for security. In some cases, more than one perspective on the climate change and security nexus can be found. Environmental security quantitatively dominates the understanding of climate change found in the documents analysed here. The perspective of environmental conflict is limited to a few incidences (Russia, UK, Finland, United States 2010). Finally, environmental threat, the idea that climate change is likely to threaten the lives and livelihoods of citizens of the respective countries through violence coming from outside, can be found in five cases (United States 2006, Romania, Russia, United Kingdom, and Australia).

In conclusion, these observations are similar to those of earlier studies, with some qualifications. First, climate change has become an issue that most national security strategies deal with. However, the way in which climate change is described differs substantially. Many governments see climate change as a minor threat. Another group of governments classifies climate change as an emerging or growing threat. Only a few governments, mostly major powers, see climate change as a major threat. Major powers also dominate among those governments who make the connection between climate change and conflict or even see climate change as a threat to national security by external violent actors.

8.4 Climate Change in National Defence Documents

The analysis now turns to a partly overlapping set of documents⁵ which more directly address the defence planning of states. They are thus good indicators of the implications of strategic discourses on the size, structure, and functions of armed forces. They are used here to study how far the changes in the strategic discussions noted above are already reflected in the planning for one important part of the security sector, namely for defence forces.

These documents, sometimes called defence reviews, generally but not necessarily start off with a brief threat analysis but then focus on the structures

5 Some documents serve both as guidance for a national security strategy and as defence planning documents (see the appendix).

and functions of armed forces. They are generally more concrete with respect to institutions and activities than national security strategy documents (table 8.2). Most often they are drawn up by defence departments in the respective countries but need the consent of the head of government (president, prime minister) or the cabinet, and are thus representative of the governments' official positions.

Again a number of observations can be made, partly by comparison with the ones made on national security strategies.

Firstly, climate change receives considerable attention. In many documents, however, it is not mentioned at all.⁶ This is true not only for governments which adopt the environmental security perspective and are not willing to accept the environmental conflict or environmental threat discourse, but even in cases where strategy documents list climate change as an emerging or potential threat, such as Russia.⁷

Secondly, the importance of preparedness for disaster management, already identified as the most frequently mentioned policy consequence in strategy documents, is even more important in defence policy documents. While qualified in some documents as not primarily a task for defence forces, disaster management clearly comes through in defence planning documents as the most important task for armed forces with respect to the consequences of climate change.

The emphasis on disaster management is not very surprising in documents from countries which adopt the environmental security perspective. The understanding of security contained in the environmental security perspective sees very little value, if any, in military force (Deudney 1990). The one link to defence forces is disaster management capacities, of which armed forces are often a central element. When climate change is seen as threat to the lives and livelihoods of people, whether near by or far away, dealing

6 In addition to the documents listed in the tables, no relevant references were found in recent national defence planning documents from Belarus, Belgium, Bosnia-Herzegovina, Lebanon, Macedonia, Montenegro, Sierra Leone, Singapore, Slovakia, Spain, or Taiwan; see at: <<http://merln.ndu.edu/whitepapers.html>>.

7 Note that the UK government has been conducting a strategic defence review. A green paper outlining some of the fundamental issues was published in February 2010, <http://www.mod.uk/nr/rdonlyres/790c77ec-550b-4ae8-b227-14da412fc9ba/0/defence_green_paper_cm7794.pdf>. Climate change is listed as one of the two main future drivers of UK defence policy (the other being major shifts in the global balance of power).

Table 8.2: Climate change as threat and means to counteract it in core documents on national defence. **Source:** Based on the appendix as developed by the author.

Government	Year	Climate change listed as a threat?	Means to counter threat?
Bulgaria	2002	No climate change mentioned, but disasters as minor	Disaster management
Indonesia	2003	-	-
Albania	2005	Minor, within disasters	Disaster management
Brazil	2005	-	-
Cambodia	2006	Making disasters worse	Disaster management
Germany	2006	Potential threat	Disaster management
Romania	2006	Disasters	Disaster management
United States	2006	-	Disaster management
Brunei	2007	Potentially large	Disaster management
Ukraine	2007	-	Disaster management
Canada	2008	Focused on Arctic	Increase military strength
China	2008	Growing threat	Disaster management
Czech Republic	2008	Growing threat	Important but unspecified
Denmark	2008	Emerging threat	Disaster management, resource management in the armed forces
France	2008	Growing threat	International cooperation; disaster management
Ireland	2008	-	Disaster management, humanitarian relief operations
Lithuania	2008	-	Disaster management
United States	2008	Making demographic trends more problematic	Mitigation, resource management in armed forces
Australia	2009	Potentially large	Mitigation, potentially more military power; disaster management
Finland	2009	Major threat	Mitigation, adaptation, crisis management
Japan	2009	-	Flexible armed forces
Chile	2010	-	International cooperation
Russian Federation	2010	-	-
Switzerland	2010	Danger but no threat	-
United States	2010	Major threat	Mitigation, conflict prevention, military strength

with the consequences of extreme weather events is what military forces can do.

Thirdly, some governments promote a broader set of objectives for their defence forces. A number of documents mention concrete measures. These fall into three categories:

- preparation for additional external military engagement for humanitarian tasks (Ireland, United States, Finland);
- energy saving and reductions of greenhouse gas emissions by armed forces (United States, Denmark, UK);
- build-up of armed forces for contingency measures (Canada, Australia, Japan).

There is a strong overlap between adopting an environmental conflict or environmental perspective and making suggestions for a broader role for defence forces (Australia, Finland, United Kingdom, United States). The Russian Federation's defence doctrine is silent on the climate change and security nexus, but in general it promotes a strong military for dealing with security problems. Japan and Ireland are not among the countries listed in [table 8.1](#), as they did not adopt national security strategies in the relevant time period, but can be surmised to see climate change as an envi-

ronmental conflict or environmental security issue, based on the discussion in the Defence White Paper. Denmark is an interesting case as it is one of the few countries (in addition to the United Kingdom and the United States) promoting a resource conservation strategy for its armed forces in their national defence planning document.

Some governments (Switzerland, Chile) seem to reject a role for armed forces in climate change, either because they do not see climate change as a threat in the sense of being a danger to the life and livelihoods of the domestic population, or because they see other institutions as responsible for averting these dangers by mitigation or adaptation policies.

In summary, the documents on defence planning fit quite well with those on national security. A majority of countries see armed forces as important instruments for countering the dangers resulting from climate change, with a clear focus on disaster management. As armed forces are already involved in disaster management in all of these states, climate change is pictured as likely to add the demand for such activities by armed forces. Consequently, though not spelled out in detail in any of the documents, the capacities of armed forces for disaster management need to be built up. An emphasis on disaster management corresponds to an environmental security perspective.

Governments which see climate change in a different light with respect to security generally promote broader measures. However, there is little agreement on what these measures should be, with resource conservation by armed forces, larger capacities for humanitarian action, or a general build-up of armed forces as measures mentioned in the relevant documents.

Clearly, the practical implications for armed forces of arguing for the climate change and security nexus have so far been very limited. There is widespread agreement that capacities for disaster management should grow, but no agreement on additional measures. In no case can one detect in the relevant documents arguments for urgent action or exceptional measures. Even with disaster management, the emphasis is on the longer-term build-up of capacity and not on immediate activities.

8.5 Climate Change in Security Sector Practice

The documents collected and analysed in this study address future planning and say little about what has already been done to address the consequences

argued as following from the climate change and security nexus. In order to gain more insights beyond the documents analysed so far, two country cases will be discussed in more detail. In a way, they represent the current spearhead of military planning for the consequences of climate change, and relevant additional documents have been adopted.

In the United States, the discourse on the security implications of environmental change, including climate change, has clearly been overshadowed by the highly controversial debate on the anthropogenic nature of climate change. During the Bush presidency, climate change was hardly mentioned in official publications. The 2006 Quadrennial Defense Review, for instance, contains no reference to it (see appendix). Humanitarian and environmental disasters are, however, seen as a task for the armed forces. The Bush administration's 2008 National Security Strategy includes climate change, reflecting the intensive debates of 2007, but only as a factor that increases the negative effects of population growth. On relevant policies it states that

The Department will invest in hedging against the loss or disruption of our traditional advantages, not only through developing mitigation strategies, but also by developing alternative or parallel means to the same end; further, the Department is examining its own energy demands and is taking action to reduce fuel demand where it will not negatively affect operational capability. Such efforts will reduce DoD fuel costs and assist wider U.S. Government energy security and environmental objectives (United States 2008: 22).

Meanwhile, opponents of the Bush administration's view on climate change took up the public debate on security implications and attempted to put pressure on the administration to change its policies in general, and also to start addressing climate change's implications for US national security policy. For instance, in 2007 House of Representatives member Edward Markey and 13 co-sponsors (one of them Republican) introduced the "Global Climate Change Security Act", which among other measures asked for a major assessment of the implications of climate change for security. While the act never got beyond the initial legislative steps, a provision for a major national security assessment is contained in the 2008 National Defense Authorization Act. More, however, was difficult to achieve in the US Congress, where there was little overlap between parliamentarians with concerns about climate change and those who focused their work on security issues (Mildner/Richert 2009: 8-9).

The Obama administration came to power with climate change as one of its major issues. At least so

far, not much of this has translated into concrete defence planning. However, a large number of studies have been initiated which address a wide spectrum of issues ranging from the foundations of climate change to the consequences of sea-level rise for naval bases.

The 2010 Quadrennial Defense Review contains numerous references to climate change. Climate change is depicted as a problem for global security as well as national security. Allusions are made to the environmental security discourse, the environmental conflict discourse, and the environmental threat discourse. But the document is vague on actual policies. In its National Security Strategy of May 2010, the Obama administration suggested “forging cooperative solutions to the threat of climate change, armed conflict, and pandemic disease” (United States 2010a: 3). Furthermore, there is a strong emphasis on energy policy and its link to climate change. “As long as we are dependent on fossil fuels, we need to ensure the security and free flow of global energy resources. But without significant and timely adjustments, our energy dependence will continue to undermine our security and prosperity...” (United States 2010a: 30). With respect to consequences of this perspective for the military, the emphasis in the Quadrennial Defense Review is on mitigation strategies by the armed forces, on assessments, and on general improvements in preparedness. In continuation of measures already adopted earlier, the military is to reduce its energy consumption and carbon footprint. In addition to the studies already initiated in the intelligence community and the military, more assessments are announced, for instance on the effects of climate change for US military bases, noting that “in 2008, the National Intelligence Council judged that more than 30 U.S. military installations were already facing elevated levels of risk from rising sea levels” (United States 2010: 85). In addition to that, the document states that “as climate science advances, the Department will regularly reevaluate climate change risks and opportunities in order to develop policies and plans to manage its effects on the Department’s operating environment, missions, and facilities” (United States 2010: 86).

The United Kingdom, currently with the strongest formulations on climate change in its strategy document,⁸ is the only country with an explicit climate change strategy for its armed forces (United Kingdom 2009).⁹ The UK military establishment has identified

the following future responses to climate change as tasks for the armed forces (United Kingdom 2009):

- Mitigation (reduction of fossil fuel, carbon footprint). The military is identified as the main public emitter of greenhouse gases, with about 1 per cent of total UK carbon dioxide (CO₂) emissions. This is to be reduced by 34 per cent by 2020 (United Kingdom 2010).
- Assessments of the impact of climate security on specific regions of the world, and factoring it into planning of force structure and training.
- Assessments of the vulnerability of military bases to effects of climate change.
- Changes in the acquisition process to ensure that the Ministry of Defence procures equipment that is fit for a range of operations. This includes a target for all requirements.
- Capability of providing assistance in dealing with extreme events in the UK.

The objective is to deliver on the prime objectives of the military establishment, which are defined as defending the UK and its interests, strengthening international peace and stability, and acting as a “force for good” in the world (United Kingdom 2009: 2). Armed forces are seen as important actors in dealing with climate change, as contributors as well as consequence managers.

The United States and the United Kingdom are currently the most advanced in thinking about the consequences of climate change for their armed forces. Nevertheless, they have adopted a range of tentative measures which neither express a strong sense of urgency nor can be classified as exceptional.

8.6 Factors Shaping the Climate Change and Security Discourse

This section briefly addresses differences in the perception of the climate change and security nexus. As noted, the discourse on climate change as a security issue has changed, with 2007 and 2008 as particularly important years. However, change has not been uniform. Furthermore, there is a clear divergence between the discourse and the implementation of changes at the policy level, here focused on defence

8 It is not clear whether the Cameron government will reorder national security priorities.

9 This is not listed in [table 8.2](#) because of its nature as a document authorized by the Ministry of Defence and not the government. A white paper on military strategy has been in preparation for some time.

planning.¹⁰ Two issues will be discussed in this section: the divergence among countries and that between discourse and the implementation of measures.

8.6.1 Drivers and Doubters

How likely is it that climate change will become more of a driver for security policy in the future? Earlier studies have identified a number of Western industrialized states and developing countries particularly affected by climate change, such as *Small Island Developing States* (SIDS), as the main drivers for change in the climate change and security discourse – both for raising the level of the debate and for attempting to add environmental conflict and/or environmental threat to the prevailing environmental security perspective (BMU 2002, 2010; Kinnas 2009; Brauch 2011). In addition, internal politics also plays an important role, not only in the US but also in other countries. The US is not alone in having major debates on climate change along party lines (Mildner/Richert 2009). In addition, the US case indicates the importance of the relationship between politicians and institutions engaged in climate change debates and those focusing on national security (Floyd 2010).

There is as yet little knowledge of what is driving national climate change and security discourses outside the US. Further research is needed to substantiate various possible explanations of national positions as well as changes in the predominant discourse.

As indicated above, it would be particularly interesting to further investigate possible links between the positions of the great powers and their views on the climate change and security nexus. Statements found in the documents analysed here indicate that climate change is affecting the security policies of major powers in a different way from those of smaller powers. One possible factor here is the regional or global order function, which major powers generally see as one of their tasks. If climate change raises the likelihood of state failure and complex emergencies, the number and intensity of external military interventions might increase. However, other links between

the positions and views of the great powers on the climate change and security nexus might be more relevant – a topic which can only be noted here.

8.6.2 Discourse and Action

Climate change has become an element of the security discourse. But despite major attempts to change the framing of the discourse, the conception of the climate change and security nexus as environmental security remains dominant. This understanding of climate change as a problem for the life and livelihoods of people in certain areas most affected by climate change limits the scope of action for security actors, particularly armed forces. Consequentially, disaster management by armed forces is the dominant future role emphasized in the documents analysed here. However, there is as yet little concrete action following from such statements.

Beyond disaster management, few ripple effects of the recent debates on the climate change and security nexus can be found in national defence planning. True, there are lists of additional measures in countries where climate change is judged to be an issue of environmental conflict or environmental threat. However, such lists are neither conclusive nor very concrete. Obviously, the uncertainties surrounding the effects of climate change, including effects on the core values of individuals and societies, are still so large as to preclude quick decisions. Similar to other risks with unknown and disputed probability, climate change may not have the urgency of other issues affecting security. If uncertainty about the security implications of climate change is a major factor in explaining the current divergence between rhetoric and action on the climate change and security nexus, then more action should come about with more knowledge about the effects of climate change on security.

However, another explanation for this divergence also makes sense. There are good arguments for assuming that the use of climate change in security strategies has often been tactical – that it is driven by concerns that have much to do with the climate change agenda and very little to do with security strategies and defence planning. Particularly in the United States, many statements coming from think tanks and non-governmental organizations in 2007 and 2008 seem to have used environmental threat scenarios to argue for mitigation, in a political situation where the US government was unwilling to accept much responsibility for preventing climate change (Floyd 2010). Securitization was used to elicit urgent action on climate

10 It has been argued that there has been a major change in the immigration policies of the European Union. While the climate change and security nexus has been powerful in legitimizing the tightening of immigration policies in several regions, it is an open question whether these measures would not have happened without invoking climate change as a driver and immigrants as a security threat.

change, with no or little intention of affecting national security and defence planning. In such an explanation, action in the security sector, including that by the military, may never follow from the security rhetoric.

A third proposition is that climate change is such a new challenge that institutions do not yet know how to cope with it, but will learn over time. Already a few institutions such as the UN have taken up the issues, for instance in the debate mentioned above. But that again is mostly on the level of rhetoric, with little concrete action following. Possibly, with more experience by institutions, more policy action will follow. The prime candidate is clearly disaster management, which is the main policy response mentioned in the relevant documents and which may see an expansion of capabilities in the future.

8.7 Conclusion

The foundations for security strategies and defence planning with climate change as a major element have been addressed in recent discourses among academics and policy makers. However, the framing of the climate change and security discourse continues to differ significantly, with environmental security – that is, concerns about the lives and livelihoods of people living in the areas most affected by climate change – dominating.

This understanding of the climate change and security nexus prioritizes disaster management as the prime activity for armed forces to address the consequences of climate change. This is reflected in the dominance of disaster management in defence planning documents. A few governments go further and include humanitarian interventions and other activities to strengthen state capacity in countries likely to be affected by climate change. These are mostly major powers. Major powers are in general more likely to have a broad perspective on the security measures necessary for addressing climate change as a policy issue.

The driving force of the climate change and security nexus for defence planning has so far been very limited. More consensus on actions beyond disaster preparedness, including by armed forces, seems unlikely unless more concrete knowledge about the security effects of climate change is established. The scenarios of major wars contained in documents and reports, particularly in 2007 and 2008, seem to have been effective in raising the importance of the climate change and security discourse but much less so in instigating change in security strategies or defence

planning. Even in those countries spearheading the climate change and security discourse, such as the UK and the US, uncertainty about the consequences for armed forces prevails.

‘Securitization moves’ which occurred in 2007 and 2008 thus did not result in urgent or exceptional measures in the security sector. They also have not led to an encroachment on other sectors by security actors. However, they have not been without effect. Five observations stand out.

- The first is that climate change has become a widely, though not universally, accepted security issue among national security elites.
- However, even among security elites there is no consensus on what kind of security is threatened by climate change.
- A third conclusion resulting from the analysis of these documents is great uncertainty about the measures that need to be taken to address climate change as a security issue. Even in those countries where security elites accept the salience of climate change for national security, there is little in terms of concrete proposals on what to do (with the exception of disaster preparedness). This includes defence planning in the two countries with the strongest statements on climate change as a security issue, the United States and the United Kingdom.
- Still, and this would be the fourth conclusion, there seems to be a link between great power status and arguing that climate change will bring about future violent conflict and even be a threat to national security.
- Fifthly, disaster preparedness is almost universally promoted as a primary issue for dealing with the security consequences of climate change. However, while there is a sense of urgency expressed in many of the broader security strategy documents presented here, the action to be taken in the security sector, including the military, is not seen as very urgent. Furthermore, advocacy of a prominent role by security actors is rare – with the telling exception of disaster preparedness.

So far, the climate change and security nexus largely remains a rhetorical figure in security strategies with little effect on security policy and planning. Many countries have adopted a view on the climate change and security nexus which suggests little, if any, action in the security sector. It is not yet clear whether this will remain so. Much will depend on the future effects of climate change on security-relevant issues, but also on great power politics.

Appendix: Excerpts from core documents on national strategies (N) and national defence (M).

Government	Year	Document name	Source	Threat? (T)	Countermeasures? (M)	Short hand
Albania	N 2004	National Security Strategy 2004	< http://merln.ndu.edu/whitepapers/Albania_English_2004.pdf >	"Climate and atmospheric change and further development of the society are an evidence of water resource insufficiency as a global danger."	"Environmental pollution reduction".	T: Minor, addition to disasters M: Mitigation
Albania	M 2005	The Military Strategy of the Republic of Albania 2005	< http://merln.ndu.edu/whitepapers/Albania_English_2005.pdf >	Minor threat: Natural and environmental disasters.	Participation of military in "prevention and management of natural, environmental and humanitarian disasters."	T: Minor within disasters M: Disaster management
Armenia	N 2007	National Security Strategy 2007	< http://www.mil.am/eng/index.php?page=49 >	Lowest on the list of threats: "The outbreak and spread of life-threatening epidemics globally and in neighbouring regions, as well as natural or man-made disasters, may threaten the National Security of the Republic of Armenia."	"forming favorable environment for the present and future generations" ...	T: Minor, within disasters M: Mitigation
Australia	N/ M 2009	Defence White Paper 2009	< http://www.defence.gov.au/whitepaper/docs/defence_white_paper_2009.pdf >	"In the past decade we have also become increasingly more conscious of the potential security impacts of changing climate patterns, resource and energy scarcity, and persistent patterns of poverty and poor governance in many parts of the world." "Changing climate patterns, combined with booming population growth, will sharpen competition for scarce food, water and energy resources in many parts of the world, particularly in Africa and the Middle East, and are likely to exacerbate existing population and infrastructure problems in developing countries in those regions, straining their capacity to adapt and cope. Large-scale strategic consequences of climate change are, however, not likely to be felt before 2030."	"The main effort against such developments will of course need to be undertaken through coordinated international climate change mitigation and economic assistance strategies, and concerted international action to assure energy supply and distribution, which will need to be at the forefront of Australia's policy responses." ... "Should these and other strategies fail to mitigate the strains resulting from climate change, or resource security issues, and they exacerbate existing precursors for conflict, the Government would possibly have to use the ADF as an instrument to deal with any threats inimical to our interests." "From a defence planning point of view, the key issue concerns the nature of such conflicts and the implications for defence capabilities, rather than their cause. More frequent and severe natural disasters and extreme weather events will also increase demands on the ADF and other government agencies to provide humanitarian assistance and disaster relief assistance in the future."	T: Potentially large M: Mitigation, potentially more military power; disaster management
Azerbaijan	N 2007	National Security Concept of the Republic of Azerbaijan 2007	< http://merln.ndu.edu/whitepapers/Azerbaijan2007.pdf >	"Environment-related natural disasters and human induced technological accidents may endanger internal security through harming the well-being and property of the population. These hazards should therefore be considered within the broader security context."	"... measures for early warning of the emergency situations and for dealing with their consequences"	T: Minor, M: Disaster management

Government	Year	Document name	Source	Threat? (T)	Countermeasures? (M)	Short hand
Brazil	M 2005	National defense policy 2005	< http://merln.ndu.edu/whitepapers/Brazil_English2005.pdf >	"Gradually, the concept of security was enlarged, embracing the political, military, economic, social, and environmental fields among others. However, the external defense has a primordial role in the armed forces in the interstate sphere."	-	T:- M:-
Brazil	N 2008	National Strategy of Defence 2008	< http://merln.ndu.edu/whitepapers/Brazil_English2008.pdf >	-	-	T:- M:-
Brunei	M 2007	Shaping the Forces Defence White Paper Update 2007	< http://www.mindef.gov.bn/new_home/whitepaper2007/english.pdf >	"The impact of the Indian Ocean tsunami and the subsequent earthquake in Indonesia highlighted how dramatically environmental disasters can impact on national security, affecting neighbours without warning or cause. The current debate on global warming suggests that such instances may become more prevalent."	"The main focus is on delivering multi-tasked armed forces capable of responding to any eventualities, undertaking a wide range of challenges (including natural disaster relief and support operations) more rapidly, effectively and jointly."	T: Potentially large M: Disaster management
Bulgaria	M 2002	White Paper on Defence 2002	< http://merln.ndu.edu/whitepapers/Bulgaria_English.pdf >	One of a number of "non-traditional threats": natural disasters.	For armed forces: "tasks related to the eliminating the effects of natural disasters and industrial accidents both on the national and the international level".	T: Minor M: Disaster Management
Cambodia	M 2006	Defence Policy 2006	< http://merln.ndu.edu/whitepapers/Cambodia-2006.pdf >	"A decrease in rain forests, coupled with an earth climate change, makes Cambodia encounter natural disasters almost every year."	The military "has been a very important force for rescuing local people when facing a natural crisis by providing assistance such as building embankments along river and stream banks, evacuating civilians to safe areas, providing protection and security, and maintenance and reconstruction of damaged infrastructure, etc".	T: Making disasters worse M: Disaster Management
Canada	M 2008	Canada First Defence Strategy 2008	< http://www.forces.gc.ca/site/pri/first-premier/June18_0910_CFDSEnglish_low-res.pdf >	"In Canada's Arctic region, changing weather patterns are altering the environment, making it more accessible to sea traffic and economic activity."	"These changes in the Arctic could also spark an increase in illegal activity, with important implications for Canadian sovereignty and security and a potential requirement for additional military support."	T: Focused on Arctic M: Increase military strength

Government	Year	Document name	Source	Threat? (T)	Countermeasures? (M)	Short hand
Chile	N/ M	Libro Blanco de Defensa Nacional	< http://www.defensenet.ser2000.org/Archivo/libro-chile/defc-indice.htm >	-	“De igual forma, en un contexto de cooperación e integración, el impacto de las acciones que afectan al medio ambiente obliga al país que las emprende a considerar consecuencias en los países de su entorno.” [Similarly, in a context of cooperation and integration, the impact of activities affecting the environment requires the country who undertakes them to consider the consequences for neighbouring countries.]	T: - M: International cooperation
China	M	China’s national defence in 2008		“Issues such as terrorism, environmental disasters, climate change, serious epidemics, transnational crime and pirates are becoming increasingly prominent.”	“PLA is needed in emergency rescue and disaster relief operations organized by the State Council”.	T: Growing threat M: Disaster management
Czech Republic	M	The Military Strategy of the Czech Republic 2008	< http://merlin.ndu.edu/whitepapers/Czech_Republic_English-2008.pdf >	“...humanitarian crises and natural disasters also require appropriate attention.”	“These threats have already manifested themselves up to various degrees and it is necessary to face them in a timely manner.”	T: Growing threat M: Important but unspecified
Czech Republic	N	Security strategy of the Czech Republic	< http://pd.cceu.hu/archive/00002564/01/sec_strat.pdf >	Among a list of additional threats: “Human activity is causing global climate change. The environmental impacts are evident in the Czech Republic too, and may generate threats in the form of large-scale natural disasters. Attention must still be paid to the potential risk of an environmental disaster.”	Mitigation, disaster management.	T: Potential threat M: Mitigation, disaster management
Denmark	M	Defence Commission Report 2008/ Danish Defence Agreement 2010-2014	< http://merlin.ndu.edu/whitepapers/Denmark2010-2014English.pdf >	“Furthermore, the emerging global threats and risks mean that there is a continued need for military capabilities to form part of Denmark’s emergency and disaster response management system, dealing also with such extraordinary events as acts of terrorism and violent natural phenomena.”	“As part of the efforts in this regard, a climate strategy is to be formulated that, among other things, sets specific targets in relation to the Danish Armed Forces’ CO2-reducing initiatives, and to provide relief assistance in connection with humanitarian or environmental disasters abroad, insofar as the assistance provided by the Danish Armed Forces is more effective, more rapid or more economical than would otherwise be the case if the assistance was provided by another public body or private organisation.”	T: Emerging threat M: Disaster management, resource management in the armed forces
Finland	N/ M	Finnish Security and Defence Policy 2009	< http://merlin.ndu.edu/whitepapers/Estonia2004.pdf >	Major global security challenge; “Climate change potential source of disasters, migration, conflict.”	Mitigation, adaptation, crisis management.	T: Major threat M: Mitigation, adaptation, crisis management

Government	Year	Document name	Source	Threat? (T)	Countermeasures? (M)	Short hand
France	N/ M	White Paper on Defence and National Security 2008	< http://merlin.ndu.edu/whitepapers/France_English2008.pdf >	"... environmental damage and unchecked urban development. This factor will be aggravated by climate trends; climate change can also lead to major conflict."	"Concerning the protection of the biosphere and combating the effects of climate warming, France has called for the creation of a multilateral body for prevention and concerted action in this area"; "Set operational objectives for the domestic and civil security structure and an operational contract of protection for the armed forces, in order to cope with large-scale attacks and disasters that might take place on national territory."	T: Growing threat M: International cooperation; disaster management;
Germany	M	White Paper on Defence 2006	< http://merlin.ndu.edu/whitepapers/Germany_White_Paper_2006.pdf >	"Obstacles to Development and Fragile Statehood...In parts of Africa and Asia, supply and distribution problems, besides the factors inherent in globalisation, repeatedly affect political and social stability. The consequences of climate changes may compound these effects even further."	"The Bundeswehr, in drawing upon available assets and capabilities, can subsidiarily provide relief aid in the event of natural disasters and particularly grave accidents at home, and as part of humanitarian relief actions and disaster responses abroad."	T: Potential threat M: Disaster management
Hungary	N	National Security Strategy 2004	< http://merlin.ndu.edu/whitepapers/Hungary_English_2004.pdf >	"Defines security in a comprehensive way: besides the traditional political and defence components, it also contains, inter alia, economic and social, including human rights and minority rights-related, as well as environmental elements".	-	T:- M:-
Indonesia	N/ M	Defending the Country 2003	< http://merlin.ndu.edu/whitepapers/IndonesiaWhitePaper.pdf >	"Entering the 21st century, ideological issues are driven aside by global issues: democratization, human rights, and environment. So strong is the World's attention to global issues that ideological issues are shifted and no longer popular."	-	T:- M:-
Ireland	M	Strategy Statement 2008	< http://merlin.ndu.edu/whitepapers/Ireland_2008-2010.pdf >	-	"There will be an increased need to train for and conduct disaster relief and/or humanitarian relief operations most of which will be conducted in demanding climatic conditions."	T:- M: Disaster management, humanitarian relief operations
Jamaica	N	National Security Policy 2007	http://www.jis.gov.jm/NSPANNET.pdf	"The Caribbean is one of the few regions with active volcanoes and although tsunamis may be rare, the region is not immune to them. Climate change could significantly affect rainfall patterns impacting agricultural production and food security."	"Objective: To improve coordination mechanisms for managing disasters."	T: Potential major threat M: Disaster management

Government	Year	Document name	Source	Threat? (T)	Countermeasures? (M)	Short hand
Japan	M 2009	Defense of Japan 2009	< http://www.mod.go.jp/e/publ/w_paper/pdf/2009/22Part2_Chapter2_Sec2.pdf >	-	"As new threats and contingencies are difficult to predict and have the potential to emerge suddenly, Japan will effectively counter such changes by forming and deploying highly ready and mobile defense force units capable of responding appropriately to the characteristics of each situation in accordance with the characteristics of the units and Japan's geographical characteristics."	T: - M: Flexible armed forces
Lithuania	N/ M 2008	White Paper 2006	< http://merlin.ndu.edu/whitepapers/Lithuania-2006.pdf >	-	"The armed forces now must pay more attention to the tasks that used to be of somewhat secondary importance: to aid civilian institutions in case of a terrorist attack in Lithuania, to assist in responding to natural disasters."	T:- M: Disaster management
Poland	N 2003	National Security Strategy 2003	< http://pdcc.hu/archive/00002796/01/poland_foreign_9_doc.pdf >	Natural disaster as a potential threat.	"Protection of the population against the threats and consequences of natural disasters", including by the military.	T: Natural disasters M: Disaster management
Poland	N 2007	National Security Strategy 2007	< http://merlin.ndu.edu/whitepapers/Poland-2007-eng.pdf >	"Poland may also be at risk of environmental threats as a consequence of inappropriate use of technical and technological progress and of upsetting the equilibrium between men and nature."	"to protect against the consequences of natural disasters and man-induced catastrophes; international community must act together to ensure energy security, to look for alternative sources of energy and to stop negative changes of the global climate."	T: Natural disasters, also man-made; M:- International cooperation, mitigation
Romania	M 2006	Military Strategy 2006	< http://pdcc.hu/archive/00002906/01/Military_Strategy.pdf >	"The region is also prone to natural disasters: floods, drought and earthquakes. It is extremely important to assess the consequences of risks to national security, in the field of defense"	Last in a list of functions for the military: "support of public authorities in a civilian emergency, natural and other types of disasters."	T: Disasters M: Disaster management
Romania	N 2007	National Security Strategy 2007	< http://merlin.ndu.edu/whitepapers/Romania2007_English.pdf >	"National security can also be jeopardized by a number of serious phenomena of geo-physical nature, climate change or similar, stemming from the environment or reflecting its degradation."	"... to protect, guard and defend the inhabitants, communities of people, infrastructure and assets against military or non-military asymmetric threats, as well as from threats caused by geo-physical, weather-related or other natural factors."	T: Potential threat M: Military strengths
Russian Federation	M 2010	Military Doctrine of the Russian Federation 2010	< http://merlin.ndu.edu/whitepapers/Russia2010_English.pdf >	-	-	T: - M:-

Government	Year	Document name	Source	Threat? (T)	Countermeasures? (M)	Short hand
Russian Federation	2008	National Security Strategy 2008	http://russia-national-security-strategy-to-2020	“Strategic objectives relating to ecological security and environmental management are: preserving of the environment and ensuring its protection; redressing the environmental consequences of economic activity in the context of a growing economy and global climate changes.”	“In order to counteract threats in the sphere of ecological security and environmental management, the forces of national security together with civil society institutions create the conditions for the introduction of ecologically safe production; the search for promising energy sources; the creation and implementation of a state programme for the establishment of strategic reserves of mineral and raw material resources sufficient to supply Russia’s mobilization requirements; and the guaranteed provision of water and biological resources to meet the needs of the population and the economy.”	T: Emerging threat M: -
Serbia	2009	National Security Strategy 2009	http://merlin.ndu.edu/whitepapers/SerbiaNationalSecurityEnglish2009.pdf	“Climate change at the global level, particularly global warming, negatively affects the change of biodiversity in ecosystems and leads to disturbances in agricultural production in the territory of the Republic of Serbia, which could have implications on its overall security and economic stability.”	Role of armed forces: “protection against natural disasters”.	T: Growing threat M: Disaster management
Switzerland	2010	Sicherheitspolitischer Bericht 2010	http://www.news-service.admin.ch/NSB-Subscriber/messages/attachments/18805.pdf	“Drei im Kontext der Sicherheitspolitik oft genannte Gefahren oder Probleme, Klimawandel, Pandemien und Migration, haben zwar sicherheitspolitische Konsequenzen, die primäre Zuständigkeit liegt aber bei der Umwelt, Gesundheits- und Ausländerpolitik.” [Three often named dangers or problems, climate change, pandemics and migration, do have consequences for security policy, but the primary responsibility is with environmental, health and policy dealing with foreigners.]	-	T: Danger but no threat M: -
Uganda	2004	White Paper 2004	http://merlin.ndu.edu/whitepapers/uganda2004.pdf	Environmental stress and “resource constraints can degrade the natural environment and resource base of Uganda upon which livelihood of the formal and informal economy depends, exacerbating competition over resources.”	-	T: - M: -
Ukraine	2007	White Book 2007	http://www.mil.gov.ua/files/white_book/white_book_en2007.pdf	-	“Taking part in liquidation of the after-effects of natural and man-made emergencies and disasters, providing real assistance to civilian agencies and the public in general.”	T: - M: Disaster management

Government	Year	Document name	Source	Threat? (T)	Countermeasures? (M)	Short hand
United Kingdom	2008	National Security Strategy	< http://interactive.cabinetoffice.gov.uk/documents/security/national_security_strategy.pdf >	"Climate change is potentially the greatest challenge to global stability and security, and therefore to national security. Tackling its causes, mitigating its risks and preparing for and dealing with its consequences are critical to our future security, as well as protecting global prosperity and avoiding humanitarian disaster."	"That includes defensive measures such as greater protection against flooding and sea level surges; modifications to plans for development and the management of resources, such as increased water efficiency, and changes to agricultural crops and practices to mitigate water stress and food insecurity; and changes to energy policy to tackle the causes of climate change, achieving a reduction in global carbon emissions and meeting rising global energy demand in a sustainable way."	T: Potentially very large threat M: Mitigation, energy policy, resource management
United Kingdom	2003	Defence White Paper	< http://merlin.ndu.edu/whitepapers/United-Kingdom-2004.pdf >	-	-	-
United States	2006	Quadrennial Defense Review	< http://www.globalsecurity.org/military/library/policy/dod/qdr-2006-report.pdf >	-	"... conduct humanitarian assistance and disaster relief operations".	M: Disaster management
United States	2006	National Security Strategy 2006	< http://www.strategicstudiesinstitute.army.mil/pdf/files/nss.pdf >	"Environmental destruction, whether caused by human behavior or cataclysmic mega-disasters such as floods, hurricanes, earthquakes, or tsunamis. Problems of this scope may overwhelm the capacity of local authorities to respond, and may even overtax national militaries, requiring a larger international response."	"Preparing for and managing these challenges requires the full exercise of national power, up to and including traditional security instruments. For example, the U.S. military provided critical logistical support in the response to the South-east Asian tsunami and the South Asian earthquake until U.N. and civilian humanitarian responders could relieve the military of these vital duties."	T: Disasters M: Military strength, disaster management
United States	2008	National Defence Strategy 2008	http://www.defense.gov/news/2008%20national%20defense%20strategy.pdf	"As we plan, we must take account of the implications of demographic trends, particularly population growth in much of the developing world and the population deficit in much of the developed world. The interaction of these changes with existing and future resource, environmental, and climate pressures may generate new security challenges."	"The Department will invest in hedging against the loss or disruption of our traditional advantages, not only through developing mitigation strategies, but also by developing alternative or parallel means to the same end; Further, the Department is examining its own energy demands and is taking action to reduce fuel demand where it will not negatively affect operational capability. Such efforts will reduce DoD fuel costs and assist wider U.S. Government energy security and environmental objectives."	T: Minor threat M: Mitigation, resource management

Government	Year	Document name	Source	Threat? (T)	Countermeasures? (M)	Short hand
United States	2010	Quadrennial Defense Review	< http://www.defense.gov/qdr/images/QDR_as_of_12_Feb10_1000.pdf >	“Climate change and energy will play significant roles in the future security environment.”	“While climate change alone does not cause conflict, it may act as an accelerant of instability or conflict, placing a burden to respond on civilian institutions and militaries around the world.”	T: Major threat M: Mitigation, conflict prevention, military strength
United States	2010	National Security Strategy 2010	http://www.whitehouse.gov/sites/default/files/rss_viewer/national_security_strategy.pdf	“Climate change and pandemic disease threaten the security of regions and the health and safety of the American people”. “The danger from climate change is real, urgent, and severe. The change wrought by a warming planet will lead to new conflicts over refugees and resources; new suffering from drought and famine; catastrophic natural disasters; and the degradation of land across the globe.”	“... <i>Home:</i> Our effort begins with the steps that we are taking at home. We will stimulate our energy economy at home.... This will allow us to make deep cuts in emissions.... <i>Abroad:</i> Our goal is an effective, international effort in which all major economies commit to ambitious national action to reduce their emissions, nations meet their commitments in a transparent manner, and the necessary financing is mobilized so that developing countries can adapt to climate change, mitigate its impacts, conserve forests, and invest in clean energy technologies. ..” “A global effort to combat climate change must draw upon national actions to reduce emissions and a commitment to mitigate their impact. Efforts to prevent conflicts and keep the peace in their aftermath can stop insecurity from spreading; a changing climate portends a future in which the United States must be better prepared and resourced to exercise robust leadership to help meet critical humanitarian needs.”	T: Major threat M: Mitigation, conflict prevention

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9 From 'Securitization' of Climate Change to 'Climatization' of the Security Field: Comparing Three Theoretical Perspectives

Angela Oels

9.1 Introduction¹

Since 2003, climate change has been articulated as a threat to national, international, and human security in scientific publications and political declarations. What does the articulation of climate change as a security issue mean in terms of policy implications? How is climate change being rendered governable as a security issue and what are the consequences of this? In this chapter, three theoretical perspectives are introduced that shed light on this question: the Copenhagen School, the human security perspective, and the Paris School. These three schools all offer theoretical perspectives on the question of what it means (or should mean) to render something governable as a security issue and whether or not this is desirable. As well as being those most discussed in the literature, these three schools also cover the full spectrum of positions on the issue: against securitization, for securitization, and neutral (it depends).

First, the Copenhagen School warns that the successful 'securitization' of climate change could legitimize a political state of exception, in which drastic mitigation measures are adopted using undemocratic procedures. While decisive action on climate change is considered desirable, the political price paid for such emergency action is seen as too high. However, empirical analysis shows that there is no evidence of undemocratic procedures and of extraordinary measures in the case of climate change. According to the Copenhagen School, the securitization of climate change has failed and we should not be worried.

The second perspective claims that the counter-productive effects of the securitization of climate

change as spelled out by the Copenhagen School can be avoided once security is redefined in terms of human security. From this perspective, when climate change is constructed as a threat to human security, sustainable development emerges at the top of the policy agenda. Not only does sustainable development tackle pre-existing vulnerabilities, but it also enhances adaptive capacity to the impacts of climate change, actively reducing the likelihood of mass migration and violent conflict. However, empirical analysis shows that since 9/11, human security has more often than not been redefined in terms of homeland security of the global North. As a result, human security concerns in the global South are becoming policy-relevant only to the extent that they are strategically relevant for Northern homeland security.

Finally, the Paris School argues that the failed securitization of climate change is better understood as the successful 'climatization' of the security field. According to the Paris School, the articulation of climate change as a security issue signifies that professionals of (in)security (i.e. intelligence, military, police, defence ministries) are producing climate change as a legitimate threat in their everyday practices. This means that traditional practices of the security field are being applied to the issue of climate change – for example, scenario planning studies, early warning systems etc. At the same time, the security field is expanding to include climate change professionals with their practices of risk management, climate modelling etc., thereby transforming the security field and its practices. 'Climatization' of the security field means that existing security practices are applied to the issue of climate change and that new practices from the field of climate policy are introduced into the security field. While these transformations are still in their infancy and empirically hard to detect, this chapter argues that defence, migration, and development policy are being transformed in order to secure global circu-

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lation from disruptions caused by disasters induced by climate change.

The review of each analytical perspective is concluded with an assessment of the strengths and weaknesses of the respective approach. In doing so, the author attempts to convince the reader that the Paris School offers the most interesting analytical perspective for understanding the policy implications relating to the production of climate change as a security issue. The chapter begins with a review of how climate change emerged as a security issue in science and politics (9.2), prior to the theoretical analysis (9.3).

9.2 Emergence of Climate Change as a Security Issue

In this section, key scientific and political documents are introduced which have been influential in establishing climate change as a security issue of one kind or another. By the late 1980s, climate change was already being discussed in the alarmist language of security, leading to the declaration of the *UN Framework Convention on Climate Change* (UNFCCC) in 1992. However, the security implications of climate change disappeared from the agenda until 2003. This chapter focuses on the current production of climate change as a security issue from 2003 until the present. It highlights the fact that there are various and competing readings of security prevalent in the debate, ranging from national security via international security to human security. The demarcation line drawn between 'science' and 'politics' in the following discussion is artificial: there are close linkages and co-productions. For structural clarity, the following section distinguishes between scientific and semi-scientific knowledge production on the one hand (9.2.1) and political declarations at the international level on the other (9.2.2). The chapter then turns to theoretical reflections on these developments and their (normative) evaluation (9.3).

9.2.1 The Scientific Debate

Currently, very little empirical research has been completed on the security implications of climate change. The limited amount available is often inconclusive or contradicts other studies. Environmental organizations were among the first to produce climate change as a security issue in order to mobilize action for mitigation. Later on, defence and environment ministries as well as the military sector itself joined the chorus.

The *Intergovernmental Panel on Climate Change* (IPCC), the institution charged with producing consensus knowledge on climate change for policymakers, will address the security implications of climate change in its fifth assessment report due in 2014.

Environmental organizations argued early on that the impacts of climate change could trigger mass migration. Concern over millions of 'climate refugees' as a security threat has been mobilized from 1988 onwards by environmental non-governmental organizations like the Worldwatch Institute, the Climate Institute, and the Earth Policy Institute (all based in Washington DC), the New Economics Foundation in London, and Australia's Friends of the Earth (McNamara/Gibson 2009: 477-478). They sought to establish climate change as a threat to *human* and *national security*. Most recently, Greenpeace Germany commissioned a study on 'climate refugees' (Jakobeit/Methmann 2007). Why were environmentalists the first to actively attempt to 'securitize' climate change? McNamara and Gibson explain:

The geopolitical context was reluctance from the United States, Australia and other governments to accept that climate change was a problem; hence depictions of entire countries disappearing beneath sea level rise performed a particular function, contributing to a counter-discourse problematising inaction by western governments on climate change (McNamara/Gibson 2009: 479).

In academia, the debate on 'environmental refugees' was fuelled by Norman Myers. Myers described 'environmental refugees' as people who have been forced to flee their homelands because their livelihood has been destroyed by environmental degradation - and conceived overpopulation as a major factor in this degradation (Myers 1995: 18-19). Thomas Homer-Dixon cautiously put forward the idea that population growth together with other factors could degrade renewable resources like fresh water, soil, and forests, and that this resource scarcity could trigger mass migration and violent civil wars (Homer-Dixon 1994, 1999). It was, however, Robert Kaplan's alarmist *The coming anarchy* (1994) that made these ideas popular and strongly influenced US President Clinton's policy-making on environmental security. With increasing attention being paid to climate change in the early 2000s, the environmental conflict hypothesis became extended to climate change - in the absence of new research findings specifically on its nexus with conflict.

Climate change has been established as a security issue in studies commissioned by governments, especially by their environment, defence, and foreign af-

fairs ministries. For example, the US Pentagon commissioned a Scenario Planning study by Schwartz and Randall (2003) which was leaked to the press in 2004. In this study, Schwartz and Randall developed a worst-case scenario of abrupt climate change (a drop in temperature of 5°F in North America and Europe) and imagined the resulting resource scarcity, mass migration, and violent conflict, and even the breakdown of civilization as such. Climate change is presented as a threat to 'national' and 'international security'. This worst-case scenario was popularized, for example in Emmerich's film: *The Day after Tomorrow*.

Both the German and UK governments also commissioned influential studies on climate change as a security issue. The UK government commissioned the *Stern Report* on climate change as a threat to economic security, arguing that preventing climate change pays off (Stern 2007). The German environment and development ministries jointly commissioned the 2007 report by the German Advisory Council on Global Change (WBGU), *Climate Change as a Security Risk* (WBGU 2008). The WBGU report explores the linkage between climate change and violent conflict and offers policy recommendations for climate change mitigation and adaptation policy, security policy, development policy, migration policy and early warning/ disaster management. The WBGU explicitly rejects a *human security* framing for its report (WBGU 2008: 20–21) and instead addresses *human vulnerability* to climate change impacts. For example, issues like water security, food security, livelihood security (and the need for migration) and security from climate change induced disasters are at the heart of the report, even when not presented explicitly in a human security framing. Policymakers are advised by the WBGU to tackle the causes of climate change, to use development assistance to reduce vulnerability in affected countries, and to strengthen institutions that could aid in conflict prevention and resolution. This report was also published in English and has been highly influential in the international debate.

Substantial input into the debate on climate change as a security issue has come from the security sector primarily in the US and the UK. In this sector, security is usually narrowly defined as 'national security'. The report by the Center for Naval Analysis (CNA 2007), a consultancy that was formed out of the US Navy, provides a good example of such a study. The CNA Report *National security and the threat of climate change* discusses possible civil and international wars fuelled by the impacts of climate change for each world region, from Africa to the Arc-

tic. In their policy recommendations, the generals and admirals argue that mitigating climate change should be a policy priority. They also focus on a partial restructuring of forces, in order to enhance preparedness for interventions in states where climate change has overwhelmed national capacities, potentially leading to humanitarian disasters and breeding terrorism.

It was not until 2006/2007 that peer-reviewed science entered knowledge production concerning climate change as a security issue. There are two strands in the academic debate: the first asks if and under which conditions climate change could trigger violent conflict in affected regions, while the second investigates the impacts of climate change as a threat to human security. In 2007, the first special issue of a peer-reviewed journal covered the link between climate change and violent conflict (*Political Geography* 26/2007). Contributions to this special issue focused on the difficulties of establishing valid causal linkages between modelled climate change/environmental degradation and future decisions of people about cooperation, migration, or violent conflict (Nordas/Gleditsch 2007). Since then, the scientific debate has intensified and become more differentiated. Burke, Miguel, Satyanath et al. (2009) claim a statistical correlation between historical climate variability (rise in temperature) in African countries and the number of civil wars. Halvard Buhaug (2010) refutes Burke's hypothesis: he tested 11 models for a statistical correlation between short-term climate variability data and civil wars in Africa and concluded that climate variables were not statistically significant (see chap. 2 by Buhaug/Theisen). Supporters of Burke counter that Buhaug did not test the most likely correlation between climate variability and conflict outlined by Miguel, Satyanath and Sergenti (2004).² Nevertheless, scientists like Schellnhuber and Pielke warn that the climate signal is still weak compared to other social factors but that in the future, the destruction of livelihood systems by climatic shocks may well lead to violent conflict.³ Based on this review, it is argued that the scientific debate on the link between climate variability and conflict remains open and inconclusive.

2 Marc Levy: "On the Beat: Climate-security linkages lost in translation" (2010); at: <<http://newsecuritybeat.blogspot.com/2010/09/on-beat-climate-security-linkages-lost.html>> (15 November 2010).

3 Quirin Schiermeier: "Climate Change Not Linked to African Wars", *Naturenews*, 6 September 2010; at: <<http://www.nature.com/news/2010/100906/full/news.2010.451.html>> (17 October 2010).

The current most influential strand of academic literature assesses climate change as a threat to *human security*. Human security is defined as “a variable condition where people and communities have the capacity to manage stresses to their needs, rights, and values” (Barnett/Matthew/O’Brien 2010: 18). Those working from a human security perspective do not deny that environmental stress could be a contributing factor to violent conflict under certain conditions (Barnett/Adger 2007). However, they emphasize that a much wider variety of responses is possible, ranging from conflict to cooperation (Barnett/Matthew/O’Brien 2010: 13–14). People’s capacity to cope with environmental stress – i.e. the state of their human security – is a key factor structuring behavioural options. From a political ecology perspective, coping capacity is a matter of access to resources which are distributed unequally by economic, political, and cultural institutions (Barnett/Matthew/O’Brien 2010: 13–14). The claim made by this literature is that sustainable development is the only legitimate answer to the security implications of climate change, firstly because it tackles pre-existing vulnerabilities, and secondly because it enhances adaptive capacity: “Thus building the capacity to adapt to climate change can help prevent or resolve climate-related conflicts and insecurity” (Brown/Hammill/McLeman 2007: 1150).

The assessment reports of the *Intergovernmental Panel on Climate Change* (IPCC) have investigated human vulnerability to climate change impacts, especially Working Group II (Adger 2006). The term ‘human security’ has been avoided in past assessments but the type of analysis is often implicitly guided by a human security perspective (which Detraz and Betsill label environmental security framing, see Detraz/Betsill 2009: 309–310). In its *Fourth Assessment Report* (AR4), Working Group II discussed the concept of *human security* only once in chapter 9 on Africa, citing Karen O’Brien’s work (IPCC WGII 2007: 456). However, the concepts of food security (IPCC WG II 2007: 297) and water security (IPCC WG II 2007: 516) are widely used by Working Group II. A change in terminology is expected in the future. In the forthcoming Fifth Assessment Report (2014), the IPCC Working Group II dedicates an entire chapter (chapter 12) to the human security implications of climate change. One of the ten subheadings of this chapter is supposed to address ‘conflict’ and another ‘migration and population displacement’, according to the current government approved outline.⁴ Four other chapters of Working Group II are likely to make explicit

reference to the security implications of climate change (chapters 3, 9, 13, and 19).⁵

It is concluded that in the realm of knowledge production, the various claims about climate change as a likely cause of violent conflict remain highly contested. Peer reviewed science has entered into the debate rather late. The IPCC has used the term human vulnerability to assess the impacts of climate change on human well-being, avoiding the explicit use of the term human security in its Fourth Assessment Report. However, chapter 12 of Working Group II of the Fifth Assessment Report by the IPCC that is due by 2014 will explicitly discuss climate change as a threat to human security.

9.2.2 The Political Debate

Concern about the security implications of climate change entered the political agenda in the absence of scientific consensus on this issue. The governments of Germany and the United Kingdom commissioned their own scientific studies on climate change as a security issue (WBGU 2008; Stern 2007) in order to support their case for strong adaptation and mitigation action in international climate negotiations. The security implications of climate change were put on the agenda of the UN Security Council by the UK in 2007, and on the UN General Assembly agenda by the small island states (and others) in 2009 (see chap. 33 by Kurtz). The UN Secretary-General’s 2009 report *Climate Change and its Possible Security Implications* builds on available research findings and is considered the most authoritative political declaration on the issue. This author argues that a reading of security in line with (though rarely explicitly referencing) human security is prevalent in the political debate in Europe and at the United Nations, and that a national security reading is prevalent in the US.

The security implications of climate change were put on the international political agenda by Germany and the United Kingdom. Germany used its EU Presidency in spring 2007 to mobilize EU concern about climate change as an issue of *international security* (Council of the European Union 2007: 11). In March

4 IPCC, “Fifth Assessment Report (AR5) Authors and Review Editors”, at: <http://www.ipcc.ch/pdf/ar5/ar5_authors_review_editors_updated.pdf>.

5 Neil Adger, University of East Anglia in Norwich, UK at a conference on Climate change and Security in Trondheim, 21–24 July 2010; at: <<http://climasecurity.files.wordpress.com/2010/06/neil-adger.pdf>>.

2008, as a result of the German Presidency Conclusions, EU commissioner Benita Ferrero-Waldner and EU High Representative Javier Solana presented a report on *Climate change and international security* (Council of the European Union 2008a). This report addresses climate change as a “threat multiplier which exacerbates existing trends, tensions and instability” (Council of the European Union 2008a: 2), thereby adopting the terminology proposed by the *German Advisory Council on Global Change* (WBGU). The so-called Solana Report considers international security as closely linked to the EU’s own (national) security as well as to the ‘human security’ of people in developing countries (Council of the European Union 2008a: 2). The Solana Report calls for action in three fields. First, it proposes enhancing the monitoring and early warning of mass migration and violent conflict especially in regions of ‘state fragility’ (Council of the European Union 2008a: 7). Second, it calls for European leadership to foster a post-Kyoto treaty on mitigation and adaptation, in order to make the 2°C target internationally binding. Particular attention is paid to “environmentally-triggered additional migratory stress” (Council of the European Union 2008a: 8). Third, cooperation and capacity-building with third party countries is suggested in the fields of mitigation, adaptation, and crisis management. Despite great efforts by France to make alterations to the EU Security Strategy in the face of climate change security implications, the regular review of the EU Security Strategy in December 2008 reached no agreement for change (Council of the European Union 2008b: 5–6).

In the US, the environment was rendered governable as a *national security* issue under the Clinton administration, while the Bush administration did its best to reverse this development. In his efforts to appeal to a US audience, former US Vice-President Al Gore has repeatedly depicted climate change as an existential threat to Western civilization that leaves humanity the choice between “life and death”.⁶ The Kyoto Protocol was signed by Clinton in 1997 but was never ratified by the Senate or the House of Representatives. In 1993, the Clinton Administration - with Al Gore as Vice-President - created the Office of Deputy Under-Secretary of Defense for Environmental Security (ODUSD-ES) within the Department of Defense (Floyd 2007a: 345). The environment was also

integrated into the *US National Security Strategy* (US NSS) of 1994/1995 (Floyd 2007a: 345). Policies undertaken focused on the compliance of the US military with existing environmental law. However, these policies only lasted a few years. In 2005, the Bush Jr. Administration deleted the phrase “environmental security” from the US NSS, cut funding for the programme where possible, and replaced the environmental security directive from 1996 with a new directive that “exempts many military activities from existing environmental legislation” (Floyd 2007a: 347). The Bush administration officially withdrew support from the Kyoto Protocol in 2001. Nevertheless, the Pentagon commissioned a scenario planning study by Schwartz and Randall (2003) which assessed climate change as a threat to national and international security. The Obama administration has committed itself to the 2°C target at the Copenhagen (2009) and Cancún (2010) climate negotiations. Even today, US-based NGOs remain convinced that articulating climate change as a threat to *national security* is the only way to convince politicians that action on climate change is a necessity.

The United Kingdom used its presidency of the UN Security Council in April 2007 to put the security implications of climate change on the agenda of a session that was open to all member states. The UK was supported in this effort by all Western industrialized states and by some small island states. At the session on 17 April 2007, the majority of speakers from developing countries strongly objected to having a discussion about climate change in the UN Security Council. Instead, they argued that climate change was an issue of sustainable development that should be discussed under the *UN Framework Convention on Climate Change* (UNFCCC) or in the UN General Assembly (UN Security Council 2007a, b). This was also the official position of the G77 group. Nevertheless, 80 per cent of the speakers agreed that climate change is likely to have strong human security implications for people in developing countries. Half of the speakers (27 out of 55 represented governments) linked climate change to the threat of violent conflict, but most did so in the context of a broader “environmental security” framing in line with human security (only four used an environmental conflict perspective) (Detraz/Betsill 2009: 311). The debate focused less on the question of whether climate change could trigger violent conflict than on whether the exclusive setting of the UN Security Council was a suitable arena for discussion about the security implications of climate change.

6 Al Gore: “Nobel Lecture”, 10 December 2007 in: The Nobel Foundation; at: <http://nobelprize.org/nobel_prizes/peace/laureates/2007/gore-lecture_en.html> (3 October 2010).

The UN General Assembly (UNGA) discussed climate change and security on two occasions, on 22 May 2008 and on 14 April 2011.⁷ In 2009, the small island states, with the support of most industrialized countries, put the climate change and security nexus on the agenda of the UN General Assembly. They requested a report by the UN Secretary-General on *Climate Change and its Possible Security Implications*, which was presented by Ban Ki-moon on 11 September 2009 (UNGA 2009). Like its predecessors, the report defines climate change as “a ‘threat multiplier’, exacerbating threats caused by persistent poverty, weak institutions for resource management and conflict resolution, fault lines and a history of mistrust between communities and nations, and inadequate access to information or resources” (UNGA 2009: 2). The report defines security in terms of human vulnerability to climate change – fully in line with *human security*, but without explicitly using the term. It states in the introduction “The principal focus in the present report is on the security of individuals and communities. It ...is consistent with the suggestion of the *Human Development Report 1994*” that, for ordinary people, “security symbolized protection from the threat of disease, hunger, unemployment, crime, social conflict, political repression and environmental hazards” (UNGA 2009: 4–5).

The report also acknowledges that most states consider *human vulnerability* and *national security* as interdependent (UNGA 2009: 1,5). The issues raised in the report range from threats to human development to threats to human lives lost as a result of intra- or inter-state violence. Mitigation of and adaptation to climate change are acknowledged as essential, but the main part of the report is dedicated to action in four other policy areas. First, “climate-proving economic development” is recommended as a strategy of sustainable development in order to enhance resilience and grow adaptive capacity (UN GA 2009: 25). It is argued that “the best way to reduce [developing countries’] vulnerability is to help to lift them out of poverty” (UNGA 2009: 28). Second, in the face of a rising number of expected extreme weather events, building capacity for disaster risk reduction and disaster preparedness is recommended (UNGA 2009: 27). Third, in the field of migration policy, a new legal

framework to protect persons displaced by climate change is called for (UNGA 2009: 15–20). The UN is advised to engage in planned resettlements and to think about solutions for those becoming stateless as a result of rising sea levels. Fourth, in the fields of defence and development policy, capacity building for conflict prevention is proposed. The ‘weak’ states of Africa are considered a particular security threat, as their institutional capacities could be overwhelmed by extreme weather events and resulting mass migration (UNGA 2009: 18). This reading of human vulnerability is clearly concerned about the homeland security of Northern industrialized countries.

The author concludes that the UK, Germany, and the small island states have successfully put the security implications of climate change on the international political agenda. The UN Secretary-General’s report on *Climate Change and its Possible Security Implications* is the most authoritative political statement to date. It combines the two strands of the academic debate: it defines climate change as a threat to *international security* and *human vulnerability* in developing countries, but also dedicates long parts of the report to the risk of violent conflict in regions of state fragility, and recommends conflict prevention.

9.3 Theoretical Perspectives on Climate Change as a Security Issue

Climate change is now a security issue, politics and science tell us. How is climate change being produced as a security issue and what are the policy implications of this development? Three theoretical perspectives have been chosen to shed light on this question. *First*, the *Copenhagen School* warns of the dangers to democracy which are implied in the successful ‘securitization’ of an issue. The analytical framework suggested by the Copenhagen School discusses whether climate change has been successfully securitized, triggering extraordinary measures (9.3.1). The *human security* perspective argues that once security is redefined as human security, the ‘securitization’ of an issue propels sustainable development policies to the top of the policy agenda (9.3.2). The section sketches the human security approach to climate change and analyses to what extent human security has played a role in the ‘securitization’ of climate change and which policies have been facilitated as a result. *Finally*, the *Paris School* argues that the ‘securitization’ of an issue is neither good nor bad per se – it depends on the policy

⁷ The debate on climate change and human security occurred in the UNGA (Brauch 2009a, 2011) on 22 May 2008 and also on 14 April 2011; see at: <<http://www.un.org/News/Press/docs//2011/ga11072.doc.htm>> (7 June 2011).

implications which need to be assessed. For the Paris School, the failed 'securitization' of climate change is better understood as the 'climatization' of the security field (9.3.3). This section introduces the Foucaultian account of security used by the Paris School and investigates whether there is evidence for a transformation of security practices resulting from the production of climate change as a security issue by the professionals of (in)security. In particular, possible changes in defence policy, migration policy, and development assistance are discussed which could be linked to the 'climatization' of the security field. It will be concluded that the Foucaultian framework proposed by the Paris School is the most capable of offering a comprehensive assessment of the policy implications of climate change as a security issue, which are neither all bad nor all good.

9.3.1 Failed Securitization of Climate Change: Absence of Extraordinary Measures

The term 'securitization' was coined by Ole Wæver to criticize a form of policymaking in which extraordinary measures and undemocratic procedures are enabled in the name of 'security'. Bill McSweeney (1996) introduced the term 'Copenhagen School' to refer to the work of Buzan, Wæver and others (Buzan 1991, 2004; Buzan/Wæver/de Wilde 1998; Buzan/Wæver 2003; Wæver 1995, 1999, 2000). This section introduces the framework of analysis and assesses empirically the extent to which climate change can be considered successfully securitized according to the Copenhagen School.

Security is redefined by the Copenhagen School as a performative speech act that carries out an action by speaking the word 'security' (Wæver 1995: 55): "By uttering 'security', a state-representative moves a particular development into a specific area, and thereby claims a special right to use whatever means are necessary to block it." To study whether an issue has been securitized, the researcher is advised to investigate two things: firstly, elite speech acts need to be identified that define an issue as an "existential threat to a designated referent object" and thereby "justif[y] the use of extraordinary measures to handle" it (Buzan/Wæver/de Wilde 1998: 21). Secondly, a relevant audience has to be identified that shows "signs of [...] acceptance" of these speech acts (Buzan/Wæver/de Wilde 1998: 25). It is not required that exceptional measures are actually adopted for an issue to count as securitized; it just has to appear possible (Buzan/Wæver/de Wilde 1998: 25). Security is said to carry

with it "a history and a set of connotations that it cannot escape" (Wæver 1995: 47). These connotations include thinking about an issue in terms of threat-defence, attributing responsibility to the state (Wæver 1995: 47), and legitimizing exceptional forms of politics (Wæver 1995: 55). This logic does not necessarily imply the use of force or military means: "it is a coincidence that military means have traditionally been the *ultimo ratio*" (Wæver 1995: 53). Bail-out packages for failing banks which involve huge sums of taxpayers' money and which are pushed through parliament without due process are a prime example of this. The successful securitization of an issue and the use of extraordinary measures are considered as a failure to deal with the issue by means of normal politics (Wæver 1995: 29). The Copenhagen School admits that strategies of securitization may be instrumental in mobilizing support and resources for an issue under certain circumstances (Buzan/Wæver/de Wilde 1998: 29). However, the Copenhagen School is highly critical of processes of securitization and recommends strategies of desecuritization in order to bring issues back to 'normal' politics and democratic procedure.

What are the findings of those who have investigated the 'securitization' of climate change from the perspective of the Copenhagen School? Is there evidence of securitizing moves by elite speakers, and if so, in which years? An initial finding is that the articulation of climate change as existential threat is nothing new. In the formation phase of the climate regime from 1985 to 1992, climate change was also described as an existential threat by heads of government and in newspaper reporting in several industrialized countries, among them Germany and the UK (Carvalho/Burgess 2005: 1466-1467). In 1990, for example, these 'securitizing moves' facilitated the ambitious German target of reducing carbon dioxide emissions by 25 per cent by the year 2000 (Weingart/Engels/Pansegrau 2000: 272). The dramatic language of existential threat is said to have returned from 2003 to 2009 (Brauch 2009; Oels 2009a). However, the majority of those who articulate climate change as a security issue do not call for extraordinary measures but instead emphasize the importance of the 'normal' political process of international negotiations under the UN Framework Convention on Climate Change (Oels 2009a). It is only a few people, like former US Vice-President Al Gore, who actually call for "the urgency and resolve that has previously been seen only when nations mobilized for war"⁸.

There are actually a number of different security discourses being mobilized by the elite speakers, with

potentially different policy implications (Detraz/Betsill 2009). While US speakers, delegates from the small island states, and speakers from the military establishment are clearly concerned about the *national* security implications of climate change, developing countries and the IPCC, as well as UN resolutions, analyse human vulnerability to climate change and address climate change as an issue of sustainable development and more recently as a human security issue (see section 9.2) The Copenhagen School does not, however, distinguish between these different discourses – it is assumed that good intentions are not necessarily linked to desirable results (Trombetta 2011: 140). The Copenhagen framework is blind to the fact that the articulation of climate change as an issue of human security could have different policy implications from the articulation of climate change as an issue of national security.

Were these speech acts accepted by a relevant audience? Existing studies have found it difficult to identify what constitutes a ‘relevant’ audience. Oels (2009a) suggested that the community of international states might be a relevant audience, and proposed looking at the debates in the UN Security Council and the UN General Assembly. The findings of this analysis are divided: while developing countries clearly opposed the treatment of climate change in the UN Security Council, there was widespread consensus on discussion of climate change and security in the UN General Assembly (UNGA 2009). The report by the UN Secretary-General on *Climate Change and its Possible Security Implications* uses the language of human vulnerability, but makes it very clear that for most countries, human vulnerability and national security are interdependent concerns (UNGA 2009: 1; see section 9.2.2). In conclusion, there seems to be audience acceptance amongst international states that human vulnerability to climate change impacts – especially in developing countries – requires political action. Secondly, Brauch (2009) has suggested studying international opinion polls to see whether climate change is considered to be a ‘serious’ threat and if the figures supporting this have been going up or down. Comparative national opinion polls from 2005 to 2007 show that public concern about climate change is huge and increased over that period of time. However, Oels (2009a) argues that this does

not necessarily imply that people would find extraordinary measures the appropriate means of addressing the problem of climate change. Third, Oels (2009a) suggested reviewing national media representations of climate change and searching for securitizing language. In the absence of media analyses of securitizing language after 2003, there were only early hints of securitizing language in the German and British newspapers around 1990 and in British newspapers from 2003 onwards (Carvalho/Burgess 2005: 1466–1467, Weingart/Engels/Pansegrau 2000: 272). A more recent study addresses the discursive construction of ‘climate refugees’ as a security issue in the media and its policy implications, using case studies of media representations of small island people and of Hurricane Katrina victims (Oels/Carvalho 2011).

Finally, does evidence exist of extraordinary measures in the field of climate policy? Julia Trombetta has suggested that in foreign policy it is possible that “the securitization of climate change would result in confrontational politics, with states adopting politics to protect their territory against sea-level rising and immigration; with the Security Council adopting resolutions to impose emission targets, and even military action against polluting factories; and surveillance systems to monitor individual emissions” (Trombetta 2008: 599). There is no evidence of such measures in foreign policy. In the environmental sector, Hans Günter Brauch has suggested that the successful securitization of climate policy would “legitimate extraordinary and costly measures that require a progressive increase in energy efficiency and a decarbonization of the energy system by increasing renewable energy sources but without creating serious food security challenges” and this would mobilize “significant public funds” (Brauch 2009: 71). For Brauch, successful securitization depended on the outcome of the Copenhagen COP-15 negotiations under the UN Framework Convention on Climate Change (Brauch 2009: 102). With the stalemate at the Copenhagen negotiations and the weak Cancun Agreements, all observers agree that the securitization of climate change has failed (Oels 2009a; Brauch/Oswald Spring 2011; Oswald Spring/Brauch 2011).

Oels (2009a) has argued that the political momentum for climate change in 2007 was lost when the Bali negotiations under the UNFCCC postponed decision-making to Copenhagen. Between Bali and Copenhagen, the financial crisis became a major policy priority and the climate negotiations never regained the same priority that they had in 2007. Despite the election of a new US President with strong climate

8 Gore, Al, 2007: “Nobel Lecture”, 10 December 2007 in Oslo, *The Nobel Foundation*; at: <http://nobelprize.org/nobel_prizes/peace/laureates/2007/gore-lecture_en.html> (3 October 2010).

policy ambitions, Obama's failure to get his climate legislation through the House of Representatives and the Senate in time for Copenhagen was the breaking point for a binding agreement in Copenhagen. When compared with 9/11 in 2001 or the financial crisis of 2008–2009, it is obvious that no emergency measures concerning climate change have been taken. The terrorist attacks in 2001 and the financial crisis of 2008–2009 were responded to with frequent exceptional 'crisis talks' by heads of government, followed by determined legislation passed in (undemocratically) short time with little consultation. In both cases, fundamental rights were violated by these new laws. In contrast, the issue of climate change was tackled by existing forums (G-8, UN General Assembly, UN Security Council), and almost all requests for policymaking were directed to the negotiations under the UN Framework Convention on Climate Change.

What are the strengths and weaknesses of analysing the 'securitization' of climate change drawing on the Copenhagen School's framework? *First*, regarding the production of climate change as a security issue, limiting analysis to speech acts is a significant constraint. By doing so, the Copenhagen School has in the past excluded visual representations and security practices (Stritzel 2007; McDonald 2008). The Paris School and revised versions of securitization theory include such practices in their analysis (Hansen 2010; see chap. 14 by Rørbæk). *Second*, it is both a strength and a weakness of the Copenhagen School that it puts forward a framework of analysis that fixes the meaning of security to just one option (existential threat) and the policy response to one option (extraordinary measures). Strippel has suggested that the Copenhagen School is "constructivist in regard to social relations, but more objectivist in regard to security" (Strippel 2002: 109–110). The Copenhagen School contributes to a further marginalization of alternative security discourses by binding the meaning of security to exceptionality (McDonald 2008: 579). However, "the meaning of security is not an ontological given, but changes across time" (Floyd 2007a: 333). Because it has fixed the meaning of security, the Copenhagen School is incapable of distinguishing between competing security discourses and their *very different* policy implications (Detraz/Betsill 2009). Moreover, the Copenhagen School is blind to the transformations in the logic of security and in the practices of security which occur when the environment becomes the referent object (Trombetta 2011: 136). *Third*, regarding policy implications, a strength is that we know whether or not security discourses are legitimizing a

political state of exception. In the case of climate change, the Copenhagen School reassures us that the construction of climate change as a security issue has not yet passed the critical threshold of exceptionality.

Does this mean that the articulation of climate change as a security issue has not had any consequences for policymaking? Didier Bigo (2007) has claimed that narrowing the meaning of security to exceptionality means that only the tip of the iceberg of securitization processes is rendered visible. All other policy implications which could be linked to the articulation and the practices of security remain invisible and unrevealed. Trombetta insists that the securitization of the environment must be considered 'successful' in such cases where it "brought about measures and policies that probably would not otherwise have been undertaken" – not only in cases where exceptional measures were enabled (Trombetta 2011: 136). Trombetta argues that the politicization of the environment has in many cases been achieved *through* its securitization (Trombetta 2011: 142). Floyd insists that the securitization of the environment can trigger positive environmental outcomes (Floyd 2007a: 342), while desecuritization can be negative in cases where the issue simply disappears from the policy agenda altogether (Floyd 2007a: 343, 347). Trombetta suggests that in the environmental sector, the logic of security is often transformed into something more along the lines of risk management, for example using the precautionary principle and the concept of resilience (Trombetta 2011: 135, 142). In the case of the European Union, Julia Trombetta has claimed that the climate security discourse has facilitated the development of a common energy policy: "The plan committed member states to raising the European share of renewable energy to 20 per cent, increasing energy efficiency, completing the internal market for electricity and gas, and the development of a common external energy policy" (Trombetta 2008: 598). The driving force for these developments was – according to Trombetta – the merging of the concern for energy security (to secure energy supply) with concerns about climate security (to secure climate stability). The original Copenhagen framework is blind to such observations below the threshold of exceptionality.

The Copenhagen School reveals that the 'securitization' of climate change has failed: the articulation of climate change as a security issue in numerous elite speech acts has not (yet) passed the critical threshold of exceptionality. The Copenhagen School can also reassure us that we should not be worried. Criticism

raised against the Copenhagen School points to the possibility that a transformation in the logic of security could trigger positive outcomes for the environment and for people. The following section explores whether a new reading of security in terms of *human security* can actually facilitate desirable policy outcomes.

9.3.2 Climate change as a Threat to Human Security: An Agenda for Sustainable Development

A second perspective frames climate change as a threat to *human security*. Human security is clearly a normative approach as it is concerned with what security ought to be. The human security perspective is first and foremost “a policymaking agenda” that originated from the policymaking world, not a theoretical framework of analysis (Floyd 2007b: 38).

It was the United Nations Development Programme that introduced the term human security in its Human Development Report (1994). The human security approach takes the individual lives of people as the referent object of security, not the political order of states. The aim is “to highlight persisting insecurities of individuals or groups of individuals” (Floyd 2007b: 39). The UNDP argued in 1994 that human security should include both “freedom from fear” (mainly safety from violent threats) and “freedom from want” (i.e. poverty, disease, climate change). The UNDP envisioned a broad concept of human security that covered threats to economic security, food security, health security, environmental security, personal security, community security, and political security. The influential Commission on Human Security further specified the meaning of human security. It argued that “[t]he focus must broaden from the state to the security of people – to human security” (Commission on Human Security 2003). However, the exact meaning of human security remains contested.

In essence, “those who work within the human security tradition perform securitizing moves themselves” (Floyd 2007b: 42). It is hoped that framing environmental problems as security issues will contribute to “making them more important than other politicised issues” (Barnett 2001: 136). Articulating climate change as a security issue is an instrumental attempt to turn climate change into a policy priority. It is hoped that the counterproductive effects of securitization as defined by the Copenhagen School can be avoided once the meaning of security is reclaimed as human security.

The human security perspective reveals the manner in which a national security perspective fails to address the root causes of environmental problems (Floyd 2007a: 342). The human security perspective emphasizes that “the sovereign state is one of the main causes of insecurity: it is part of the problem rather than the solution” (Jones 1995: 310). Daniel Deudney (1990) has argued that traditional notions of national security are totally inappropriate and counterproductive when it comes to securing the environment. The national security perspective is “reactive” in that it is about “using the troops to prevent disruption to social order after ‘nature’ has done her worst” (Dalby 2009: 135). Followers of human security believe that their voice in the environmental security debate can transform the meaning and the practices associated with security: “Environmental security, wittingly or not, contests the legitimacy of the realist conception of security by pointing to the contradictions of security as the defence of territory and resistance to change” (Barnett 2001: 137).

As a suitable alternative to readings of environmental security as national security, Jon Barnett (2001), Simon Dalby (2009), and others (Barnett/Matthew/O’Brien 2010) suggest reframing security as *human security*. In the global environmental change research community, human security is defined as

something that is achieved when and where individuals and communities have the options necessary to end, mitigate or adapt to threats to their human, environmental and social rights; have the capacity and freedom to exercise these options; and actively participate in pursuing these options (GECHS 1999).

The human security perspective claims that economic, political, and cultural processes structure people’s access to resources and hence their capacity to respond to climate change. When the impacts of climate change strike, the current state of people’s human security determines their capacity to respond, adapt, and cope. At the same time, the impacts of climate change erode human security as climate change reconfigures access to and destroys resources. For example, farmers and others who depend on natural resources are particularly vulnerable to climate change, yet their fate is mediated by governmental institutions which may offer emergency shelters and compensate losses from natural disasters. Dalby (2009) has suggested that working towards peace in the face of climate change requires first, drastically decarbonizing the developed economies, and second, preparing for the climate-induced disruptions that cannot be avoided, by means of conflict prevention and sustainable develop-

ment. It is claimed that human security offers a form of securitization without the “counterproductive outcomes that come from securitization by the state; indeed it points to a role for the state in mitigating the drivers of environmental change and in facilitating responses to minimize insecurities” (Barnett/Matthew/O'Brien 2010: 20).

Simon Dalby has claimed that not only should the meaning of “security” be reconsidered, but also the meaning of “environment”. Dalby draws on Paul Crutzen's idea of a new geological era called the ‘Anthropocene’ in which the activities of humans have become key drivers of changes in the biosphere. Dalby argues that the emergent Earth Systems science has demonstrated how it does not make sense to think of the environment as something external to humans. Instead, humans and nature are mutually constituted by politics, and closely linked in an interconnected system characterized by emergence, contingency, and change (Dalby 2009: 147, 170). Securing the environment is therefore no longer about preserving or stabilizing the status quo (Dalby 2009: 168). Instead, it is about enhancing the system's capacity for adaptive emergence, its resilience to disruptions, and its capacity to regenerate (Dalby 2009: 168).

Has the human security perspective been influential in framing the way climate change is perceived? The concept of human security has achieved widespread acceptance in international policy discourse over the last two decades (McCormack 2010: 39). The UN General Assembly hosted its first systematic discussion on human security on 22 May 2008. At this meeting, “many countries listed as major threats to HS [human security] environmental degradation, climate change, natural disasters and forced migration” (Brauch 2011: 4). On 8 March 2010, the UN Secretary-General presented his first report on Human Security, in which he listed “climate change and the increase in the frequency and intensity of climate-related hazard events” as one of five priorities of the UN (Brauch 2011: 4). On 14 April 2011, the UN General Assembly hosted an informal thematic debate on human security in which climate change featured once more (Brauch 2011). The EU has mentioned the human security implications of climate change in its Solana Report 2008. At the level of national governments, only Greece has recognised climate change officially as a challenge for human security.⁹

As was argued above (9.2.1, 9.2.2), a human vulnerability perspective is dominant in the realm of climate science and climate policy. In climate science, the IPCC as the advisory body for policymakers is committed to a human security perspective on climate change in its *Fifth Assessment Report (AR5)* due by 2014. The IPCC will address the human security implications of climate change in chapter 12 of Working Group II, according to the government approved outline of the AR5. In the realm of international politics, the UN Secretary-General's 2009 Report on *Climate Change and its Possible Security Implications* defines security in terms of “the security of individuals and communities” (UNGA 2009: 4), much in line with a human security perspective. The report explicitly cites the *Human Development Report 1994*, which was essential in the debate on human security (UNGA 2009: 5). However, at the same time it acknowledges that for most states, national security and human vulnerability are two sides of the same coin. While an explicit framing of climate change as an issue of human security has emerged rather recently, there is a long tradition in international science and politics of focusing on human vulnerability to climate change impacts. Such a focus on human vulnerability is clearly in line with a discourse framed in terms of human security (labelled environmental security by Detraz and Betsill), as Detraz and Betsill demonstrate in their discourse analysis of climate change science and politics (Detraz/Betsill 2009).

Has (human) security framing propelled the issue of climate change to the top of the policy agenda as intended by those making securitizing moves? Or is it too early to ask this question since explicit framing of climate change in terms of human security has begun emerging rather recently? For many years, global climate governance was depoliticized and technocratic, allowing a broad range of actors to become part of the negotiation process with a rather low level of commitment (Methmann 2009). The last milestones of global climate governance were the adoption of the UN Framework Convention on Climate Change in 1992 and the Kyoto Protocol in 1997. From 2007 to 2009, a process of politicization of climate change occurred which was certainly helped if not facilitated through its securitization in those years (Trombetta 2011: 142). In the years 2007–2009, climate change and its possible security implications were certainly at the top of the policy agendas of the European Union, G8/G20, the UN Security Council and the UN General Assembly. Has this politicization facilitated decisive mitigation and adaptation action on climate change?

9 “Greece assumes the Chairmanship of the Human Security Network May 2007-2008”; at: <http://www.mfa.gr/www.mfa.gr/Articles/en-US/ts18052007_KL2115.htm>.

Not yet, as the failure to officially adopt the *Copenhagen Accord* (COP 15 in December 2009) shows, and as the officially adopted weak *Cancún Agreements* (COP 16 in December 2010) illustrate. The *Cancún Agreements* officially integrated the main points of the *Copenhagen Accord* into the UNFCCC by having them adopted by all member states. Since Copenhagen, the US and the EU have used all their diplomatic power to coerce developing countries into signing the *Copenhagen Accord*, for example by threatening to withdraw or cut development assistance. As a result, 180 countries have since signed on to the *Copenhagen Accord*. In the *Cancún Agreements*, the goal of limiting average global warming to below 2°C above pre-industrial levels was officially adopted by all member states. This is to be achieved by voluntary mitigation pledges which developed countries committed to at their own discretion when signing on to the Copenhagen Accord. Developing countries on the other hand agreed to self-defined mitigation actions. Some improved standards for *measurement, reporting, and verification* (MRV) of mitigation actions, and support for developing countries, were adopted in Cancún. Developed countries collectively committed in Copenhagen and Cancún to mobilizing up to US\$ 30 billion in 2010–2012 and US\$ 100 billion a year by 2020 in order to support mitigation and adaptation measures in developing countries. In addition, a Green Climate Fund was established, the Cancún Adaptation Framework was set up, action to *reduce emissions from deforestation* (REDD+) was taken, and in Cancún a Technology Mechanism was established. New legally binding emission reduction targets for a second commitment period of the Kyoto Protocol were, however, missing. In sum, the politicization of climate change might have been facilitated through its securitization. However, the outcomes of the politicization process remain far below the expectations of the human security community.

So what are the strengths and weaknesses of the human security perspective on climate change? One strength of the human security perspective is that it has a lot to say about what the meaning of ‘security’ and ‘environment’ should be and how securing civilization from climate change could be achieved. It is assumed that decisive action on climate change will be triggered by the climate security discourse, most likely the drastic decarbonization of the economy. However, for critics, the human security perspective remains naive and unrealistic wishful thinking (Schweller 1999). With regard to climate change, its

politicization was certainly helped by the human security framing of the issue. However, there is little evidence so far that focussing on human vulnerability to climate change has facilitated substantial mitigation action on climate change and/or sustainable development.

A major weakness of the human security perspective is that it fails to take into account that the articulation of climate change as a (human) security issue might trigger a whole range of other policies which were not intended by the proponents of this discourse. Rita Floyd argues that broadening security in the direction of human security has not always had positive consequences – it has been counterproductive in some instances (Floyd 2007b). In the field of climate policy, McNamara and Gibson (2009: 480) demonstrate that the securitization of ‘climate refugees’ by environmental organizations has directed policy attention away from mitigation and towards migration and border control. Another weakness of the human security perspective is that it does not pay sufficient attention to how the meaning of human security has changed over time. In the process of ‘mainstreaming’ (i.e. its widespread usage in the realm of politics), human security has become reinterpreted. Duffield and Waddell (2006) have offered an insightful genealogy (i.e. historic discourse analysis) of human security from a Foucaultian perspective. Despite the fact that Duffield and Waddell’s argument is put forward within a theoretical framework more in line with the Paris School (9.3.3), it is used here to indicate the blind spots of the human security perspective.

When it was originally conceived, the concept of human security sought to balance concerns about development with concerns about security. As Duffield and Waddell (2006: 5) show in their historical analysis, the *development* pole was concerned with “improving the resilience of global populations through better coordination and biopolitical regulation”. The concept of human security was used to facilitate sustainable development in line with the UNDP’s *Human Development Report* in the 1990s. In the realm of *security*, the main concern was to secure global circulation from disruption (Duffield/Waddell 2006: 10). In the 1990s, security concerns shifted from inter-state wars to intra-state violent conflicts. These so-called “new (civil) wars” became conceptualized as “development in reverse” (Collier 2000: ix). Because it enhances resilience, sustainable development became conceptualized as a “bulwark” against organized violence (Duffield/Waddell 2006: 6). It is on this note that develop-

ment and security were conceptualized as two sides of the same coin.

The meaning of human security has changed over time, with an important rupture after 9/11 (Duffield/Waddell 2006). Duffield and Waddell argue that after 9/11, the balance between *development* and *security* in the concept of human security tipped towards *security*. As a result, concern with global circulation is now dominant, "the security of 'homeland' populations has moved centre-stage" (Duffield/Waddell 2006: 19). Southern populations' human security is only relevant to the extent that it contributes to Northern 'homeland' security (Duffield/Waddell 2006: 12). In the realm of *development*, this means that development funding is concentrated on "regions and sub-populations deemed critical in relation to the dangers and uncertainties of global interdependence" (Duffield/Waddell 2006: 11). In the realm of *security*, this means that so-called 'weak' or 'failing' states become conceptualized as a threat to global circulation and 'homeland' security. In the name of human security, military interventions which override national sovereignty are considered justified where 'failing' states (and violent conflicts between competing groups of the population) pose a risk to global circulation.

Tara McCormack argues that the concept of human security has in both the past and present been abused to legitimize military interventions in sovereign states in the name of the human security of the population (McCormack 2010: 36–40). The 2001 report by the International Commission on Intervention and State Sovereignty *The Responsibility to Protect* "moves the earlier juridically based idea of 'humanitarian intervention' as requiring authorization under the UN charter, onto the terrain of moral duty" (Duffield/Waddell 2006: 8). Human security therefore clearly has the potential to legitimize extraordinary measures such as military interventions in sovereign states. As a result, the outcomes of securitizing moves in the name of human security can be just as violent, short-term-oriented, and undemocratic as those criticized by the Copenhagen School.

This suggests that assessment of the policy implications of framing climate change as a (human) security issue must not be limited to environmental politics – instead, it should trace policy impacts in a variety of sectors such as defence, migration, and development. It is these unintended side effects of the climate security discourse that must be investigated in order to reveal the policy implications of the 'securitization' of climate change. The Paris School offers a suitable framework for investigating changing policies

and practices in the sectors of defence, migration, and development.

9.3.3 Climatization of Security: Securing Global Circulation from Disruptions Caused by Climate-induced Disasters

The claim to be substantiated in the following section is that climate change as a (human) security issue facilitates a 'climatization' of the security field. The security field is a Bourdieuan, socially constructed space, the boundaries of which are constantly being renegotiated among its legitimate members and would-be members (Bigo 2008a). The security field is therefore not limited to the military, police, and intelligence, but also includes securitized sectors like migration and development – and more recently climate change itself. 'Climatization' of the security field means that existing security practices are applied to the issue of climate change and that new practices from the field of climate policy are introduced into the security field. Overall, a restructuring of the security field as a result of its 'climatization' may be expected. The empirical section assesses the defence sector, the migration sector, and the development sector in search of evidence for the claim that climate change is being produced as a (human) security issue by professionals of (in)security. Secondly, it will be explored whether there is evidence of transforming or of new security practices resulting from the recognition of climate change as a legitimate threat to (human) security. For reasons of space and clarity, no analysis of the underlying governmentalities (i.e. rationalities of government) will be offered, which inform security practices in each sector (see Oels 2012).

This section starts with an introduction to the Paris School (9.3.3.1). In the empirical section, the 'climatization' of the defence sector, the migration sector, and the development sector (9.3.3.3) will be assessed, and the practices enabled in the name of human security will be explored. It is claimed that climate change as an issue of human security is mainly about securing global circulation from disruptions caused by climate change induced disasters.

9.3.3.1 The Paris School

The Paris School, represented primarily by the writing of Didier Bigo, investigates the everyday practices of "professionals of (in)security" and studies the ways in which subjects and objects are produced as security problems as a result of these practices (Bigo 2008b: 12). The label 'Paris School' was coined by Ole Wæver

because most of the contributing authors were based in Paris, with the exception of Huysmans (Bigo/Guild 2005; Huysmans 2000, 2006; Tsoukala 2004; Bonelli 2005; Hanon 2000). The Paris School draws on Foucault's governmentality lectures where security is conceptualized as a security dispositif (Foucault 2007). Foucault draws on the term *security dispositif* to emphasize that elements as heterogeneous as architectures, discourses, legal texts, institutions, technological devices, and the daily practices of actors are linked by a complex web of relationships and taken together, render a social problem governable as a security issue (Foucault 1982: 194). Security dispositifs are dynamic, the relationships between the elements can change over time, and new elements may link up. The term *discourse* refers to "a specific ensemble of ideas, concepts, and categorizations that are produced, reproduced, and transformed in a particular set of practices and through which meaning is given to physical and social realities" (Hajer 1997: 44). The problematization of security renders a social field governable in a certain way. The following analysis focuses on technologies of security, the practices that actors engage in to produce knowledge about and to manage an object as a security problem or risk.

The Paris School argues that the production of issues by the transnational and transversal security field is neither good nor bad per se - it depends on the policy implications. Most analysts in the Paris School focus on simply revealing the practices and policy implications of specific security dispositifs, and in doing so highlight unintended and problematic developments. The following analysis remains in this tradition. Others go one step further and offer an explicitly consequentialist assessment of the policy implications. In the case of HIV/AIDS, Stefan Elbe (2009) has suggested that the positive impact of international policy attention and upscaled financial resources for HIV education, testing, and treatment considerably outweigh the negative consequences of the securitization of HIV/AIDS, for example the stigmatization (or even exclusion from the labour market and from travel) of risk groups.

9.3.3.2 Rendering the Risk of Climate Change Governable: Mitigation, Adaptation, and Disaster Management

Three policy fields have emerged to address the risks of climate change: mitigation, adaptation, and managing disasters induced by climate change. The risk construction of climate change has shifted significantly over the last 25 years (Oels 2012). Reducing green-

house gas emissions in order to slow down and halt global warming (*mitigation*) has been the main focus of climate policy from its very inception (Oels 2005). When the IPCC announced in 2001 that climate change was already happening and could not be stopped (though it could be influenced in intensity), *adaptation* to projected impacts of climate change emerged as a complementary policy field (Oels 2012). Since 2003, science and politics have addressed climate change as a security issue, with a peak of attention in 2007. Several policy documents have defined climate change as a 'threat multiplier' that exacerbates existing vulnerabilities and tensions (9.2.2).

The discussion dealing with climate change as a security issue is a small, but growing part of the larger field of climate change policy in which *mitigation* and *adaptation* still dominate policymaking. For the Paris School, the articulation of climate change as a security issue indicates that the transnational field of professionals of (in)security (i.e. police, military, intelligence, etc.) has recognized the primary and secondary impacts of unmediated climate change as a legitimate threat. As a result, the security field has become 'climatized' and new security practices have evolved. The following analysis is limited to the risk perception of climate change as a security issue (for mitigation and adaptation, Oels 2012).

9.3.3.3 'Climatization' of Security: Defence, Migration, Development

Which reading of security do the professionals of (in)security perform in the case of climate change? Science and politics have focused on human vulnerability to climate change impacts in the past, a reading that is very much in line with human security (Detraz/Betsill 2009). The possible threat of violent conflict as a result of climate change has been only one among many concerns (Detraz/Betsill 2009). More recently, the term human security is officially emerging in the language of the IPCC, the EU and the UN General Assembly (9.2.2). Mark Duffield and Nicholas Waddell have suggested reading "human security as a relation of governance" (Duffield/Waddell 2006: 2). They conceptualize human security as a biopolitical security dispositif, concerned with the population as referent object of security: "Security in this context relates to improving the collective resilience of a given population against the contingent and uncertain nature of existence" (Duffield/Waddell 2006: 4). In their reading, human security is about securing global circulation from disruptions and informs "how international institutions and actors categorize, separate

and act upon Southern populations" (Duffield/Waddell 2006: 2).

Once human security is conceptualized as a form of biopolitical governance, we can explore the intended and unintended policy implications of viewing *climate change as a (human) security issue* in a field constituted by the professionals of security. The following empirical section assesses the defence, migration, and development sectors in search of evidence for the claim that climate change is being produced as a (human) security issue by professionals of (in)security. Secondly, the section explores whether evidence exists of transforming or new security practices as a result of the recognition of climate change as a legitimate threat to (human) security.

To what extent is climate change being produced as a (human) security issue by the defence sector and how is the defence sector restructuring as a result? There is clear evidence that climate change has been recognized as a legitimate threat by the defence community in Northern industrialized states. Climate change is acknowledged as a threat in two-thirds of the 24 national security strategies reviewed by Michael Brzoska. In the majority of cases, climate change is defined as an issue of *human security* (Brzoska 2010: 6–7). Only four countries (the United States, Russia, Finland and the United Kingdom) conceptualize climate change as a major threat that could trigger violent conflict and have *national security* implications (Brzoska 2010: 8). The main threats recognized are disasters induced by climate change that could spark humanitarian crises, large-scale migration, and violent conflict. To counter these secondary impacts of climate change, the national security strategies recommend building more *disaster management* capacity (Brzoska 2010: 6–7). At the level of policy implementation, that is, in defence planning documents, capacity building for *disaster management* is again the main means of preparing for climate change (Brzoska 2010: 10). The growing importance of disaster management is underlined by the 2011 special report on *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* which is being prepared by the IPCC. The Special Report was proposed jointly by the UN International Strategy for Disaster Reduction (UN/ISDR) and the Government of Norway.

The emerging science makes it very clear that it is impossible to predict future climate-related disasters. However, it is possible to identify regions which are more threatened by climate change than others, so-called 'climate change hot spots'. Indicators previ-

ously used to identify populations which are particularly 'vulnerable' to climate change could now be used to monitor when the 'vulnerable' might become 'dangerous', for example by migrating in large numbers (Oels 2009b). The study commissioned by the Pentagon suggests using the same indexing and ranking systems developed to prioritize those most in need of support to mark dangerous "migration hot spots" and "conflict hot spots" (Schwartz/Randall 2003: 2). It is by such moves that the human security of populations displaced by climate change is translated into a problem of *national security* for 'homeland' populations in industrialized states (Duffield/Waddell 2006: 19).

Hartmann identifies a potential role for the military *before* and *after* a climate-induced disaster strikes. The use of Northern military to intervene in Southern sovereign states is facilitated by the concepts of 'human security' and 'failed state' (Hartmann 2010). There are two types of possible interventions:

First, as a preventive measure, civilian-military stability interventions might be enabled in 'weak' or 'failing states' which have been identified as 'climate change hot spots'. Civilian-military stability operations could help to establish infrastructure that reduces disaster risk and enhances disaster management capacity. Hartmann has argued for the case of the US that 'stability' operations carried out in 'military-civilian teams' are now given equal priority to combat operations by the Department of Defense (Hartmann 2010: 240). These operations could be extended to 'climate change hot spots'.

Second, military responsibility-to-protect interventions might be enabled in states which fail to offer sufficient levels of protection to their population *after* a climate-induced disaster strikes, most likely in Africa (Hartmann 2010: 241). These could be states whose coping capacity is overwhelmed by climate-induced disasters and migration flows. The motivation behind responsibility-to-protect interventions is clearly guided by concern with security: to secure global circulation from disruption. For the EU, Wagner (2008) argues that security actors have long demanded additional satellite surveillance and transport capacities and that these demands are now made in the name of climate change. Thus, in the future, the military might be involved in stability operations and/or responsibility-to-protect interventions in the name of the 'human security' of Southern populations affected by climate-induced disasters (McCormack 2010: 36–40).

In the field of *migration*, 'climatization' contributes to the already ongoing process of 'securitization' of migration. Environmentalists draw on a racist dis-

course to stir up fear of ‘millions of climate refugees’ – for the ‘good’ cause of mobilizing for emission reductions. According to this discourse, ‘we’ in the industrialized countries “if not literally flooded, will most certainly be flooded by the ‘climate refugees’” (Kolmannskog 2008: 9). According to migration experts, it is highly unlikely that the poor populations of the South would have the resources to migrate over long distances to the industrialized countries. This option is reserved for the privileged few. The poor will only be able to migrate short distances if at all, for example to neighbouring countries. It is the affected countries and their neighbouring countries that will be most in need of support to regulate migration flows and to assist affected populations. The Northern concern about ‘millions of climate refugees’ is mainly driven by the fear that uncontrolled migration flows of a large scale could destabilize the political order of affected countries and possibly give rise to violence between migrating groups and receiving communities. The breakdown of a state monopoly on violence could cause severe disruption to global circulation, directly affecting the resource supplies of the economies of Northern industrialized states. Securing global circulation is a major goal informing how climate change-induced migrants are rendered governable.

National governments are concerned to clarify the status of climate change-induced migrants as either ‘refugees’ or ‘internally displaced persons’ in order to include or exclude them from their legal order. Humanitarian organizations, the *International Organization for Migration* (IOM), and the *UN High Commissioner for Refugees* (UNHCR) address climate change-induced migrants as bodies whose lives need to be saved by humanitarian assistance (food, water, shelter, and health care). Funding to afford such humanitarian assistance is often closely linked to the legal status of ‘refugee’ or ‘internally displaced person’. A focus on the legal status of climate change-induced migrants has the potential to enable and legitimize more border controls, designed to create a distinction between deserving ‘climate change-induced refugees’ and undeserving, illegalized ‘others’. However, the quest for refugee status for climate change-induced migrants led by some academics and NGOs is yet to have much policy resonance (chap. 15 by Biermann/Boas; chap. 16 by Jakobeit/Methmann).

Instead, the Cancún Adaptation Framework (2010) officially recognizes the problem of climate change-induced migration for the first time, and includes a provision that could channel adaptation funding to climate change-induced migrants. Most

likely, these funds will be used for adaptation measures in ‘climate change hot spots’. These measures could enhance the resilience and coping capacity of the local population, and reduce the need for migration. Given that reliable climate predictions are not available, the new security practices focus on enhancing people’s adaptive capacity (in terms of social capital) and their resilience to current weather variability. It is also possible to use these funds to resettle people who live in ‘climate change hot spots’ to safer regions in the same country. Migration is considered a legitimate adaptation option if not a right of affected populations by migration and development NGOs and human security activists. To date, no political decisions have been taken regarding how the scarce funding is to be distributed between affected regions. Adaptation measures and adaptation funding are clearly measures from the field of climate policy. In the process of the ‘climatization’ of the security field, these practices are introduced, in this case in the migration sector. Adaptation funding will play a significant role in future decision-making on migration management and resettlement. A similar process can be observed in the development sector.

The ‘climatization’ of the *development* sector is marked by the introduction of adaptation as a new goal of development policy. The bulk of the practices enabled by the ‘climatization’ of development policy are about enhancing people’s coping capacity and resilience through disaster planning and adaptation measures. Rather than reducing poverty levels per se, development policy is currently focused on enhancing resilience and self-reliance, i.e. the capacity to adapt to any kind of disruption. This is in line with a neo-liberal governmentality which regards those governed responsible for their own fate (Duffield 2007). As a result, the division of the world’s populations into the ‘insured’ (enjoying social protection by the state) and the ‘uninsured’ might be reinforced rather than overcome (Duffield 2007).

Given the highly variable and in many places negligible reach and impact of development aid (for example, the lack of aid in urban poor areas), many of those most vulnerable to climate change will remain unprepared and unable to cope. The amount of funding provided by industrialized countries to developing countries for adaptation projects so far remains symbolic compared with the estimates of adaptation needs. By June 2009, the total sum of US\$ 352.5 million had been raised for adaptation projects in the form of voluntary pledges by industrialized countries, and US\$ 1.38 billion in co-financing (GEF 2009a; GEF

2009b). However, in the Copenhagen Accord (2009) and Cancún Agreements (2010), developed countries promised to raise US\$ 30 billion from 2010 to 2012 and to 'mobilize' US\$ 100 billion a year by 2020 for *mitigation and* adaptation measures in developing countries (UNFCCC 2009: 3). If such sums were actually raised "it would represent a radical reallocation of the global aid budget, which was \$103 billion in 2006" (Brown/Hammill/McLeman 2007: 1152).

The construction of millions of 'climate refugees' as a threat to human security and to the 'homeland' security of Northern states in particular could also facilitate a militarization of development assistance. Some of the transformations the 'climatization' of development aid might trigger can be inferred from the 'war on terror'. As a result of this war, military expenditure accounts for a growing percentage of the development assistance budget: 22 per cent alone in the US (Hartmann 2010: 240). Moreover, development assistance has been shifted to those countries of strategic importance for fighting terrorism (Duffield/Waddell 2006: 1). Early indications suggest that a similar strategic reorientation of development spending might be facilitated to reduce the risk of conflict in so-called 'climate change hot spots'. Indicators used to identify populations which are particularly 'vulnerable' to climate change could guide the redistribution of development aid. Unfortunately for those in other regions, development assistance might in the future be prioritized towards 'climate change hot spots'. This may be aimed at preventing migration and violent conflict in affected regions, and protecting global circulation of resources, goods and people from disruptions.

9.3.3.4 Concluding Section

What are the strengths and weaknesses of analysing the climate change and security nexus from the perspective of the Paris School?

- First, this school does not fix the meaning of security. Rather than studying whether one particular understanding of security is prevalent (exceptionalism), the heterogeneous network of security practices and discourses is investigated. The distribution of discursive elements can be mapped and changes can be observed over time. In the case of climate change, it was possible to show that the predominant understanding of security employed in political discourse was a human security reading which aimed at securing global circulation from disruptions.

- *Second*, the Paris School directs attention away from 'extraordinary measures' and towards the routine practices of (non-elite) professionals of security, and analyses how their practices produce security discourses (and are incited by them). This renders visible all those policy transformations which remain below the threshold of exceptionality. The articulation of climate change as a security issue is caused by and incites transformations in the practices of security. It was argued that the recognition of primary and secondary climate change impacts as a legitimate threat by the transnational security field is an indication of the 'climatization' of the security field.
- *Third*, to understand the policy implications of climate change as a security issue, not (only) must *climate* policy in a narrower sense (mitigation) be studied, but also changing security practices in defence, migration, and development. For the *defence* sector, it was shown that new flexible military response capacities are being developed in the North, so that the political order of overwhelmed Southern states can be re-established after climate change-induced disaster. For the *migration* sector, it was argued that adaptation funding will be used in the future to resettle people and/or to reduce the need for climate change-induced migration. For the *development* sector, it was shown that aid is currently being restructured towards adaptation to climate change – as a result, climate change hot spots might attract more resources than other states.

It is concluded that what the Copenhagen School has studied as the failed 'securitization' of climate change is reconceptualized by the Paris School as the 'climatization' of the security field. Climate change is rendered governable as an issue of human security. The reading of human security applied here is to secure global circulation of resources, goods and people from disruptions caused by disasters induced by climate change.

9.4 Conclusion

Climate change has been referred to as a security issue by science and politics, particularly from 2007 to 2009. There is some evidence that a reading of climate change along the lines of human security has emerged. While the term 'human security' was not always explicitly used in the past, this is clearly changing recently. In the fifth IPCC Assessment Report, sched-

uled for 2014, IPCC Working Group II will dedicate an entire chapter to the human security implications of climate change. The EU and the UN have framed climate change as a ‘threat multiplier’ that may exacerbate existing vulnerabilities and tensions. This means that climate change alone is unlikely to trigger violent conflict, but may increase its likelihood in combination with other factors. According to this reading, sustainable development, adaptation policy, and disaster management are suitable means of addressing human vulnerability to climate change.

In this chapter, three theoretical approaches were discussed regarding the meaning and policy implications of climate change as a security issue. First, the Copenhagen School was introduced, which is interested merely in assessing whether the articulation of climate change as a security problem has passed a critical threshold of exceptionality. Given the general agreement in the literature that there is so far no evidence of ‘extraordinary measures’ or a state of exception, the Copenhagen School has little of interest to say about the meaning of climate change as a security issue. Future research from the Copenhagen School’s perspective could explore why ‘securitizing moves’ on climate change ‘failed’ to result in ‘extraordinary means’. Moreover, an extended reading of securitization as suggested by Trombetta (2011: 142) could be used to analyse in greater detail the policy implications of ‘politicization’ through securitization.

Second, the chapter introduced a normative perspective that seeks to mobilize policy attention and resources for the problem of climate change by addressing it as a human security issue. Despite the fact that a human security framing of climate change is emerging in science and politics, this has not yet led to ambitious and legally binding emission reductions. It may be too early to tell. In the discussion of strengths and weaknesses, it was argued that the human security perspective seems to be blind to the fact that in the process of mainstreaming human security, its meaning has shifted. The balance between development and security within this concept has clearly shifted towards the security side. As a result, securing global circulation from disruption is taking primacy over enhancing the coping capacity of local populations. In the future, responsibility-to-protect interventions might even be enabled in the name of human security where developing countries are overwhelmed by the impacts of climate change-induced disasters. So a human security perspective is not necessarily non-violent and unproblematic.

Third, the Paris School was introduced. The Paris School investigates the failed securitization of climate change as a ‘climatization’ of the security field. From this perspective, it is possible to see that the everyday practices of professionals in the transnational security field are producing climate change-induced disasters as a legitimate threat. It was argued that one strength of the Paris School is that it studies policy transformations below the threshold of exceptionality. As a result, it was possible to observe transforming security practices in the sectors of defence, migration, and development. It was demonstrated that practices of disaster management are emerging in the defence sector while practices of adaptation are featured in migration and development policy. It was asserted that climate change is rendered governable as an issue of human security and that what is to be secured from disruption is global (economic) circulation. The Paris School appears to offer the most promising research strategy for understanding the policy implications of climate change as a security issue. It is here that further research should be encouraged. The implications of the ‘climatization’ of the security field should be investigated in much more detail and over longer periods of time (diachronically) for the defence, migration, and development sectors. The figure of the ‘climate refugee’ deserves particular research attention, as it is mobilized by several different and sometimes competing climate security discourses.

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10 Critical Deconstruction of Environmental Security and Human Security Concepts in the Anthropocene

Judith Nora Hardt

10.1 Introduction¹

The end of the Cold War induced an important evolution in the field of security studies, in theory and in practice. The further development of theories initiated in the 1980s led to an integrative and multidimensional concept of security, supposed to be capable of facing emerging new types of threats characterized by their transnational and uncontrollable nature and by their dangerous impact on states, societies, and persons. The most discussed environmental threats, which in their totality are conceived as *Global Environmental Change* (GEC),² are: environmental degradation, deforestation, desertification, biodiversity loss, climate change, temperature increase, soil degradation, urbanization, agriculture, land-use change, overfishing, increasing weather extremes, and natural disasters. The most striking and frightening characteristics shared by all of these are their interconnectedness, their increasing extent, the speed at which they are developing, and the understanding

that they are to a high degree influenced and caused by human activity. The last characteristic is conceptualized within the assumption that humanity has pushed Earth's history forward to a new 'human-made' geological era: the Anthropocene.³ The premise that humans are in charge of their own fate now and have to learn how to manage their habitat leads to the necessity of addressing the root causes of GEC and revisiting the linkages between environment, security, and societal change.

In this way, security is understood as carrying a positive value in the sense of ensuring basic human needs with a normative transformative aspiration. The negative understanding of security with the closely linked theory of environmental conflict and risk of militarization is only briefly mentioned as it dominated the literature until recently.

This chapter is dedicated to providing a critical understanding of both concepts which address environmental issues in relation to security. The hypothesis is that a critical deconstruction of both concepts will contribute to clarifying their ability and limitations and finally their interrelationship. This is based on the question of whether and how the underlying root causes of GEC are addressed and whether they aim at invoking societal change in the Anthropocene.

The chapter elaborates a framework for analysis (10.2) based on *Critical Security Studies* (CSS) for the Anthropocene and it discusses the concepts of environmental security (10.3) and human security (10.4). The critical deconstruction points to the risks and weaknesses of the different versions of environmental security and of the human security approach in relation to GEC. The chapter concludes that contrary to

1 The author is grateful for helpful comments and suggestions from Karlos Pérez de Armiño, Simon Dalby, Katharina Rach, Sebastian Markt, Geert de Cock, and Hans Günter Brauch, as well as from three anonymous reviewers. The research presented here forms part of a PhD project financed by the Basque Government through the scholarship "Programme for the training of Research Personnel" of the Department of Education, Universities, and Research.

2 As the focus here is on the new challenge of GEC, the focus of this chapter is limited to ecological processes and the chapter leaves natural resources aside. The argument is that natural resources are principally seen in an economic dimension, and are directly related to power politics and to a linear depletion process. In contrast to this, global ecological processes and their importance have received very little attention so far and are still very little understood and much less controllable. Through increasing knowledge and consciousness of climate change, however, perception is slowly changing.

3 The *Anthropocene* is a new geological era adopted by the Earth System Sciences which follows the relatively stable period of the Holocene and is dated back to the era of the industrial revolution (Crutzen 2006; Steffen/Crutzen/McNeill 2007).

common assumptions, environmental security encompasses the concept of human security (10.5). It is argued that only a human-centred environmental security concept can provide a coherent conceptual basis for invoking necessary societal change and securing the living basis for human existence.

10.2 Elaborating a Framework for Analysis

Both concepts have been used with different definitions, interpretations, lines of argument, and theoretical contexts, something that often results in misunderstandings and calls for clarification. It is therefore necessary to distinguish between different conceptualizations and to categorize their inherent problems and challenges.

The suggested framework is principally based on the thoughts and aspirations of CSS, in particular of the Welsh or Aberystwyth School whose major authors are Booth (Booth/Vale 1997; Booth 2005) and Wyn Jones (1999, 2001) as well as of Canadian experts (Krause/Williams 1997; Cox 1981). According to this school, a researcher should reveal hidden power relations and question structural inequalities from a normative perspective (C.A.S.E. 2006: 455), with a primary focus on the people and on justice. Critique is a first step of guiding the way towards change by defining desirable structural change in the human interest in order to “become other than we are now without destroying others, ourselves, or the planet on which we all live” (Walker 1997: 78). Contrary to traditional security studies and in spite of the warning by Neocleous (2008: 5) that security leads to a constant reshaping of society and to a re-ordering of politics and therefore to oppression, CSS considers security and emancipation⁴ as two sides of the same coin (Booth 1991: 319). The positive value which has to be fought for “entails radical change in distribution of power, and in how the power is conceived and exercised” (Ryerson 2010: 181).

Another important research group for security studies is the *Copenhagen School* (CoS) represented

by Barry Buzan, Ole Wæver, and Jaap de Wilde (1998), whose main contributions are: 1. the theory of securitization (Wæver 1995; Buzan/Wæver/de Wilde 1998), which distinguishes three levels of politics: non-politicized, politicized and securitized (chap. 13 by Karafoulidis; chap. 33 by Kurtz; chap. 7 by Trombetta; chap. 11 by Wallbott); 2. the widening of the security concept to other sectors; 3. regional security complexes; and 4. an analytical framework for deconstructing security, on which this framework is partly based.

Floyd (2007) has suggested a *bridge-building* between both schools, but they have heavily criticized each other. While CSS attributes a positive meaning to security, the CoS has stressed its negative value and aims at a desecuritization of issues.

The context of the research is the Anthropocene, a term that was coined by Paul Crutzen (Steffen/Crutzen/McNeill 2007) for a new geological epoch starting in 1780, adopted by the Earth System Sciences community. Apart from the emerging scientific consensus of an anthropogenic climate change (IPCC 2007), in the Anthropocene era of earth history immediate and effective action will be necessary to save humanity. The phenomena associated with *global environmental change* (GEC) have severe implications especially for the vulnerable and poor and for future generations. Humankind is moving the earth beyond *natural* and prevailing ecological processes.⁵ Environmental threats are becoming more severe and impacting on human societies by threatening their basic living conditions. According to Dalby (2009: 34): “Environmental security is, in this sense, about the conditions that make civilization possible, and these need to be secured as the precondition for all other human activities; therefore if ever there is a security issue this is surely it!”

Based on CoS analytical framework the key questions to be addressed in deconstructing both concepts are: What different versions or interpretations exist? Who is secured? What is the threat? What is the cause of the threat? What are the answers/solutions to GEC? Which values are defended? Who is the intended target group⁶ and to whom is the concept di-

4 CSS defines emancipation as “...synonymous with an open-ended and ethical conception of politics, the rejection of false necessities in social life, justice as fairness, empowerment and choice, mutual respect of rights, the acceptance of common humanity duties, and the promotion of world-order values such as economic justice, non-violence, humane governance, ecological sustainability, and human rights” (Booth/Vale 1997: 337).

5 It is in this light that the German Advisory Council on Global Change (WBGU) designed different strategies for the global community to decrease CO₂ emissions until the year 2050 in order to maintain the global average temperature increase below 2°C. Everything that goes beyond would “...lead to dangerous, irreversible and practically uncontrollable consequences for both nature and mankind” (WBGU 2009: 1).

rected? The critical analysis is carried out with the goal of revealing the limitations and abilities of the concepts for inducing necessary societal change in the Anthropocene. This leads to these questions: Are the environmental causes, symptoms or consequences addressed? What are the potentials, the weaknesses, and the risks in the context of GEC? How are both concepts related? Must they be treated as independent variables on one level or does one provide a basic condition for the other?

10.3 Analysis of the Environmental Security Concept

The concept of environmental security first emerged at the *United Nations Conference on the Human Environment* in 1972 (Buzan/Wæver/de Wilde 1998: 71). With the end of the Cold War and the disappearance of concerns about nuclear war, perception turned to the significance of environmental crises with a global reach and a high level of devastation (Smil 1997: 107). After evolving through several phases (Dalby/Brauch/Oswald Spring 2009), the year 2007 marked a turning point in the environmental security debate due to three related events: a) the publication of the 4th IPCC Assessment Report, b) the debates in the UN Security Council (2007) and General Assembly (2009), and c) the award of the Nobel Peace Prize to the IPCC and Al Gore, giving climate change a high political visibility (Brauch 2009b).

Several definitions of environmental security coexist, but usually the following basic elements are shared: it is about repairing the damages to the environment, in order to a) sustain human life and b) maintain the intrinsic values of the environment and prevent damage, attacks, or other forms of human abuse (Glenn/Gordon/Perelevy).⁷ This definition remains vague, and the debate whether security and environment should be linked at all continues and has

re-emerged in the context of climate change. The main critiques are the risk of a militarization of environmental issues (10.3.1.) and that the environmental-security nexus only aims at dramatizing environmental problems (Wæver 1995: 65).

A major weakness is the co-existence of several debates which are regularly mixed up. The following deconstruction is to clarify the manifold meanings of environmental security, locating the theoretical debates in three versions of the concept, which are categorized with regard to three referent objects (table 10.1).

10.3.1 Critical Deconstruction of the State-centred Environmental Security Concept

Based on realist theory, the traditional version of the concept focuses on state stability, its territorial borders, and sovereignty, and understands environmental threats as a threat to the state. The dominant research has focused on the relationship between environmental issues and inter- or intra-state conflict.⁸ The approach stresses the immediate achievement of goals and concrete short-term problems of interest to the state. Causes of threats may be rogue states, terrorists, or GEC, leading to tension or conflicts and extreme poverty, which in turn themselves reinforce environmental problems. Addressing the threat requires strong military agencies and state action, which would either focus on defence or intervention strategies⁹ against the agents increasingly responsible for environmental threats in the South, e.g. in China and India. Based on soft politics, the alternative would be multilateral cooperation through voluntary means. In sum the state-centred version of the environmental security concept differs from the traditional security concept by incorporating an environmental dimension.

As a consequence a major limitation is that it does not present solutions to global environmental challenges, because it sticks to the traditional security focus. The environment is only considered as the cause

6 The *target group* differs from the referent object in the sense that it is not the object to be secured, but the group to which the concept is applied to, and on whom the principal research and political focus rests. It points to the difference between the initial theoretical definition and the consequence of the practical application.

7 Glenn, Jerome C.; Gordon, Theodor J.; Perelet, Renat, 1997-1998: "Environmental Security Study - Emerging International Definitions, Perceptions, and Policy Considerations. Executive Summary" of: *The Millennium Project*; at: <<http://www.millennium-project.org/millennium/es-exsum.html>> (12 January 2011).

8 See Homer-Dixon (1993, 1994) and Bächler (1998). While Homer-Dixon analysed violence between and within states, based on environmental scarcity and population growth, the Swiss *Environmental Conflict Project* (ENCOP) focused on the interrelations among environmental degradation, maldevelopment, and violent conflict (Bächler 1998: 24).

9 For a discussion of ecological intervention see the impressive review of different scenarios, if the human security principle of 'responsibility to protect' were to be linked with environmental issues (Eckersley 2007).

Table 10.1: Critical deconstruction of three versions of environmental security. **Sources:** Elaborated by the author based on a review of the literature (Barnett 2000, 2001; Buzan/Wæver/de Wilde 1998; Dalby 2002, 2009; Dalby/Brauch/Oswald Spring 2009; Pirages/DeGeest 2003).

Environmental security concept		State-centred	Human-centred	Eco-centred
Referent object		State	Human beings as part of society (from the individual to all kinds of social institutions, networks, structures etc. up to global level)	Environment
Which values are defended?		Territoriality, political sovereignty	Human well-being; health; human rights; human development	Intrinsic values of the biosphere; ecosystems; biodiversity etc.
Security theory and security schools		Horizontally extended traditional concept of security; securitization in CoS	Horizontally and vertically redefined security concept; CSS	Horizontally and vertically redefined security concept
Threat of what?		Inter- or intra-state war; physical violence; state failure; limitation or loss of state sovereignty and power; natural catastrophes and disaster; resource scarcity; biological and chemical weapons; bioterrorism	GEC as threatening the human species and basic human needs or necessities such as water, food, air, health, and the life support system; increase of poverty, injustice, structural and physical violence; migrants; war; social stresses; particular focus on relationship between North and South	Changes of the status quo of bio- and geophysical global environment; different ecological processes such as species extinction; environmental degradation (GEC)
Cause of threat	Agency	Rogue states or failed states and terrorists, primarily in the South	Particular focus on North – South relations; transnational corporations	Human activity
	Structure		International political and economic structure; gap between North and South, rich and poor; international policy determined by the industrialized countries; global injustice; politics dominated by and focused on states instead of global society/individual	Massive structural exploitation and pollution of nature
	Other processes	GEC in combination with extreme poverty, which results in resource scarcity, reinforces environmental problems and leads to tensions within and between states; intended and unintended action; short-term	Industrialization history; prevailing development paradigm of economic growth and ‘western’ lifestyle; political and societal ignorance of serious degree of GEC; lack of political will and consciousness in society of necessity of change; lack of responsibility; politics not based on prevention principle; high vulnerability; long-term threats =>societal	Damage to ozone layer; pollution of water and air; overfishing; desertification; deforestation; temperature increase; unintended war; long-term threats

Environmental security concept	State-centred	Human-centred	Eco-centred
Established/ relevant theories and research lines	Humans apart from nature; link between environmental degradation and violent conflict; environmental degradation as a threat to the industrialized states, or as a threat for the developing states; limits to growth; doom spiral of poverty-environmental problems	Humans as part of nature; GEC as a challenge for global society; link between environmental degradation and cooperation, development and peace; link between under-development, poverty and environmental degradation; gender studies; link between under-development, poverty, wealth, and environmental degradation; war as a cause for environmental degradation; justice; North-South relations, ecological debt	Humans separate from nature; focus on the relationship between humans and nature
International Relations theory	Realism; Liberalism	Liberalism; Structuralism; Constructivism; Critical theory; Feminism	Radical Ecology and Critical theory; Green theory; Eco-feminism
Research disciplines	Peace and Security Studies; Environmental Politics; Cooperation; Economics	Peace and Conflict Studies; Environmental Politics; Environmental Cooperation; Development Studies; Equity/justice issues; Critical Studies; Gender Studies; Environmental Economics; Sociology	Environmental Sciences; Gender Studies
Answers or solutions to GEC	Military and traditional security measures; strong security agencies; politics of interests and power; cooperation between states; voluntary measures for environmental protection	Structural change; applying the principle of responsibility and preventive political style; change of lifestyles and new development paradigm based on model of contraction and convergence ^{a)} and decoupled from growth; long-term prevention; equity; rule of international law=> social transformation	Reduce biodiversity loss; CO ₂ emissions reduction; reforestation; environmental protection measures; sustainable development...
Target group	Rogue states, failed states and terrorists, primarily in the South	North; transnational corporations; South	Humankind as a whole

a) The model proposed by Sachs and Santarius (2007) is based on the premise of equality between industrial and developing countries concerning the degree of consumption of nature. The industrial countries would have to contract to reduce their consumption, while the developing countries could improve or converge their consumption of natural resources. In the context of GEC, however, the model has to include the ecological impacts and externalities apart from mere consumption of resources.

of violent conflict and as threatening the state through natural hazards. However, neither the factors of impermeability nor territoriality have analytical value when facing climate change (Dyer 2001: 442). This realist understanding of environmental security

ignores the vertical reinterpretation and redefinition (with regard to the international level or the individual) of the security concept. The horizontal extension of security from the military to other sectors has only happened to a very limited degree, and so does not re-

spond to the main characteristics of the new threats, which were the reason why a redefinition of the security concept was considered necessary.

Concerning the causes and responses to GEC, the absence of efforts to initiate change is totally unacceptable from a CSS perspective. The strategy of voluntary multilateral cooperation currently dominates global environmental politics, but this does not lead to necessary and effective responses. The alternative of building strong security agencies for environmental threats will not lead any further, as there is no military solution to environmental threats. On the contrary it would secure “the processes that destroy the environment and create insecurity for the many for the benefit of the few” (Barnett 2001: 122). Indeed, as several other authors point out (Dalby 2002, 2009; Sánchez 1998; Barnett 2000, 2001, Barnett/Adger 2007; Floyd 2008), the key instrument of the classical security agenda is one of those human institutions with a major detrimental impact on the environment during peace and war. It also consumes a huge amount of money, which is thus not available for other uses to tackle environmental problems, e.g. for research, development cooperation, or reforestation projects.

10.3.2 Critical Deconstruction of the Concept of Human-centred Environmental Security

The human-centred version of environmental security focuses on human society, encompassing individuals as well as all other forms of social agents, organizations, structures, and systems. It does not address the link between environmental issues and conflicts (Barnett 2001: 128) as primary concern. Insecurity is defined as the vulnerability of people in relation to the effects of environmental degradation and facing the environmental crisis as a social fact (Barnett 2001: 17), which requires social answers. Security is understood in the sense of ensuring the basic necessities of living.

This version deals with issues which so far have not been related to the security context (Terriff/Croft/James 2005: 119) by addressing the asymmetric relationship between actors and victims, of externalities and characteristics in universal spatial terms as well as in intergenerational temporal terms (Vogler/Imber 1996: 27).

An important challenge is the required multidisciplinary approach (drawing on natural and social sciences) for implementing the concept. A major potential is the relationship established between GEC, cooperation, and peace, which so far has received lit-

tle attention in contrast with the environmental-conflict thesis. Conca (2001), Conca and Dabelko (2002), and Conca, Carius, and Dabelko (2005) called for an ‘environmental peace-making’ agenda, where environmental cooperation is understood as a fundamental element for peace building as a starting point. The research focus thus turned towards the innumerable examples in human history where severe environmental stress did *not* lead to conflict. This is also highlighted by Aguirre (2006: 10), who points out that global governance in the international system is most developed in the environmental sector.

The hope that a better world can be achieved by environmental cooperation goes even further and manifests itself in a dream of harmony among people. Global security is seen as a motivation for cooperation between North and South, rich and poor, based on the environment as a universal value (Dyer 1996: 28). The changing climate strengthens the idea of humanity because the environment obliges societies to be more cooperative, equal, and just. Even though this argument is obviously very idealistic, the creation of ideals and utopias points towards changes that are needed in the international environmental sphere, and it can be closely linked to the line of argument of CSS that identifies what should be, in contrast to what is at present, understood as security. The fundamental aim is a normative change in the current structure.

The main causes of threats are rooted in human society and GEC is only an entry point, rather than the problem itself. The aim is to apply the environmental lens to human society, without stopping to deal merely with symptoms, as one of which GEC has to be understood. Reforestation, for example, is understood as a partial solution which would lead only to momentary relief of the general crisis.

From a critical perspective the causes lie in the social structures, with a strong consciousness of and focus on not only future trends but also with questioning of the causes and responsible agents of the past and the present. The primary focus rests on the cycle between wealth and GEC. Contrary to the neo-liberal message, industrialization and the dominant development paradigm of growth are crucial determinants for creating and maintaining the structural conditions for environmental deterrence and for the gap between a secure North and an insecure South. The North is being accused of being the principal agent causing the environmental problem by having enriched itself through a process which it now tries to deny to others (Desai 1998: 196).

As the solution lies in the search for a fundamental change within society by rejecting the dominant institutional or societal structures (Detraz 2009: 355–6), this version of environmental security points to necessary requirements in the Anthropocene and to the normative aspirations of CSS. Some of the most important steps are to accept the historical facts of industrialization and to transform the development paradigm by decoupling it from growth, based on the model of convergence and contraction (Sachs/Santarius 2007) and quality of life, long-term prevention, and a strong focus on issues of intra- and intergenerational justice (table 10.1.).

10.3.3 Critical Deconstruction of the Concept of an Eco-centred Environmental Security

The third version is closely tied to Deep ecology and focuses on securing the environment, the biosphere, ecological processes, etc. What is threatened can differ from concrete objects, such as a species, different types of habitats (lakes, tropical rainforests etc.), or ecological processes such as global climate change (Buzan/Wæver/de Wilde 1998: 23).

This version explains and raises awareness of the necessity of addressing the ongoing detrimental environmental process and of focusing on and questioning the dominant relationship between humans and nature, arguing for an eco-centric approach. However, several theoretical difficulties emerge in implementing the policies that secure particular interests in the absence of a political or moral agent (groups, states, or other actors) (Dyer 2001: 446). Besides its doubtful rationale there are two main reasons why environmental issues are always linked to security from an anthropocentric position. From an ecological perspective, ‘threats’ or ‘disasters’ do not exist, because changing the status quo is part of the ecological processes and nature cannot be *destroyed*. It is a socially constructed concept, which differs in perception and constitution depending on cultural, religious, political, and individual backgrounds and the degree of vulnerability. As it is impossible to argue on behalf of the supposed ‘interests of mother Earth’, anthropocentric interests are always involved. The real motivation cannot possibly be what is claimed, because it is always made by an anthropocentric agent. This theoretical inconsistency is not helpful because it automatically leads to the suspicion that, in the words of Robert Cox (1981: 128), the theory was established “for *someone* and for *some purpose*” different from what it claims. When critical

analysis is applied to the deconstructed content of an eco-centred environmental security concept, it becomes clear that this approach stops with the symptoms of GEC pointing to environmental protection measures necessary to secure the environment.

After the exploration of the environmental security concept and the critical deconstruction of the three versions in the context of GEC, only the human-centred environmental security approach can be seen as a coherent concept and with the potential to include and address the root causes of GEC by addressing the necessity for a transformation of society. As it was argued for the other two versions, the answers, the agents, and the structures are limited in their ability to provide the necessary focus on the social structures with an emancipatory goal of change.

10.4 The Human Security Concept and Its Environmental Dimension

The human security concept was launched by the *United Nations Development Programme* (UNDP 1994), which claims that its goal is to achieve a society which comprises ‘freedom from fear’ and ‘freedom from want’. Even though these two ‘pillars’ are the most commonly referred to in practice, others were suggested and added later. The Commission on Human Security (CHS 2003) further developed this argument pointing to the right of people to develop and improve their own situation as the ‘freedom to take action on one’s own behalf’ within the ‘development’ pillar. A third pillar ‘freedom to live in dignity’ (Annan 2005) includes the human right and international law agenda, while the United Nations University’s Institute of Environment and Human Security (UNU-EHS) proposed a fourth pillar of ‘freedom from hazard impacts’ that adds an environmental dimension. The original UNDP concept comprises seven interrelated dimensions (table 10.2.).

The great potential of the human security concept is understood as highlighting the interconnectedness of these dimensions and shifting the focus from the state to the individual. It aspires to address the principal roots of the problems, presents answers, focuses on the poor, powerless, and vulnerable, and establishes a direct link between development and instability (Ryerson 2008: 268). The much-cited definition of the CHS is to protect fundamental freedoms of the people from widespread and severe threats by building on people’s aspirations and strengths in order to “give people the building blocks of survival, livelihood

and dignity” (CHS 2003: 4). However, the strength of the concept of human security lies not only in the new elements proposed but in the incapacity of the traditional concepts to generate adequate answers and solutions to the new challenges, such as poverty, global diseases, terrorism, and GEC.

The concept is based on liberal and humanistic ideals (Pérez 2006: 64) and claims to join a) the peace research agenda with that of conflict resolution and transformation; b) the studies and practice of development with development cooperation; and c) the fight for human rights, democratization, and good governance (Grasa 2006: 13). Closely connected to these articulations is the principle of “responsibility to protect” of the Report of the *International Commission on Intervention and State Sovereignty* (ICISS 2001) that relies on the (in traditional security terms) radical assumption that ‘rogue’ or ‘failed states’ can be considered as a threat to the individual. The UN endorsed the notion of the “responsibility to protect” as an emerging norm and thereby extended the initial definition of human security by highlighting the obligation of states to protect their populations (UN 2005: 31).¹⁰ It further attributes to the global community the responsibility of protecting world citizens, which allows in extreme cases state sovereignty to be ignored so as to permit a humanitarian intervention for the sake of the people.

Human security has been widely debated and was criticized for its encompassing and therefore fuzzy character, introducing too many variables that are not necessarily related or may even be competing with each other (Dalby 2002). Its usefulness for policy analysis and its difficulty of implementation may result in misuse and may offer a pretext for intervening in the affairs of sovereign states. This has been one main reason why many developing countries have reacted with caution to the human security concept (Grasa 2006; Brauch 2009). This poses a contradiction to the motivation and goals most of its supporters claimed. However, there are other fundamental weaknesses and risks embedded in the concept of human security that will be discussed next.

10.4.1 Exploration of the Environmental Dimension of the Concept of Human Security

In the initial UNDP report the environmental dimension is referred to as a combination of local ecosystems degradation and global system, with a focus on the threats within countries such as water pollution and scarcity, air pollution, deforestation, salinization, droughts and floods, storms, and natural disasters (UNDP 1994: 28–29). But so far very few scholars have exclusively addressed the environmental dimension of human security. GECHS and UNU-EHS have been most prominent in exploring and developing politically the environmental dimension of human security (Bogardi/Brauch 2005; Brauch 2005, 2005a, 2009a: 32; Bogardi/Birkmann/Gebert 2009). In order to gain a deeper understanding of how the environment is conceived from a human security perspective, the following section analyses its four pillars.

10.4.1.1 Freedom from Fear

The environment is referred to as a cause for inducing tensions and conflicts. Together with the principle ‘responsibility to protect’ the dominant link to the environmental-conflict theory and to the state affinities becomes obvious. For the Commission on Human Security “human security and state security are mutually reinforcing and dependent on each other” (CHS 2003: 6). This pillar is close to a state-centred environmental security concept and to the traditional security concept with all its difficulties and weaknesses (see 10.3.1. above).

10.4.1.2 Freedom from Want

The main focus is on development, which is clearly growth-oriented. From a neo-liberal perspective, economic growth is seen as one of the answers to GEC. The restriction of ‘pro-poor growth’ or ‘growth with equity’ refers to the human development concept (CHS 2003: 1, 149) and the adding of sustainability as an adjective points to a certain degree of taking natural-physical limits and equity issues in account. However, they are not specified any further than the necessity of reversing environmental degradation and resource depletion in relation to health issues and to safeguard access to natural resources. But the fact that structural violence is recognized as a cause of GEC is a step in the right direction. It further recognizes the unequal distribution of benefits from natural resources as a structural cause and advocates protection and empowerment for the vulnerable.

10 United Nations General Assembly, 2005: *World Summit Outcome*, Resolution adopted by the General Assembly, A/RES/60/1, 24 October 2005; at: <<http://daccess-dds-ny.un.org/doc/UNDOC/GEN/No5/487/60/PDF/No548760.pdf?OpenElement>> (January 2011).

Table 10.2: Critical deconstruction of the human security concept. · **Sources:** Elaborated by the author based on UNDP (1994), GECHS (1999), CHS (2003), Annan (2005), Brauch (2005, 2005a, 2009c: 983), Leichenko and O'Brien (2005), Grasa (2006), Barnett and Adger (2007), and Hearne (2008), and on Matthew, Barnett, and O'Brien (2010).

Human Security Concept		Freedom from Fear	Freedom from Want	Freedom to Live in Dignity	Freedom from Hazard Impacts
Referent object		Individual, humankind, human being			
Which values are defended?		Human rights; rule of law; survival	Sustainable development	Human rights, rule of law, sustainable development; democratic rights	Sustainable development; survival
Basic theory		Peace and Conflict Studies	Development Studies; Gender Studies	Law Studies	Environmental, Hazard, and Disaster Studies
Threat of what?		Physical violence	Growing extreme poverty; underdevelopment; structural violence; resource scarcity; diseases	Growing poverty; underdevelopment; structural violence	Environmental hazards (rapid and slow onset ^a), industrial/technological (human-made) accidents
Cause of threat	Agency	States, 'rogue'/'failed states'; international terrorism; armed forces; criminal networks	Transnational corporations; North and South	'Rogue'/'failed states'; international terrorism	Nature; human actions
	Structures	Politics of human rights, humanitarian rights and violation of international law; forced resettlement; global hegemony over resource control through international agreements; power relationships; economic injustices and inequalities	International economic system; global hegemony over resource control through international agreements; power relationships; patriarchy; unfair distribution of benefits; unequal trade arrangements; unequal access to resources; economic injustices and inequalities; discrimination; poverty; inequality	Politics of human rights, humanitarian rights and violation of international law inequitable distribution of resources, lack of institutional support, and political oppression; forced resettlement; marginalization; patriarchy; unequal access to resources; economic injustices and inequalities; discrimination	Inequitable distribution of resources, lack of institutional support; increasing demand for agricultural products; settlement in disaster-prone areas
	Other Processes	Corruption; weapons proliferation; illegal trafficking of resources	Corruption; terrorist attack; illegal trade of resources; market and policy failures; unchecked population growth; excessive international migration; urbanization	Corruption; illegal trade of people	Vulnerability; poverty; migration; population growth; lack of knowledge; uncontrolled development and urbanization
Established/relevant theories and research lines		Principle 'responsibility to protect'; peace research with conflict resolution and transformation	Democracy and good governance link with development studies and practice of development with development cooperation; Vulnerability assessment; resilience building	Principle 'responsibility to protect'; link between human rights, democratization, and good governance	Link between poverty and environmental degradation, pollution etc.; vulnerability assessment; resilience building

Human Security Concept	Freedom from Fear	Freedom from Want	Freedom to Live in Dignity	Freedom from Hazard Impacts
International Relations theory	Liberalism is dominant; to a certain degree: Critical theory ^{b)} , Structuralism and Feminism			
Environmental dimension	Focus on natural resources or GEC as inducing tensions, stress, and conflicts	Healthy environment and access to natural resources as a necessary precondition for sustainable development and health	Right to a healthy environment and access to natural resources	Environment as a cause of disasters and threatening survival; access to natural resources as a necessary precondition for livelihood
Answers or solutions to GEC	Concerted action; compliance of treaties such as non-proliferation of nuclear, biological, toxic, and chemical weapons; 'responsibility to protect'	Implementation of UN resolutions; greenhouse gas stabilization and reduction; protection and empowerment especially of women; development; democratization and good governance; poverty eradication; economic growth; social vulnerability reduction; resilience; strong institution building; education; public information; preventive diplomacy; humanitarian support; aid investment	Effective law enforcement; empowerment; development, democratization and good governance; education; public information; 'responsibility to protect'	Effective legally binding climate policies; empowerment; development; early warning systems; disaster response and preparedness; reduction of social vulnerability; resilience; enhancing knowledge
Dimension focused on	Personal; Community	Food; Economic; Health	Political	Environmental
Target group	Poor; vulnerable; powerless; underdeveloped; marginalized; discriminated people; communities of distress, migration, disaster, crisis and conflicts			

a) Rapid-onset hazards are categorized as *hydro-meteorological* (increase of extreme events: storm, floods etc.) and *geophysical* (earthquakes etc.) hazards. Slow-onset hazards include temperature increase and sea-level rise due to climate change, requiring adaptation, mitigation, and long-term strategies for reductions of greenhouse gas (GHG) emissions (Brauch 2005: 40).

b) See Newman (2010), who points to the necessity of more engagement with CSS and human security, whereby human security is heavily criticized.

10.4.1.3 Freedom to Live in Dignity

With regard to 'threats' of 'causes' this pillar is close to the two previous ones, but a legal dimension is added. However, within the human security concept this seems not to be recognized as a powerful and fundamental tool for finding solutions to GEC and it gets drowned within the all-encompassing 'fight for human rights' and democratization. Here again it becomes clear how weakly explored the environmental dimension is.

10.4.1.4 Freedom from Hazard Impacts

This pillar adds important facets by pointing to the vulnerability of early warning systems. In facing GEC, its proponents call for disaster response and preparedness, a reduction of social vulnerability and resilience building (Brauch 2005). Improving human security for those who are at risk is closely connected to addressing GEC. Environmental hazards are often human-induced due to a lack of preventive measures, resulting in natural disasters being partly triggered by anthropogenic climate change. The causes of these threats are a high degree of vulnerability and uncontrolled popu-

lation growth, but also an inequitable distribution of resources and a lack of institutional support. Being mainly focused on the physical factors of GEC it stresses the reliance on the environment of resource-dependent people.

Within the human security debate the environmental dimension has played a minor role. Although the environment directly supplies the basic conditions for human existence, for food, health, and livelihood, it is often reduced to natural resources that are crucial for people's livelihoods, or to the detrimental physical impacts of disasters etc. (CHS 2003: 16–17). The solutions to GEC are mainly limited to the symptoms and the societal consequences of a limited target group. Further the notion of 'freedom of future generations to inherit a healthy environment' was not taken up.¹¹ Therefore, the further development and strengthening of the environmental dimension of human security remains an important task (Brauch 2009c: 989).

10.4.2 Critical Deconstruction of the Human Security Concept in the context of the Anthropocene

The human security concept shows important weaknesses and risks regarding GEC. The first refers to the interconnectedness of all dimensions and 'pillars', which does not allow a problem to be addressed from one research angle alone and to be delimited against the others. This becomes especially open to the risk that connecting environmental issues with security may lead to a militarization or environmental intervention rather than to humanitarian strategies (Detraz/Betsil 2009: 315). As the concept is inclusive, the militarization risk remains. This becomes more apparent on the basis of further argumentation.

A major weakness is the limited *target group*. By restricting the overall focus on vulnerability assessment, resilience building and emancipating the poor and powerless, the wealthy are excluded. The wealthy are usually relatively *secure*, and all seven dimensions of human security are almost achieved. As they do not directly depend on the environment for food, water, and shelter, and mostly live in urban centres, they

have better capacity to adapt, e.g. to relatively slow changes such as temperature increase.¹²

At the same time it is crucial to bear in mind that the North has been the main contributor to GEC. Its ecological footprint, resource colonialism, and pollution export can hardly be neglected (Simonis 2007: 13). The interrelationship between wealth and environmental threats has so far hardly been addressed from a human security perspective though it might be the more important one.

According to the literature, most of the causes and threats prevail in the South and therefore require actors from *outside*, who *inform*, *protect*, and establish economic growth and good governance. If this implies that those with the 'know-how' and the resources should be in charge, this would directly lead to what Newman (2010: 93) calls the 'central paradox' of human security: although structures and norms that produce human insecurity are challenged, the remaining and enforcing effects of the traditional power structures on the vulnerable may achieve the opposite effects to the emancipatory aims, disempowering the vulnerable even more (Ryerson 2010: 183). This leads to strong criticism from a CSS perspective (Wibben 2008) because the concept is "unable to provide the basis for substantive change of the system of international security (Ryerson 2010: 169)" and does not "fundamentally" question institutions of power and existing structures (Newman 2010: 89).

The strength of the concept lies in raising awareness and fostering research on the principal victims and those most exposed to the impacts of GEC, on vulnerability assessment and resilience building, and on how traditional security practices contribute to insecurity. Another positive effect can be seen in raising awareness and understanding of the existence of linkages between poverty, migration, and environmental problems. However, the consequences of framing poverty and migration as threats are likely to lead to contrary outcomes (Smith 2007) because the response clearly comes from the powerful. Under a new pretext, they can go on managing the lives of others so as to achieve different kinds of 'freedoms for' them (contrary to what the CHS stressed). The goal is ensuring security *over there*, in order to secure security back home (Ryerson 2010: 186). "Global human in- and security is therefore positioned as external to

11 See Kofi Annan, "Secretary General Salutes International Workshop on Human Security in Mongolia", Two-Day Session in Ulan Baator, 8–10 May 2000, Press Release SG/SM/7382 (New York: UN); at: <www.un.org/News/Press/docs/2000/20000508.sgsm7382.doc.html> (January 2010).

12 The threats from environmental disasters are not taken into account; the example of Hurricane Catherina, which destroyed huge parts of New Orleans, showed how vulnerable the "rich" can turn out to be.

the western hegemonic block, arising either through the untameable forces of globalization or resulting directly from the bad governance of identifiable rogues in the global south” (Grayson 2008: 395).

As was argued above, this critical deconstruction has clearly shown that human security, as an exclusionary concept, will not be able to address the structural root causes of GEC. It seems that the concept has halted at the research stage, where the poor and marginal populations were the problem.¹³ It is however clear that the majority of the causes of environmental problems are principally related to the generation and distribution of wealth, knowledge, and power, and also guidelines of energy consumption, industrialization, demographic growth, prosperity, and poverty (Greene 2005: 453).

10.5 Conclusion

The critical deconstruction of both concepts resulted in a classification of different categories, which attempted to clarify the structure and to prevent confusing theoretical contents, potentials, and risks. The critical deconstruction of environmental security showed that only the human-centred version addresses the social and therefore underlying root causes of ‘environmental threats’ in the context of GEC. Only this version covers the new challenges and comprises an operational anthropocentric referent object that grasps the ‘new’ role of humanity in shaping its own habitat. This is implied in questioning existing power structures and invoking societal changes on the basis of emancipation and environmental justice. The state-centred and the eco-centred approaches only deal with the symptoms of GEC and therefore lack a theoretical and operational ability to address these challenges.

A main conclusion drawn from the critical deconstruction of human security is its exclusionary character with regard to its limited *target group*: the insecure and therefore mostly poor, powerless, and marginalized people. Even though this is a very important focus, the claimed ‘universality’ of the concept is lacking, in terms of including all human beings, as the security of the wealthy is usually well guaranteed. The relationship between wealth and environmental insecurity cannot be addressed by the human security con-

cept. A notion of justice-equality-universality exists in the sense that the same rights, necessities etc. should be applied to all human beings, but it is not addressing the structural causes within the global society, which are contributing to and resulting in reinforcing the gap between North and South.

However, the concept of human security is re-orienting the discussion from a *defensive* to an *integrative* understanding of security (UNDP 1994) and from the state to the people. It has therefore broadened, shaped, and altered security narratives and practices (Ryerson 2010: 171) and played a crucial role in the process of problem recognition, contextualization, and policy framing (Brauch 2009c: 989), and has highlighted the situation of the poorest and most vulnerable to GEC.

Important changes within the concept would have to be carried out in order to meet the challenges posed within the Anthropocene. The first one would be to include the dominating actors and structural causes into the *target group* and to redirect the research towards how to tackle the challenges effectively. The second one would be to strengthen the environmental dimension of human security to the extent that the environmental dimension is recognized as the operating basis for human activity (and therefore for human security). In addition the human security approach is analytically weak in the context of the Anthropocene, because anything that presents a critical threat to one of the seven dimensions is seen as a security threat. In contrast, human-centred environmental security has a clear focus on securing the living basis of human existence.

The critical analysis of how both concepts tackle the root causes of GEC showed some fundamental differences. Even though both aspire to change reality, human security is an exclusionary concept with a limited focus on empowering and protecting the vulnerable and the powerless. So while it is important to be aware of the vicious circle of poverty and environmental insecurity, the relationship between wealth, the current dominant development paradigm of growth, and environmental insecurity is from a historical and present perspective much more decisive. The human-centred concept of environmental security is more encompassing and can address both and more cycles. It has a broader scope in defining the agents, phenomena, or institutions that are causing GEC because it applies the environmental lens to human society. It can rather be understood as not only providing the basic condition for human security, but also as encompassing it.

13 See for example Brainard, Chollet, and LaFleur (2007). According to them the link between environmental threats and poverty is a doom spiral.

The conclusion is that of all concepts revisited, the human-centred environmental security approach has to play a key role as a theoretical framework in the context of the Anthropocene. Security in this context cannot be achieved by maintaining or restoring order but has to be understood as changing and opposing them and taking environmental justice as a basis for achieving human-centred environmental security.

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11 Political in Nature: The Conflict-fuelling Character of International Climate Policies

Linda Wallbott

11.1 Introduction¹

Climate change is a political issue and currently a hot cake of the international debate. Agenda-setting surrounding this issue, framing of the problem, determination of the character of the crisis, and the possible solutions that are put on the table are subject to multilateral negotiations. Science points out that warming of the climatic system is unequivocal, and it is similarly clear that this is mostly due to human-made emissions of atmospheric *greenhouse gases* (GHG), mostly CO₂ (IPCC 2007).² Furthermore, the indications are that while global temperature will remain at below 2°C above the pre-industrial average, even this scenario will lead to significant consequences and rapid as well as slow-onset hazards, including:

- Rise in sea level by 0.18–0.59 m (IPCC 2007, 2007a, 2007b, 2007c) or even by 0.4–1.4 m by 2100 (Rahmstorf 2007: 18).³ The implications are

inundation, erosion, saltwater intrusion, and intensified storm impacts.⁴

- Loss of genetic, species, and ecosystem diversity due to an estimated 20–30 per cent extinction of the world's species (IPCC 2007d: 11).
- Increase in frequency, intensity, and length of severe weather events such as heatwaves, droughts, extreme rainfall events, floods, and tropical storms (IPCC 2007).

These developments put enormous stress on natural and social as well as political systems since they affect agricultural patterns, food, water, health, and human security. To avoid a rise above 2°C, OECD countries would need to reduce their emissions (*mitigate*) by 25–40 per cent compared with 1990 levels by 2020. Before 2050 developed countries would have to cut their emissions by at least 50 per cent below 2000 levels in order to stabilize GHG at between 445 and 490 ppm⁵, which would still result in an estimated global temperature rise of 2–2.4°C. Hence, in any case, people will have to cope with changing habitats and livelihoods (*adapt*).

This chapter offers a conceptual and macro-level standpoint to argue for the need for a *balanced* policy approach that equally considers mitigation as well as socially sensitive adaptation policies.⁶ While the relevance of reducing GHG emissions is not neglected, special consideration for adaptation to climate change

1 The author is grateful to the participants of the International Conference 'Climate Change, Social Stress and Violent Conflict: State of the Art and Research Needs' at Hamburg University on 20 November 2009 and to two anonymous reviewers for their valuable comments.

2 Some even reject the framing of climate change as 'human-made', given that "[b]laming the human species conveniently eclipsed the fact that only a tiny sector of the species actually bears a disproportionate historic responsibility for the dumping of greenhouse gases in the atmospheric commons (...) [i]t stalls any real confrontation with existing political systems, the hierarchized distribution of wealth, and the enormous power of the international oil cartel and associated extractive industries (...)" (Longfellow 2006: 2; see [table 11.1](#) below).

3 EG Science, 2008: *The 2°C target. Background on Impacts, Emission Pathways, Mitigation Options and Costs*, Information Reference Document (Brussels: EU Climate Change Expert Group), at: http://ec.europa.eu/environment/climat/pdf/brochure_2c.pdf (20 February 2010).

4 The population of small island states is especially vulnerable to these developments. In the Maldives and Papua New Guinea for example, some 50–80 per cent of the land area is less than 1 m above mean sea level (UNFCCC 2005: 14). In the Pacific, more than 50 per cent of the population lives within 1.5 km of the shore coast (PSIDS 2009); on a global scale one fifth of the population lives in coastal zones (EG Science 2008: 18).

5 At present the atmospheric concentration of CO₂ amounts to 384 ppm, an increase of 104 ppm compared with pre-industrial times (WBGU 2009).

is justified for *pragmatic, instrumental, and normative* reasons, which will be elaborated below. Climate change and disaster reduction policies⁷, especially in an instrumental approach, need to consider social and political processes in order not only to minimize vulnerability, but also to reduce the likelihood of political unrest, acting in place of sustainable conflict prevention. The required institutionalized and coordinated political activities aimed at strengthening the resilience of individual and community units need to anticipate and prevent possible negative (side-)effects on intermediate conflict-promoting factors. Special attention should be paid to social horizontal (in)equality, as two recent quantitative large-N studies have revealed the importance of this factor for the outbreak of violent civil conflict in general, and specifically in the context of a natural disaster (Østby 2008; Nel/Righarts 2008). However, it will be argued that this has not been realized so far. Climate change and its ef-

fects continue to be dominantly framed as ecological problems – and not also as a societal crisis – which can be countered entirely through measures that fit into the existing economic system, without addressing existing or imminent inequalities. As such, the crisis is regulated through “hegemonic forms ... which correspond to neoliberal political concepts” (Brunnengräber 2006: 214) and benefit the commercialization of climate change and natural disaster issues.

Against this background, the aim of this chapter is to reveal how the framing of climate change has changed over time, but also how the actual policies employed have nevertheless continuously safeguarded the hegemonic and paternalistic character of this policy field. This, it will be argued, inhibits the prevention of social conflicts which might be fuelled through climate change and natural disasters, because neither mitigation nor context-sensitive adaptation is thoroughly implemented. Even though the relevance of national and local processes for policy implementation and conflict dynamics is undisputed here, it is beyond the scope of this chapter to provide detailed case studies to support the theoretical argument and empirical findings of macro-level processes (for regional studies see e.g. chapters 5 and 17).

This chapter proceeds as follows: first, based on secondary literature analysis, a sketch will be offered showing how the framing of environmental change and challenges shapes the definition of problems and solutions at various political levels (11.2.1), followed by an elaboration of the climate change-security nexus (11.2.2 and 11.2.3). Based on this assessment, three reasons for the implementation of context-sensitive adaptation policies are developed and highlighted (11.2.4). Then the evolution of international climate change policies (11.3.1) will be traced, subsequently revealing through primary data analysis and secondary literature analysis that the formal commitments for both mitigation and adaptation have not been followed by agreed practices (11.3.2 and 11.3.3). This will finally feed into a critical assessment of the hegemonic and paternalistic structures that underlie this policy field (11.4).

6 ‘Adaptation’ itself is not defined in the two main documents on global climate governance, the *UN Framework Convention on Climate Change* (UNFCCC) and the *Kyoto Protocol* (KP). For definitions in the IPCC Reports see Brauch and Oswald Spring (2011). As a result, various scientific and policy communities may use the term differently, contributing to incoherent activities that form part of the problem to be elaborated in this chapter. In addition, different connotations entail different expectations from different stakeholders towards the impact of ‘adaptive’ measurements (Burton/Diringer/Smith 2006; Levina/Tirpak 2006; Huq/Rahman/Konate et al. 2003). In this chapter adaptation is understood as comprising changes in “processes, practices, or structures to moderate or offset potential damages or to take advantage of opportunities associated with changes in climate” (IPCC 2001; for definitions in the IPCC Reports see also Brauch and Oswald Spring 2011). As such it involves adjustments to decrease vulnerability in key sectors like health, agriculture, water/sanitation, and housing, and equals disaster risk reduction (DRR) in important aspects. On the conceptual and practical similarities and differences between adaptation and DRR see Ireland (2010) and Schipper (2009). In this chapter the terms “adaptation” and “DRR” will be used interchangeably.

7 A natural disaster can be defined as “a situation or event which overwhelms local capacity, necessitating a request to national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering [when] at least 10 people are reported killed, 100 people reported affected, a state of emergency has been declared, or a call for international assistance has been issued” (Centre for Research on the Epidemiology of Disasters, in: Buhaug/Gleditsch/Theisen (2008: 10)).

11.2 Discourses on Environmental Change and Human-Ecological Relations: Climate Change and Natural Disasters as Political Issues

Depending on the discursive ‘construction’ of the nature-society relationship, how global environmental

change and challenges are understood and what recommendations for problem-solving action are made both vary. Climate change can be regarded as a “terrain of conflict on which social struggles are taking place over the interpretation of the problem and the ‘correct’ plan for solving it” (Brunnengräber 2006: 217). The next section will depict how the interpretative framing of the relationship between climate change, hazardous natural events, and accompanying political processes has changed over time.

11.2.1 Framing Hazardous Natural Events and Vulnerability: From External to Political

Modern western thinking has conceptualized ‘nature’ as predominantly *external* to the social sphere, a perception that facilitates the view of dominance and control of society over nature (Arndt/Mayer 2009). Not least “the enlightenment ideal of human emancipation and self-realization was closely linked to the idea of control and use of nature” (Oliver-Smith 2004: 13). This notion “led to a construction of hazards as disorder – as interruptions or violations of order by a natural world that is at odds with the human world” (ibid.). Natural disasters are understood as the result of ‘the violent forces of nature’ or humankind’s misunderstanding of natural forces and the inadequate handling of the environment (Wisner/Blaikie/Cannon et al. 2004). Building on this conception, a naturalist and biophysical view dominated the literature up to the 1970s. The construction of mathematical models of demographic, social, economic, and ecological trends forms the basis of an ‘Earth system’ science, making possible the projection of the way in which human activities will affect biological and physical conditions and processes (Wisner/Blaikie/Cannon et al. 2004). This identification of physical hazards, perceived as external forces, entails the use of technological forecasting instruments to reduce susceptibility to their negative outcomes, and to actually control the risks. Environmental challenges are met with the call for better science and technology, based on “the belief that if scientific knowledge can be developed enough to reduce uncertainty, then a basic social consensus on actions and responses will follow” (Leichenko/O’Brien 2008: 16). Because impending material losses are perceived as the greatest threat to security, vulnerability can in this approach be relatively easily quantified and measured. Accordingly it can be reduced “if national governments adapt safety nets, insurance, and calamity funds” (Heijmans 2004: 116).⁸ This approach was criticized “for applying positivist

science to produce ‘technocratic’ knowledge while ignoring the underlying socioeconomic processes that are transforming nature” (Leichenko/O’Brien 2008: 115). Its shortcoming is that it only deals with the general likelihood of losses but does “not answer the question of *why* people in certain areas suffer greater losses in a disaster than other areas despite apparently having equal risk exposure” (Lowe/Haklay/Longley et al. 2007: 3; emphasis added). This proves even more fatal under the conditions of the “ubiquitous” (Brunnengräber 2006: 217) greenhouse effect, because it fails to capture the fact that “[f]loods, storms and droughts are ... risks immanent to the system, or internal risks” (ibid.: 218), as hazardous natural events are increasingly based on humankind’s activities and interference with ‘natural equilibria’.

In the 1970s and 1980s vulnerability was regarded more and more as a dynamic feature. Corresponding conceptual work in the field of ‘political economy and ecology’ placed emphasis on the linkages between social and physical systems. In this view, humans are an integral part of the environment, hence the talk of a ‘coupled social-ecological system’ (Leichenko/O’Brien 2008: 17). Consequently this discourse “emphasize[s] the importance of integrating both biophysical and social vulnerability in order to understand how outcomes of environmental change are distributed within society” (ibid.). Ecological crises and disasters are in this view “produced by the dialectical interaction of social and natural features” (Oliver-Smith 2004: 16). Natural disasters, be they of slow- or rapid-onset character, “are also the product of social, political and economic environments (as distinct from the natural environment), because of the way these structure the lives of different groups of people” (Wisner/Blaikie/Cannon et al.: 4). While potentially everyone is opposed to the negative impacts of climate change, the level of de facto vulnerability towards the negative effects of hazardous natural

8 However, insurance-based risk reduction systems alone are not suitable for an encompassing risk reduction. First, they are not able to include the ‘bottom-poor’ who do not have assets to pay for their premium. Second, related to post-disaster compensation, while statistics exist on the loss of earnings and increased unemployment in the formal economy, the destructive impact of disasters in developing countries is often not captured adequately as most of the workforce there is active in the informal sector. On the implications of distinguishing between ‘insured’ and ‘non-insured’ life for the concepts of development, security, and dominance in the international system; see also Duffield (2007).

events such as loss of water and food security, shelter, and health is strongly determined by social stratification – e.g. not all residential areas and buildings are equally affected by flooding or earthquakes. Assets, income, and access to ‘soft’ resources like knowledge and information influence the level of coping capacities at all levels: on the one hand, non-industrialized countries are more vulnerable as (1) their economy is dependent on agriculture, and (2) they obtain fewer resources to initiate the necessary security responses after a supposedly external shock such as a drought. On the other hand, this observation is reflected at the meso- and micro-level of regions, households, and individuals. Socially marginalized groups and individuals are also more vulnerable to the negative impacts of climate change and natural hazards. While successful adaptation to environmental challenges also generates technological solutions and innovations, this perspective does not neglect e.g. the facets of globalization such as liberalization of international trade, and how these may influence vulnerability and resilience to global environmental change. Vulnerability is understood as the result of socio-economic and political processes that create disadvantageous conditions for certain groups and individuals. These processes already exist before the hazardous event takes place. Those measurements that build on a biophysical notion of climate change and natural disasters and, accordingly, focus exclusively on mitigation and provision of technical equipment in order to forecast physical hazards, miss out on the constitutive social and political dimension of vulnerability creation, which already exists before the hazardous event occurs:

In this perception, a safer environment can only be achieved if disaster response [and climate change adaptation; LW] changes the processes that put people at risk. The long-term solution lies in transforming the social and political structures that breed poverty and the social dynamics and attitudes that serve to perpetuate it (Heijmans/Victoria 2001: 16; also: Smith/Vivekananda 2003).

While these considerations focus on the political character of the *input* side of natural disasters and the disastrous character of climate change, the severity of the *effects* of hazardous natural events has also increasingly been identified as political.

11.2.2 The Political Effects of Hazardous Natural Events

A major part of the early work on the dynamics between (rapid-onset) natural disasters and politics fo-

cused on negative outcomes for the political sphere (i.e. corruption) “and intentionally avoided characterizing disasters as political” (Enia 2008: 10). Natural disasters were mostly of interest in terms of quantifiable material losses and challenges for economic reconstruction. Peace and conflict research “traditionally considered ‘the environment’ as ‘a price’ in resource wars, or as ‘the victim’ of conflict” (Nel/Righarts 2008: 160). Research in the late 1990s was for the first time specifically concerned with the political effects of natural disasters, and a significant positive relation between the occurrence of a natural disaster and general political unrest was established (Olson/Drury 1997; Drury/Olson 1998). Even if the research results of that time were thought to have a rather weak interpretative power due to their limited scope and timescale (Nel/Righarts 2008: 160), they have been confirmed by recent studies (Bhavnani 2006; Brancati 2007; Enia 2008). Meanwhile it is uncontested that natural disasters lead to significant changes within the affected societies and form a ‘window of opportunity’ within which “major policy shifts can take place” (Pelling 2006; Enia 2008: 12). However, the direction of action is not predetermined in this approach – the impact of a natural disaster can influence conflict dynamics positively and negatively. This variability can be regarded as a function of the following equation:

An interruption in social routines (Xa) triggers a process of collective redefinition (Xb) which produces an emergent normative structure (Xc) orienting interaction around themes that affect likelihood of community conflict (Y) (Stallings 1988: 572).

Positive effects are generally subsumed under the heading ‘disaster diplomacy’. This research area enquires how far disaster-related activities can bring about cooperation among ‘antagonized’ countries (Kelman/Koukis 2000; Enia 2008). Bhavnani even talks of “the role of disasters in peacebuilding” (Bhavnani 2006: 40).⁹ But under what circumstances do climate change and natural disasters diminish the likelihood of peace?

9 Prominent examples are the rapprochement between India and Pakistan (2001/2005), the US support for Iran after the Bam earthquake (2003) and – on an intrastate level – the re-entry into peace negotiations of GAM rebels and the Indonesian government after the 2004 Tsunami (Kelman 2006: 65).

11.2.3 Climate Change and Violent Conflict

Climate change is generally regarded as a ‘threat multiplier’ (CNA 2007), even though yet in 2008 Salehyan entitled an article “From Climate Change to Conflict? No Consensus Yet” (Salehyan 2008). On the local level, it will challenge strategies of environmental resource management, destroy infrastructure, and increase both the risk to health and loss of livelihood (Buhaug/Gleditsch/Theisen 2008). On this basis existing tensions will be aggravated and new conflicts generated.¹⁰ Various studies predict a rise in social tensions due to climate change (BMU 2002; Brauch 2002; Stern 2006; WBGU 2007; CNA 2007). Even if the possibly resulting intrastate conflicts are of a ‘low-level’ character, they will have a potentially destabilizing impact at the regional level because of migration and the establishment of war economies (Carius/Tänzler/Maas 2008: 18). In particular, those political and social units that are among the less consolidated and developed, predominately situated in the so-called Global South, are increasingly facing the “double-headed problem” of climate change and violent conflict (Smith/Vivekananda 2007). A research unit of International Alert identified 46 countries that are likely to experience violent conflict as a result of climate change. In addition, the government institutions of 56 countries “will have great difficulty taking the strain of climate change on top of all their other current challenges” (Smith/Vivekananda 2007: 3). Three inter-related processes, triggered by climate change, are considered to promote social instability and conflict: resource scarcity, intensification of natural disasters (the most severe and conflict-fuelling factor), and a rise in sea level (Buhaug/Gleditsch/Theisen 2008).

The effects of *natural resources scarcity* have in the past been captured through ‘environmental/ecological security’ and ‘political ecology’ research, already mentioned in 11.2.1. The introduction and development of these concepts was based on the ‘new’ assumption that security was more than traditional national security or the absence of a threat. Instead, ‘human security’ indicates the need not only to protect individuals from all forms of direct violence, but also

in a more encompassing approach from all those social and environmental processes that might indirectly undermine individual well-being (UNDP 1994). This shift towards a positive and multi-dimensional security concept has opened up the space for action beyond classical (military) instruments, entailing the demand for political action in the fields of economic, political, food, health, and environmental policy to achieve sustainable development.¹¹ These aspects add up to what Adger and Kelly (2005) refer to as the “architecture of entitlements” (in Barnett/Adger 2005: 4). These are all those “social and economic entitlements that are necessary to reduce an individual’s vulnerability (or increase their ability to adapt) to environmental changes” (Barnett/Adger 2005: 4; Leichenko/O’Brien 2008: 11; Wisner/Blaikie/Cannon et al.: 11; DFID 2006: 5). In this context environmental insecurity “is the double vulnerability of people that arises when underdevelopment and poverty are compounded by environmental change” (Barnett 2003: 14).¹² The level of environmental and human security shows discrepancies across the board. Low levels of development – on the micro and the macro-level – generally equate to fewer assets that could be spent on research, resource conservation, and the development of resilient systems that can tackle unexpected incidents such as natural hazard events (Buhaug/Gleditsch/Theisen 2008: 17–8). Focusing on natural disasters, Nel and Righarts tried to identify factors leading to violent conflict after a natural disaster. “As a rule” (Nel/Righarts 2008: 171) they found that natural disasters increase the probability of violent conflict in the short and medium term, specifically in low- and middle-income countries.

All in all, however, the claim of a direct link between scarcity of resources or natural disasters and armed conflict is put forward rather reluctantly (Breit-

10 The conflict in Darfur, Sudan, is discussed as the first violent conflict resulting from climate change (Freire et al. 2009; UNEP 2007: 9; Nascimento, Aline, 2007: “Darfur: The first climate change conflict of the 21st Century?” in: *MediaGlobal, Voice of the Global South* [24 September 2007], <<http://www.mediaglobal.org/article/2007-09-25/darfur-climate-change-conflict>> [13 November 2009]).

11 See the three volumes of the *Global Environmental and Human Security Handbook for the Anthropocene* with 270 peer-reviewed chapters by 300 authors from 100 countries offering a topical and comprehensive overview of the global debate on the reconceptualization of security since 1990 (Brauch/Oswald Spring/Mesjasz et al. 2008; Brauch/Oswald Spring/Grin et al. 2009; Brauch/Oswald Spring/Mesjasz et al. 2011).

12 Following a similar approach Leichenko and O’Brien (2008) speak of *double exposure* to describe those circumstances “in which a particular region, sector, social group, or ecological area is simultaneously confronted to both global environmental change and [economic, political, cultural] globalization,” (Leichenko/O’Brien 2008: 9).

meier 2008: 9; Barnett 2003: 11; Buhaug/Gleditsch/Theisen 2008: 18). On the one hand “[e]nvironmental scarcity is never a sole or sufficient cause of large migrations, poverty, or violence; it always joins with other economic, political and social factors to produce its effects” (Homer-Dixon 1999: 16).¹³ Similarly, the relationship between climate change, natural disasters, and violent conflict is an indirect one. Intermediate factors that channel the effect of natural events are inter alia (a) undemocratic regime and governance structures; (b) weak functional capabilities of the government in relation to other groups of actors; (c) political instability and brevity of peace; (d) bulge in the population of young males; and (e) low economic development/sluggish economic growth (Smith/Vivekananda 2007; Nel/Righarts 2008).

Special attention should be paid to social inequality. Some studies, which focus on vertical inequality, a concept that denotes socio-economic differences between the least and most well-off individuals (Buhaug/Gleditsch/Theisen 2008: 24) find that it does not increase the risk of civil war (Collier/Hoeffler 2004; Hegre/Gissinger/Gleditsch 2003). However, Nel and Righarts conclude in the context of their research on the natural disaster-violent conflict nexus:

Clearly, measures of vertical economic inequality do not capture the motive factor with respect to major violent civil conflict. ...There may be other dimensions of inequality, such as horizontal inequality between societal groups for instance, which are more significant predictors of major violent civil conflict (Nel/Righarts 2008: 177).

This assessment is supported by research on ‘post-conflict peace-building’: “Horizontal inequalities are an important element behind mobilization for conflict and [if] this is not addressed there is a danger of renewed mobilization around horizontal inequalities and a further outbreak of violence” (Stewart 2005: 5). In addition, a recent large-N study confirms the positive correlation between horizontal social inequality and conflict outbreak (Østby 2008; Stewart 2000). Hence, the relative functional capabilities of various groups of actors and dissatisfaction with social stratification add up to a potentially conflictual post-disaster setting.¹⁴ Climate change and natural disasters are likely to induce processes of mass migration, entailing

13 Recently, it has been argued that it is rather the abundance of natural resources that drives conflict, famously invoking the ‘greed vs. grievance’ debate (Collier 2000; Humphreys 2005; Keen 2000; Berdal/Malone 2000; Ballentine/Sherman 2003).

the heterogenization of the population in host countries.¹⁵ Insofar as this leads to the increase of horizontal inequalities and (perceived) relative deprivation this may pave the way for social unrest and conflict. As Buhaug, Gleditsch, and Theisen (2008) put it:

Given its discriminatory spatial impact, climate change has the potential to affect horizontal inequalities, particularly in agrarian societies. If these changes correspond with and amplify existing socio-economic fault lines (and other risk factors present), the probability of social instability and armed conflict increases significantly (Buhaug/Gleditsch/Theisen 2008: 25).

11.2.4 Three Reasons for Context-sensitive Adaptation Policies

If the observations in the previous sections are valid, then three reasons can be put forward as to why it is necessary to promote the formulation and implementation of adaptation measures to climate change and *disaster risk reduction* (DRR) in a comprehensive, substantial, and institutionalized manner. First, the *pragmatic* component of social-sensitive adaptation aims at safeguarding the basic livelihoods of vulnerable people in the context of a sustainable development approach (11.2.1). Second, there is also an *instrumental* value to it, which is based on the assumption that climate change and natural disasters will increase the likelihood of violent conflict (11.2.2 and 11.2.3). Hence, if the implementation of adaptation policies can positively influence intermediate conflict-fuelling factors and contribute to diversified livelihood options and enhanced social equality, then the risk of the perpetuation and outbreak of conflict will also decrease. Finally, the *normative* value of context-sensitive adaptation policies follows from the observations that those who are least responsible for climate change bear the highest burden of its impacts (see also table 11.1).¹⁶ Climate change constitutes a set of social justice issues at all political levels. While climate change is in principle an all-affecting phenomenon, it exacerbates existing inequalities and further

14 For a corresponding analysis on Aceh, Indonesia, and Sri Lanka see Bhavnani (2006) and Enia (2008).

15 The number of climate refugees could, by approximation, amount to 50 million by 2010 and 200 million by 2050 (“Auf der Flucht vor dem Klima”, in: *Le Monde diplomatique*, 2007: Atlas der Globalisierung spezial. Klima: 42–43, here: 42). Even though most migration induced by climate change or disaster will take place domestically, it has been labelled as “internationalization from below” (Pries 2008: 21).

deprives the poorest of their livelihood options. Hence, the duty to prevent further climate change through mitigation, which in itself is the subject of extensive debate on what is to constitute a fair allocation scheme of emission rights, has to be accompanied by a shifting of resources from wealthy parties to protect people from the ill effects of climate change already taking place: “[T]o make the least well-off pay in a world where others are able to pay and still live a very affluent life seems perverse ... The most advantaged are most able to pay the price without sacrificing any reasonable interests: therefore, they are under a duty to do so” (Caney 2010: 214). This is the moral duty of adaptation.¹⁷

What follows for the formulation and implementation of climate policies is obvious: first, they need to shed light on social and political processes that shape vulnerability, invoking context-sensitive measures of immediate as well as long-term adaptation and capacity building next to serious mitigation efforts to slow down climate change. Second, they have to anticipate their own impact on intermediate factors such as horizontal equality, e.g. the inclusion of ethnic minorities. A further stratification of social structures through the implementation of adaptation measures needs to be avoided. While it is clear that the final character and implementation of climate and disaster reduction policies is determined by the respective nation state, these are nevertheless strongly shaped by policy discourses at the international level. That is why, on the basis of the prior considerations, the following section will depict the evolution and character of global climate policies including the relevance that is attributed to adaptation and DRR measures.

11.3 International Climate Change Policies: Goals and Instruments Revised

11.3.1 Policy Evolution and Milestones in a Nutshell

When the international community dealt with the security implications of climate change for the first time in April 2007, especially developing countries emphasized that the issue was one of sustainable development.¹⁸ Looking back, however, climate change was put on the international political for the first time already in the run-up to the 1972 *UN Conference on Environment and Development* (UNCED) in Stockholm and then at the World Climate Conference in 1979. Discussions, fed by the Club of Rome’s ‘Limits to Growth’ report, centred on water and air pollution and population growth. The 1990s then marked the UN International Decade for Natural Disaster Reduction (IDNDR). While there was progress “in some areas of skill transfer and international networking [it] failed to engage fully with the social, political and economic contexts of risk and the interplay of disaster with international development” (Pelling 2003: 235; Lowe/Haklay/Longley 2007: 2). International negotiations “avoid[ed] framing the global warming issue in terms of winners and losers” (Linnér/Jacob 2008: 126). The analytical and political focus of the mid-1990s can still be described as technocratic.

In 1992 UNCED took place in Rio de Janeiro. Its major outcome was the *UN Framework Convention on Climate Change* (UNFCCC), which was still formulated in the spirit of the debates on mitigation that had dominated the previous decade. Its goal was the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (Art. 2)¹⁹. However, no precise benchmarks were defined. Three approaches were to facilitate the achievement of this goal: technological change, exchange of scientific data, and liberal arrangements of economy and politics (Oosthoek 2008: 162). Two years later the World Conference on Natural Disaster Reduction facilitated the ‘Yokohama Strategy and Plan for a Safer

16 It is already the case that least developed countries account for more than 53 per cent of the total recorded disaster-related deaths while in developed countries more commodities are at risk in absolute terms (UNDP 2004: 1; Burton/Diringer/Smith 2006).

17 This theoretical approach does not further elaborate on the empirical task of differentiating populations by their ‘level’ of vulnerability and their relative need for improved adaptive capacity.

18 See at <<http://www.un.org/News/Press/docs/2007/sc9000.doc.htm>> (13 January 2010). This Security Council debate facilitated General Assembly resolution 63/281 on the issue two years later; see at: <<http://daccess-dds-ny.un.org/doc/UNDOC/GEN/No8/487/65/PDF/No848765.pdf?OpenElement>> (13 January 2010).

World. Guidelines for Natural Disaster Prevention, Preparedness and Mitigation', which was to provide "landmark guidance on reducing disaster risk and the impacts of disasters" (UN ISDR 2005: 2), and identified, among other things, shortcomings in the reduction of underlying risk factors to disaster threats and in knowledge management, education, and preparedness for effective disaster response and recovery.

Influenced by the *Second Assessment Report* (SAR) of the *Intergovernmental Panel on Climate Change* (IPCC 1995) that had identified "a discernible human influence on global climate" and stressed its relevance for sustainable development, in 1997 the international community agreed the *Kyoto Protocol* (KP). For the first time binding quantified emission targets were laid down as industrialized parties committed themselves to reduce overall GHG emissions by 5.2 per cent below 1990 levels by 2008–12. Implementation is primarily to be carried out on the basis of technological and market-based policy measures such as emission trading²⁰, and the project-based *Clean Development Mechanism* (CDM) and *Joint Implementation* (JI).²¹ Besides this, CDM also has the objective of financing long-term sustainable development in host countries. While a financial mechanism was also formally introduced to provide funds to developing countries,²² complementary and 'system-transforming' measures such as a protocol on technology transfer between industrialized and developing

countries were not established. The KP formally prioritized the framing of climate change in economic terms and with a focus on single projects. It has been criticized "as one of the most far-reaching economic agreements which has been signed under the auspices of the United Nations for many years. Under its aegis, a hegemonic treatment of the problem took shape" (Brunnengräber 2006: 220). Not surprisingly, these measures led to "the emergence of irreconcilable differences between the North and the South" (Linnér/Jacob 2008: 121). Generally speaking, the countries of the South pushed for the priority of social and economic development, and the principle of differentiated responsibilities in the context of mitigation. Furthermore, they called for additional funding for adaptation on top of *Official Development Assistance* (ODA).

In light of IPCC's Third Assessment Reports (TAR 2001), whose Working Group II dealt with 'Impacts, Adaptation and Vulnerability', and the 'Road map towards the implementation of the UN Millennium Declaration' (UN GA 2001)²³, which emphasizes the need for tackling climate change as a priority issue

19 UNFCCC, 1992: <<http://unfccc.int/resource/docs/convkp/conveng.pdf>> (13 November 2009). Basic features are the 'precautionary principle' and the 'principle of common but differentiated responsibilities'. Parties to the convention are categorized according to their individual GHG reduction commitments. The so-called Annex I countries are all OECD members (as of 1992) plus *East European economies in transition* (EITs). These are encouraged – and obliged under Annex B of the KP – to stabilize GHG emissions. Non-Annex I countries are mostly developing countries, which are not obliged to cap their emissions. OECD countries further constitute the group of Annex II parties and are to provide financial resources for Non-Annex I countries to facilitate the development of green technology and adaptation mechanisms. Not all members of the UNFCCC are also parties to the KP.

20 All states receive certificates corresponding to their assigned amount of emissions. Unused emission rights can be sold to countries which exceed their assigned emission amounts, thus compensating for failed emission cuts. In this way, GHG becomes a true commodity; at: <http://unfccc.int/kyoto_protocol/mechanisms/items/1673.php> (4 December 2009); Brunnengräber 2006: 221; also Smith/Vivekananda 2006).

21 Industrialized parties that are obliged to cut their emissions can meet this goal by carrying out climate protection measures in another country. The saved emissions can be credited to the account of the investing country. JI refers to projects involving investments in another industrialized country while CDM projects are undertaken in a developing country. These measures have to be additional, *measurable, reportable, and verifiable* (MRV), so that *certified emission reductions* (CERs) can be traded.

22 Under the Convention the *Global Environmental Facility* (GEF) was assigned operation of the financial mechanism. Furthermore, three special funds were established: under the Convention these are (a) the *Special Climate Change Fund* (SCCF) and (b) the *Least Developed Countries Fund* (LDCF), whose task is also to assist developing countries in the preparation of the *National Adaptation Programmes of Action* (NAPAs). Both were set up in 2001 and placed under the World Bank. Under the KP the Adaptation Fund (AF) had been established (on the unique institutional and governance features of the AF see Müller, Benito, 2007: "The Nairobi Climate Change Conference: A breakthrough for adaptation funding", Oxford Energy & Environment Comment; at: <http://www.oxfordenergy.org/pdfs/comment_0107-1.pdf> (27 February 2010)).

23 UN General Assembly (UN GA), 2001: "Road map towards the implementation of the United Nations Millennium Declaration"; at: <<http://unpan1.un.org/intradoc/groups/public/documents/un/unpan004152.pdf>> (11 November 2009).

and to reduce vulnerability and the impact of natural and man-made disasters, development agencies increasingly proclaimed the goal of mainstreaming climate change adaptation within ongoing development assistance programmes, national development plans, and poverty reduction strategies (Tanner 2006; Klein 2006: 4).²⁴ In 2005 the second UN Conference on Disaster Reduction in Kobe, Japan, saw the adoption of the ‘Hyogo Framework for Action 2005–2015: Building Resilience of Nations and Communities to Disasters’ by 168 governments. It aims for “the substantial reduction of disaster losses, in lives and in the social, economic, and environmental assets of communities and countries” and contains five key elements (UN ISDR 2005: 8; Barros/Field/Ypersele 2009)²⁵:

- (1) Ensure that DRR is a national and a local priority with a strong institutional basis for implementation;
- (2) identify, assess and monitor disaster risks and enhance early warning;
- (3) use knowledge, innovation and education to build a culture of safety and resilience at all levels;
- (4) reduce the underlying risk factors;
- (5) strengthen disaster preparedness for effective response at all levels.

In 2005 the *Nairobi Work Programme* (NWP) was also launched under the UNFCCC to improve all parties’ and in particular developing countries’ “understanding and assessment of impacts, vulnerability and adaptation to climate change” and to “make informed decisions on practical adaptation actions and measures to respond to climate change on a sound scientific, technical and socio-economic basis”.²⁶ At UNFCCC’s COP 13 (2007), parties agreed on the ‘Bali Road Map’, aiming to establish a new binding climate agreement on mitigation by the end of 2009 (UNFCCC 2007).²⁷ The Bali Action Plan emphasizes the relevance of DRR and advanced adaptation, and calls for enhanced action on risk management and risk re-

duction strategies, including risk transfer mechanisms (Barros/Field/Ypersele 2009). The latest COP, which received a lot of public attention, COP15 in 2009, had actually been mandated to reach an agreement on a post-2012 framework for a second commitment period of the KP. However, parties did not manage to do so. Instead they agreed upon the submission of voluntary mitigation pledges, marking a fundamental shift away from KP’s top-down approach to a bottom-up approach for GHG emission reduction activities. On the other hand, in the final outcome, the Copenhagen Accord, adaptation and the need for “enhanced action and international cooperation on adaptation” was widely mentioned (UNFCCC 2009).²⁸

To summarize, the international community on the one hand has over time reiterated its commitments to cut emissions and on the other hand has, also with a view to the possible security implications of climate change, been increasingly inclined to officially acknowledge the need for adaptation and DRR.²⁹ However, to what extent have these formal obligations actually entailed practical changes? In how far can those commitments be regarded as reflecting a *substantive* political response to the evolving counter-discourse that challenges the traditional bio-technological framing of climate change and natural disasters as described in section II.2.1?

11.3.2 Implementation of Adaptation Policies and Kyoto Mechanisms: Business as Usual

Despite the ‘formal’ consensus in the international community on the need for improving DRR and adaptation, mainstreaming practices are still rather “elusive” (Venton/La Trobe 2007: 7). Burton, Diringier, and Smith find that “the international adaptation effort is more an irregularly funded patchwork of multi-lateral and bilateral initiatives than a fully conceived and functioning regime” (Burton/Diringer/Smith 2006: 13). Similarly, Barros, Field, and Ypersele (2009, footnote 25 above) note that there has not been a comprehensive assessment of the guides, frameworks, and tools used by various institutions, organizations,

24 Notably, mainstreaming is rather easy for mitigation (related to energy policy), while mainstreaming adaptation and vulnerability reduction constitutes a multi-dimensional phenomenon, requiring cross-sectoral policy coordination.

25 See Barros, Vicente; Field, Christopher; Ypersele, Jean-Pascale van, 2009: “Scoping Paper - IPCC Special Report. Managing the Risks of Extreme Events and Disasters to Advance Climate Change”; at: <http://www.ipcc-wg2.gov/AR5/extremes-sr/extremes_documents/doc14.pdf> (15 November 2009).

26 See at: <http://unfccc.int/adaptation/nairobi_work_programme/items/3633.php> (12 October 2010).

27 UNFCCC, 2007: “Bali Action Plan, Decision-/CP.13”, at: <http://unfccc.int/files/meetings/cop_13/application/pdf/cp_bali_action.pdf> (10 November 10 2009).

28 UNFCCC, 2009: “Copenhagen Accord”, <http://unfccc.int/resource/docs/2009/cop15/eng/LO7.pdf> (20 January 2010).

29 See UN SC 2007 and UN GA 2009 (footnote 18 above) and the Report of the Secretary-General of 2009; see at: <<http://www.unhcr.org/refworld/docid/4ad5e638o.html>> (13 January 2010).

and communities to build the capacity for reducing vulnerability and risk (Barros/Field/Ypersele 2009: 3). A study by Klein – based on self-evaluative screenings of six development agencies – showed that development agencies “consider climate change as a real albeit uncertain threat to future development” at the same time as giving “less thought to how different development patterns might affect vulnerability to climate change” (Klein 2006: 4). These findings are consistent with research results from 2003, when the policy and practice of nine institutional donors of *disaster risk reduction* (DRR) were investigated. The research concluded “that DRR was not being sufficiently integrated (or mainstreamed) into relief and development planning and programming” (Venton/La Trobe 2007: 7). These overall results were further confirmed in a more encompassing study in 2005–2006 (ibid). Furthermore there is still the tendency “to focus ODA investments in areas where poverty reduction gains are perceived to be more certain or cost-effective” (Tanner 2006: 8). DRR is rather “focused on the recovery and reconstruction stage – instead of being an integral part of ‘normal’ development. It is therefore often associated more with ‘disaster management’ than ‘vulnerability reduction’” (Venton/La Trobe 2007: 18).

Similarly, Methmann notes that “instead of growing coherence of political reactions to climate change among international institutions, climate mainstreaming seems to have paradoxical results. The reference to climate protection spreads, but climate protection itself changes its meaning and becomes ambiguous” (Methmann 2009: 2). Further, he finds that “institutions mostly rephrase existing activities ... but in reality almost do not change them according to the challenges of global warming” (ibid.). Similarly, also the incorporation of adaptation language in the IPCC reports does not reflect a qualitative shift in policy measures. Still, the Panel is mainly concerned with technological solutions to adaptation, leaving aside socio-political qualifications of those measures (IPCC 2007a). Concerning the financial mechanisms, developing countries repeatedly point out that access to funding and implementation of concrete activities through the Adaptation Fund, in the context of the NWP and other facilities, are still inadequate³⁰, even though 43 developing countries have – despite limited

financial, technical, and human resources – managed to prepare NAPAs.³¹

Business as usual can also be observed as regards the promotion of KP's flexible mechanisms. CDM and JI are advertised by calling upon their potential to “[s]timulate sustainable development through technology transfer and investment”.³² Further, the COP 7 decision of 2001 called for the “need to promote equitable geographic distribution of clean development mechanism project activities at regional and sub-regional levels” (UNFCCC 2001: 2).³³ However, data suggest that CDM “serves more to promote foreign trade than to reduce emissions” (Brunnengräber 2006: 221) or even to promote (green) development, which would also be relevant for the establishment of sustainable and (climate change-) resilient economic structures. Firstly, more than 66 per cent of the registered project activities are hosted by the BRIC states India (23.71 per cent), China (36.42 per cent), and Brazil (8.20 per cent).³⁴ In contrast, only 1.84 per cent of CDM projects are registered in Africa.³⁵ Secondly, out of the ten African countries that host CDM registered projects,³⁶ eight countries (South Africa, Egypt, Nigeria, Morocco, Tunisia, Ethiopia, Kenya, and Tanzania) rank among the 12 biggest African countries as measured by Gross Domestic Product (in purchasing power parity), constituting comparatively realistic trading partners.³⁷ On the one hand it is clear that Africa – given its low average emission rate (table II.1) – and especially its least developed countries provides little incentive for the implementation of CDM

30 See at: <<http://afboard.org/projects-programmes.html>> (25 February 2010). On the problem of adequate funding see Burton, Diringer, and Smith (2006).

31 As of 18 November 2009; see at: <http://unfccc.int/cooperation_support/least_developed_countries_portal/submitted_napas/items/4585.php> (27 February 2010).

32 UNFCCC: “The Mechanisms under the Kyoto Protocol”; at: <http://unfccc.int/kyoto_protocol/mechanisms/items/1673.php> (26 February 2010).

33 UNFCCC 2001: “Decision 15/CP.7. Principles, nature and scope of the mechanisms pursuant to Articles 6, 12 and 17 of the Kyoto Protocol”; at: <<http://unfccc.int/resource/docs/cop7/13a02.pdf>> (27 September 2010).

34 See at: <<http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html>> (26 February 2010).

35 See at: <<http://cdm.unfccc.int/Statistics/Registration/RegisteredProjByRegionPieChart.html>> (26 February 2010).

36 See at: <<http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html>> (27 February 2010).

37 CIA World Fact Book, 2009; at: <<https://www.cia.gov/library/publications/the-world-factbook/rankorder/2001rank.html>> (27 February 2010).

projects, “because the volume of the expected savings is too small” for industrialized countries (Brunnen-gräber 2006: 221). Also, weak institutional and technical capacity leads to lengthy and relatively costly implementation processes, posing a further obstacle to investing in poor developing states.

On the other hand, though, it is also clear that the KP and its mechanisms are generally weak in promoting general green technological transfer for the benefit of non-industrialized countries. As well as this, they do not exert a positive influence as regards the establishment of ‘fairer’ North-South relationships or a reduction of ‘Southern’ vulnerability to the effects of hazardous natural events through the implementation of sustainable development structures.³⁸ Rather, the CDM might even increase competition between less/least developed countries, as it is up to the potential host country to state if the prospective project suits the country’s sustainability targets: “[T]o date, ‘market efficiency’ has resulted in carbon finance being directed into projects that reduce emissions cheaply, often with low social benefits, shunning projects with higher sustainable development benefits but higher per unit abatement costs” (Perskaja Wisén/Dankers 2010³⁹). It is conceivable that under these circumstances CDM host countries might feel forced to compete for these projects through lowering their sustainable development requirements. That this ‘race to the bottom’ is not only a structural feature of the CDM but also a deliberate country strategy to attract foreign investment, using carbon credits “as just another export product”, has for example been demonstrated in the case of Chile (Rindefjäll/Lund/Strippel 2011: 9; for a criticism of CDM’s negative side effects on social aspects and equity see Bäckstrand/Lövbrand 2006).

Another feature of the current CDM system renders the probability of the promotion of sustainable development less likely. As mentioned above, countries that conduct CDM projects are required to prove that the project’s emission reductions are MRV-able and that they are additional to what would have occurred without them.⁴⁰ However, criteria for deter-

mining additionality are rather vague and the accuracy of reporting mechanisms is still in dispute. The on-the-ground supervision of CDM projects, the assessment of their additionality, and the calculation of the CERs attributable to them is delegated to *Designated Operational Entities* (DOEs), which are private companies accredited by the CDM *Executive Board* (EB), and which are selected and paid for by the project developers themselves. As there is a strong economic incentive for DOEs to positively evaluate a project in order to gain a favourable reputation with other potential clients, there is doubt about their impartiality and their consideration of sustainable development objectives (Lund 2010).

Table 11.1: Global CO₂ Emissions by Region in 2004.

Source: World Resources Institute (2008) as cited in: Anderson, Fergusson, and Valsecchi (2008: 14).

Country	Mt CO ₂	Percentage of World Total	Tons CO ₂ per Person
World	30,689.5	100.00	4.8
Asia	10,388.7	33.85	2.9
Europe	6,651.5	21.67	9.2
North America	6,570.0	21.41	20.2
Middle East & N. Africa	1,960.7	6.39	4.5
South America	871.8	2.84	2.4
Sub-Saharan Africa	676.2	2.20	0.9
Central America & Caribbean	558.0	1.82	3.2
Oceania	401.4	1.31%	12.6

11.3.3 Mitigation Results: Change for the Worse

As regards achieving mitigation targets, even the ‘consensus’ that is represented through the scope of membership of the UNFCCC, being a signatory of the KP⁴¹, and endorsement of IPCC’s reports has not led

38 For a review of the literature on CDM’s contribution to sustainable development see Holm Olsen (2007).

39 Perskaja Wisén, and Dankers (2010): “African Challenge”, Carbon Finance: News & Analysis of Market Solutions to Climate Change; at: <<http://www.carbon-financeonline.com/index.cfm?section=features&action=view&cid=12357>> (27 September 2010).

40 See at: <<http://cdm.unfccc.int/about/index.html>> (27 February 2010).

41 UNFCCC is supported by 196 Parties and Observer States. As of 3 December 2009, 189 countries and 1 regional economic integration organization (the EEC) have deposited instruments of ratification, accession, approval, or acceptance to the KP; see at: <http://unfccc.int/parties_and_observers/parties/items/2352.php; <http://unfccc.int/kyoto_protocol/status_of_rati-fication/items/2613.php> (28 February 2010).

to the implementation of the GHG reduction required to slow down climate change. Indeed, GHG emission by Annex I countries decreased by an overall 3.3 per cent between 1990 and 2004 (with a decrease of 15.3 per cent for those countries who are parties to the KP; UNFCCC 2006: 2).⁴² However, this had been mostly due to the change in energy provision patterns on the part of the EITs of eastern central Europe (-39.3 per cent). On the other hand, within the same time period, the GHG emissions of the other industrialized parties to the Convention grew by 11 per cent (ibid.). Furthermore, from 2000 to 2004, emissions of all Annex I parties together increased by 2.4 per cent (with EIT parties increasing their emissions by double that of non-EIT parties; UNFCCC 2006: 6), and taking the period 1990 to 2007, emissions increased by as much as 38 per cent (Global Carbon Project, in: Bedall 2009: 11). Since the year 2000 anthropogenic CO₂ emissions have been growing four times as fast as in the previous decade (ibid.). Also, the number of parties with decreased emissions has declined considerably since 2000: between 1990 and 2000 more than half the Annex I parties reduced their emissions (23 out of 41), but between 2000 and 2004 only 7 did so (UNFCCC 2006). What follows from these observations for an assessment of the character of international society and international climate change policies?

11.4 The International Climate Change Regime as a Paternalistic and Hegemonic Setting

The findings presented in sections 11.3.2 and 11.3.3 lead to the conclusion that current climate change politics are dominantly symbolic and regulative in character, and actually without effect. The current climate change discourses can be regarded as an element of risk management, according to Ulrich Beck a feature of the second modernity (Beck 2007, 2011). Risks, as opposed to threats, are rather incalculable, ambiguous, and complex probabilities and possibilities (Klinke 2009). They give advantage to the policy-influencing role of so-called experts “to give authori-

tative answers on the risks we face” (Clapton 2009: 6).⁴³ Following Foucault, social relations, power structures, and what is accepted as ‘true’ is constructed and maintained across a communicative field. The production of knowledge and the use of power are, in this approach, immanently linked (Foucault 1990). A hegemonic order manages to exclude rival discursive elements from this debate. At the same time social and political meanings get firmly attached to the vocabulary of the dominant – allegedly consensus-based – *common-sense* discourse. This defines how, why, and what to govern, and what to know in order to govern, with the aim of maintaining the status quo. However, the dominant discursive elements have been emptied of their actual content, instead providing for the unity of the discourse (Methmann 2009). They become empty signifiers that sustain the hegemonic position (see also Laclau/Mouffe 1991; Mouffe 2005). Hence, the consensus is based on the “ability of dominant social groups and classes to pursue their interests in a way that subaltern groups and classes still perceive as an expression of the general will, so that there is further a shared image of social relations and developments” (Brand 2005: 9; own translation). This framework can be applied to the issue at stake in this chapter in the following way:

First, international climate change policies still largely build upon the authority of the IPCC – which is itself based on the notion that natural science is able to capture objective facts and ‘truth’ (Raustiala 2001). The social implications of climate change, on the other hand, “are dealt with by the IPCC only in scattered comments” (Buhaug/Gleditsch/Theisen: 4). As described above, one can observe a continuous ‘naturalization’ and ‘technocratization’ of the problem. The IPCC constitutes a “socio-nature association” that is united by a modernistic approach towards climate change, which is framed as an objective, global, and homogeneous phenomenon that can be captured by simulation and by the processing of aver-

42 UNFCCC, 2006: “GHG Data 2006: Highlights from Greenhouse Gas (GHG) Emissions Data for 1990–2004 for Annex I Parties” see at: <http://unfccc.int/files/essential_background/background_publications_html/pdf/application/pdf/ghg_booklet_06.pdf> (13 January 2010).

43 See also work on the transnational capitalist class grouping and transnational manager class by neo-Gramscian authors (Gill 1990; Cox 1987). This class, consisting of managers, bureaucrats, public officials, and academics shares a common normative understanding of the global order as it is supposed to be. It organizes as transnational networks and international organisations, especially international financial institutions. This results in the dominance of a “neoliberal discourse of governance that stresses the efficiency, welfare, and freedom of the market, and self-actualisation through the process of consumption” (Gill 1995: 413).

age data (Arndt/Mayer 2009; Bedall 2009). Even though it is not the mandate of the IPCC to make policy recommendations, it constructs, organizes, and gives directions to international activities and state projects. It is guiding and justifying policy formulation through a positivistic and 'rational' scientific approach – even to adaptation – that deems climate change a purely external phenomenon. In this way climate change and its effects are extracted from the political realm.

Second, it is precisely through this numerical comprehension and objectification that the issue is rendered 'governable'. It is made observable, at the same time making possible the political instrumentalization of statistics (Gephart 2009). The scientific proof that certain phenomena do not fit the 'standard' performance legitimizes political action to intervene. In climate change politics this takes place through the real subsumption of nature to capital by artificially valorizing the atmosphere through emission trading and other flexible mechanisms (Brunnengraber 2006: 226). This benefits the introduction of private (economic) actors as having authority for the implementation of those mechanisms, as in the case of the CDM mentioned above. Policies are regarded as 'successfully' implemented when statistical values are reached – no matter – and that is important for the argument of this chapter – what qualitative shortcomings, strategic-rhetorical action, or circumventive processes might be at stake: "This view stems from a technocratic and fundamentally false assumption that once hazards are mapped in terms of their location, duration, frequency, severity and impact characteristics, then the risk assessment process is complete" (Wisner/Blaikie/Cannon et al. 2004: 33). The westernized scientification of politics, based on a quantitative vision of the world (Rivero 2003: 117) in the end leads to the institutionalization of actually contingent normative presumptions and their conversion into self-evidence (Erkkilä/ Piironen 2009: 141; Gephart 2009). As Brunnengraber notes,

[t]he official documents alone now comprise several thousand pages. The devil is either in the detail or in the design of the economic instruments. In this way the debate on climate protection has been moved increasingly out of the everyday world into the hands of 'global resource managers' (Brunnengraber 2006: 224–5).

On the other hand, ironically, it is precisely this quantitative approach that allows for demonstrating that the programmes' own provisions are not fulfilled (11.3.2 and 11.3.3). In this context international institutions like the UNFCCC can be described as political

entities with a mediating function, within which a transnational balance of power is condensed and through which private interests are advanced (Wissel 2007: 15; Gilpin 2002: 21). Based on their ascribed ability "to structure knowledge, international organizations (1) classify the world, creating new categories of actors and action; (2) fix meanings in the social world; and (3) articulate and diffuse new norms, principles, and actors around the globe" (Barnett/Finnemore 1999: 710). Hence, international policy negotiations as well as the documents and reports which they produce actually constitute norm-defining points of reference for "acceptable and legitimate ... behaviour" (Barnett/Finnemore 1999: 713). In this process, the west, equipped with comparatively high human and material capital, takes on the role of a global risk manager, governing risks and aiming at preventing "negative future occurrences by policing the globe and intervening to reshape risky environments" (Clapton 2006: 3).

Third, as shown in 11.3.1 above, consensus on the urgent need for mitigation and increasingly also adaptation has emerged in international climate change negotiations over time. Repeated formal commitment to emission caps on the part of developed countries is supposed to give the impression of activity, pacifying public outcry. But it is not met with appropriately matching behaviour by most parties. Most recently, at COP 15 parties even agreed on softening the fundamental structure of mitigation commitments and establishing a system of voluntary pledges for emissions reductions. On the other hand, the recognized call for adaptation increasingly shifts the burden of coping with climate change and its effects officially and in formal terms to the vulnerable and worst off, namely the developing countries. The formal institutionalization of structures like the Adaptation Fund and the Nairobi Work Programme serve the function – as interviews of the author with party delegates during COP 16 in 2010 have shown – of silencing developing countries' demands for more support to cope with the effects of climate change. However, the implementation of those structures, in the form of adequate financial and technological transfer from industrialized to developed countries, does not take place. While it is clear that adaptation must proceed, the lack of timely and substantive support mechanisms shows the unwillingness of a sustained paternalistic international political structure to realize climate justice. If the roots and effects of climate change are to be tackled seriously, if they are to be widely framed as a crisis of global economic production, consumption

patterns, and political dynamics, then a solution would require a qualitative shift of these structures and a focus on the substantial issues of global social justice. Altering the underlying social, political, and economic factors which determine levels of vulnerability and which – on the basis of structural social inequality – also favour the outbreak of violent conflict after the occurrence of a natural disaster, in the end would mean questioning the fundamental power structures within a society (be it a national society or international society). Hence, it is not too surprising that “[f]or many countries and donors, vulnerability reduction is too political” (Heijmans 2004: 117; Bender 1999; Wisner/Blaikie/Cannon et al. 2004: 333). What is tabled instead, revealing a “strategic selectivity” (Brunnengräber/Dietz/Hirschl et al. 2008: 188–93), is a free-market setting which is supposed to trigger technological innovation to solve the crisis “in a cost-efficient manner” (Oels 2005: 196). This neutral ‘adjustment’ of technical factors is rather easy and more ‘convenient’, as it does not tackle the structural root causes of the crisis. In fact, synergy between trade and climate protection is claimed while sidelining detrimental influences on the environment and societies. One could argue that western countries have employed this concept “as a means of maintaining their socio-economic and political ascendancy in world affairs” (Bankoff 2004). By following on the notion “that anything of social worth must be tradable in the global market” (Smith/Vivekananda 2006: 21) a radical objectification of nature takes place, reaffirming the positing of nature as external vis-à-vis society (ibid. 22). Last but not least, the financialization and commodification of the issue reverse the logic of the precautionary principle that who is paying now has the *right* to pollute. The same goes for the sustainability principle: if the underlying capital or credit system collapses, economic rationality will provide a mandate for withdrawing from this ‘market segment’. All in all, the prevailing flexibility, global management, scientific uncertainty, and economic rationality of international climate change politics turn climate protection into an empty signifier (Methmann 2009: 8). Prevention of conflict related to climate change is neglected, on the mitigation as well as the adaptation side.

11.5 Conclusion

The baseline argument of this chapter was that international climate and disaster reduction policies can contribute to conflict prevention if mitigation and

context-sensitive adaptation measures are consequently implemented but that this has not been realized so far. While mitigation of GHG emissions is the prerequisite of tackling climate change at all, adaptation is necessary to cope with already existing environmental changes and hazards. The relevance of connecting climate change and violent conflict in research activities is mandated through various studies that predict a rise in social tension due to climate change and its effects: “The double-headed problem of climate change and violent conflict ... has a unified solution – peacebuilding and adaptation are effectively the same kind of activity” (Smith/Vivekananda 2007: 4). Hence, in this chapter, the presentation of various discourses on human-ecological relations has paved the way for framing adaptive capacity as a feature of human security and for elaborating on the nexus between climate change and natural disasters and violent conflict. This was followed by an outline of the evolution of international climate policies. The stock-taking of mitigation activities and measures to support adaptation in vulnerable countries has shown that neither aspect has been implemented thoroughly so far. Rather, it seems likely that those mitigation mechanisms which have been put forward through international agreements serve mainly as a means of economic regulation and exchange through a ‘transnational climate capital class’ under conditions of power asymmetries. This invokes the image of international climate negotiations and policies as ‘just another’ scene for processing trade relations, confirming earlier analyses of ‘liberal environmentalism’ (Bernstein 2001, 2002; Eckersley 2008, 2009). GHG emission scenarios are still perceived as a matter of outer space. On the other hand, the call for increased adaptation has been accompanied neither by the necessary mainstreaming in development planning, which would require coordinated action across various policy sectors, nor by additional financial and technical support on top of ODA on the part of industrialized countries. Rhetorical action shifts the burden of dealing with climate change and disasters formally on to the already disadvantaged and vulnerable actors, primarily in the countries of the South. Those measures that aim at capturing the social and economic foundations of climate change and natural disasters are not promoted adequately: “Much of the information on impacts remains focused on advocacy for national and global emissions reductions. Awareness of ... development priorities and poverty reduction remains comparatively low” (Tanner 2008: 8).

In fact, even though the climate change-security nexus is increasingly entering public debate, climate change and disaster prevention are still de-politicized, bringing forward the paternalistic and hegemonic character of this transnational/international policy field. Urgently, though, also a political approach is required to tackle the root causes and consequences of those phenomena.

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12 Security as a Weapon: How Cataclysm Discourses Frame International Climate Negotiations

Delf Rothe

12.1 Introduction

I want to testify today about what I believe is a planetary emergency – a crisis that threatens the survival of our civilization and the habitability of the Earth (Al Gore 2007).

[...] apocalyptic imaginations are decidedly populist and foreclose a proper political framing [...], ecology is the new opium for the masses (Swyngedouw 2009).

In 2007 the issue of global climate change received unprecedented public and political attention culminating in the award of the Nobel Peace Prize to Al Gore and the *Intergovernmental Panel on Climate Change* (IPCC). At the same time in scientific, political, and public discourse an image of climate change that portrayed global warming as a security threat gained more prominence (Klare 2007: 355; Brauch 2009). The question of the security implications of climate change has also fuelled a series of scientific studies (e.g. Brauch 2002; Barnett/Adger 2007; Klare 2007; Podesta/Ogden 2008). These empirical studies, the first of them conducted as early as the 1990s, showed above all that there is no robust statistical evidence of a correlation between alterations in the climate system and security concerns (Barnett 2009; Gleditsch/Nordås 2009; Salehyan 2008; Salehyan 2008). However, these doubts did not restrict the influence of the security argument in political discourses. Going even further, proponents of the *Copenhagen School* (CS) of securitization warned as early as 1998 against the negative impact of an expansion of security logic into different issues such as the environment. A securitization of environmental issues, such as climate change, could lead to the adoption of exceptional measures, they feared. These could turn out to be inappropriate and even counterproductive in dealing with the environment. Yet, as different empirical studies have shown, despite discursive securitization we have not so far seen these political implications realized in climate politics (Brzoska 2009).

The starting point of this chapter is thus a twofold paradox: first, while empirical knowledge about the security implications of climate change is still insecure, this does not affect the growing public perception of climate change as a security issue; second, this discursive shift does not lead to the adoption of 'exceptional measures' at the political level – thus opposing the assumptions of the theoretical framework of the CS and experiences with other cases of securitization such as avian flu (Youde 2008) or international migration (Huysmans 2000). At the heart of this chapter lies the question of why the storyline of climate change as a security threat is so successful but does not lead to the political consequences that are assumed by the CS securitization framework. The chapter is a promising and logical next step in an ongoing disciplinary debate on the securitization of climate change and its political implications. Previous contributions to this debate (Brauch 2002, 2009; Brzoska 2009; Detraz/Betsill 2009; Trombetta 2008) have applied the original CS approach thoroughly, and shown that things in the empirical field of climate politics are more complex, as suggested in the framework.¹ This chapter accounts for these empirical insights in that it provides a theoretical revision of the CS account in order to make it more applicable to the complex case of climate politics.

In doing so, it draws upon the insights of a post-structuralist discourse theory to overcome the shortcomings of the CS as identified in the literature (Balzacq 2010). Rather than being the product of the utterances of single actors, securitization is better understood as an argumentative process, where the statements of different actors compete in a certain discursive or political arena. Through this perspective

1 For example, all studies agree that there is not one single security discourse in climate politics but rather different competing concepts (e.g. Brzoska 2009; Brauch 2009).

it will be shown that in the arena of international climate politics the storyline of climate change as a threat is used by different actors as an ‘argumentative weapon’ to give weight to their arguments, position themselves, or blame other actors. The question of whether a securitization succeeds, in this perspective, depends on the ability of actors to win others over to their arguments, thereby establishing a discourse coalition giving weight to the demands they promote (Hajer 2006).

The explorative case study of the chapter is based on a metaphor-based discourse analysis. The (pre-)negotiation process of a post-Kyoto agreement here serves as a most likely case example, as it concentrates on a period that has been characterized as being highly securitized in contrast to earlier periods of climate discourse. Empirically, the study draws on 60 newspaper articles from major German print media from 2009 and 2007 (as a reference year), as well as speeches from different political actors that gained public attention in 2009.²

12.2 A Discourse-sensitive Account of Securitization

12.2.1 The Copenhagen School

The securitization approach of the so-called *Copenhagen School* (Buzan/Wæver/de Wilde 1998; Wæver 1995) has to be understood against the background of a disciplinary debate about the expansion of security politics into different policy fields such as economics or the environment in the aftermath of the end of the cold war. The CS provided a novel perspective on this debate as it saw the widening of security not as an ob-

jective historical development but as the result of conscious political action. By drawing on the linguistic Speech Act Theory³, they developed the basic idea of the approach, namely that security problems do not just exist out there but are intentionally constructed in the process of articulating them (Buzan/Wæver/de Wilde 1998). The account consists of very few basic concepts: a ‘securitizing actor’, which can be political decision-makers or other actors in an authoritative position; a ‘securitizing move’ – i.e. statements that depict a certain reference object of reality as a security threat for another; and the relevant audience, which judges the plausibility of the construction and has to be convinced in order for the ‘securitizing move’ to succeed (Buzan/Wæver/de Wilde 1998: 2). In this way, the ‘securitizing move’ is intentionally performed by the actor following a specific calculus: the construction of a political issue as existential and urgent legitimizes the adoption of exceptional political instruments to deal with it (Wæver 1995: 55).

Since its initial formulation (Wæver 1995) this quite simple model has subsequently been revised and complemented. The focus was initially on the formulation of different facilitating conditions that could explain the success or failure of securitizations. One internal condition, which refers to the ‘speech act’ itself, is that the latter needs to be formulated on the basis of a certain grammar of security.⁴ The two external conditions on the one hand refer to the social position or authority of the speaker as well as the speaker’s relation to the audience, and on the other hand the characteristics of the constructed security problem exert an influence: the more this issue is generally associated with notions of threat and danger, the likelier the securitization is to succeed (Buzan/Wæver/de Wilde 1998: 33). In a more recent publication, Buzan and Wæver, as the main proponents of the CS, have provided another revision of the framework with respect to its spatial dimension (Buzan/Wæver 2009). In the original model the CS had suggested that a securitization in most cases will be restricted to the mid-range political level, i.e. the national or at the most the regional level. In the 2009

2 Media articles qualify as primary sources as they are an important arena for transnational climate discourses and provide statements from very different political positions. While it is justified to claim that the analysed sample is representative for discourses in ‘Western’ industrialized countries, one could expect quite different findings when media from so-called developing countries were added. This divergence is an issue for a different study and is not relevant for the argument of this chapter. The media sources comprised the *Süddeutsche Zeitung*, the *Frankfurter Rundschau*, and the *Tagesszeitung*, as well as the magazines *Der Spiegel* and *Die Zeit*. The articles that were chosen dealt with the various pre-negotiations of COP15 in Copenhagen 2009. The speeches were made at the UN Summit on Climate Change, 22 September 2009 in New York.

3 Speech Act Theory, which was developed by J. L. Austin and J. R. Searle, proposed that language does not consist only of propositions, i.e. statements that can be judged true or false, but also of performatives, i.e. utterances through which certain actions are performed.

4 ‘Grammar of security’ refers to the established collective understanding of security that is dominated by the realist concepts of existential threats, exceptionalism, national responsibility, and military (re)action.

article they present the possibility of how different smaller securitizations might be linked to more comprehensive security discourses at the transnational or even global level. These ‘macro-securitizations’, like the discourse on the ‘global war on terror’, subsequently affect all securitizations at lower levels, e.g. terrorism discourses inside national states. For our purpose this is of interest as the climate security discourse could be regarded as exactly such a macro-securitisation.

12.2.2 Problematising Securitization

In the discipline of *International Relations* (IR), the novel and refreshing perspective of the CS has fuelled an intense theoretical debate. The debate has also produced a series of criticisms of the CS’s account of securitization. Summarizing the various points made in the literature, we are able to sift out three general strands of criticism. The first strand refers to the concentration on single linguistic utterances as a means of securitization (Stritzel 2007). These authors for example argue for regarding securitization as a process rather than a single event and for including a variety of different means from media visualizations to policy tools and practices (Bigo 2007; Williams 2003; chap. 14 by Rørbæk). A second main point for many authors is the limited conceptualization of the actors and audiences in the securitization process. It was, for example, suggested that securitization could be understood as an inter-subjective process of argumentation between several securitizing actors and audiences (Balzacq 2010). Thirdly, adherence to a military security concept involving the identification of existential threats and the adoption of exceptional measures has provoked a lot of criticism for unnecessarily constraining the account (McDonald 2008: 576). All these criticisms result from a complex combination of two elements: first, security thinking in the tradition of Carl Schmitt and (neo)-realist scholars such as Kenneth Waltz (1979), and second, the partially contradictory assumptions of discourse and ‘speech act’ theory on the constructed nature of social meaning. In the following, the aim is to identify contradictions and to show possibilities for overcoming them by strengthening the discourse-theoretical position inside the CS.

12.2.3 Speech Acts Versus Discourses

From a perspective that draws on the insights of post-structuralist⁵ discourse theories, many of the above-mentioned criticisms are self-evident. In line with the

CS, discourse theory starts from the assumption that language is not simply the representation of an already existing objective reality but it is indeed the linguistic structure which constitutes the perceived reality in the first place. Yet, and at this point discourse theory is often misunderstood, this does not mean that there is no material reality at all. Rather, the point is that material facts do not have any meaning for us until we give them a name or term, thereby putting them into a relationship with (the terms of) other things. This can be regarded as the structuralist core (De Saussure 1967) of discourse theory: language is a structure or system which produces the meaning of objects by relating and ordering them along two axes or logics – difference and equivalence (similarity).⁶ This also means that there is no natural relation between a term, or sign, and the object it denotes. The relation is arbitrary, as the meaning of any word can be seen as a social convention which is not fixed. Following this, one and the same term will have very different meanings depending on the discursive context of its formulation. What we will understand as security heavily depends on the context and on how the term is uttered in different discourses. A banker may denote security as “the guarantees for an investment”, while a computer scientist may speak of “the vulnerability of a network”. These denotations differ strongly from the use of the term ‘security’ in a military context.

Post-structuralism now extends these basic assumptions in two ways that are decisive for our purpose. The first revision says that the discursive structure is never ultimately fixed but can always be changed through individual articulations – e.g. by introducing new concepts or by putting old ones into a different context just as in the case of a securitization (Glynos/Howarth 2007: 109–10). A discourse then is a spatially and thematically demarcated field in which the meaning of its elements is *temporarily* stabilized (Laclau/Mouffe 1985: 167). To phrase it precisely: a discourse is “a specific ensemble of ideas, concepts and categorizations that are produced, reproduced and transformed in a particular set of practices and through which meaning is given to physical and social

5 With the term *post-structuralist discourse theory* in this chapter, the author mainly refers to the work of Ernesto Laclau and Chantal Mouffe (1985).

6 For example, the meaning of security is constituted through its potentially endless differentiation from other phenomena, e.g. fear, social injustice, freedom etc., and its equation with others, e.g. nationalism, existential threat, physical integrity etc.

realities” (Hajer 1995: 44). In the case of climate change, ideas and concepts, for example, are the notion of the climate as a complex system or the concept of vulnerability. Our contemporary understanding of climate change is produced within a set of scientific practices such as modelling, which give meaning and substance to the complex reality of climate change. Discourses define and constrain what can reasonably be said and what counts as true for a given issue at a certain time. Through this, they have a certain self-enforcing potential: if the articulations in a thematic field are repeated again and again they appear as naturally given and gain a certain taken-for-granted status (Hajer 1995: 61). For a theory of securitization this has some very important implications. First, every securitizing move depends to a considerable degree on the already established discourses. Thus, the discursive context has at least to be incorporated as a ‘context variable’. Second, an actor can never fully control the discursive effects of that actor’s statements as these always compete and/or link up with a variety of utterances from other actors. In this respect, securitization is to be understood as an argumentative struggle in a certain discursive arena such as the global climate change discourse. Thirdly, this transcends the very distinction between the securitizing actor and the audience in the CS. Rather than taking the form of action and re-action, securitization is a mutual interactive process.

The second revision of the structuralist account of discourse was to abandon the notion of a fully constituted subject as the origin of language and meaning (Howarth 2000: 44). For many theories – this holds true for linguistics as well as for social sciences – the human individual is seen as the origin of social phenomena. The individual intentionally determines the meaning of the sentences he or she articulates or changes his or her social environment through purposeful actions. This also holds true for the theory of securitization: here he or she is the securitizing actor, who intentionally constructs something as a security issue. This implies that actors have fixed and given identities, beliefs, and intentions. For discourse theory this is a sheer impossibility: single individuals cannot be regarded as origins of social change since their very identity, and hence their beliefs, interests, and desires, are themselves dependent on the discourses they are embedded within (Gottweis 2003). From this perspective every discourse provides a series of different subject positions⁷ that individuals take up and identify with. Subject positions are the “places of enunciation” (Howarth 2010: 313) in a certain dis-

course that enable individuals to speak and to be heard. The climate discourse, for example, provides subject positions such as climate scientist, climate sceptic, or environmental activist. The influence of a subject position also depends on the historically specific discourse – for example, in the early 1990s ‘climate sceptic’ was a widely accredited subject position in global climate discourses. Today, this is no longer the case.

Like all elements of discourse, subject positions are not fixed or given but are established and/or changed in a process of mutual positioning. Positioning here refers to those speech acts or arguments of actors that relate to and shape others’ identities. This positioning again works along the two dimensions of difference and equivalence. For example, the position of climate sceptics depends on a breakaway movement from scientists that warns against the risk of climate change. Yet to say that subject positions are potentially contingent does not exclude the possibility of their becoming temporarily fixed, e.g. by becoming institutionalized in political or economic institutions. Such institutionalized subject positions are often equipped with a considerable moral and legal authority (Walter/Helmig 2008: 122). For a theory of securitization this means that instead of taking a strategically behaving actor as the origin of a securitization, we should start by identifying the influential subject positions provided by the (climate and security) discourses which enable individual actors to define security threats. Furthermore, we should pay attention to the positioning effects that security arguments can have. To denote someone else as a threat is indeed one of the strongest positioning moves. An example is the securitization of the carbon-intense economies of the Western world by the AOSIS states as a threat to their survival.

12.2.4 Security and Politics

From a discourse-theoretical perspective, both the dichotomization between politics and security and adherence to a realist security concept cannot be maintained. If the relationship between a term and its content is arbitrary, as described above, it is not reasonable that the security concept should have any natural immutable core. The prominent role of the exception and a realist security concept for the CS has been attributed to the influence of Carl Schmitt

⁷ The concept of subjectivity refers to the identity of actors and corresponding behavioural norms.

(Williams 2003). Schmitt had developed a conflictual concept of politics, which sees the distinction between friend and enemy at the heart of political action (Schmitt 1996). In national states, political enmities become institutionalized and partly tamed through a stable order based on the sovereign's monopoly of force, the rule of law etc. Nevertheless, there is always the possibility for the state of order to become vulnerable, e.g. through revolutionary struggles. For the state of order to withstand this temporary suspension, the political leader makes use of its emergency powers. In this way, the leader identifies an existential enemy which is blamed for threatening the social order (Schmitt 1993). This concept has two implications that are important for us. On the one hand, while the exception is the moment of pure and absolute enmity, normal politics is not free of friend-enemy distinctions (Schmitt regarded an absolute absence of this distinction as the "death of politics"). Schmitt instead suggested taking the degree of enmity and friendship as a yardstick for the intensity of politics. On the other hand, for Schmitt, the presence of an enemy also has a positive political function, which is to enable and guarantee the collective identity of the "inside" community.

The construction of threats is thus a feature of every ordinary political process where collective identities are constructed against the background of a common enemy.⁸ Playing the security card in this respect can be seen as a highly effective weapon in a discursive political struggle, e.g. to forge alliances, blame others, or raise popular identification with certain issues. In all these functions securitization displays a clear politicizing bias. Yet there are also cases in which a securitization will lead in the opposite direction towards a de-politicization or de-democratization. This is the case when security arguments are used to narrow the corridor of political alternatives. Security narratives, and the sense of urgency they bring about, can invoke a notion of 'there is no alternative', thereby silencing criticism or opposition. The existence of conflicting alternatives can be regarded as the pulsing heart of politics (Mouffe 2005). Consequently Chantal Mouffe has criticized contemporary forms of (global) governance that aim at reaching a deliberative consensus, and are often legitimized through the notion of a common threat as inherently anti-democratic.⁹

8 For an analysis of the use of the concept of 'threat' in relationship to 'challenge', 'vulnerability', and 'risk' in different scientific communities, see Brauch (2011).

12.2.5 The Rhetorical Face of Securitization

Another critical point applying to the account of securitization, which has not been dealt with in the literature so far, is the focus on the textual surface structure of language (what has been said). This hides the 'depth range' of language, which comprises the dimension of rhetoric (how something has been said). Different studies have highlighted the important role of metaphors, in particular in the discursive construction of reality (Howarth/Griggs 2008; Hülse 2003; Walter/Helmig 2008). The prominence of metaphors stems from their ability to produce equivalences or analogies between different specialized discourses by providing a common vocabulary (Sarasin 2003: 13-4). Through metaphors, we are able to use more accessible and generally intelligible concepts to delineate and thus understand very complex empirical phenomena.

These assumptions correspond to the findings of cognitive linguistics that metaphorical reasoning is the structural organizing principle of human thought (Lakoff/Johnson 1980: 11). In an extended theory of securitization, the study of metaphors of security helps us to understand how the security discourse is linked with other specialized discourses. Securitization at the rhetorical level represents a subtler, often unnoticed and therefore even stronger possibility of imposing discursive changes, e.g. by picturing climate change in metaphors of war and conflict.

12.2.6 A Different Account of Securitization

An account that is able to bring together these theoretical considerations is the argumentative discourse analysis developed by Maarten Hajer. Following Hajer, political action is based on a continuous argumentative struggle, where alternative interpretations of the world, political problems, and the right political solutions compete with each other. In this process, individuals will take up different subject positions to construct their arguments. In this way, they draw upon the present discursive vocabulary and knowledge. According to Hajer, this knowledge does not exist in an atomized fashion, but is organized through so-called storylines. Storylines are short and con-

9 Following Mouffe (2005), consent always and necessarily rests upon the exclusion of some demands so that the existence of a real consensus ultimately remains an illusion. The absence of alternatives in consensual political settings meanwhile reduces the democratic legitimacy of such policies.

densed narratives that give meaning to a certain aspect of reality by reducing its complexity (Hajer 2006: 69).¹⁰ Storylines often draw upon particular metaphors which raise their intelligibility and plausibility. Argumentative action through the promotion of storylines not only aims at framing a certain problem but also at positioning other actors in the field, e.g. polluters and sufferers in the climate change discourse. If we understand securitization as an interactive argumentative process, this also implies that we need a different criterion from the acceptance of the audience for the success of a securitization. In line with Hajer's theory, this criterion can be found in the evolution of a discourse coalition, i.e. a coalition of different actors who identify with and promote the same set of argumentative storylines (Hajer 2006: 70). When such a discourse coalition is established, the acceptance and authority of the promoted storylines increase. The influence of any set of storylines will increase the most if it is taken up by actors with antagonistic subject positions, e.g. by oil businesses as well as by environmental *non-governmental organizations* (NGOs). If a storyline is publicly accepted, this retroactively increases the authority and credibility of the coalition that promotes it.

12.3 Actors, Coalitions, and Storylines in the Securitization of Climate Change

To study the securitization of climate change as an argumentative process, a methodical approach after Hajer (2003: 103) is followed and partly extended by the inclusion of metaphor analysis. As a first step the institutional context of the securitization process and its related practices and subject positions will be identified. Secondly, the dominant discursive vocabulary (storylines and metaphors) at the macro level will be analysed. Thirdly, argumentation strategies and the evolution of different discourse coalitions will be analysed. Finally, the political implications and consequences of this process will be discussed.

12.3.1 The Institutional Background of the Securitization Process

Social practices into which the discursive production of climate change is embedded are characterized by a relatively high degree of institutionalization. This also holds true for the subject positions of the relevant speakers in the discursive field. The signing of the *United Nations Framework Convention on Climate Change* (UNFCCC) in 1992 gave birth to the international climate regime and thereby established a stable and continuous frame of reference for international climate negotiations (Biermann 1998: 193). Crucial for the orientation of future climate politics was the establishment of the UNFCCC as an intergovernmental institution, with its annual *conferences of the parties* (COP) as its general decision-making agency. This put climate politics mainly into the hands of national governments. Politicians – often from the background of Western national environmental bureaucracies – are thus an influential and highly institutionalized subject position in climate politics. Besides these national actors, the IPCC, through its incorporation into the UNFCCC architecture, became the most influential actor in climate politics. The IPCC conforms to what Callon and Latour have called a “macro-actor” (Callon/Latour 1981: 281). These are actors who bear the sole ability to announce the state of facts in a given political domain. Climate discourse and hence politics are highly dependent on the IPCC assessment reports and their summaries for policymakers. We can thus identify climate scientists as a second influential subject position with a high degree of institutionalization in the climate discourse.

Yet, since the initial establishment of the climate regime, considerable changes with regard to the architecture of international climate politics have taken place. Due to increasing public awareness and perception of climate change as a matter of justice or development, the number and influence of NGOs in climate politics has risen. The number of NGOs participating in the annual COPs is growing as well as the degree of cooperation among them (Carpenter 2001: 319). Businesses have also changed their strategy with respect to climate politics. Businesses now try to introduce themselves into the discourse, pursuing the role of reasonable actors (Global Leadership Forum on Climate Change 2009). At the same time two developments can be noticed, first a higher prioritization of the issue and second a shift of competence from environmental ministries or organizations to national leaders and hence organizations like the G8 or

10 An example is the greenhouse storyline that explains and simplifies the complex phenomenon of climate change.

G20 (G8 2009). The phase which is analysed in this chapter is characterized by the so-called *Bali Road-map*. This defines a pre-negotiation process which should prepare for adopting a successor agreement for the expiring Kyoto Protocol at COP 15 in Copenhagen. Statements in this phase have to be seen as arguments in the negotiation process. Besides the official delegation meetings of the UNFCCC, several further international meetings were held. The most prominent was the UN summit in New York in September 2009, which nearly 100 political leaders from industrialized and many developing countries attended.

Lastly, there is the subject position of security officials and security professionals, which until 2007 was not really present in the climate discourse. Yet through reports and interventions that were widely perceived by the public, they managed to integrate themselves into the climate discourse without any external assistance. **I**

In the field of security politics, government officials from Germany (WBGU 2007), Great Britain¹¹, and the USA¹² are among the most active players in the climate discourse. NATO has also discovered climate change as an important issue and is currently becoming more active in the field.¹³ A report on climate security by the *Center for Naval Analysis*¹⁴, an American security think tank with close connections to the Pentagon, has received the most publicity. In Europe, the German Advisory Council on Global Change has shaped the debate with an influential report (WBGU 2008). There are further non-governmental actors from a broader security policy context such as the British *International Alert* (IA) or the American *Center for Strategic & International Studies* (CSIS) that were major drivers of the debate (see table 12.2).

12.3.2 Metaphors of Climate Change

As nobody is able to directly perceive the complex phenomenon of climate change, a system of conceptual metaphors and simplifying storylines is needed for people to be able to think about and communicate over climate change. The most dominant way of framing climate change in the empirical material is through metaphors of war and struggle. The war metaphoric of climate discourse comprises several sub-concepts such as *climate change is an enemy/weapon; is a criminal; is a catastrophe or a threat*.¹⁵ Sometimes an even more dramatic version of the *threat* metaphor is used, which is *climate change is an apocalypse* – a concept of danger that is structured around several biblical signifiers. As climate change is an *enemy* or *threat*, logically there is a need for defenders. This corresponds to the often-used concept *climate politics is a struggle*. In the empirical material two different dimensions of the metaphorical frame can be identified. The first dimension constructs politics as one party in the struggle against the enemy climate change, while the second dimension paints a picture of a struggle between different countries over their responsibility for global warming, as well as their contribution to climate politics.

In addition to these dominant framings of climate change and climate change politics, there are further metaphors that are directly related to them. One of these is *climate change is a disease*. There is a strong affinity to the war metaphors that stems from their common roots in human experience with the fragile physicality of the body or the contingency of life (Sarasin 2003: 191–2). Similarly, the two metaphorical concepts of *climate change is a test or challenge* and *climate change is a game/sport* are deductions of the more general concept of struggle. Whereas the former concept of a challenge stresses the common fate of humanity, the latter is mainly used to stress the tough negotiation process – e.g. through the metaphor of climate poker. Further related concepts draw on the sports metaphors mentioned as well as on metaphors of motion that help explain the temporal dimensions of climate change. The first of these metaphors is *climate politics is a journey* which rewrites political progress in spatial terms. Following this fram-

11 National Security Strategy of the United Kingdom, 2008: “Security in an interdependent world”; at: <http://interactive.cabinetoffice.gov.uk/documents/security/national_security_strategy.pdf> (24 April 2010).

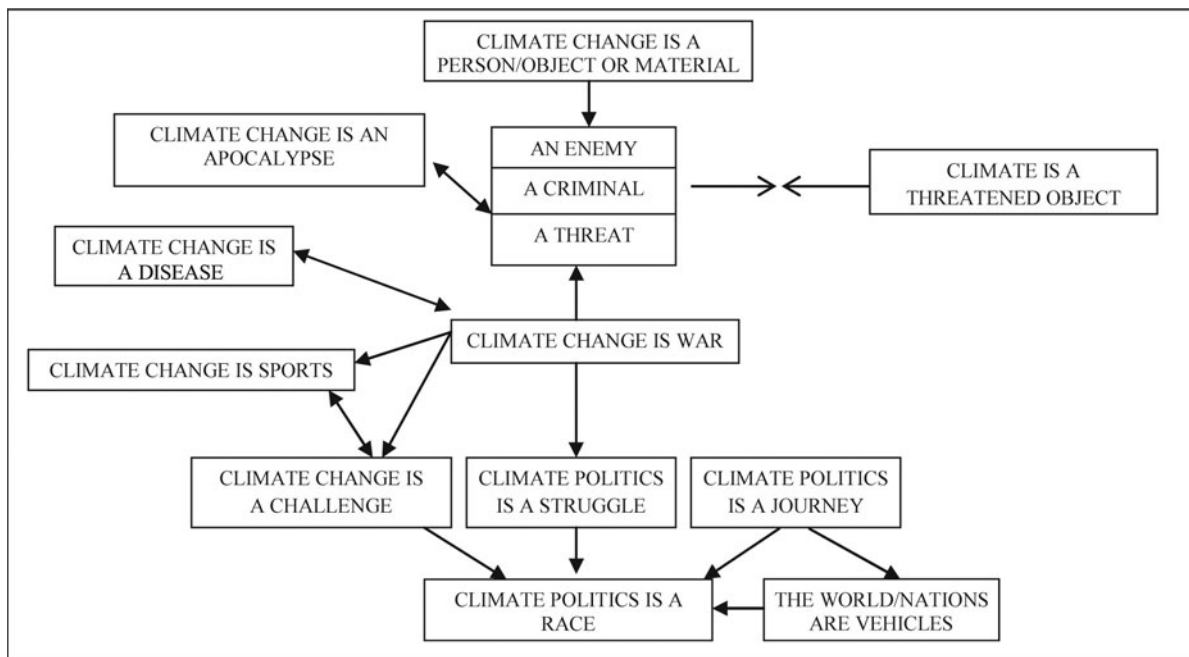
12 U.S. Government, White House: *National Security Strategy of the United States of America*, March 2006, at: <<http://www.strategicstudiesinstitute.army.mil/pdf/files/nss.pdf>> (20 April 2010).

13 Anders F. Rasmussen, 2009: *NATO Secretary General at the NATO Parliamentary Assembly*, Edinburgh, 17 November 2009; at: <http://www.nato.int/cps/en/SID-6AC1AA22-4B68D4FB/natolive/opinions_59214.htm?selectedLocale=en> (24 April 2010).

14 Center for Naval Analysis, 2007: *National Security and the Threat of Climate Change*; at: <<http://securityandclimate.cna.org/report>> (12 April 2010).

15 To differentiate metaphors as broader discursive concepts from concrete linguistic metaphors, the former are written in capitals. You will find textual examples for the metaphorical concepts from the empirical material in table 12.2 (Appendix).

Figure 12.1: The metaphorical vocabulary of climate discourses. **Source:** The author.



ing, the warming *earth* as well as *countries* are *vehicles*, which are supposed to be in a *race* or *run against each other*. Thus, the earth is moving horizontally – which metaphorically represents the time dimension of global warming – whereas climate politics stand still. Now, on this horizontal axis different points of no return exist. An example of such a point is the perception of COP15 in Copenhagen as the ultimate chance to get the earth on to a track of sustainable development and the perception of the 2^o C target as a demarcation of chaos. These metaphors expressively highlight the urgency dimension of climate politics. Ultimately, there is a surprisingly marginal metaphor which portrays the *earth* or *climate* as a *threatened object*.

12.3.3 Discourse Coalitions and Storylines

A thorough look at the empirical material can show that speakers who have a voice in the discourse can be allocated to a set of six to seven different subject positions. These are climate scientists (especially IPCC), political elites and/or delegation leaders from industrialized countries, politicians from developing/small island states, security actors and security think tanks, NGOs, and to a lesser degree transnational businesses.¹⁶ Furthermore, due to their major significance another subject position for climate celebrities is introduced: examples are Al Gore, Ban Ki-Moon or Yvo

de Boer. These are characterized by a perceived neutrality, a high moral authority, and institutional influence due to their social position (e.g. as UN or UNFCCC general secretary). The analysis of empirical material shows that in the period from 2007–2009, actors from all the subject positions drew on storylines that promoted the danger of climate change and identified it as a threat, enemy, or apocalypse. In this storyline, climate change has the role of the anti-hero or enemy, who will at an uncertain future point in time turn against humanity and threaten the earth as we know it. We can notice further that different actors use the storyline in slightly different versions to promote quite dissimilar arguments. Summarizing the various individual arguments articulated in the material, four ideal type sets of storylines can be identified. It can be assumed that the subject positions that promote the respective sets of storylines constitute a discourse coalition.

A first discourse coalition could be called *alarmist*. It basically puts forward the urgency or time dimension of the dangerous climate change storyline. The coalition comprises climate scientists and critical NGOs, but to some lesser extent also the other subject positions in climate politics. It revolves around

¹⁶ Table 12.2 in the Appendix lists the subject positions found in the texts and gives examples of the individual speakers that were assigned to them.

Table 12.1: Discourse coalitions drawing on storylines of a dangerous climate change. **Source:** The author.

Storylines	Subject position	Arguments
Alarmist: Dangerous climate change (above 2.0 °C) is causing apocalyptic and <i>incalculable</i> effects (<i>climate change as war or challenge</i> and <i>climate politics is a race</i>).	All	Immediate response → Copenhagen! We need to keep climate change below 2.0 °C.
Globalist: Climate change threatens the whole world and is thus a test for humanity (<i>climate change is war/climate change is a test</i>).	Politicians (industrialized countries) Climate celebrities	Developing countries have to contribute a share. We need a global agreement immediately.
Developmental: Climate change is threatening the survival and the development of developing countries (<i>climate change is a threat/enemy</i>).	Politicians (Developing countries) NGOs Business	Support of developing countries with funds and technology; ambitious and immediate mitigation of industrialized countries.
Climate Conflict: Climate change fuels conflicts over resources and migration which threaten international security, (<i>Climate change as a threat to national security</i>)	Security officials and professionals	A global early warning system for conflicts; establishment of a networked security.

the concepts of *climate change as an apocalypse, challenge, journey, and a race/run*: “[...] the journey is long. The journey is hard. And we don’t have much time left to make it.”¹⁷ The metaphors of motion are mainly used to highlight the time dimension of climate politics as time is running out: “We have to limit it to 2.0 degrees and if we don’t succeed, it will be a disaster.”¹⁸ The basic argument that accompanies an alarmist narrative is the need for urgent action. Another argument is that the severity of the problem can only be solved by world leaders who are steering the vehicles which are in a *race against climate change*.

For NGOs as well as for climate scientists the alarmist storyline can be regarded as a means of raising awareness in the first place. The motional metaphors of the alarmist storyline (*climate change as a race*) are intentionally ‘exploited’ for the purposes of positioning. As climate politics is a race/run along a horizontal axis or climate change is an enemy that is heading towards us, actors are able to metaphorically position themselves along the spatial axis of climate politics. Particularly brave or wise actors like the EU are forerunners or pioneers, others – especially the USA – are accused of lagging behind. The security

concept used by the alarmist coalition thus is one that clearly draws upon the notion of existentialism.¹⁹ Yet due to the prominent role of the time factor it also often refers to the notion of global risk – a threat lying in the future that can be mitigated through precautionary actions. This risk paradigm is ultimately represented by the (artificial) 2.0 °C demarcation between a manageable climate change and an uncontrollable one.

Slightly different is a second discourse coalition that can be called *globalist*. It differs from the alarmist one through privileging the spatial dimension of climate change over its time dimension. Its storylines are established along the metaphors of *climate change as a threat* and as an *enemy of humanity*. As one feature of dangerous climate change is its spatial de-boundedness, it abolishes the differences and boundaries between countries, regions, and humans: “This is a test of our ability to work together as nations facing common challenges in this new global era. If we falter, the Earth will itself be at risk [...]”²⁰ The globalist storyline is mainly promoted by politicians and climate celebrities. It is obvious that the sto-

17 Barack Obama: “Speech at the United Nations Summit on Climate Change”, New York, 22 September 2009; at: <<http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/USA.pdf>> (19 April 2010).

18 Nicolas Sarkozy: “Speech at the United Nations Summit on Climate Change”, New York, 22 September 2009; at: <<http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/090922Discoursclimat.pdf>> (19 April 2010).

19 Unlike other security concepts like human security that account for risks with varying degrees of danger, the alarmist discourse frames climate change as a threat to the existence or survival of the whole planet.

20 Gordon Brown: “Speech to the Major Economies Forum”, London, 19 October 2009; at: <<http://www.number10.gov.uk/Page21033>> (19 April 2010). The quotations in this paragraph serve as paradigmatic examples but constitute only a very small proportion of the total number of expressions in the empirical material.

ryline is used to promote international cooperation in climate politics. Faced with a common enemy, humanity unites and stands up together to defeat the exogenous challenger. This is often dramatized by politicians when they state that *climate change is a test* which humanity has to pass: “Global climate change has a profound impact on the existence and development of mankind, and is a major challenge facing all countries.”²¹ It thus has strong positioning effects as it constructs a collective identity of nations and people in face of the climate catastrophe. This is a strong argument against the common distinction between polluters and developing countries in international climate politics. The globalists draw upon an international if not universal security concept that reframes climate politics as a matter of (global) collective defence.

In opposition to this globalist storyline there is a discourse coalition between the subject positions of politicians from developing countries and (developmental) NGOs. The coalition, which is called *developmental*, promotes a storyline that again depicts climate change as a dangerous enemy. Yet in this version the industrialized countries bear the responsibility for nature becoming ‘evil’. Threatened are mainly the survival and economic well-being of the developing countries. The storylines promoted revolve around the concept of human security. With respect to the arguments promoted, we can further differentiate a moderate and a radical faction of the developmental coalition. The radical version, for example advocated by some AOSIS members, securitizes the industrialized countries as a threat for their survival. This links, for example, to arguments calling for strong international support for adaptation in vulnerable regions. In the moderate version the threat is not the Western world but again the external enemy of climate change. Here, one concept often represents the possibility of rescue: ‘sustainable development’. While being radically ambiguous, the term has been established as a major argument for the compatibility of economic growth and the protection of the environment.²² Again, the developmental storylines are also used for the positioning of identities in climate politics. While the developing countries position themselves or are positioned as *victims*, industrialized states as the *polluters* are accomplices in climate change wrongdoings.²³

21 H.E. Hu Jintao: “Speech at the United Nations Summit on Climate Change”, New York, 22 September 2009; at: <<http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/China.pdf>> (19 April 2010).

The last coalition of actors promotes a set of storylines that draws upon a narrow, national, and military concept of security and can be called the *climate conflict* coalition. The basic argument establishes a causal chain between climate-change-related instability and diminishing human security in the global South and the security concerns of industrialized countries in the global North. In this respect human insecurity results from a high degree of negative climate impacts (such as rise in sea level, droughts, etc) combined with a lack of governmental coping capacity to deal with the impacts of climate change. The passive and helpless victims in this narrative turn out to be dangerous for the industrialized countries as they bear the potential of violent conflicts and migration that could spread internationally: “[...] as a result of climate-induced migration and poverty in the poorest countries, [there will] almost inevitably [be] greater conflict.”²⁴ Climate change, through the spread of migration, violent conflict, and/or terrorism, becomes in these narratives a national security threat for the Western world. The coalition mainly comprises subject positions of Western political leaders, climate celebrities, and security professionals and officials. Interestingly, even subject positions one would not expect to join the climate conflict discourse coalition, such as environmental NGOs, can be found here. This gives the arguments even more weight: “Failure to agree a strong, effective deal in Copenhagen will accelerate the demise into competing smaller entities, resource wars, disruption, refugees, and natural catastrophes.”²⁵

22 See David Zuzuki Foundation, Germanwatch, Greenpeace, IndyAct, National Ecological Centre of Ukraine, WWF International, 2009: “A Copenhagen Climate Treaty I.O. A Proposal for a Copenhagen Agreement by Members of the NGO Community”; at: <http://www.greenpeace.de/fileadmin/gpd/user_upload/themen/klima/NGO_Treaty_Overview.pdf> (20 April 2009).

23 Mohamed Nasheed: “Speech at the United Nations Summit on Climate Change”, New York, 22 September; at: <<http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/Maldives.pdf>> (19 April 2010).

24 Gordon Brown: “Speech to the Major Economies Forum”, London, 19 October 2009; at: <<http://www.number10.gov.uk/Page21033>> (19 April 2010).

12.3.4 Political Implications

We can see that the securitization of climate change is a highly contested, interactive process where different argumentations and very different security concepts are applied. The framing of climate change as a security threat in a narrow sense makes up only a part of this broader discursive struggle. This is in line with the findings of different studies on the securitization of climate change (Brzoska 2009; Detraz/Betsill 2009; Trombetta 2008). In this respect it is not surprising that up till now we have not seen the adoption of exceptional measures to mitigate the risk of climate change as we had to suggest following the CS's account of securitization. What kind of measures will be applied in the future depends on the question of which discourse coalition will enforce its storylines as the correct interpretation of the climate change issue (this does not exclude the possibility that different concepts and arguments might coalesce).

Contrary to previous studies of the securitization of climate change, it is argued here that there are nevertheless noticeable political implications of the process described. These implications appear to be contradictory, but with regard to the theoretical background presented above this contradiction disappears. On the one hand, the process of securitization from 2007 on has certainly led to a considerable politicization of climate change in the sense of a Schmittian concept of politics. This means that the intensity of public identification with the issue of climate politics has risen. This has shifted climate change towards an issue of 'high politics', which is further exemplified by the participation of national leaders in COP15 in Copenhagen in December 2009, where a sense of urgency and existentialism was continuously present at the negotiating table. This culminated in a highly emotional and controversial concluding debate - bringing the post-Kyoto negotiations close to failure. The more the debate heated up, the more the different speakers drew upon securitizing storylines to highlight the importance of their agreement or to accuse the other actors' proposals of not being ambitious enough.²⁶

At the same time scholars such as Eric Swyngedouw (2010) have pointed to the fact that the promi-

nence of narratives of a dangerous climate change leads to a steady de-politicization of international climate governance. On the basis of the present empirical study this can be explained as follows. Although contrary in their conclusions the different storylines draw on the same discursive vocabulary to promote their arguments. Thus they share a certain common denominator, which is the construction of climate change as an external enemy. Put in CS terms, the different securitizations of climate change link up to a universal globalist macro-securitization, constructing climate change as a global threat and 'humankind' as a threatened reference object. This simplifying storyline offers a basis for a variety of specialized discourses for communicating. Through this, it becomes possible to condense the incredibly complex scientific and socio-economic causes and processes of climate change into a few basic metaphors (Swyngedouw 2009: 7). The existence of the macro-securitization discourse at the same time constrains and structures possible arguments at lower political levels. At the same time this leads to the paradox that antagonistic actors such as security officials and climate activists draw on the same storyline of a dangerous climate change for their arguments. Even actors such as oil companies refer to the common threat storyline (Global Leadership Forum on Climate Change 2009). Even critical voices such as NGOs now speak the language of dangerous climate change.²⁷

As was argued above in the theoretical part, the presentation of an external enemy is the basis for a common identity. Yet in the case of international climate politics this leads to the blurring of fundamental sociopolitical antagonisms between the different actors in the negotiations. Furthermore, the notion of necessity and urgency closes the window of opportunity for political options that lie beyond the architecture of the climate regime in the framework of the UNFCCC and its policy instruments, notably the flexible mechanisms of the Kyoto Protocol. This does not mean that dispute and conflict would be silenced in the climate negotiations, otherwise it would not be so difficult to agree on a post-Kyoto climate regime. Rather, the macro-securitization of climate change has

25 David Zuzuki Foundation, Germanwatch, Greenpeace, IndyAct, National Ecological Centre of Ukraine, WWF International, 2009: "A Copenhagen Climate Treaty 1.0. A Proposal for a Copenhagen Agreement by Members of the NGO Community"; at: <http://www.greenpeace.de/fileadmin/gpd/user_upload/themen/klima/NGO_Treaty_Overview.pdf> (20 April 2009).

26 The different speeches can be viewed here: <http://cop15.meta-fusion.com/kongresse/cop15/templ/ovw.php?id_kongressmain=1&theme=unfccc#> (18 January 2011).

27 US Africom, 2009: "A New Approach to Global Food Security and Hunger", at: <<http://www.africom.mil/getArticle.asp?art=3569&clang=0>> (20 April 2010); Greenpeace et al. 2009.

supported the widely-acknowledged view that there is no alternative to a global climate deal and its political instruments. This means at the same time that fundamental disputes and antagonisms are channelled into a very narrow set of abstract and technical matters. This became obvious at COP16 in Cancun, where the highly controversial negotiations revolved around questions such as: should we allow for an average warming of 2.0 °C or 1.5 °C? How should CO₂ potentials be measured? Should carbon capture and storage be included in the *Clean Development Mechanism* – or not?²⁸ This equally means that fundamental political decisions concerning the functioning of the capitalist system, the Western way of life, and the impossibility of infinite growth are excluded. The consensual setting regarding the danger of the climate crisis prevents the development and discussion of real political alternatives based on a democratic decision-making process.

12.4 Conclusions

A twofold puzzle was noted above: on the one hand, climate change is more and more seen as a security problem, while empirical findings do not necessarily support this assumption. On the other hand this securitization of climate change has so far not led to the adoption of ‘exceptional measures’ in climate politics. Now we are able to solve this puzzle by adding the missing pieces to the securitization account. Securitization is neither the result of growing evidence of the security implications of climate change nor is it an intentional manipulation of reality by political elites. In the theoretical part of this section it was shown that securitization can best be described as the emergence of transnational discourse coalitions who share the use (of different versions) of a climate security storyline for argumentative purposes. Furthermore, it was suggested that a securitization does not take place solely at the surface structure of language but also at the lower rhetorical level. In the empirical part, it was shown that climate discourses are structured by metaphorical storylines that revolve around the concepts

of war, struggle, and security. Different actors in climate politics use these storylines to promote their own arguments and claims. It was argued that the securitization of climate change can be regarded as a cumulative by-product of this argumentation process and that it is not an intentional strategy of national leaders.

The result of this process can be seen in the evolution of a macro-securitization representing climate change as a global threat for humankind. On the one hand this has led to the intensification and politicization of climate politics. On the other hand it could be seen as part of a broader trend towards the de-politicization of international climate governance. The presentation of climate change as an external enemy fosters a counterproductive focus on an international agreement as the only solution to climate change. This means that fundamental questions about the organization of our society and economy are not raised. In this respect an ever-growing number of international climate activists have stopped calling for a strong international agreement and instead made a case for the shutdown of the Copenhagen process so as to develop alternative solutions to the climate crisis. For the research community dealing with climate change and security issues, the findings of this chapter have three major implications. Firstly, caution is needed about how politically relevant research findings are presented and their possible unintended consequences. Secondly, positive sociopolitical visions should be developed that depart from apocalyptic security scenarios as well as from the technocratic framing of the UNFCCC setting. Thirdly, further studies of the political impacts of a securitization of climate change are needed which should cover a longer time span in order to establish the possible long-term effects of the securitization process. The studies should also include a wider range of policy fields such as development or security politics to account for possible spillover effects and interactions with international climate politics.

28 UNFCCC, 2010a: “Outcome of the work of the Ad Hoc Working Group on long-term cooperative action under the Convention”, at: <http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_1ca.pdf>; UNFCCC, 2010b: “Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol”, at: <http://unfccc.int/files/meetings/cop_16/application/pdf/cop16_kp.pdf> .

Table 12.2: Structural metaphors and their textual expressions (translated from German). **Source:** The author.

Structural Metaphors	Textual/Linguistical Expressions
EMISSIONS ARE OBJECTS (TRADABLE GOODS)	To cap emissions; establishment of a carbon market; emissions do not have a price tag (Zeit 50/2007); “deposit emissions in the atmosphere”; a run between growth and emissions (Zeit 49/2007); climate diplomacy now has a language and a currency: CO2(-certificates) (Zeit Online 5.11.2009);
CLIMATE CHANGE AND/OR IMPACTS ARE WAR ⇒ ARE AN ENEMY/ WEAPON ⇒ ARE A CRIMINAL ⇒ ARE THREATS a) FOR HUMANITY b) FOR DEVELOPING COUNTRIES c) FOR CERTAIN SECTORS d) FOR SECURITY	Victims of CC; campaign of destruction; climate refugees (Spiegel 47/2007); CC will ravage huge parts of the world; humanity has to arm for the defensive battle (Spiegel 05/2007); developing countries suffer from climate change; industrialized states have to fight against drought; 25 million climate refugees today – more than caused by war (Spiegel 15/2007); agriculture will suffer; massive problems with water supply; pests are gaining ground; threats for human health (Spiegel 5/2007); the most serious security threat in the world; more threatening than international terrorism; (Spiegel Online 6.6.2007); CC fuels conflicts; CC causes waves of migration; destabilizes states (Spiegel Online 6.6.2007) a challenge for humanity: prevent the earth from tipping into chaos (FR 07.11.2009); an irreversible catastrophe (FR-Online 30.10.2009); [...] otherwise whole landslides are in danger of dehydrating (Süddeutsche 19.09.2009); emission of dangerous greenhouse gases like CO2 (Süddeutsche 22.10.2009); disunited into the catastrophe (TAZ 13.06.2009); to dominate or control climate change; fight the impacts (Zeit Online 5.11.2009); who is braking the fight against climate change (Die Zeit 45/2009); dramatic mega-droughts are threatening; hurricanes and other extreme weather catastrophes will distress not only Asia but US coastline as well (Die Zeit 42/2009); USA obliged to fight against dangerous climate change (Zeit Online 28.10.2009); the seriousness of the situation (Süddeutsche Online 30.10.2009); if there is no agreement in Copenhagen this will mean the maximum credible accident (Zeit Online 28.03.2009)
CLIMATE CHANGE IS A BIBLICAL APOCALYPSE	Scientists warn against scenarios of horror; an exodus of biblical dimensions (Spiegel 15/2007); mass migration of biblical dimensions (Die Zeit 42/2009); environmental sins of the industrialized states (FR-Online 25.08.2009); climate-pope Al Gore prophesies [...] (FR 07.11.2009)
CLIMATE CHANGE IS A DISEASE	An epidemic of humans; fever of the earth; illness of the planet; earth falls victim to (Spiegel 05/2007); a wave of dengue fever floods south-east Asia (Spiegel Online 15.7.2007); the global fever-curve; (Zeit Online 5.11.2009). Climate collapse (Die Zeit 44/2009)
CLIMATE CHANGE IS A TEST/A CHALLENGE	A baptism by fire (Spiegel 18/2007); no nation can solve it on its own; (Spiegel Online 24.9.2007); CC is an unequalled challenge for humanity (Die Zeit 50/2007); in Copenhagen the world community plans to solve its greatest test (Zeit Online 5.11.2009); a historical caesura (Die Zeit 44/2009); the most important summit of the whole of human history (Süddeutsche 31.10.2009)
CLIMATE POLITICS IS A STRUGGLE ⇒ AGAINST CLIMATE CHANGE ⇒ BETWEEN COUNTRIES	[...] global struggle against climate change (Spiegel Online 24.9.2007); dramatic damages if we do not act forcefully; defence against climate impacts; (Spiegel Online 24.9.2007); states must consensually agree on a direction of march; search for allies; (Zeit 49/2007); common preventive measures are needed (Zeit 19/2007); spearhead of climate protection (FR 26.10.2009); EU sees itself as a climate-protection pioneer (Süddeutsche Online 30.10.2009); EU members struggle against binding commitments to support developing countries financially (Süddeutsche 11.09.2009); France and Germany increase pressure on international community (Süddeutsche 19.09.2009); increasing mistrust; this does not sound dramatic but is a bomb for climate politics; G77 as well as the USA are threatening to blow Copenhagen (TAZ 10.10.2009); Copenhagen could decide whether states will seriously continue fighting climate change (Süddeutsche Online 7.11.2009); in the USA there “rampages” a struggle about climate change; united against the marching energy lobby (Zeit Online 5.11.2009); an army of negotiators (FR 07.11.2009)
CLIMATE CHANGE IS A SPORT/A GAME	Winners and losers of CC (Spiegel 19/2007a); 100 losers of climate change (Spiegel Online 30.11.2007); Climate-poker (Die Zeit 44/2009); a new start (FR-Online 01.06.2009); until the finals from 7th to 18th December (Zeit Online 22.09.2009b)

Structural Metaphors	Textual/Linguistical Expressions
CLIMATE POLITICS IS A JOURNEY ⇒ EARTH AND COUNTRIES ARE VEHICLES ⇒ CLIMATE POLITICS IS A RACE/RUN AGAINST CLIMATE CHANGE	A breakthrough is needed (Spiegel Online 2007); to brake, boost CC (Spiegel 19/2007a); CC cannot be stopped any more – at best it can be slowed (Spiegel Online 17.11.2007); the world has got to “work the switches” to avert dangerous CC; (Zeit Online 30.03.2007); Bali is the last chance to slow CC down; world needs an electric shock (Zeit 49/2007); countdown for rescuing the world; [...] so that world does not trespass on the red line of climate scientists (Zeit Online 5.11.2009); the signs of currently unbraked climate change are alarming (Zeit Online 20.10.2009); some states press ahead (Die Zeit 44/2009); the climate has to wait (Zeit Online 20.10.2009); climate polluters which currently slow down and then suddenly accelerate (FR 07.11.2009); struggle against global warming proceeds slowly (Süddeutsche 22.10.2009); even the poorest countries have to take this path (Die Zeit 44/2009); politics moves like a sluggish tanker; (FR-Online 01.06.2009);
EARTH/CLIMATE IS A THREATENED OBJECT	The planet cannot carry away all the CO2 in such a short time (Spiegel 19/2007b); Rescuing the climate (11/2007); worldwide climate protection (Zeit 50/2007);

Table 12.3: Subject positions and representative speakers. **Source:** The author.

Subject-Positions	Representative Speakers
Politicians: Industrialized countries	<i>Wolfgang Schäuble</i> , German Finance Minister; <i>Alistair Darling</i> , British finance minister; <i>Jonathan Pershing</i> , deputy head of US delegation; <i>Karl Falkenberg</i> , European Commission general secretary for the environment; <i>Karsten Sach</i> , German delegate; <i>Barack Obama</i> ; <i>Angela Merkel</i> ; <i>Nicolas Sarkozy</i> ; <i>Gordon Brown</i> ; <i>Susan Rice</i> , UN Ambassador of the USA; <i>David Kennedy</i> , head of the British Climate Council; <i>Sigmar Gabriel</i> , German Environment Minister; <i>Arkadi Dworkowitsch</i> , chief economic advisor of the Russian President.
Politicians: Victims or Developing countries	<i>Marcus Stephen</i> , head of government of the small island state Nauru; <i>Mama Konaté</i> , delegation leader of Mali; <i>Bruno Sekoli</i> , head of the alliance of least developed countries (LDC); Group of AOSIS (small island states); environment ministers of 10 African nations; African delegations; <i>Yu Qingtai</i> , speaker of the Chinese delegation.
NGOs	<i>Jason Anderson</i> , Campaign leader of the WWF; <i>Thomas Hirsch</i> , climate expert of ‘Bread for the World’; Greenpeace; WWF climate expert <i>Renate Günther</i> ; <i>Christoph Bals</i> of Germanwatch; <i>Sven Harmeling</i> of Germanwatch; Global Humanitarian Forum; <i>Martin Kaiser</i> of Greenpeace; <i>Parag Khanna</i> (New America Foundation); <i>Sonja Meister</i> of Friends of the Earth Europe; <i>Jan Kowalzig</i> of development organization Oxfam; <i>Eileen Claussen</i> , chief of the US think tank Pew Center on Global Climate Change; <i>Karsten Smid</i> , Greenpeace.
Climate Science	<i>German Advisory Council on Global Change</i> (WBGU); IPCC; <i>Potsdam Institute for Climate Impact Research</i> (PIK); <i>Hans Joachim Schellnhuber</i> , German WBGU member.
Climate Celebrities	<i>Ban Ki-Moon</i> ; <i>Al Gore</i> ; <i>Nicholas Stern</i> ; <i>Yvo de Boer</i> .
Transnational Business	<i>Corporate Leaders Group on Climate Change</i> (incorporating about 500 leaders of transnational businesses such as the Shell Group, Philips, Unilever, German Telekom, Sky TV, the Lloyds Banking Group, AXA, Vodafone etc.).

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13 Audience: A Weak Link in the Securitization of the Environment?

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13.1 Introduction: Trends in the Global Environmental Agenda

Since the late 1980s the academic community and policymakers have faced a new trend in the global security agenda. Only a few foresaw the utility and the broader theoretical implications that the debate on this new trend was to have. The concerns for environmental issues roughly coincided with the end of the bipolar ideological and military confrontation that triggered a rethinking of the traditional security agenda and the emergence of new and under-theorized issues in public discourse. Besides this uniquely favourable coincidence, one of the first large-scale catastrophes of modern times promoted the advance of environmental issues and specifically of the issue of climate change in western societies. In the United States, the drought of 1988 shocked the unprepared population and authorities of North America. Reflecting this challenge, Homer-Dixon addressed environmental aspects of global security (Homer-Dixon, 1991: 76–116).

Since then, public attention has increasingly turned to the environment and especially to climate change as the greatest anthropogenic threat facing humanity. The study has broadened to the physical, economic, social, and political repercussions of climate change, placed on the international security agenda in 1988 in order to address environmentally-related issues such as resource scarcity, migration, violent conflict, and state failure. Intergovernmental organizations, governments, local administrations, and non-governmental organizations have increasingly participated in the protection of the environment as a major global priority with the goal of maintaining the current delicate balance of changing climatic conditions, saving our natural habitat, and the coexistence of our civilization with nature. These centres of institutional power are the ‘securitizing actors’ seeking to elevate climate change from the sphere of everyday politics to political matters of the ‘utmost importance’ requiring

emergency action, and they have partially succeeded in doing so,

The intensity of the efforts of these actors has steadily increased and increasingly resulted in visible results. However, the trend of environmental developments has not changed, nor has their pace been reduced. On the contrary, this trend has remained largely unaffected by international efforts to alter it. Scientific climate change projections of a best-case scenario conclude that a minimum increase of 1.3 °C by 2040 appears certain (Dokos 2008: 13). Along with this essentially irreversible environmental process, the international community is facing a chain of interrelated problems directly or indirectly linked to climate change such as ecoviolence, immigration, and resource scarcity, and a key question being raised is, what goes wrong in addressing climate change?

This chapter addresses the reasons for the failure of the securitization of climate change by focusing on the importance of the audience in this process. The central research question is how to explain the insufficient or incomplete securitization of climate change. The first part develops the theoretical prism for the analysis, outlining the reasons why the securitization approach is both useful and how it may be applied to climate change (13.2). Then, this theory is applied to climate change (13.3) and emphasizes the role of the audience (13.4). Finally, the chapter will discuss how ‘securitizing actors’ increase the persuasiveness of their ‘securitizing moves’ for the audience and how these results explain the lack of securitization in relation to the audience’s role.

13.2 Positive Features of Securitization Theory

Elevating climate change to top priority on the international security agenda has been going on for some time (BMU 2002; WBGU 2007; EU 2008, UNGA 2009, UNSG), yet it has remained incomplete, lacking

an effective response. This chapter argues that a completion of this securitization is necessary to address it consistently. This would permit successful management of the problem and a return to the political agenda. It is important to proceed towards a successful and result-producing 'securitization' of climate change, and then to a consequent 'de-securitization' that will put this issue back in the political sphere within a framework of less expedient and costly measures. Some questions raised are whether securitization would actually help the efforts to address climate change and whether it is the ideal way of doing so.

The Copenhagen School's securitization approach offers an appropriate theoretical framework for this chapter, defining elements of the social process that unfolds when a political matter is upgraded (Buzan/Wæver 2003: 72). Its context is essentially negative since it demonstrates a failure to address matters in an ordinary fashion. Specifically, the authors of the theory note that "security should be seen as a negative, as a failure to deal with issues as normal politics. Ideally, politics should be able to unfold according to routine procedures without extraordinary elevation of specific threats to a pre-political immediacy" (Buzan/Wæver/de Wilde 1998: 29). In this chapter, securitization will be treated as a necessary development whose successful completion is critical for policies 'of utmost importance'. Despite the profoundly negative meaning of 'securitization', rooted in the rather undemocratic elements of the 'speech act', this chapter offers a more positive view, attributing to it a certain degree of necessity. The securitization of climate change has already occurred, with climate change appearing on many security agendas around the world. Thus, the positive aspect of securitization may be understood strictly within the framework defined by its accelerative effect on policy formulation and implementation and within the temporal limits of this process. While a return to normal politics should be considered as the ideal ultimate target, as Wæver argued "security is not good but at best a minor evil, while most often our aim should be to limit the rhetoric of security and its accompanying policies of exceptions and emergencies" (Wæver 2004: 13). As a primary task, the stages of this approach must be reviewed in order to provide a comprehensive outlook on this entire process's expected pattern, and then the flaws or missing links that render the securitization of climate change ineffective must be identified.

13.3 The Triangle of Securitization: Actor, Speech Act, and Audience

The concept of 'securitization' (Wæver 1989; Buzan/Wæver/de Wilde 1998) is based on three main pillars that determine the success of this theory. Upgrading an issue from the sphere of everyday politics to that of high politics depends on three main factors that must be totally in accordance with specific rules or facilitating conditions that directly affect the effectiveness of their particular roles. The 'securitizing actor', the 'speech act', and the 'audience' form a triangle on which the theory is based. The Copenhagen School sees securitization as an interactive process, where an actor, in his/her effort to create emergency conditions for a specific matter (which he/she subjectively views as a security threat of critical importance), performs a 'speech act' by addressing an 'audience'. The interaction lies within the fact that the relevant audience is expected to react to the actor's first move either by accepting or rejecting it, and therefore concurring with the securitization of the threat or not. The very definition or characterization of a given issue as a security-related one is seen as a self-referential practice "because it is in this practice that the issue becomes a security issue - not necessarily because a real existential threat exists but because the issue is presented as such a threat" (Buzan/Wæver/de Wilde 1998: 24).

According to this theoretical framework, these 'actors' initiate the process and thus constitute one of the cornerstones of securitization because their institutional position reflects their authority or power to perform a politically important move necessary for a 'securitizing move' to appear credible and legitimate. This prerequisite links the entire approach to Schmitt's legacy of realist politics, raising important issues for the wider public's position in relation to the actor's. Institutional power becomes a prerequisite for addressing an issue as a security matter. This is also one of the conditions necessary for the felicitous result of a performative speech act (Austin (1962: 15). As Thierry Balzacq puts it, the actor-level aspect refers to "the power position and the personal identity of who *does* security" (Balzacq 2005: 178).

'Speech acts' refer to the second and most controversial pillar of the securitization process. Based on Austin's (1962: 6) distinction between *descriptive* (that can only label objects) and *performative* speech acts (or utterances that actually do something to effect changes in reality), Wæver developed his concept with a truly executive or operational role and power (Bu-

zan/Wæver/de Wilde 1998: 26). As Jef Huysmans comments, security is seen in this sense as having a performative function because “rather than describing or picturing a condition it can actually order social relations into security relations” (Huysmans 1998: 232). Institutionally powerful actors can elevate an issue from ordinary politics into the sphere of security problems just by uttering the word ‘security’ and calling for an immediate use of emergency measures to deal with the threat. However, this is the focus of controversy, from which a large amount of criticism of the securitization concept has emanated. As the Copenhagen School stressed the linguistic or internal element of the ‘speech act’, it has been justly criticized for marginalizing the third constitutive element of securitization, ‘the audience’, as well as for the process’s general interactive character. Wæver clearly attributes to the utterance of security a direct performative character, while he also describes securitization as an intersubjective process. As Holger Stritzel points out, “how can the idea of the performative force of a security articulation ... be reconciled with the concept of a social or intersubjective process of securitization?” (Stritzel 2007: 363). Although this is a debatable topic in itself and will not be thoroughly investigated here, it is crucial to take this theoretically foggy area into consideration in order to fully understand the collapse of the climate change securitization process analysed below.

The third and final pillar of the securitization concept addresses the ‘audience’. This is the ultimate target as it receives the securitizing actor’s ‘speech act’, or is the final consignee of the actor’s effort to elevate a problem into a security threat. Although the three pillars supposedly form an equilateral triangle given each side’s importance, the gravity of the audience seems to have been noticeably depreciated. This impression, also underlined by Rita Taureck (2006: 12), stems from the relatively reduced attention paid to this pillar in the authors’ original texts as well as from the contemporary dialogue on securitization where the ‘audience’ does not appear as often in the theoretical debate as ‘securitizing actors’ and ‘speech acts’. This has triggered both a conceptual confusion and a severe criticism against this theory, at the centre of which lies the claim of under-theorization. Perceiving the process as an essentially interactive one, Balzacq emphasizes that, apart from being highly context-dependent, an effective securitization must also be audience-centred (Balzacq 2005: 182). Accordingly, Matt McDonald (2008: 576) stresses the value of this third pillar by emphasizing the importance of historical processes (in which the audience is a major partici-

pant) that lead to the securitization of threats. Drawing on Lipschutz (1995: 8) who defined discourses of security as “products of historical structures and processes”, McDonald also highlights this point as a missing link, an insufficiently attended topic or flaw that weakens the entire securitization approach. In essence, while this depreciation is quite obvious by virtue of the extensive domination of the debate by the speech act and actor elements, it is not an intended consequence. In response to such criticism, Taureck (2006: 13) brings up the instrumental role of an actor’s institutional power decisively affecting the result of securitization. In her view, given Wæver’s reduced attention to the audience, the more capabilities the securitizing actor possesses the easier he or she can convince the audience, thus the importance of the latter can naturally be expected to be undermined.

13.4 Securitizing Climate Change

Applying the securitization framework to climate change, the first step is to identify the relevant actors, their corresponding speech acts, and the audience at the other end of the process. For several decades the environment has become part of the international security discourse. Although references to environmental protection and natural resource management were not totally lacking, this issue reached the research and political agendas after the official end of the bipolar confrontation and ever since its popularity increased. Gradually the thinking on security became intertwined with environmental issues, provoking methodological and theoretical debates. Homer-Dixon’s (1994; 1998; 1999) and Bächler’s (1998; 1999) ecoviolence models were among the most representative efforts in linking environmental scarcity to violent conflicts by advocating a causal relationship between them. Their main line of argument can be described as a chain process starting from environmental change and consecutively leading to scarcity, social consequences, and finally conflict.¹ Next to this highly influential model, a political ecology approach evolved that considered environmentally-induced conflict as a struggle over natural resources and that placed great emphasis on the power mechanisms of the social environment as a constitutive element of environmental violence (Peluso/Watts 2001; Le Billon 2001). Contributions to the discussion on climate change and its linkage to security continued to increase with a rising focus on its implications as a ‘threat multiplier’ to existing security challenges

around the world (Bauer 2011; Brauch 2009; Schefran 2011). Common ground for numerous contemporary studies is that those to be affected most by climate change will be people already vulnerable, meaning those living in poverty, in less developed and unstable states under poor governance, women, and children. As Smith and Vivekananda note, “climate change will add to the pressures under which those societies already live” (Smith/Vivekananda 2007: 3). States may also be overwhelmed by challenges exacerbated by the multiplying effects of climate change. Pandemics, migration, fresh water availability, and agricultural production are some of the areas where climate change is expected to bring about severe alterations, creating in this way social consequences within affected states (Campbell/Gulledge/McNeill et al. 2007: 7). The case of Darfur has attracted international interest and provided us with a major example of the alleged linkage between climate change and violent conflict, after a UNEP (2007: 8) report claimed a causal relationship between them. Michael Brzoska recently concluded on this ongoing debate that “as the growth in attention to the possible effects of climate change has shown, warnings of the consequences of global warming for peace and security have a strong influence on public discussion and political opinion” (Brzoska 2008: 17). His concern over the possible negative consequences of this securitization is demonstrated in his comparison with the effects George Kennan’s warnings (Kennan 1946) about the Soviet threat had on US security strategy.

At the policy level, the first signs of action, in the US for instance, according to Julianne Smith and Derek Mix, can be traced back to the early 1990s when George H. W. Bush signed the *United Nations Framework Convention on Climate Change* (UNFCCC), partly to mitigate his administration’s negative environmental reputation (Smith/Mix 2007: 146). Following that, it is also worth mentioning Vice President Al Gore’s efforts for the signing of the Kyoto Protocol in 1997. Although the US never ratified the

Protocol, its participation in the first global effort to address the problem remains a significant step towards the securitization of climate change. Furthermore, the Clinton administration included a paragraph on environmental protection in its US National Security Strategy of 1996 (Leboeuf/Brighton, 2008: 10; Brauch 2011: 23). Europe also took its first essential steps in addressing climate change within the UNFCCC framework, but in contrast to the US the EU has not only abided by the agreement but has become the international pacesetter in addressing climate change by committing itself to further reducing greenhouse gas emissions.

The emergence of climate change on the global security agenda was also promoted by the UNDP’s *Human Development Report of 2007-2008* that focuses on strategies of mitigation and adaptation to its unavoidable consequences. In October 2007 the Nobel Peace Prize was awarded to Al Gore and the *Intergovernmental Panel on Climate Change* (IPCC), thus emphasizing the importance of climate change and its impact on peace and security. These efforts at the international level have launched the securitization of climate change. Governments and their members have pioneered efforts to meet the environmental challenge by agreeing on common rules, time plans, and aims. However, the baton was quickly passed on to various other actors in a multi-level attempt to raise public awareness over the critical consequences of climate change. On the one hand, individual governments have been assigned the responsibility for decentralizing these environmental measures and improving their effectiveness by encouraging their own populations to accept them; on the other, *non-governmental organizations* (NGOs) have reacted to the sensitivity of the public by undertaking them voluntarily. Well-known individuals have also joined the battle against climate change, thus widening it and giving the range of securitizing actors a noticeably pluralistic character. Al Gore is one of the most noticeable, especially through his documentary *An Inconvenient Truth*, launched in 2006. He increased public awareness at the international level about the threats from the human-induced rise in the average global temperature and the resulting global climate change. Artists such as Leonardo Di Caprio have also joined the effort, and environmentally sensitizing films, such as *Home* (2009) by Yann Arthus-Bertrand, *Earth* (2007) by the BBC, or *Le Syndrome du Titanic* (2009) by Nicholas Hulot have called for a new, more responsible way of environmental thinking in daily life. All these actors have called for collective and immediate action to halt

1 This debate has been assessed in previous volumes of the Hexagon Book Series, especially by Brauch (2003, 2003a), Dalby, Brauch, and Oswald Spring (2009) and Oswald Spring, Brauch, and Dalby (2009) and in the three volumes of the *Global Environmental and Human Security Handbook for the Anthropocene* that offer a comprehensive overview of the global debate on the reconceptualization of security since 1990 (Brauch/Oswald Spring/Mesjasz et al. 2008; Brauch/Oswald Spring/Grin et al. 2009; Brauch/Oswald Spring/Mesjasz et al. 2011).

the ongoing change of the earth's climate and have thus increasingly participated in the securitization of this problem. With their power position varying from case to case, but always prestigious enough to convey loud and perceptible messages to the public, they have constituted a set of securitizing actors whose institutional plurality has helped increase the legitimization of their individual securitizing moves.

Speech acts, as the second pillar of the securitization process, have also comprised a pluralistic set in addressing climate change since a wide array of means have been used to promote the urgency of the matter to the public. According to the authors of securitization theory, speech acts are supposed to be verbal enunciations of specific and uncommon or extraordinary words (e.g. 'security') in an effort to elevate an issue into the sphere of high politics and to call for emergency measures to deal with it. In Wæver's words: "the utterance itself is the act. By saying it, something is done. By uttering 'security' a state representative moves a particular development into a specific area, and claims a special right to use whatever means are necessary to block it" (Wæver, 1995: 55). Speech acts, in this sense, are supposed to push political matters into the security agenda and therefore trigger a congruent reaction (hopefully for the actor in the form of consent) by the public. However, one can easily detect elements other than verbal phrases, which can equally or even more effectively raise public awareness of a desired issue. Michael Williams points out that modern media have played a crucial role in increasingly binding all communication with images, and concludes that political communication has also been affected by this development. As a result, political meanings can also be sent out and received by visual means and not only through words (Williams 2003: 524–528). This alters the way a speech act can be perceived since 'speech' can no longer claim exclusivity in its capability of carrying a securitizing move. The same view is shared by McDonald (2008: 568–570) when he refers to means "beyond speech" that can actually perform the same task in conveying meaning. Nevertheless, what these scholars actually claim is not that it is appropriate to substitute visual representations for speech utterances, but in essence, that it is advisable to advocate a more inclusive approach for speech acts that takes into account a greater number of communicative techniques.

In this sense, looking at climate change and its process of securitization, one can distinguish a wide variety of methods being used to convey messages to the corresponding audience. Public addresses by gov-

ernment officials are considered to be the most common types of speech acts since these securitizing actors hold the main institutional positions in western societies. Passing environmental laws, urging environmentally responsible behaviour, or using uncommonly bold language to convince the public of the necessity of drastic measures are all perceived as institutionally supported speech acts. Apart from these, if the suggestions by Williams and McDonald of incorporating visual representations into the speech act concept are taken into account, it comes as a natural consequence to shift the interest toward images and their indisputable capacity to carry compact and comprehensive meaning. In the case of climate change, in particular, images tend to acquire a significantly greater communicative power because through them the public comes virtually in visual contact with the consequences of this phenomenon even in the most remote areas of the planet. Pictures of long-term catastrophic developments, like desertification, or relatively swift natural disasters striking unwary communities, easily travel around the world spreading the dire news to an international audience. People from around the planet got to know and actually see what the aftermath of hurricane Katrina was like for those directly affected. The same applies to the great 2007 forest fires in southern Greece or to the cataclysmic floods in central Europe in 2009. A vast audience witnessed these and many similar events, all of which were linked somehow to climate change, and was consequently sensitized about humanity's fragility in facing nature's responsive fury. In this way, modern media with advanced audiovisual capabilities provide the securitization process with another kind of communicative technique, usually more expressive, and sometimes more efficient, than speeches. The concept of a 'speech act' in the securitization of climate change is thus opening up another dimension which largely complements the way securitization itself is perceived. Political addresses to the public, the passing of laws, television representations, and images constitute a wide array of instruments that function as speech acts with the only difference that actual speech is now just another constitutive element, rather than the exclusive means of communication.

Having taken a quick look at actors and speech acts in their broader concept, it only remains to turn to the 'audience' as the third and last pillar of securitization in order to gain an understanding of how this triple-factor process works. As 'audience', the Copenhagen School is referring to a significant part of the public which the securitizing actor's efforts are aiming

at when performing a speech act. It is the final receiver of the securitizing move and the one that judges whether the particular highly politicized issue, referred to as a threat, actually deserves to enter the security agenda and thereby be effectively addressed by any means possible and with an increased priority. This, however, may be described as an ideally democratic process, whereas in reality securitization can often mean a rather undemocratic course of events triggered by the unilateral decisions of political actors concerning the elevation of specific issues on the security agenda. Securitization, as Didier Bigo argues, can regularly lead to exceptional measures in dealing with a given issue, as well as to institutional empowerment of security experts such as the military or the police (Bigo 2006). Therefore, when the Copenhagen School uses the term 'audience' in the securitization process, it generally refers to the society (or population) whose prosperity or physical safety is allegedly affected or challenged by the so-called 'referent object' that is none other than the threat under examination. However, the actual, or falsely assumed, threatening nature of the issue under discussion and the subsequent possible vulnerability of the public's security is something pointed at or advocated by the securitizing actors. This audience, naturally, includes people who can be seen as individuals, citizens, the electorate (national or broader), or civil society in general. In this sense, the audience can be perceived not as a single monolithic element but as a broad and polymorphous human entity responding to a wide array of political, ethnic, and social characteristics. Taking this into consideration, concluding the cycle of securitization appears to be a rather tricky procedure since the response of the third pillar can under no circumstances be accurately predicted without a comprehensive ad hoc approach having preceded it. Culturally, ethnically, politically, and socially dependent diversity leads to differently placed audiences and this, in turn, creates the conditions for varying comprehensive capability, responsive will, and of course outcomes in the securitization process. Much of the theoretical emphasis on the audience's readiness to be convinced (Balzacq 2005: 192) as part of the facilitating conditions of securitization relies exactly on this broad diversification that defines the content of the third pillar and further highlights the constructivist nature of the securitization framework itself.

Likewise, successful (in the sense of being complete) securitization of climate change ultimately rests upon public acceptance. What matters in the final phase of the process is how the audience will react to

the securitizing move after the designation of climate change as a threat by the actors. Thus, addressing this challenge effectively and within the securitization process already under way requires a threefold development within the third pillar, one that includes a broad and polymorphous audience being convinced, concurring, and acting back. Single individuals, people constituting local communities and broader social groups, and national populations, as well as those comprising supranational ones, are all part of it and they all share an equal amount of participatory responsibility in the threefold process mentioned above in order for the securitization of climate change to be concluded. The completion of this cycle, negative in some senses (in terms of elevated cost, harsher measures, and restrictive policies), should be considered a prerequisite before a de-securitization of the subject and a return to the normal political sphere can become possible.

13.5 The Audience as the Centre of Attention

Securitization is presented above as a set of interdependent successive developments. Beyond the gravity that the authors of the concept attribute to the speech act, an effective securitization presupposes a harmonious balance of all factors that contribute to its realization. What is essential in its framework is an interactive element firmly consolidated within the very structure of the process, something highlighted by many of those commenting on the Copenhagen School's rather loosely addressed theoretical points. Wæver's initial approach describes securitization as a process essentially overwhelmed by the power of the speech act concept, ascribing to the latter a highly performative character. It is what has been labelled by Austin (1962: 14-15, 95, 107) as an *illocutionary* act, a speech act that changes reality just by being uttered, in contrast to a *locutionary* act, which is one that merely contains a given sense or reference. But there is a broader point of view, shared by many theorists who do not consider securitization as a process dominated by a single pillar. For those, the speech act is only one among several indispensable ingredients (possibly the most obvious one) for a successful securitization, and it is perceived not as an *illocutionary* act but rather as a *perlocutionary* one, meaning that the act itself does not perform a change, but actually evokes sentiments and the will to initiate a chain of changes that eventually lead to the securitization of a threat. In other

words it causes a change through acting by saying something (Habermas 1984: 289). Thierry Balzacq also shares this second view about speech acts and claims that securitization in general is a virtually interactive process. According to him, the *perlocutionary* effect of the speech act also depends heavily on “the historical conjuncture and whether this renders the audience more sensitive to its vulnerability” and therefore readier to accept the particular securitization. In a nutshell, securitization as a practice needs to be placed within a favourable environment where a range of facilitating conditions can contribute to its successful realization, and, above all, to be interactive enough to manage and have the corresponding audience respond to the process either affirmatively or negatively. The first of these would suggest that the audience is convinced about the alleged criticality of the situation and the advocated necessity of facing it with extraordinary means.

Security, in the view of the Copenhagen School, is seen as a self-referential practice, one that does not predetermine what constitutes a security threat or problem, but that through its multilevel mechanisms and interdependently linked factors explains how an issue becomes a threat or how it is convincingly and successfully presented as one. The ongoing discussion on climate change and its multiple impacts on human societies, especially in the South, even if occasionally exaggerated or not firmly substantiated, is indicative of the widespread agreement on the criticality of the issue for the prosperity of humanity. What emerges as a consequent question is how a lack of securitization is explained based on the importance of the audience’s role. To specify this even more closely, we can reflect on why an audience is prevented from being convinced to positively react to the securitization of issues that securitizing actors strongly argue are posing a severe threat to its welfare or even to its physical safety.

Climate change is an issue of increased complexity in terms of the public’s ability and will to conceive the economic, social, and ultimately physical dangers that stem from it according to the studies mentioned and many others. The impact on human societies, their prosperity, and their physical safety cannot be accurately estimated; neither can the public’s knowledge about it be automatically taken for granted. The gravity of the effects of climate change up till now has not only considerably varied between different regions of the earth, but also between dissimilarly equipped (economically, socially, administratively) populations. It is commonly accepted, after all, that those exposed

the most to climate change are the world’s vulnerable social groups like the poor, women, and of course children (Goodman/Iltus 2008; Pearl/Dankelman 2008). Some people have tasted nature’s bitter response at first hand while others are following events from a safe distance. Some have responsibly decided to act in prevention while others – often affected to the same degree – have provocatively remained indifferent. A demarcation line between antithetic behavioural patterns is more than visible even to the layman. What is not easily visible, though, not even to the expert, is *how* this demarcation line has been drawn. How can there be variable reactions to the very same phenomenon by equally affected people? What have been the reasons for this division of consciences? And, furthermore, is securitization of climate change really an interactive process? Do the particular audiences participate in it enough and do they even agree with this securitization in the first place? Do they react and do they concur in addressing the challenge? In the next part of the chapter, not only the audience’s comprehensive and responsive ability will be discussed, but also its underrated importance as a primary player in the interactive process of the securitization of climate change.

13.6 Persuading an Audience

Within the theoretical framework of securitization the speech act has been the centre of attention. The reason for this has been the revolutionary way in which the security concept was discussed by the Copenhagen School in the framework of a constructivist approach, and the controversy this created about the actual potential of a linguistic element for performing a political act. Apart from that, the speech act’s role remained the same in being responsible for conveying a convincing meaning concerning a designated threat towards a significant public. This is what constitutes the very starting point of the interactive character of the entire process, that is, the moment when a securitizing actor tries, through the use of a speech act, to convince an audience about the necessity for the extreme politicization of a specific issue, and to prompt a desired reaction from it (Balzacq 2005: 175) that concurs with emergency political measures and the respective adjustment of its behaviour. The essence of the *perlocutionary* effect explained above lies exactly in this point, when the act is supposed not simply to directly change reality but to initiate a sequence of developments in the perception of the audience and

then its responsive behaviour or, in other words, its reflexes, which would eventually lead to a proposed policy of facing the designated threat to be applied with consent and implemented efficiently.

What then turns out to be of critical importance in the completion of the process is a distinct phase where the audience, subjected to the securitizing actor's speech act, builds up its response mechanisms either by concurring or by dismissing the proposed securitization. Clearly, this phase is critical for persuading the audience about the threat's significance in the same sense that Austin's felicity conditions are critical for the result of a performative act. In the case of climate change, in particular, several ways through can be observed, through which individuals or groups of people can comprehend what the stakes are for the planet and for human societies, and can therefore be convinced about the magnitude of the problem as presented, and the measures presented as necessary for it to be properly addressed. In this respect, this chapter distinguishes some of these elements of persuasion or factors that are broadly used to bring about the audience's desired concurrence, and that very often fall short of their expected utility. Some of them can be viewed in the traditional sense of the speech act, others in the broader sense of communicative means and practices, or as conditions that act complementarily to them.

In a first category of the persuading methods that securitizing actors use in order to have an audience concur with their efforts can be grouped traditional speech acts, namely those that actually use speech to convey meaning, just like the ones that the authors of securitization first described. This *internalist* view can include all kinds of relevant verbal utterances by institutionally powerful actors that have the aim of pushing environmental priorities higher on the agenda and also into the public's conscience. The public can thereby be convinced by political speeches that stress the emergency of the situation and urge extreme measures. These, followed by empirical or simply theoretical analyses of phenomena such as the greenhouse effect and global warming in general, and sometimes also backed by alarming evidence from numbers, can naturally attract the public's interest and along with it provoke its determination to help address the threat. Explanations of nature's mechanisms and of the physics commanding climate change are more than comprehensive as well as at the centre of consideration for many people. When such scientifically based discourses come into play with the strict language used by institutional actors, the effect can be

proportionally reinforced. The word of leaders, local, national, or international, is often capable of elevating the public's simple understanding of a problem into a personal feeling of collective responsibility for every individual. Climate change and the physical, economic, and social challenges it poses, can in this way through such high-level security discourses become firmly consolidated in the public's mind and in its behavioural patterns. Greece's chairmanship of the Human Security Council in 2007-2008 provides a vivid example of speech acts being used by securitizing actors in order to influence and ultimately persuade the audience of the need to securitize climate change (Fuentes/Brauch 2009). Within the framework of this chairmanship, from 18 May 2007 onwards, Greece announced its priority of highlighting the relationship between climate change and human security at an international level. Apart from aiming to raise the international community's awareness of the impact of climate change on human life and welfare, this prioritization also aimed at the national level by seeking to designate the importance of this issue for the Greek security agenda, and consequently to raise Greek society's awareness, too. This effort was coupled with verbal utterances by representatives of institutional power that all pointed in the same direction, towards the necessity of addressing environmental issues in an expedient and effective manner.

Another means that securitizing actors use in their efforts to convince the targeted audience about the emergency situation they describe is through the use of what has been explained above as visual representations. These function quite differently from ordinary speech acts, but, in essence, they perform the same task in conveying messages to the audience. Viewing the consequences of climate change in various landscapes around the planet can be, as well as shocking, quite convincing about the problem's real size as well as its future impacts. Pictures of shrinking or even disappearing glaciers and of melting polar ice caps can convey the real meaning of the current rise of global temperature. Images from hurricane destructions, from flooded towns, and from the desertification of formerly cultivated lands bring the economic links of climate change even closer to the public's eyes. Similarly, phenomena like widespread hunger in directly affected areas, the spread of violent conflict due to resource scarcity (as ecoviolence models suggest), and possibly environmentally-induced migration are increasingly being perceived by people even in distant parts of the world as part of the indirect, but global, social repercussions of climate change. As a result, au-

diences that witness these developments that stem from shifting climatic conditions appear easier to persuade and so become considerably more eager to concur with an attempted securitization of this issue. Indicative of the power of visual images in conveying the intended meaning toward the broader public and also in convincing it about the issue's significance is the result that a TV broadcast had on the European elections in 2009. Specifically, there was a widespread understanding that the national broadcast of the environmental movie "*Home*" by Yann Arthus-Bertrand on 5 June, just two days before the election, considerably affected voters' behaviour. The French green coalition's unexpectedly increased gains of 16.3 per cent of the total votes were partly attributed to the influence of this movie. Whether this was a kind of manipulation or not, however, the projection of pictures related to humanly-induced climate change did sensitize French public opinion.

In examining the methods actors use to convince the audience about the criticality of a designated threat, it is logical to take into consideration the eventuality of this specific public itself being an actual victim of climate change. Securitizing actors can easily make use of cases where the targeted audience itself has been caught in the consequences of climate change as a persuading element when it comes to promoting its inclusion on the security agenda. People who have lost property and family due to catastrophic events, or their income due to climate change affecting production, have a strong motive to consider climate change as a real threat that puts their well-being and lives at risk. The same could be argued for instance for those who are already being affected by natural phenomena whose intensity is guaranteed to increase due to climate change, thus radically altering the degree of threat posed to those people challenged. The case of the Netherlands, where sea level has always been an issue closely linked to the nation's welfare and safety, is one that aptly demonstrates the relationship between victimization and constant vulnerability on the one hand and increased persuasiveness over the necessity of securitization on the other. Despite the deeply socially constructed environmental inclination of the Dutch (Pettenger 2007), the eventuality of rising sea levels due to climate change has unarguably helped trigger an ambitious climate change policy that includes extensive protection and adaptation projects within the country and that promotes Dutch environmental strategies at EU level and internationally. Direct or indirect (and even prospective) contact with the repercussions of climate change can

therefore be expected to strongly affect the seriousness with which people see this phenomenon's capacity for harming them, and this can accordingly enhance the actors' persuasive capabilities.

Having gone through the ways in which securitizing actors can increase their persuasive power over the audience concerning the advocated need for the securitization of climate change, there still remains a considerable feeling of uncertainty about the effectiveness of these methods for leading towards a successful securitization. Irrespective of how easily a targeted group is persuaded about the reality of a designated threat, what is ultimately necessary for the completion of the securitization process is a correspondingly reliable and powerful response on the part of the audience in the form of consent for the ongoing securitization. This, however, is exactly where the weakness of this issue's securitization lies. Climate change may be real, occasionally visible and, as scientists suggest, also galloping, and its impact on our lives and well-being has been continuously intensifying. At the same time, all this process may be entirely familiar to humankind, and also, completely clear and comprehensible as to its roots and mechanisms. Yet, being convinced about this condition and its various consequences does not always seem to be enough to prompt responsive and decisive action in facing the threat. Such action would probably be described by behavioural shifts toward radically environmentalist or simply more environmentally responsible patterns. It might include differentiated consumption practices and support for alternative, environment-friendly policies, while at the same time it could also broaden the way the developed North can perceive and then accommodate the developing South's much more fragile position vis-à-vis climate change. However, speech acts uttered by significant local, national, and international, institutional, or widely acknowledged actors, albeit capable of conveying the right message about the problem's magnitude, can hardly ever be enough by themselves to trigger a positive, responsible and constructive reaction by the audience. Political argument about the complex severity of climate change cannot produce a successful securitization alone without provoking an interactive engagement with the public. Indicative of such occasional inconsistency is the example of the speech acts and official announcements that took place in Greece during the country's chairmanship of the HSN and the contrast with its actual domestic results. Despite the prioritisation of climate change among other issues of human security and the verbal efforts to raise international and do-

mestic awareness of the magnitude of the challenge, this securitizing effort did not prove enough to increase either persuasion or preparedness. Following the horrific forest fires that decimated the Peloponnese in 2007 after an undeniably climatically extreme period of drought, and only one year after the conclusion of Greece's chairmanship of the HSN, the broader region of Attica (surrounding the capital, Athens) suffered an unprecedented (at the local level) catastrophe. A first striking element is that the securitization attempted previously did not seem to have any obvious effect on the authorities' (or the wider public's) level of preparedness in responding to the forest fires. A second one was that unlike the fires of 2007 that were largely attributed to disaster-prone climatic conditions (extensive drought, reduced humidity, strong winds, and extreme temperatures), the fires of 2009 in Attica were thus not indicating a much heavier responsibility on human factors. In essence, an outside observer might justifiably doubt whether the securitizing move ever even reached the particular audience.

Roughly the same picture is drawn in the case of visual representations and their effect on the recipients' perception and senses. Emotionally powerful images, mainly those depicting human suffering due to natural disasters, while having an extremely strong impact on the average viewer's psyche, seldom manage to cause further reaction on their part. Actors often employ such images to increase persuasion about the securitization they attempt, but this is not always guaranteed to work. Besides, it has not been uncommon to witness an abrupt rise in the public's sensitivity about climate change triggered by a sudden catastrophic event, and then a following deflation of this interest in environmental issues after socio-economic priorities that brought back the normal rhythm of life and consigned memories of these images to oblivion. Examples of such a discontinuity in the build-up of human compassion are many, and this is also true for disasters caused or exacerbated by climate change. When based on images, the persuasive power of actors over the audience is critically linked to the audience's visual exposure. Images of extensive desertification, unprecedented floods, and other climate-related disasters can really create a positive framework for the acceptance of relevant securitizing moves, but only as long as they keep attracting the public's interest undiminished. What characterizes a large part of such images is the element of initial shock, witnessed for example around the globe in the aftermath of hurricane Katrina in 2005, but that alone cannot credibly en-

hance the persuasive capacity of a securitizing move. Similar visual representations projected either through the broadcast of environmental films (such as *Home* or *An Inconvenient Truth*) or through pictures of severe environmental catastrophes indeed create an atmosphere noticeably receptive for the completion of securitizing moves, but the sensitivity evoked usually lasts no longer than the event itself. This discontinuity, while not implying anything negative about the audience's sensitivity or consciousness, certainly indicates a missing element in the necessarily interactive framework of the process.

In a similar fashion, the outcome of a securitization based on people's actual contact with associated phenomena cannot reliably be estimated beforehand. One would expect those directly affected by the consequences of climate change not only to constitute an audience easier to convince of the necessity of securitization, but also to be willing to proceed to a more active participation in an effort to address the problem (Whitmarsh 2008). People who have somehow been harmed should normally constitute one of the most receptive and action-eager audiences, yet this does not seem to apply equally to all cases. Examples of disregard for the attempted securitization by severely affected people are not that uncommon. Obstruction of securitization need not necessarily be deliberate and is most likely unintentional, yet the outcome barely varies: either the audience knowingly rejects a securitizing move or just bypasses it in an ignorant and routine fashion. This reveals that there is a discontinuity between expectation and actual practice as far as environmental discourse is concerned. Nevertheless, it is more than understandable to expect continuation of economic life rather than environmental concerns to emerge as a top priority for affected people. Cases of generally disadvantaged populations that do not stress the prioritization of addressing climate change albeit having been severely affected by it are not difficult to come across. From the inhabitants of the Pacific island states (Tuvalu, for instance, which has already applied permanent mass relocation strategies to protect its population) that are threatened by sea level rise, soil erosion, and salt water penetration, to the population of Darfur facing rapid desertification (which puts pastoralist communities under great stress) and prolonged - climate-exacerbated according to many - conflict, one can hardly fail to acknowledge that such severely affected groups are above all challenged by their social vulnerability and thus, naturally, their priorities are formed by subsistence-related factors. Furthermore, as a study of

public risk perception in relation to climate change and the floods of southern England has shown, victims' understanding of the challenge posed to them differed very little compared with the non-affected population (Whitmarsh 2008).

The above paragraphs offered a short outline of the means that securitizing actors employ in their effort to convince the targeted audience of the necessity of securitization of climate change. The inconsistency detected in the results demonstrates that they alone cannot provide the actors with enough persuasive power to decisively influence the response of the audience to the securitizing move. In other words, the securitization process is essentially obstructed at the point where the audience, having received the meaning carried by the speech act, remains undecided whether to concur with the attempted securitization or not. Securitization literature suggests, as Rita Taurck notes (2006: 13), that the capabilities of actors, discussed within Austin's felicity conditions, are directly linked to their persuasive power over the audience. The more capable an actor is, the more persuasive his securitizing move is and, consequently, the less relevant or important the audience becomes. However, this is a logic that ultimately leads back to the disproportionate theoretical attention on actors and speech acts and to the marginalization of the audience as one of the main pillars of the process. As the examination above has shown, persuasive power is not always enough to promote securitization and address a designated existential threat, and should be coupled with a considerable degree of receptiveness from the public. From the perspective of this chapter, the persuasive capabilities of actors are rightly regarded as part of the general facilitating conditions of securitization, but so also should be the readiness of the audience to respond. The missing link in the securitization of climate change is located in the absence or in the imperfect realization of these facilitating conditions in particular due to the passive incorporation of the audience in the process. Being prepared and – why not? – eager to react to the ongoing securitization of climate change and to the challenges associated with it would at least help construct a deeply interactive procedure by providing a collaborative and actively engaged partner at the other end of the table. This is of the utmost importance if we keep in mind that securitization is able to produce solutions and avoid its not at all uncommon negative aspects and pathologies only within such a participative framework.

13.7 Conclusion

This chapter has tried to navigate through the straits of the securitization of climate change and highlight the weak or unattended points of this process. Having been stimulated by the seeming inconsistency of most official attempts to address the issue, it has narrowed down the focus to the triple-pillar framework of securitization, and to the audience in particular as the weak link in this process. It approaches the concept not as axiomatically negative, but as a potentially helpful mechanism for stimulating effective response once it has been applied in a genuinely interactive way. A quick but inclusive look at the securitizing actors and the speech acts used in order to raise the issue of climate change on the security agenda has shown that although there is a surprisingly wide and still increasing spectrum of actors and acts working in different fashions but towards the same goal, the outcomes are noticeably disproportionate to the efforts put into this project. The problem has been spotted in the responsive ability and will of the audience, thus disconnecting the initial stages of the securitization process from its final one, where the targeted public has to judge the communicated messages to it and then proceed to some kind of action with the aim of addressing the threat. Exploring the persuasive power of four distinct factors that more or less resemble the function of speech acts in the results they produce, the chapter has led to an understanding that climate change can neither be effectively securitized through bold language used by institutionally powerful actors only, nor by highly expressive visual representations of the phenomenon's harmful consequences. Not even actual victimization appears sufficient by itself to sensitize those directly and severely affected and to prompt their dynamic response to climate change. Facilitating conditions concern not only actors and speech acts but the audience as well, and a felicitous securitization would inevitably require the latter's centralized and instrumental role within the mechanisms of securitization. However, whether this presupposes a socially constructed positive disposition within the audience's perception of environmental issues that appear embedded over time is a question that falls outside the focus of this chapter. In conclusion, the currently intensifying securitization of climate change does not have the luxury of not maintaining the balance among the three basic pillars by marginalizing the audience, if it is planned to bring it to an end successfully and allow a subsequent de-securitization to begin.

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14 Words, Visuals, and the Vanished Enemy: Visual Securitization and the COP15 Opening Film

Tore Rørbæk

The political entity cannot by its very nature be universal in the sense of embracing all of humanity and the entire world. The political world is a pluriverse, not a universe.

Carl Schmitt (1996: 53)

14.1 Introduction¹

On 7 December 2009 leading diplomats and policy-makers gathered in Copenhagen for the 15th *Conference of Parties (COP15) of the United Nations Framework Convention on Climate Change (UNFCCC)*. The conference was opened with a short film that showed climate-change-related disasters and concluded with a plea to save the world.

The film poses a challenge to the securitization framework and its epistemological reliance on speech, as it utilizes televisual means to dramatize the apparent threat posed by climate change. The point of departure for this chapter is that climate change already has been securitized, although by various actors with differing agendas and audiences. The opening film, however, attempts to address representatives of all states on the basis of one global collective identity. This constellation poses a fundamental challenge to both the theoretical conceptualization of climate change as a security issue and to securitization theory. The film is a clear example of a securitization running through the visual and the case is therefore made for introducing ‘visual securitization’.

The focus of this chapter will be on how ‘visual securitization’ is implemented and how the theory relates to other frameworks that also evolved from Securitization theory. Based on the observance that a ‘security act’ establishes a community through the identification of an enemy, and that the logic underpinning the COP15 is that climate change is human-made, this chapter claims that the externalization of an inhuman ‘other’ becomes the intricate and self-defeating task of the opening film. This issue furthermore complicates the categories in the ‘visual securitization’ framework: ‘image’ and ‘wider political discourse’ which are structured around a ‘self/other’ dichotomy that renders the film a hard case for the framework and thus illuminates its weaknesses.

This chapter utilizes a short fiction film produced specifically for the opening of the COP15 in Copenhagen. According to the producers of the film it displayed:

A six-year-old girl who after watching news reports on climate change has a nightmare in which she tries to escape floods, tornadoes and droughts. She wakes up and begs politicians to ‘help the world’ in a touching scene on top of a skyscraper.²

The intention of the film, according to its director, was to “affect politicians in a positive way, so that they may raise their goals a little higher, because their emotions have been touched”. More than 2,000 dele-

1 The author would like to thank the participants of the research seminar on “Visual Securitization: Threats, Genre and Temporality” at the *Center for Advanced Security Theory (CAST)* at the University of Copenhagen for fruitful comments on the first draft of this text, especially Lene Hansen, Rens van Münster, Erika Doss, and Rune Saugman.

2 See at: <<http://www.denmark.dk/en/menu/Climate-Energy/COP15-Copenhagen-2009/Selected-blog-posts/COP15-Cultural-Opening-Ceremony.htm>>.

gates watched the film as the COP15 opened thousands of other delegates watched the opening on screens in adjacent meeting rooms at the Bella Centre. Although these issues favour an examination of the film's effect on the conference, this is not a study of cause and effect. The negotiations were most likely a product of narrow national agendas defined prior to the meeting and the likelihood that the bargaining process would have been influenced by the delegates' emotional reaction to a film is marginal if not practically unfeasible to detect. Nevertheless, the film is of major importance for the study of climate change as a security issue because the social meaning of the phenomenon also relies on how it is visually displayed and in particular what kind of identities it operates with.

In a large-scale international context, climate change could be conceived as everything from a universal, global, and humanitarian problem to a local, regional, or Western problem; an issue to be addressed on the basis of a global collective identity with equal burdens to share or by separate collective identities structured around cleavages and dichotomies such as North vs. South, rich vs. poor, or industrialized vs. developing countries.

As the visual medium in question appeared at such a prominent venue in terms of audience, and in a social context constituted as an opening ceremony for a conference on climate change, it certainly has a crucial role in framing the general perceptions of climate change as a security issue, and especially the identities attached to it in terms of 'referent object', 'source of threat', and finally the 'actor', institution, or community considered appropriate to deal with it. These categories are, however, not fixed but rather co-constituted with the attempt by the conference and the film to securitize climate change to a global audience on behalf of a threatened global collective identity.

The aim of this chapter is therefore to show how the opening film constitutes a part of this attempt, and through this investigation to argue that addressing climate change as a global threat to a global human collective faces acute complications due to the immanent logic of how the identity construction functions - and finally that this compromises the utility of conducting the COP conferences in terms of actually preventing climate change.

It is, however, only possible to approach these issues on the basis of a suitable theoretical framework and by dealing with the queries to which such a framework draws attention.

This chapter introduces 'visual securitization' theory as developed by Lene Hansen (2010; 2011) in order to comprehend the dynamics of the securitization conveyed visually by the film. The following section explains the fundamentals of securitization theory and accounts for the theoretical foundation for introducing 'visual securitization'. This is done by relating it to the sociological approach to security, which also emerged out of a critique of the narrow focus on securitization as 'speech acts'. The next section focuses on the status of climate change as a security issue. It clarifies how the issue has moved from normal politics to the realm of security affairs (14.2).

Then follows a section accounting for the critique levelled against securitization theory for not taking more of modern communicative techniques into account. It summarizes the approaches suggested by these scholars, and specifies the particular insights that the 'visual securitization' approach has to offer compared with these approaches (14.3).

The fourth section presents the three categories 'immediacy, circulability, and ambiguity', which together comprise Lene Hansen's argument that an image has specificity worthy of theoretical differentiation from a text, which ultimately constitutes the argument for introducing 'visual securitization' theory (14.4).

The chapter then proceeds to the analysis. Firstly, it summarizes the film; then follows a presentation of the categories of the framework; and finally, it applies the categories to the film. The analysis allows for a critique of the framework by focusing on the two issues: 'image' and 'wider political discourse', which are dependent on the formation of identities along a 'self' vs. 'other' dichotomy. This section introduces the perspective of the 'other' in order to bring attention to perspectives that regard this problem as local rather than global, and offers an alternative example of how the framework could be employed. As the film and the conference seek to construct climate change as a global threat against a global collective identity, it contradicts the logic of the alternative account of the categories (14.5).

With this insight, the chapter concludes that the current formation of fragmented identities and disjointed referent objects underpinning the current securitization of climate change is destined to persist. The scheme of the film can thus be considered a failure as it felt short of an actual establishment of a referent object based on a global collective identity and instead amplified the already existing securitization based on disjointed identities (14.6).

14.2 Visual, Philosophical, Traditional, or Sociological Securitization Theory and the Other

Securitization theory, or the *Copenhagen School of Security Studies* (CSS) as it was labelled in 1996, constituted a break with traditional objectivist approaches to security (McSweeney 1996: 81–93). According to this theory, something becomes a security issue through discursive politics. Inspired by the ‘speech act’ theory of J. L. Austin, the CSS regards the utterance of ‘security’ as an act. That means, by articulating something as a security issue, one is also doing something to bring this effect about (Wæver 1995: 55). The utterances are ‘performatives’ as opposed to ‘constatives’ subject to truth or falsity tests (Balzacq 2011: 1). It is, however, not the utterance of the word security itself but the “designation of an existential threat requiring emergency action or special measures and the acceptance of that designation by a significant audience that characterizes a successful securitization” (Buzan/Wæver/de Wilde 1998: 27).

When this chapter refers to traditional securitization theory, it merely refers to the notion of ‘visual securitization’ and does not classify ‘securitization’ among the traditional objectivist theories, nor does it claim that ‘visual securitization’ constitutes a completely new paradigm. Critics of the theory have referred to the CSS as ‘philosophical securitization’ to distinguish it from their own proposed ‘sociological securitization’ (Balzacq 2011). The sociological approach to securitization emphasizes the practices, contexts, and power relations underpinning securitization in addition to its discursive basis (Balzacq 2011: 1). The key difference according to its proponents is that the philosophical departure ultimately reduces security to a ‘conventional procedure’ dependent on the felicity conditions that refer to the success of the speech act, whereas the sociological view sees securitization as a strategic and pragmatic process dependent on social circumstances such as the power configuration between speaker and listener, the *habitus*³ of the agents mediating the performatives, as well as a conceptualization of the audience as a developing phenomenon co-constituted by actor and audience (Balzacq 2011: 2).

It is important to emphasize two aspects when considering ‘visual securitization’ in relation to this

debate. Firstly, although the innovation of securitization advanced by the sociological perspective broadens the scope of analysis, the point of departure for this chapter is the CSS (or philosophical) version of securitization. This is simply because security in this view still gets conceptualized as what the sociologists call a conventional procedure dependent on felicity conditions. That means that it is still the “designation of an existential threat requiring emergency action or special measures and the acceptance of that designation by a significant audience that characterizes a successful securitization” (Buzan/Wæver/de Wilde 1998: 27).

The designation of that existential threat is not necessarily transmitted through language, but can be performed through visual tropes with no language attached to it. While the conditions of felicity are largely the same, the grammar of securitization necessarily has to change, as the medium in question transforms from language to visual presentations. Although the ‘visual securitization’ framework places heavy emphasis on the wider social constitution of the image in determining its ability to speak security, the visual grammar of the image has to follow a certain strategy of depiction. The image invokes certain subject positions which are not determining but rather informing the wider social constitution of the image and thereby its ability to speak security. These categories will be explained in the section presenting the ‘visual securitization’ framework, but here it is sufficient to point out that the subject positions presented in the image serve as reference points for the wider political discourse as it accentuates threats structured around notions of ‘self and other’.

The other important aspect when considering the ‘visual securitization’ framework in this debate is the scope and aim of introducing the theory. The aim of the sociological critics of the CSS was to “reformulate the assumptions of securitization in a form appropriate to empirical studies” (Balzacq 2011: 1). This introduction of ‘visual securitization’ should be considered along the same lines. It is a reformulation of securitization theory in order to address securitizations running through the visual that may not be addressed by the traditional approach due to its narrow focus on ‘speech acts’.

Security as something inherently ‘performative’ still constitutes the core of this framework. The concept of ‘speech act’ is therefore reformulated as a ‘communicative act’, whereby the idea of ‘performativity’ is retained but the sources of its production are broadened as to enhance communication beyond

3 *Habitus* refers to Bourdieu’s (1990, 1991) concept and relates to the various dispositions informing the perceptions and behaviour of agents.

speech. The intention of this chapter resembles that of the sociological approach, to reformulate the assumptions of securitization in a form appropriate to empirical studies. The empirical study utilized in this chapter comprises material in which ‘existential threats’ are clearly designated and securitizations obviously transmitted, but the prime medium for this process is neither text nor ‘speech’ but the ‘visual’ presentation of a protagonist in immense distress as she flees one climate-related disaster after another. The ‘visual securitization’ framework is heavily reliant on identity formation because two important categories in the theory are structured around a ‘self vs. other’ dichotomy. It is here argued that the construction of a collective identity is dependent on the designation of an other or in security terms of a threatening ‘other’. That poses the challenge of identifying constructs with no apparent ‘other’. It has already been argued by IR scholars that the conceptualization of the exceptional in the securitization framework resembles Carl Schmitt’s rendering of the political as the exceptional decision that constitutes the border between ‘friend’ and ‘enemy’ (Huysmans 1998; Williams 2003). According to Wæver a “speech act is interesting exactly because it holds the insurrecting potential to break the ordinary” (Wæver 2000: 286). Jeff Huysmans quotes Schmitt in the same vein: “the normal rules do not tell us how to go on. It is at the limit that one finds the radical open condition which allows for calling into being new rules, a new community” (Huysmans 1998: 581). Breaking the ordinary and transgressing the limit are here presented in absolute terms and the limits between ordinary and extraordinary are convergent in the two accounts. Going from one condition to another can in this view not be conceived as a process, as the sociologist’s account perceives it, and by adhering to this idea of ‘visual securitization’ the visual places itself firmly within traditional securitization. In addition, the Schmitt quote reveals an intimate relationship between security and the identity of a political community. In this view the sheer handling of a security situation can be considered a founding practice for the community. It is thus the ability of the ‘other’ to pose an existential threat to the ‘self’ that brings the ‘self’ into being. It therefore bears upon not only the condition of the possibility of the ‘self’ but more importantly to its condition of impossibility (Campbell 1998). COP15 has a world community as its referent object and it designates an external threat to it, but the question is whether this threat can resemble the character of an ‘other’.

14.3 Securitization of Climate Change

In continuation of the logic underpinning the securitization approach, the question of whether climate change can be regarded as an ‘existential threat’ and thus a security issue depends on how successful the performative act is in declaring it as a threat. This section sets out to explore this question, and not whether climate change is real or not.

An account of the voyage of the topic of climate change from environmental low politics to the realm of security cannot be examined independently from the question of how the issue has been dealt with in the political realm. Climate change has been an increasingly critical subject on the political agenda and it has been argued that security research simply followed climate change to the top of the political agenda, and as climate change was coupled with different elements it also happened to be coupled with security (Wæver 2009: 7). With the establishment of the IPCC in 1988, the adoption of the UNFCCC in 1992, and the Kyoto Protocol in 1997, climate change had become firmly politicized (Brauch 2009).

A quantitative view of the subject reveals that despite differing views on the topic, almost all political parties in the Western world had to take the issue seriously enough to include some kind of statement about it in their political party programmes (Boykoff 2009). The perception of the seriousness of the climate problem differs between populations in different countries, but a large majority in all the countries examined consider it a serious concern, and the trend is clearly towards more awareness of climate-related issues (Boykoff 2009; WBGU 2008; Wæver 2009). The fact that climate change was brought to the political agenda and deliberations on the subject became increasingly tense, however, only entitles the subject to be politicized (Buzan/Wæver/de Wilde 1998: 73). The issue was at this point not consistently brought out of the political agenda and framed as a security issue, so that it would have reached the status of a “securitized issue” (Buzan/Wæver/de Wilde 1998: 73).

The most important breakthrough for this securitization of the subject was in 2007. Al Gore and the IPCC were awarded the Nobel Peace Prize for bringing to attention the broader global consequences of climate change, and IPCC had previously published the *fourth assessment report* (AR4) stating with a higher degree of scientific certainty that climate change was human-made and that the state of the global environment was rapidly deteriorating (Wæver 2009: 13).

Hurricane Katrina swept through the southern part of the United States in August 2005, and although the Bush administration sought to decouple the incident from climate change, it was widely perceived by 2007 as yet another incidence of a climate-change-related natural disaster (Goodwin/Walmsley 2010: 3). To sum up, more issues related to climate change have appeared on the political agenda in recent years, and an increasing number of these have been considered security issues. According to Buzan, Wæver, and de Wilde (1998) and the (traditional) securitization theorists, the environmental sector tends to be divided between those with a scientific and those with a political agenda (Buzan/Wæver/de Wilde 1998: 71). Although a division of the two entails several overlaps, the entrenchment of the scientific agenda in the natural sciences and in non-governmental activity represents it as belonging to the (inter-)governmental political agenda. The scientific agenda often acts as an authoritative reviewer of threats, and thus structures security debates at the political level. In this context, it is of crucial importance that COP15 took place shortly after a *scientific* congress on climate change that was also held in Copenhagen. The relation between the two agendas was clearly demonstrated when the Danish Prime Minister at the time, Mr. Anders Fogh Rasmussen, unsuccessfully pushed for a scientific consensus on a precise upper limit that would be permissible for temperature rise, obviously intended for the political process at the COP.⁴ Although unable to reach a concrete agreement, the conference, held by the University of Copenhagen and an alliance of research universities, marked the largest gathering of climate change scientists so far.⁵

A securitization of climate change proper could easily take place in this setting against a backdrop of a politicized and scientifically problematized climate debate. However, it would need an actor with a clear agenda and an unambiguous formulation of the extraordinary means of dealing with the threat posed by climate change. Several actors appeared with differing agendas, but who were altogether successful in their common attempt to securitize climate change. The EU, Greenpeace, and a transnational network of UN institutions, *non-governmental organisations* (NGOs), and the US Department of Defense all emerged as se-

curitizing actors but with agendas ranging from justifying acquisition of new military equipment adjusted to climate change to the EU's attempt to acquire global leadership by ambitious cuts in CO₂ emissions (Wæver 2009; Trombetta 2007, 2008). The result is a mixed bag of mechanisms, and Ole Wæver's formulation 'all dressed up and nowhere to go' described the situation prior to the COP meeting very well (Wæver 2009a). Climate change was generally perceived as a security issue, and moreover an 'existential threat' demanding rapid action and the use of 'extraordinary means'. The different agendas furthered by the various actors, however, did not seem to accumulate to specific extraordinary means or mechanisms for dealing with the threat. This again poses a problem for securitization theory, in that the legitimization of 'extraordinary means' is the outcome of a securitization, and it is hard to talk about a securitization when an unknown but extraordinary something is legitimized. The main point is that, prior to the COP15 meeting, articulations about climate change as a security threat seemed more to be the rule than the exception, and although securitizing actors had various agendas, climate change had been securitized and only the (extraordinary) means of dealing with it was at stake.⁶ It is important to see the COP15 opening film in this context. It is being performed in a highly securitized institutional setting and it is therefore not relevant to ask whether or not it securitizes, but rather what it adds to an already established securitization of climate change and how it does it.

Although representations of climate change in various visual media clearly have an impact on how climate change is understood and whether it is securitized, it is beyond the scope of this chapter to provide a genealogy of how climate change has been visually securitized. The aim is rather to provide an example of how the subject of climate change is visually represented, and to show how it is structured around the visual semantics of securitization by using a politically vital case. Visual representations of climate change range from Hollywood blockbusters employing grand disaster narratives to information-dense documentaries with a direct political message. While neither denying their individual impact nor any possible refer-

4 See the synthesis report at: <<http://climatecongress.ku.dk/pdf/synthesisreport>>.

5 See for a list of universities participating in the *International Alliance of Research Universities* (IARU); at: <<http://climatecongress.ku.dk/aboutthecongress/>>.

6 The argument that climate change has been securitized is disputed, see S. V. Scott (2008), 'Securitizing climate change: international legal implications and obstacles', *Cambridge Review of International Affairs* 21:4, 603-619 for the argument that climate change has not been securitized.

ences the COP15 film might make to these films, they vary in genre so considerably that it would be impossible to include them without either changing the focus of the whole chapter or neglecting the theoretical framework's emphasis on how the visual medium is embedded in a social context. In addition, this section has argued that climate change has been securitized, and has done so by utilizing the (traditional) securitization approach because it allows the way visual tropes resist being reduced to unambiguous discourse to be elucidated, and more importantly, because employing a genealogy of how climate change has been visually securitized largely juxtaposes a visual and a discursive ontology. As already pointed out, visual securitization should not be considered a new paradigm contingent on a separate ontological position but a reformulation of securitization along lines enabling it to take into account the visual dimension of security.

14.4 Need for a Theory for Visual Securitization?

Before new frameworks are introduced, the ability of existing theories to deal with the question or case at hand should be considered. Post-structuralist theorists of IR have long claimed that images are important elements in international politics, and some discursive approaches have systematized how patterns of visual representations can be decoded or deconstructed so as to reveal how people, communities, or underdeveloped regions like Africa are cast as inferior or dangerous (Campbell, in: Dunne/Kurki/Smith 2010: 246; Herrmann/Voss/Schooler et al. 1997; Manzo 2008). An appeal for securitization theory to deal with the 'visual' as well as with modern forms of communication was principally made by Michael C. Williams (2003), who called, more specifically, for an examination of the ways images function autonomously as communicative acts. In the vocabulary of securitization, this means how they function as 'securitizing actors' independent from 'speech acts' (Williams 2003: 527). Another central aspect is how both production and reception of communicative acts are influenced by the medium they travel through. Regardless of how the visual interacts with discourse, it has a meaning that must be assessed on its own terms (Williams 2003: 526). The images of desperate boat refugees, regardless of the text accompanying them, are a central component of the way the issue of immigration and its status as a threat is understood. These questions are set against the backdrop of an increasingly signifi-

cant media environment and a communicative setting ever more conducive to the meaning constructed and conveyed by televisual media (Williams 2003: 526). The rising significance of televisual media also questions the securitization framework's ability to capture the way visuals interact with traditional security discourse, and its ability to impact on different audiences (Williams 2003: 527-528). Do pictures amplify or contradict traditional security discourse? How is this done and what impact does it have that new groups, like illiterates, have access to pictures? The 'narrow' focus on 'speech acts' has lately been under particular scrutiny (McDonald 2008). By focusing on 'speech acts' only, images are reduced to mere facilitating conditions for subsequent 'real' textual security discourse, and no room is left for them to make 'security utterances' on an independent basis (McDonald 2008; Hansen 2011: 4). The significance of photographs in security issues has also been examined as so-called 'photographic interventions' that constitute our visual reservoir and pictorial memory and therefore function as reference points for legitimating and validating the security discourse (Müller 2007: 187-189). Attempts have also been made to explain securitization as a media frame (Vultee 2011). Drawing on a tradition of framing that blends psychological and sociological influences, Fred Vultee suggests that securitizations are created by political actors and transmitted through the media, which again reduce or amplify its impact, and finally, if the securitization is effective, function as an organizing principle for the ways the issues are thought about (Vultee 2011). The media is thus channelling information given to it by political actors, thereby enabling 'some' securitizations while 'silencing' others, and in the end the frame functions as an instrument structuring the ways the political actors can possibly talk about issues (Vultee 2011: 78). Securitization in Vultee's words therefore becomes an independent variable *in* media and a dependent variable - an effect *of* media (Vultee 2011: 78). This study certainly provides valuable information on the causes and effects of securitizations in a media frame, but makes no inquiry into *how* the media makes these effects. Are the media, with all their channels of communication from televised images to printed text, crafting securitizations with a dynamic of their own? And how does the security discourse combine with visual channels of communication in particular?

In order to deal with these questions a more comprehensive framework is needed for understanding how securitizations interact with the visual medium. Lene Hansen (2010; 2011) is the first to deliver a fun-

damental visual reformulation of securitization theory in order to address these questions. The conceptualization of security as discursively constructed is retained, while a new category called the ‘image’ is introduced, whereby the visual dimension is included in the framework, while the interdependence of the visual and discursive categories are underlined. This will be further clarified in the next section. In conclusion, it should be emphasized that none of the critiques or improvements accounted for in this section advocates a visual ontology or substitution of ‘speech acts’ with visual representations, but they encourage a more inclusive approach that takes account of new communicative practices and media through which information and thereby securitizations are transmitted.

14.4.1 The Frozen Image and the Rolling Picture: Immediacy, Circulability, and Ambiguity

The central question that needs to be asked with regard to the introduction of ‘visual securitization’ theory is whether we need a specific framework for studying images and security or whether we can make do with the existing post-structuralist and discursive approaches and their reading of images as text. The answer to this question is contingent on whether there is anything entirely specific about images. Or, for scholars of securitization theory, whether the securitizations running through the visual rather than the textual have specificity worthy of theoretical differentiation (Hansen 2010: 3). The argument for the need of a specific visual theorizing falls into three categories as it accentuates ‘immediacy, circulability, and ambiguity’. This section specifies the central theoretical points with regard to these three issues as well as examining how films more specifically share these features to varying degrees. Considerations of how the COP15 opening film (henceforth *Please help the world*) as a visual shares these features will also be made, although the actual analysis will follow in the subsequent section.

14.4.1.1 Immediacy

Firstly, the section explains the categories and clarifies how they relate to the film whereby the argument that the COP15 film needs a specific framework sensitive to the visual dimension of securitization is made. This should allow for a qualified estimation of whether the film could be regarded as an autonomous securitizing actor or whether it just facilitates securitizations made by other actors.

As a specific feature characteristic of the image, ‘immediacy’ is perhaps the component with the closest relation to the image itself. A crucial element for immediacy as a concept is authenticity. A visual has a privileged epistemic status because it brings the audience closer to the event. This is especially valid for documenting genres such as photography, video, and live broadcast because it corresponds directly with the reality it presents, whereas spoken or written text involves a mediation of this reality and therefore a temporal delay (Hansen 2010: 9).

Although *Please help the world* does not in any way claim to be a documentary or pretend to correspond with real events, it propounds two levels of fictional reality: the protagonist’s nightmare, which is obviously imaginary, and the story taking place before and after the nightmare. When contrasted with the imaginary level, this story appears real and authentic, thereby lending credence to its epistemic value.

Another central aspect of the way authenticity is constituted is through identification that involves an emotional attachment of the viewer to a character or a general sentiment in the visual, which ‘draws’ the spectator in. It is most obviously at stake when the character looks directly back at the audience, thereby confronting the viewer with “a grammar of face to face encounters” (Shapiro 1988: 124, quoted in: Hansen 2011: 10). Contingent on the social context, this could clearly relate to the grammar of securitization.

Representations of, for example, people in distress are obvious communicative acts when confronted with an audience with the ability to change the situation of the distressed subject. The film places the protagonist in immense distress and in addition allows her to face the camera directly and address the audience with the plea *Please help the world*.

The underlying but obvious logic of this rather direct confrontation with the audience is that the audience has an ethical responsibility to act. In terms of the audience at COP15, the ability to act is evident and an effect is openly sought, but the way it differs from, for example, Connie Hedegaard’s plea to “act now” is that it runs through an emotional register brought about by the visual face-to-face encounter with the girl.

There is, however, no deeper or fundamental difference between pictures and films in the way immediacy and its main components authenticity and identification convey securitizations. Differences mainly relate to the ability of films to invoke suspense. Emotional effects can clearly be elaborated by the temporal extent in film and produce a feeling of suspense

Figure 14.1: Image from the film *Please help the world*. **Source:** The film is available at <http://video.liveearth.org/video/Please-help-the-world-COP15-ope> and <http://www.youtube.com/watch?v=NVGgncVq-4>.



seemingly impossible in pictures. Suspense is produced by maintaining the audience in the space between the actuation of a perilous incident and its potentially lethal consequences, a technique often employed by horror movies.

14.4.1.2 Circulability

The second category underpinning a specificity of the visual is 'circulability'. For Hansen the central aspect distinguishing visuals and words in terms of circulability is speed (Hansen 2010: 11). The one who provides the visuals first gains the upper hand. An obvious example underlining this claim is the flotilla incident, where Israeli authorities published edited video tapes showing Israeli soldiers being attacked by activists, thereby representing their killing of 9 activists as self-defence, while confiscating all video material aboard the boats that contradicted this narrative (Bayoumi 2011). Although a UN investigation now concludes that Israeli use of violence was disproportionate and conveys in detail how nine activists were killed, it was the pictures of Israelis being attacked that set the agenda, framed the deliberations, and structured the media reporting on the incidence in the first crucial days.⁷

In terms of securitization, the visual's ability to reach mass audiences potentially erodes the commu-

nunicative act's capacity to transmit exact messages, because depictions or symbols familiar to one audience appear odd to another, especially as the visual travels through different social contexts. In particular, the visual's ability to reach illiterate audiences exposes it to more heterogeneous social contexts than would texts or words.

In addition, many producers of visuals have no strategic intention in forming a security discourse. Soldiers uploading videos on YouTube is a clear example (Hansen 2010: 12). They are not strategic actors comparable with politicians or other elite actors because they are unconscious of the conditions of circulability.

14.4.1.3 Ambiguity

The last element is 'ambiguity'. The notion of ambiguity as an aspect differentiating visuals from text is underpinned by three features; the first concerns the 'referent object', the second how visuals present measures to deal with threats, and the third the differentiation already discussed that audiences with diverse frames of reference have towards the same visual. The first aspect relates directly to the last because referent objects containing collective identities like 'state' or 'nation' or 'specific communities' are visually hard to depict as a whole, and a representative for the collective is often shown instead.

In *Please help the world* the girl obviously appears as the representative of a larger collective. But she could technically just represent herself or Danish girls in general. The film clearly attempts to exclude such interpretations by showing children of different eth-

⁷ See the UN report at: <http://www2.ohchr.org/english/bodies/hrcouncil/docs/15session/A.HRC.15.21_en.pdf>; see pp. 29–30 for details on the killings.

nicities repeating the message of the girl, but the problem is that no matter how explicitly the ‘referent object’ is delineated, it is not directly said that ‘the next generation is threatened by climate change’, and room will unavoidably be left for other interpretations by people with radically dissimilar frames of reference. The second aspect relates to the lack of a clear prescription for dealing with the articulated threat. To most audiences the message in the film is clear, *Please help the world*, and the reference is obviously the conference, but by how much do CO₂ emissions have to be reduced? Visuals might lend themselves to particular interpretations that suggest certain paths of action, but they do not present an explicit policy demand. The problematic of a successfully securitized threat but no exact means to deal with it is thus still present.

As pointed out, climate change has already been securitized, and thus one could expect this film to make this securitization more manifest by utilizing its televisual capacities. This would fit well with both the sociological approach and Michael C. Williams’s critique of the CSS for not taking stock of a situation’s ability to gradually intensify and “thus (be) rendered susceptible to securitization, while remaining short of the actual securitizing decision” (Williams 2003: 521; Bigo 2001, 2002; Balzacq 2011).

These are valuable insights for this chapter insofar as it is obviously significant that climate change has been articulated and accepted as a security threat already, but it considers the COP15 and the opening film as 1) a clear attempt to securitize climate change on behalf of a world community and 2) an extension of a constellation of a world community as both referent object and audience – as a separate securitization detached from the securitizations already mentioned undertaken by other actors with dissimilar referent objects. In the context of the discussion about whether visuals can act as autonomous securitizing actors, the sociological critique once again proves useful because it sheds light on the problems related to the evaluation of a securitization in isolation from the larger social range and development of its status as a security issue. This chapter therefore conceptualizes the film as a part of the larger securitization it poses together with the whole COP15 project. Therefore, it does not consider the film an autonomous security act.

14.5 Analysis of the Film *Please Help the World*

The protagonist, a young Danish girl, is seen in a playground with other children until a rainstorm breaks out. The next frame shows her at home in front of the television. Her father puts her to bed and a close-up follows, in which the setting changes. Until the close-up the strategy of depiction is largely neutral. As the girl watches the climate disasters on television she shortly gasps and squeezes her teddy bear and the scene discreetly insinuates danger, but neither the visual as a whole nor the threat presented on television is embodied in a subject position or a social tangible entity enabling it to appear as an agent of threats.

A scene where the camera zooms in on the girl marks the transition from the first close-up to the next, emphasizing that she is falling asleep. With the next close-up, the light, music, and setting alter, accentuating a change of the fictional level. We are in her dream. She wakes up in her bed in a deserted and exhausted tundra-like landscape. The swing from the beginning of the film appears and she walks slowly towards it, but stops halfway, just to stare at it. The sound disappears for a short while but only to reappear drastic and loud as the earth cracks along a line heading directly towards her. From this point on floods, tornadoes, and various other natural phenomena close in on her. This clearly qualifies the strategy of depiction as belonging to the category ‘suffering’. The content of this category will be explained in the next section. The girl is obviously unable to help herself and, as the situation reaches its critical climax, she screams, a third close-up intervenes, and the setting changes again. From the third close-up until the end, the strategy of depiction is again largely neutral, and a specific security depiction cannot be detected (table 14.1).

14.5.1 Analysis of *Please Help the World*: The ‘Visual Securitization’ Framework

The actual elements in Hansen’s framework are listed in table 14.2, in four categories with the relevant sub-categories in order to provide an overview of the constitutive elements of the framework. The category ‘image’ relates to the strategies of depiction within the image itself, whereas the meaning and significance of the other categories, ‘immediate intertext’, ‘wider political discourse’, and ‘constitution of the image’ are all constituted or co-constituted with social elements separate or isolated from the image.

Table 14.1: Summary of the trajectory of the film. **Source:** Compiled by the author.

Period	Strategy of depiction	Security depiction	Referent object	Layer of reality
Start 1 st close-up	Neutral	No	None	Reality in the story
2 nd close-up 3 rd close-up	Suffering	Yes	Girl as a representative of children, a generation, humankind	Fictional in story: a dream
3 rd close-up – End	Neutral	No	None	Reality in story

Table 14.2: title/description [please add]: **Source:** Adapted by the author, based on Lene Hansen (2010).

Image	Immediate intertext	Wider political discourse	Constitutions of the image
Strategies of depiction • ‘Self’ vs. ‘other’ – <i>Demonization</i> – <i>Belittling</i> – <i>Familiarizing</i> – <i>Suffering</i>	Epistemic authority, examples • <i>Documentation and fiction</i> • <i>Photography and cartooning</i> • Epistemic registers • <i>Editorial and satire</i>	Larger ‘self’ vs. ‘other’ constellations examples – Oriental vs. Occidental • Capitalism • Communism	• Immediacy • Circulability

This section explains and employs the categories of the theory one at a time in order to provide an analysis consistent with the theoretical framework. In this way a continuum is set up, ranging from the characteristics of the image itself as an isolated visual medium to the discourses constituting it completely independently from its content. This point also underlines the argument that ‘visual securitization’ is an attempt to create a framework that addresses the need to engage with the specificity of the image, but within the premises of both the image itself and the way its meaning is constituted by the wider political discourse external to it.

14.5.2 The Image

The main point of this category is drawn from the reliance on the ‘other’ as a radical and threatening category vital for the founding practice of a community. As already argued, the externalization of an ‘other’ constitutes the possibility of the formation of a ‘self’. Visual securitization works the same way, although Hansen classifies four ideal-typical forms of depiction typically employed for the ‘other’ and characteristic of ‘visual securitization’: ‘demonization’, ‘belittling’, ‘familiarizing’, and ‘suffering’.

The strategy of depiction called ‘suffering’ represents someone as maltreated, subjugated, distressed, or anxious. This strategy differs from the others in that it is directed towards the causes producing the

suffering portrayed. It securitizes those phenomena, institutions, practices, or even human beings producing the suffering, and involves our responsibility to act. The film is obviously displaying this kind of depiction. She is running away from one natural disaster straight into the next. In terms of the identity groupings underpinning this category, the film poses a paradox. If a subject ‘suffers’ it is because in some way it is intimidated by circumstances that in the end are produced by some kind of ‘other’. If the logic is followed that the externalization of the other as a threat is the condition of possibility for the collective identity, the ‘other’ would have to be represented by some phenomenon bearing no resemblance to a human subject.

Drought, tornadoes, and floods are all material effects of climate change. This means the cause of the threat is not displayed. It could be expected that a conference on climate change based on the conviction that the deterioration of the climate is a product of human-made pollution would present us with the culprits that the Copenhagen Conference is supposed to facilitate some kind of containment of. Not a single instance of polluting industry is displayed. It is important to emphasize that this constellation as the ‘other’ can be located along with the source of the threat and not with its effects. If a community ultimately depends on the existence and suppression of that which is said to threaten it, it could be forcefully argued that the film presents a spectacle with no real

identities involved. The film can thus be interpreted along the lines of a securitization with no ‘other’. Involving more identities would undermine the aspirations of empowering a global collective identity. Displaying a spectacle dramatizing the effects of climate change would not. The film withstands a depiction or visual securitization of any collective identity. It is in this context important to emphasize the three phases illustrated in [table 14.1](#). When talking about ‘visual securitization’ it is only in phase 2 that security depiction can be detected. There are many identities engaged in the other phases but they are not displayed along the lines of the security depiction.

14.5.3 Immediate Intertext

The film was produced by the production company Zentropa RamBuk at the request of the Danish Ministry of Foreign Affairs. It was shown at the opening on 9 December 2009 for all attendants at the Climate Conference in Copenhagen and thereafter widely circulated in international media. It has been shown over 1 million times on YouTube and has appeared on various TV Channels around the world in a short period after the conference.⁸ The central concern in this category is how, or rather whether, the film speaks with an epistemic authority. This means from where the film speaks, how is its position constituted as one of knowledge and authority?

This question is crucial as different genres of discourse make different epistemic political claims. A genre like war photography has a strong epistemic basis as it documents the ‘real’ and thus speaks with a strong claim to the truth. But what kind of genre is *Please help the world?* And how is it related to COP15? These questions have to be dealt with by investigating how the film presents itself and the way it is constituted as an opening film for COP15, relying on that event just as an illustration in a newspaper is dependent on the text describing it.

The film does not in any way present itself as a documentary and it therefore operates in a different truth-terrain from other climate films such as, for example, Al Gore’s *An Inconvenient Truth*. It can rather be considered as a commentary, an ‘act’ or an ‘intervention’ into the social context framing the subsequent meetings. Thus, it is more an indirect claim and

shies away from the scientific debate about whether the human race has produced climate changes or whether the global temperature should be allowed to rise more than two degrees.

According to its director Mikkel Blaabjerg Poulsen, it is “a film speaking to the heart rather than the brain”.⁹ This comment shows very well how the film seeks to avoid being judged in a rational or scientific way. It is clearly fiction, but it has an enormous number of references to a reality where the environment is deteriorating and political characters are pleading for action. As already argued, it does employ a strategy of security depiction, but this is done within the fictional layer of the story, the dream or rather nightmare ([table 14.2](#)). When the mode of depiction falls within the securitizing category of ‘suffering’, it is within the head of the girl and therefore not a claim about reality, although it has an immense emotional impact. Consequently, it can be read or interpreted in much the same way as an editorial cartoon elaborates on the theme of the editorial. It makes its own comment about climate changes and the issues at stake at COP15, but the comment falls outside the realm of truth and falsehood, and so it operates within an epistemic register comparable to a newspaper editorial cartoon.

14.5.4 Wider Political Discourse

Hansen’s theoretical point in this category is that larger constellations of ‘self’ and ‘otherness’ often transcend the visual, and therefore it is often not meaningful to ignore these larger constellations as they co-constitute the relationship between identities in the visual. Whereas one could perceive the identity of the girl as in opposition to the dangers of nature she is subjected to or to the distant personas on the computer and TV screens, this seems forced, as it makes little sense to construct collective identities against non-human phenomena like drought or flood. The various distant personas like Desmond Tutu, Ban Ki-Moon, and the other children are generally advancing the same message as she is. Hence the larger formations of ‘self’ and ‘other’ are contingent on the discursive agendas at COP15 and in climate debate in general.

“The time has come to set the right course for our world – while we still can! ... Let’s mark this meeting in history! Let’s open the door to the low-carbon age!

8 See at: <<http://www.denmark.dk/en/menu/Climate-Energy/COP15-Copenhagen-2009/Selected-blog-posts/COP15-Cultural-Opening-Ceremony.htm>>; and at: <<http://www.youtube.com/watch?v=NVGgncVq-4>>.

9 See at: <<http://good-cop15.org/blogs/behind+the+scenes>>.

Let's get it done! Now!" said Danish Climate Minister Connie Hedegaard.¹⁰ Her articulations about a right course for the world and an urgent need for action while it is still possible resonates very well with the theme of the film, but who is the overarching 'we' and who is the 'other' and its relationship to the conference?

The construction of 'referent objects' in the discourses on climate change, as already argued, takes the shape of a general and all-encompassing human community. The articulations of Connie Hedegaard and of other agents of an ambitious climate policy rest on both a moral imperative of our common humanity and a logical imperative for a global and broad response. This rationale is very different from that of the binary 'us' vs. 'them' oppositions that security articulations usually employ. To a large extent, it is a construction of an identity with no 'other' and in consequence it deviates from the binary identity construction that security discourse usually relies upon (Phillipsen 2008).

One could easily criticize this kind of security construction for being semantically weak, and the critique could be furthered by the lack of solutions and steps taken to counter the threats posed by climate change, but it is also possible that the binary oppositions instead rely on the much broader categories of humanism, solidarity, and universalism on the one side versus nationalism and realism on the 'other' (Phillipsen 2008a). Instead of an extreme or radical 'other', it is in this view the fear of complex and global threats that unites this collective identity.

From the perspective of the actual discourses employed at the conference, the emotional manifestation of a global 'us' advanced by the film definitely served as a bulwark against an identity construction tied to the North-South divide as employed by some Third World leaders. If such a construction gained ground it could, from a Danish perspective, where enormous amounts of political capital have been invested in making Copenhagen the reference point for a global climate deal, be disastrous and blur the agenda to the benefit of other agendas, for example the regional North-South perspective. When considering the question of what the film adds to an already established securitization of climate change it is, apart from the capacities associated with its visual nature, to counter every alternative identity-construction, as they una-

voidably would contradict that of a shared global identity.

14.5.5 Wider Political Discourse and the 'Other' Perspective

This perspective could, however, be criticized for being inherently Western and colonial. From a Third World point of view the 'other' could easily be interpreted into the film. Several leaders of the Third World criticized the conference for being the industrialized countries' attempt to make the non-industrialized countries pay the price for their own pollution or hinder their industrialization, or, more radically, it could be the white man's attempt to reproduce hegemony.¹¹ This viewpoint is in this chapter nominated 'the other perspective' as it takes its point of departure from what consequently would be a Western perspective and thus considers the missing or absent 'other' in the film.

If I sift back through the countless images of the Third World that have confronted me through the media . . . one persistent iconography dominates. This is the tight-shot close-up photograph of a single child - usually (apparently) not older than ten or eleven, looking, wide-eyed, directly into the camera (Ruddick 2003: 341; quoted in: Manzo 2008: 632).

The child in the film is a typical Danish girl and neither she nor her Danish middle-class surroundings carry any connotations of the Third World. When looking straight into the camera begging the world for help, her character effectuates an institutionalized iconography normally employed in relation to suffering Third World children.

In fact, the quote is taken from an article about how NGOs utilize images of suffering Third World children in their visual communication strategies. In this case, the roles are distributed somewhat differently. The girl is Danish, and so is the production company and its customer the Foreign Ministry of Denmark, and although the main 'securitizing actors' of climate change, the EU, Greenpeace, and a transnational network of UN institutions, NGOs, and the US Department of Defense are not Danish, they remain mainly Western. Reflecting back upon the absent 'other' in the film and the fear of complex and global threats that unite a collective identity based upon humanism, globalism, solidarity, and universalism, a cer-

10 See at: <http://www.kemin.dk/Documents/COP15/COP15-president_opening-speech_061209.pdf>.

11 See at: <<http://www.theceogame.com/2009/12/cop15-african-disaster/>>; and at: <<http://www.sudan-tribune.com/Africa-urges-release-to-Copenhagen,37220>>.

tain pattern of possible subject positions can be detected. The complex and global threats are not items lacking in ‘otherness’. On the contrary the ‘other’ is observed by the girl on television and appears in flooded vehicles and in desert-like landscapes. In fact, the classical iconography of a black suffering child in a hopeless condition looking straight into the camera is cautiously repeated, albeit the receiver of this gaze from the Third World is the girl in the film.

The gaze and the TV pictures are the source of her nightmare, but it is only through her imagination that she reaches the desert of the Third World. She encounters the typical climate-related dangers in this Third World environment, screams, wakes up in her own bed in Denmark, and shoots a film with a video camera pleading to help the world.

This presentation indicates a division of worlds and subjects, a division between children with the means of screening themselves and making their worries public so that they can be catered for, and those appearing in all their misery on the TV screens of others, between worlds of privilege where the disasters of climate change appear on TV screens, and worlds where the subjects feel them directly on their own bodies. One then has to ask the question, if the COP15 opening film is supposed to produce visual tropes and emotional signifiers generating collective identity based upon humanism, globalism, solidarity, and universalism – could these concepts become the property of a privileged Western self-perception? The film could easily be seen as undermining the attempt to make the security threat posed by climate change a *global* issue to be *globally* addressed at the conference. If the film is an attempt to erase an obvious ‘other’ for the sake of a general humanitarian and global collective identity, it runs the risk of degenerating the *global* to an empty shell that disguises Western concerns with a phenomenon in oppositional relation to the regional and local, which in the end are the levels of existential concern for most Third World countries. If the concept of the global is buttressed by an inherently Western or Northern perception of climate change, it could function as a hegemonic discourse marginalizing a ‘Southern’ perspective and its ability to ‘speak security’ rooted in the immediate local and regional setting its security problems are embedded in. To sum up, it is of crucial importance to think in ‘other’ perspectives when utilizing visuals to provoke emotional reactions to further a certain security agenda. In terms of disseminating securitizations, the ambiguity of ‘a visual’ leaves its significance open for interpretation on a fundamentally different level from

the textual, and combined with its ability to travel through various audiences with locally-rooted frames of reference it becomes vulnerable to perceptions framed by different identity constructs. It is, however, also able to affect audiences emotionally and unconsciously with potential ramifications for how climate change is perceived and dealt with as a *global* threat. As this chapter has already argued for the need for a framework with the capacity to conceptualize the significance of images in security studies and in addition based this argument on the specificity of the image, the two last categories ‘immediacy’ and ‘circulability’ have already been thoroughly dealt with.

14.6 Conclusion

The chapter has clarified the relationship between the ‘visual securitization’ framework and the new approaches in both the context of the criticisms based on securitization’s narrow focus on ‘speech acts’, its neglect of the way modern media conveys information (Vultee 2011; Möller 2007; McDonald 2008; Williams 2003), and in relation to the more theoretical critique of the way the CSS regards securitization as a conventional procedure reliant on felicity conditions (Bigo 2001, 2002; Balzacq 2011). Although it would seem obvious that ‘visual securitization’ would lean towards the sociological approach by its inclusion of both image and discourse, the logic structuring the categories of the framework adheres in the view of this chapter, which is based on a Carl Schmittian reading of the CSS, to an either/or logic by focusing on the specific turning point that securitization ‘breaks’ the ordinary or transgresses ‘the limit’.

On the other hand it has addressed the criticisms levelled against securitization theory by Williams et al. The framework effectively integrates the abilities and effects of the image with the wider discourse and constitutions of it. The chapter has also accounted for the ways climate change has developed into a security issue and has concluded that climate change already has been securitized although by various actors and on behalf of conflicting agendas. COP15 was processed in this institutional context but its logic differed as it sought to authorize climate change not only as a global threat to a global audience, but also with a global world community as its referent object.

Finally, the chapter has analysed the film with the ‘visual securitization’ framework. The phase of the film employing security depiction could be interpreted along the lines of a securitization with no

'other'. In the *Schmittian* reading of identities utilized in this chapter, this renders the formation of identities unfeasible as it considers the identification of an enemy 'other' as a condition for the possibility of a 'self'. As ambiguity is an unavoidable aspect of images, room was left for other perspectives and a view from a marginalized position suggested that the articulations on climate change as a global problem could function as a hegemonic discourse, silencing perspectives rooted in local geopolitical realities.

The chapter is critical of facing climate change as a global security threat and this is admittedly an easy position to take. On the other hand, by not presenting and articulating the sources of the threat, something that was avoided in the COP15 discourse in order not to undermine COP15's own attempt to advance a global collective identity, the capacity of public opinion and the pressure it could exert upon states who do not abide by the climate agenda becomes compromised. Permitting articulations and presentations of 'climate sinners' in the institutional setting constituting the political realm in which climate changes are embedded, which on a global level mainly are the COPs, would allow for scapegoating and shaming strategies. Authorizing a return to the antagonisms constituting the 'political' in Carl Schmitt's rendition could bring about the fundamental dynamics the issue has been lacking since its materialization as a security issue.

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Part IV Climate Change and Migration

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15 Climate Change and Human Migration: Towards a Global Governance System to Protect Climate Refugees

Frank Biermann and Ingrid Boas

15.1 Introduction¹

Climate change will fundamentally affect the lives of millions of people who will be forced over the next decades to leave their villages and cities to seek refuge in other areas. Although the exact numbers of climate refugees are unknowable and vary from assessment to assessment depending on underlying methods, scenarios, time frames, and assumptions (as laid out below), the available literature indicates that the climate refugee crisis will surpass all known refugee crises in terms of the number of people affected. Many climate refugees may seek refuge in their own countries; others will need to cross borders to find a new home. Some local refugee crises, in particular in the richer countries in the North, may be prevented through adaptation measures such as reinforced coastal protection or changes in agricultural production and water supply management. Many poorer countries, however, are unlikely to be able to initiate sufficient adaptation programmes, and climate-induced migration might be the only option for many communities in the South. In these situations, climate refugees will need to rely on effective protection and support from

the international community, regardless of whether climate migration is internal or transnational.

These systems of global governance for the recognition, protection, and resettlement of climate refugees stand at the centre of this chapter, as a major building block of the emerging global governance architecture of adaptation towards climate change. In 2007, the link between climate change and ‘large-scale migration’ even became part of the rationale for awarding the Nobel Peace Prize. Yet there is little systematic academic research on appraising the threat of climate-related mass migration. Almost no studies have analysed such migration from the perspective of global governance reform. This chapter attempts to address this lacuna.

Lack of conceptual clarity and consensus is a key problem hindering research on climate refugees, in particular comparative research programmes and data collection. Most assessments so far have addressed the larger phenomenon of ‘environmental refugees’, a term that was popularized over twenty years ago by the *UN Environment Programme* (UNEP) in a 1985 report (El-Hinnawi 1985). This report defined environmental refugees broadly as “people who have been forced to leave their traditional habitat, temporarily or permanently, because of a marked environmental disruption (natural and/or triggered by people) that jeopardized their existence and/or seriously affected the quality of their life” (El-Hinnawi 1985: 4; for critiques see Suhrke 1994: 478; Bates 2002: 466). The notion of environmental refugees generally includes climate refugees (e.g. Myers/Kent 1995; Myers 2002: 611), although its breadth makes it impossible to specify or quantify climate-related migration. In fact, a clear definition of ‘climate refugees’ does not so far seem to exist. Many studies leave the term undefined or, while purporting to analyse ‘climate refugees’, still implicitly rely on broader concepts. For instance, Derek Bell while focusing in his work “on one cause of environmental disruptions, namely, global climate

1 This chapter strongly draws on Biermann/Boas (2010). The research has been funded by the European Commission (Global Change and Ecosystem Priority of the Sixth Framework Research Programme, Integrated Project ‘Adaptation and Mitigation Strategies. Supporting European Climate Policy’ [ADAM Project], Contract no. 018476). For valuable suggestions and comments, we are grateful to Harro van Asselt, Steffen Bauer, Klaus Dingwerth, Aarti Gupta, Mike Hulme, Henry Neufeldt, Sebastian Oberthür, Kate O’Neill, Philipp Pattberg, and Fariborz Zelli, as well as to two anonymous reviewers. More information is available on the website of the Climate Refugee Policy Forum, a new initiative set up by the Global Governance Project, a joint programme of twelve European research institutions, see at: <<http://www.glogov.org/?pageid=80>>.

change” seems to draw on the much broader UNEP concept of environmental refugees without further differentiation (Bell 2004: 137). Other studies offer overly complex definitions that are difficult to operationalize in practice. Not least, the very term ‘refugee’ is – implicitly or explicitly – disputed, and several authors and intergovernmental bodies suggest instead terms such as ‘migrants’ or ‘displaced persons.’

Some intergovernmental agencies – such as the *International Organization for Migration* (IOM) and the *UN High Commissioner for Refugees* (UNHCR) – seem to reject the term environmental or climate ‘refugee’ because of the legal rights that the intergovernmental system currently bestows upon ‘refugees’. In their view, the term ‘refugee’ should remain limited to transboundary flight, mainly because the *Geneva Convention Relating to the Status of Refugees* (1951) is restricted to persons who cannot avail themselves of the protection of their home state for fear of persecution. As an alternative, some international agencies prefer the notion of ‘environmentally displaced persons’ (UNHCR 2002, 12–13; Keane 2004). By contrast, it was the *United Nations Environment Programme* (UNEP) that popularized the term environmental ‘refugee’ in the first place. Also, Agenda 21 – the highly influential intergovernmental programme of action agreed upon by almost all governments at the 1992 *United Nations Conference on Environment and Development* (UNCED) – uses the term ‘environmental refugees’ in a number of places. Moreover, the notion of ‘climate refugees’ appears to find acceptance in some national political debates too. For example, Australia’s Labor Party had proposed an international coalition to accept climate refugees from the Pacific² – in response to the (then) Australian government’s position that rejected the notion of climate refugees (Renaud/Bogardi/Dun/Warner 2007) – and in 2007 Australia’s Greens party even tabled a Migration Amendment (Climate Refugees) Bill.³

We support the use of the term climate refugee for two main reasons. First, the distinction between transboundary and internal flight that is a core element of the traditional refugee concept of the UN High Commissioner does not help much since climate change

will cause both transnational and internal flight. Some island nations will effectively cease to exist, and some countries, especially those affected by drought, will be overburdened by the degree of the national predicament. These people will have to find refuge outside their home country. Some climate refugees might thus cross borders while most will stay within their country – it seems difficult to argue that a global governance mechanism for their protection should bestow a different status, and a different term, depending on whether they have crossed a border. Secondly, we see no convincing reason to reserve the stronger term ‘refugee’ for a category of people who became the centre of attention after 1945, and to invent less appropriate terms – such as ‘environmentally displaced persons’ – for new categories of people who are forced to leave their homes now, with similar grim consequences. Why should inhabitants of some atolls in the Maldives who require resettlement by reason of a well-founded fear of being inundated by 2050 receive less protection than others who fear political persecution? The term refugee has strong moral connotations of societal protection in most world cultures and religions. By using this term, the protection of climate refugees will receive the legitimacy and urgency it deserves. Therefore, we propose to continue using the term climate refugees, and to adjust the outdated UN terminology accordingly by allowing for different types of refugees and different agreements on their protection.

In sum, we define ‘climate refugees’ here as people who have to leave their habitats, immediately or in the near future, because of sudden or gradual alterations in their natural environment related to at least one of three impacts of climate change: rise in sea level, extreme weather events, and drought and water scarcity (see Biermann/Boas 2010 for more detail on this definition). This definition covers climate refugees in both industrialized and developing countries. However, in practical terms only climate refugees in poorer developing countries will be an issue of international concern, cooperation, and assistance. It is people in developing countries who are most likely to be compelled to leave their homes and communities, owing to low adaptive capacities, their often vulnerable location vis-à-vis climate change events, often high population densities, existing hunger and health problems, low level of GDP per capita, often weak structures of governance, political instability, and other factors (Stern 2006: 92–97; German Advisory Council on Global Change 2007: 119–120).

Even though the exact number of climate refugees is hardly certain given the various methodological

2 Australian Labor Party, “Labor Calls for International Coalition to Accept Climate Change Refugees,” press release (9 October 2006); at: <<http://www.alp.org.au/media/1006/msehwt090.php>> (26 August 2007).

3 K. Nettle, “Climate Change Refugees,” press release (Australian Greens Senator Kelly Nettle, 2007); at: <http://www.kerynnettle.org.au/300_campaigns_sub.php?&deptItemID=51> (23 August 2007).

problems, and even though these methodological problems are likely to sketch out an overly pessimistic picture, large migration flows over the course of this century are plausible. The total number of people at risk of becoming climate refugees by 2050 could well be around 200 million or more, even though this number is a rough estimate with a large margin of error, depending on the different conditions and factors considered in the estimate (Stern 2006; see Biermann/Boas 2010 for more detail). This would mean twenty times as many refugees as are at present protected by the UNHCR.⁴

In the following sections, we analyse the current global governance of refugees and provide a blueprint for a global governance architecture for the recognition, protection, and voluntary resettlement of climate refugees. We then reflect on the political constraints that these proposals are likely to face, followed by the conclusion. Our focus on global governance does not imply that only global solutions are needed, and that local and national policies and programmes are less important. Instead, we believe that the protection of climate refugees requires an effective system of multi-level governance, with a strong global framework providing vital support for, and coordination of, national and local efforts.

15.2 The Protection of Climate Refugees in Current Global Governance

To what extent is the current global governance system able to deal with the crisis that may emerge in the decades to come? The main global institution dealing with refugees is the regime provided for by the 1951 Geneva Convention Relating to the Status of Refugees and its 1967 Protocol Relating to the Status of Refugees. These institutions are restricted to individual political refugees who flee their countries because of state-led persecution, and thus do not cover climate refugees (McGregor 1994: 126). A broader definition of refugees has been adopted in two regional conventions, the *Convention Governing the Specific Aspects*

of Refugee Problems in Africa (1969) of the Organization of African Unity and the *Cartagena Declaration on Refugees* of 1984 concerning refugees from Central America, Mexico, and Panama (Keane 2004: 216; OAU 1969: art. I.2.; Cartagena Declaration on Refugees 1984: art. III.3). Both regional conventions also cover people fleeing from events that have seriously disturbed public order (OAU 1969: art. I.2; Cartagena Declaration on Refugees 1984: art. III.3), and the African convention applies to groups as well (McGregor 1994: 127). Even though the extension of protection to people affected by seriously disturbed public order and to groups may open up the two regional conventions – which happen to cover regions most severely affected by future climate change – to include climate refugees, neither convention was originally intended to protect these types of refugees (Renaud/Bogardi/Dun/Warner 2007: 12; McGregor 1994: 127; Keane 2004: 216).

The main agency in the United Nations system for the protection of refugees is the *United Nations High Commissioner for Refugees* (UNHCR). Its primary focus is (political) refugees protected under the Geneva Convention and under the Protocol of 1967,⁵ and thus not environmental or climate refugees. By the end of 2007, 11.7 million refugees fell within the formal mandate of the UNHCR (2008: 23–25). Given the restricted definition of political refugee under the Geneva convention, the executive committee of UNHCR and the UN General Assembly have permitted the agency to extend its activities towards other groups, such as former refugees who have returned to their homeland, internally displaced people, and people who are stateless or whose nationality is disputed, even though these people have a different legal status and are formally not referred to as ‘refugees’ (UNHCR 2007b). In total, the UNHCR dealt with 32.9 million people by the end of 2006 and 31.7 million by the end of 2007 (UNHCR 2008: 23), including ‘refugees, asylum seekers, returnees, stateless people and a portion of the world’s *internally displaced persons* (IDPs)’ (UNHCR 2006a: 1; 2008: 24).

4 The United Nations High Commissioner for Refugees covered 11.4 million refugees in 2007 (UNHCR 2008: 23–25). This is a rather restricted number and does not include, for instance, roughly 4.6 million Palestinian refugees who fall within the mandate of the *United Nations Relief and Works Agency for Palestinian Refugees in the Near East* (UNRWA) (UNHCR 2008: 23).

5 ‘Refugees include persons recognized under the 1951 *Convention Relating to the Status of Refugees*; its 1967 Protocol; the 1969 *OAU Convention Governing the Specific Aspects of Refugee Problems in Africa*; those recognized in accordance with the UNHCR Statute; persons granted complementary forms of protection; or, those enjoying “temporary protection”.’ (UNHCR: 2007a, 3, emphasis in original); see also UNHCR (2007b).

In the current regime, most climate refugees could be conceptualized as internally displaced persons. The UN High Commissioner for Refugees has a variety of programmes for such people, even though the High Commissioner claims not to have a specific mandate for them (UNHCR 2006b: 5, 12). Environmentally internally displaced persons also fall under the Guiding Principles on Internal Displacement of the Office of the High Commissioner for Human Rights (Office of the High Commissioner for Human Rights 1998: Introduction article 2; Keane 2004: 217). However, the concept of ‘environmentally internally displaced person’ serves only ‘as a descriptive term, not as a status that confers obligations on states’ (Keane 2004: 217). The Guiding Principles state for example that the primary duty to provide protection and humanitarian assistance lies with national authorities (Office of the High Commissioner for Human Rights 1998: principle 3), and the 2006 Operational Guidelines on Human Rights and Natural Disasters ‘Protecting Persons Affected by Natural Disasters’ from the Inter-Agency Standing Committee directed towards internally displaced people places primary responsibility on the national authorities of affected countries with assistance from humanitarian agencies (IASC Working Group 2006: 9–10). No duties or obligations of other states are mentioned.

In sum, the current legal regime relating to refugees provides only marginal protection, with no specific mandate, to climate refugees. The main responsibility is placed on their home countries, which contradicts global responsibility for the victims of climate change. In addition, the maximum number of persons the UN High Commissioner for Refugees can currently deal with is merely a small fraction of the additional number of climate refugees that many studies predict for 2050. It is doubtful whether these governance arrangements can cope with the looming climate refugee crisis (Oliver-Smith 2009, on the need for legally binding policies to address mass climate migration).

One reform option within the present institutional setting could be to extend the mandate of the 1951 Geneva Convention and of the UN High Commissioner for Refugees to cover also ‘climate refugees’. This has been proposed recently by the Republic of the Maldives (Biermann/Boas 2008), yet does not find much support in the literature.⁶ Politically it would seem unlikely that donor countries would allow the current refugee regime with its fixed set of refugee rights to be extended to cover a twenty-times larger group of refugees. Related to this, such exten-

sion could produce a trade-off between the (political) refugees that are protected under the Geneva Convention and climate refugees.

Most importantly, however, climate refugees require a different kind of protection. Most climate refugees will not leave their home countries, and will still be able to enjoy the protection of their governments. In addition, it is possible to predict, within limits, many of the population centres that may potentially be affected – notably low-lying coasts and islands. Climate-related migrations can therefore be planned and organized with the support of their governments and public agencies, this being exactly the opposite of political or religious persecution. Thus, the problem of climate refugees is at its core a problem of development policy. It requires institutions that take account of this special character.

15.3 Outline of a New Regime for Protecting Climate Refugees

For these reasons, we argue against the extension of the definition of refugees in the Geneva Convention to cover climate refugees. Instead, we argue for a *sui generis* regime for the recognition, protection, and resettlement of climate refugees. This regime must be tailored to the needs of climate refugees, and it must be appropriately financed and supported by the international community. This section lays out the central elements of such a regime. We address its core governing principles, its legal-institutional character, and its organizational setting. Section 15.4 will address financial support and compensation.

A *sui generis* regime for the recognition, protection, and resettlement of climate refugees must build on a set of core principles tailored for the specific problem, including its political, legal, and ethical dimensions. We suggest five principles to serve as a basis for the institutional development of this regime.

6 See the discussion in German Advisory Council on Global Change (2007, 174, 204–207), where the Council eventually argues against an extension of the UN regime. See also the discussion in McGregor (1994: 126–127) rejecting the extension of the definition in the Geneva Convention. See also Renaud, Bogardi, Dun, and Warner (2007: 34) with further references.

15.3.1 The Principle of Planned Relocation and Resettlement

Even though climate change impacts will eventually manifest themselves in unpredictable singular events—such as storms, floods, or droughts – the increase in magnitude and frequency of such events can be predicted, and the consequential need for local populations to leave regions that suffer from increased risk can be foreseen. The governance of climate refugees can thus be better organized and planned than is the case with victims of political turmoil or war, and can be carried out in planned, voluntary relocation and resettlement programmes – sometimes over many years and decades. At the core of a regime for climate refugees are therefore programmes for planned and voluntary resettlement over longer periods rather than for emergency response and disaster relief.

15.3.2 The Principle of Resettlement Instead of Temporary Asylum

Over the long term, most climate refugees – especially victims of a rise in sea level – will not be able to return to their homes. Thus, the underlying assumption in current refugee governance that refugees may return once state-led persecution in their home countries has ended, needs to be replaced by an institutional design that conceives of (most) climate refugees as permanent immigrants to the regions or countries that accept them.

15.3.3 The Principle of Collective Rights for Local Populations

The Geneva Convention is based on the concept of persecution of individuals. This has included quasi-collective titles – for example, when entire ethnic or religious groups in a country are judged as being persecuted – but essentially the Convention is designed to deal with state-based persecution of individuals. A climate refugee regime, however, would need to be tailored for groups of people, such as the populations of particular villages, cities, regions, provinces, or – as in the case of small island states – of entire nations.

15.3.4 The Principle of International Assistance for Domestic Measures

Climate refugees enjoy in principle the protection of their own countries, and in many cases, serious impacts from climate change will affect only parts of a

country. Thus, an international regime for climate refugees will focus less on the protection of persons outside their states than on supporting governments, local communities, and agencies in protecting people within their own territory. The governance challenge of protecting and resettling climate refugees is thus essentially about international assistance and funding for domestic support and resettlement programmes of affected countries that have requested such support.

15.3.5 The Principle of International Burden-sharing

Climate change is a global problem in its causes and consequences, and the industrialized countries bear most of the moral responsibility for its victims. This also suggests the adoption of institutional elements from existing agreements on climate, or from similar areas for the protection of climate refugees. These could include: the ‘principle of common but differentiated responsibilities’ and respective capabilities (which suggests that richer countries have to bear higher costs for the protection of climate refugees); the principle of reimbursement of the full incremental costs of affected countries incurred through the resettlement of climate refugees; and the principle of double-weighted decision-making procedures, which would give both developing and industrialized countries equal clout in a new institution on climate refugees.

These five principles are not linked to a specific institutional form or embedding. Theoretically, governments could agree on a new treaty on climate refugees, such as the ‘cross-sectoral multilateral convention’ on climate refugees that was recently proposed by the German Advisory Council on Global Change (2007: 129, 205, 206–207). Such an independent convention, however, could require a lengthy negotiation process on core principles and would weaken the link with the climate policy process and its particular agreements on equity, responsibility, and international co-operation.

The five principles of a climate refugee regime rather suggest a Protocol on Recognition, Protection, and Resettlement of Climate Refugees (‘Climate Refugee Protocol’) to the *United Nations Framework Convention on Climate Change* (UNFCCC). Such a protocol could build on the political support from almost all countries as parties to the climate convention. It could draw on widely agreed principles, such as ‘common but differentiated responsibilities’ and the reimbursement of full incremental costs. It could

support the protection of climate refugees by inter-linking their protection with the overall climate regime, including progress in climate science that defines risks for people in certain regions. For developing countries, a protocol on climate refugees based on the principle of 'common but differentiated responsibilities' and full incremental costs could become a major goal for negotiation, especially when one takes into account the way in which the North exerts increasing pressure on advanced developing countries in an attempt to integrate them into a regime of global mitigation whose objectives are quantified reduction and limitation (Biermann 2005: 273).

When it comes to putting the procedures into operation, the protocol could provide for an executive committee on the recognition, protection, and resettlement of climate refugees that would function under the authority of the conference of the parties to the climate convention serving as the meeting of the parties to the climate refugee protocol. This executive committee would maintain a list of specified administrative areas (such as villages, islands, and districts) under the jurisdiction of member states whose population is determined to be 'in need of relocation due to climate change' or 'threatened by having to relocate due to climate change'. Any state party to the protocol – and in fact only state parties – would be entitled to propose areas under their jurisdiction for inclusion in the list of affected areas. In line with the United Nations principle of sovereignty, inclusion of affected areas, as well as the type of support measures to be taken, would be determined only upon formal proposal from the government of the affected country.

While the composition and procedures of this executive committee will likely be contentious in negotiations, it would appear reasonable to follow examples such as that of the Montreal Protocol on Substances that Deplete the Ozone Layer, which is governed by committees with an equal number of affected countries and donor countries with double-weighted majority voting. This would allow both the affected developing countries and the donor countries to hold a collective right to veto over the future evolution and implementation of the regime.

Inclusion in the list of populations 'in need of relocation due to climate change' or 'threatened by having to relocate due to climate change' would trigger specific rights and support mechanisms, including financial support and voluntary resettlement programmes over several years, together with the purchase of new land and, especially in the case of small

island states, organized international migration. It is likely that these rights will be restricted to inhabitants of countries that are not listed in Annex I to the climate convention, that is, developing countries as defined in the climate regime.

Creating a legal framework for 'climate refugees' will require adjustments in the existing institutional framework for political refugees under the Geneva Convention and related agreements and national legislation. Differentiating between the legal status of political refugees protected by the Geneva Convention and the legal status of climate refugees protected by a UNFCCC Protocol on Recognition, Protection, and Resettlement of Climate Refugees requires some terminological adjustment within the UNHCR regime, but is legally and practically unproblematic. In particular, a legal instrument on climate refugees would not require an amendment to the 1951 *Geneva Convention Relating to the Status of Refugees* and its Protocol, since these instruments define the term 'refugee' only for the purposes of their own regime, which will remain unchanged (Art. 1.a.2 of the 1951 Geneva Convention (UNHCR 2007c)).

Within climate negotiations, some governments and think tanks have proposed an 'adaptation protocol' for the climate convention (Okereke/Mann et al. 2007: 36–37; Ayers/Alam/Huq 2010). Here is not the place to discuss the disadvantages and advantages of such a broader legal instrument, which would address a much wider range of issues than are covered in this chapter. However, it is important to note that the core elements that we propose for a UNFCCC Protocol on Recognition, Protection, and Resettlement of Climate Refugees could theoretically also be incorporated into a broader adaptation protocol as long as key elements of our proposal – such as the financial support mechanism and its principles – are preserved. Integration of the protection of climate refugees into a broader adaptation protocol could allow for a more holistic adaptation planning in regions at risk, which will include in many cases a combination of adaptation and voluntary resettlement programmes. However, such an integration of the climate refugee problem into a larger context also places refugees in competition with other interests in affected areas. This might endanger the effective protection and financial support of the people – often the poorest – for whom adaptation is no option and who have to leave their homes and resettle elsewhere. These potential conflicts thus need to be prevented if a larger legal instrument is being negotiated.

15.4 Financial Support and Compensation of Climate Refugees

The protection and resettlement of possibly over 200 million climate refugees over the course of this century will require substantial funds. Since climate refugees will often (though not exclusively) live in poorer developing countries and generally seek refuge in their own or neighbouring countries, the funds will largely have to come from the international community. From a global governance perspective, there are three types of financial mechanisms for climate refugees: general development funding agencies, environment-related funds, or a new funding agency to be created especially for climate refugees.

Regarding development agencies, the World Bank group and the *UN Development Programme* (UNDP) are probably most relevant at present, though others will have to play a role (e.g. the World Health Organization or the UN Food and Agriculture Organization). These agencies will need to integrate climate change impacts into their work programmes, and most are in the process of doing so. In addition, there are a number of specialized environmental funds. Some climate programmes of developing countries are reimbursed through the *Global Environment Facility* (GEF), and the climate regime provides for a number of special funds to assist developing countries.

Yet while the protection of climate refugees will in principle fall under the terms of these funds, it may be questioned whether they are the most appropriate mechanisms for the specific funding problem of climate refugees. For one thing, the level of funding is not enough even for the current purposes of the funds. An increase in public funding from the governments of industrialized countries is unlikely or at least uncertain given other national priorities (including other climate-related priorities). The only fund that is independent from governments—the Adaptation Fund that is replenished by a 2 per cent levy on transactions under the Clean Development Mechanism – is projected to generate 160–950 million US dollars in total up to 2012 (Müller/Hepburn 2006: 7). A further rise in the levy on projects under the Clean Development Mechanism to top up the Adaptation Fund is possible, yet would create quasi-fiscal incentives against environmentally beneficial projects. Several proposals seek to address this issue, including novel funding mechanisms such as the Climate Impact Relief Fund proposed by Müller (Müller 2002: 89–91), the Inter-

national Air Travel Adaptation Levy developed by Müller and Hepburn, projected to raise 4,000–10,000 million US dollars each year (Müller/Hepburn 2006), or climate change insurance schemes (e.g. Müller 2006: 5; Bals/Burton/Butzengeiger et al. 2005).

Yet independently of these debates, it is doubtful whether climate refugees can be best protected through inclusion in these general funding mechanisms. This would put climate refugees in competition with other concerns, be it mitigation as in the case of GEF funding or overall adaptation as in the case of the adaptation funds, where adaptation measures might be motivated through additional concerns such as the protection of powerful economic interests. Integrating climate refugees in general environmental funding schemes might blur the specific moral link between climate refugees and potential donor countries and hinder claims for compensation, liability, and responsibility against industrialized countries. Thus, as in our previous discussion of the institutional setting that would govern the recognition, protection, and resettlement of climate refugees, the best option appears here also to be the creation of an at least partially *sui generis* regime for the financing of the protection of climate refugees, such as a Climate Refugee Protection and Resettlement Fund.⁷ While the operational aspects of this fund could be linked with other financial mechanisms to increase efficiency, the governance of the fund should be independent and should stand under the authority of the meeting of the parties to the UNFCCC Protocol on Recognition, Protection, and Resettlement of Climate Refugees.

A key question for this new facility specifically for climate refugees will be the amount of funding required from the international community, and the funding principles. For mitigation programmes under the climate convention, industrialized countries have committed to reimburse developing countries the agreed full incremental costs, a concept originally developed in the 1990 London amendments to the ozone regime (Biermann 1997: 179, on the operation of the principle). Similar provisions apply to adaptation (art. 4.3 of the UNFCCC (United Nations 1992)). In addition, the climate convention obliges industrialized countries to assist the most vulnerable countries in meeting adaptation costs (art. 4.4) and gives special rights to least developed countries (art. 4.9). This sug-

⁷ See also the German Advisory Council on Global Change, which proposed an Environmental Migration Fund. German Advisory Council on Global Change 2007, 211.

gests applying the principle of reimbursement of full incremental costs also to the protection and resettlement of climate refugees at least to those situations where general causality of climate change is undisputed, namely sea-level rise. For other situations in which climate change is only one causal factor to account for environmental degradation – for example in the case of water scarcity – the principle of additional funding instead of full reimbursement is probably more appropriate.

We therefore suggest four principles that would govern the Climate Refugee Protection and Resettlement Fund. First, all funds provided are on a grant basis. To the extent that larger development projects financed through loans include the resettlement of climate refugees, the particular costs of the resettlement elements will be fully reimbursed as a grant. Second, all funds provided for the Climate Refugee Protection and Resettlement Fund are new and additional, to prevent competition with other sustainable development needs. Third, in the case of refugees from rises in sea level, the Climate Refugee Protection and Resettlement Fund reimburses the full agreed incremental costs of developing countries incurred in protecting and relocating these refugees (no matter from which country they come), taking into account that a large part of the financial transfer will be channelled through international development agencies. In cases where climate change is only one cause of environmental degradation, the fund will pay for part of the protection and relocation costs, and the exact amount will be determined in intergovernmental negotiation. Fourth, the meeting of the parties to the UNFCCC Protocol on Recognition, Protection, and Resettlement of Climate Refugees, or committees under its authority, maintain the right to define a list of designated populations as ‘climate refugees in need of relocation’, to determine the amount of reimbursement and type of assistance, and to take all other measures related to the governance of the fund.

15.5 The Politics of Climate Refugees: Constraints and Limitations

This blueprint of a governance system would ensure, we argue, the sufficient and timely recognition, protection, and resettlement of climate refugees. Yet the question arises as to what extent this proposal would be acceptable to decision-makers. To begin with, the political process that we have described would need to overcome significant practical hurdles. How to

deal, for example, with requests under this protocol from countries with autocratic governments or with a record of human rights violations: should the executive committee under this protocol grant all financial and administrative support to these governments? Or, how to deal with rent-seeking behaviour by countries that try to misuse the climate refugee protocol to increase foreign funding? Such problems are likely, yet are not different from those faced by existing mechanisms of international support, from World Bank loans to GEF projects. We are confident that, in a large measure, such problems can be dealt with in political processes, and that the double-weighted voting proposed funding system would support compromise and creative, tailor-made solutions.

More difficult is that the system that we propose, would pose a significant financial burden on donor countries. Resettlement, re-training, and re-integration of millions of people from the low-lying coastal regions of Africa and Asia is highly likely to surpass all financial transfers under multilateral and bilateral development co-operation schemes. Are donor countries ready for it? At present, the indications are not promising. The protection of those who are especially vulnerable to climate change is effectively a fringe issue in climate negotiations, despite the new adaptation funding mechanisms that have been set up in recent years. Yet climate change impacts are less prominent so far, and current efforts cannot predict what governments will decide should the scenario predictions on climate migration hold. One important factor is the likely security and stability implications of large-scale climate change impacts. It is probably not surprising that the largest attention the problem has been given in the North so far is by military and defence planners. Early support for climate refugees might not only attenuate human suffering: it might also prevent violent conflict. Investment in the protection of climate refugees is also investment in global security in the 21st century. This rationale of self-interest may well change current Northern attitudes to the financial support of climate change adaptation programmes in the poorer nations in the South.

15.6 Conclusion

Climate change threatens to cause the largest refugee crisis in human history. As we described in this chapter, more than 200 million people, largely in Africa and Asia, might be forced to leave their homes to seek

refugee in other places or countries over the course of the century. However, the existing governance mechanisms are not sufficiently equipped to deal with this looming crisis. The situation calls for new governance. In this chapter, we have therefore outlined a blueprint for a global governance architecture for the recognition, protection and resettlement of climate refugees. We argue against the extension of the definition of refugees under the 1951 Geneva Convention Relating to the Status of Refugees but rather for a new legal instrument specifically tailored for the needs of climate refugees – a Protocol on Recognition, Protection, and Resettlement of Climate Refugees to the United Nations Framework Convention on Climate Change – as well as a separate funding mechanism, the Climate Refugee Protection and Resettlement Fund.

The serious impacts of climate change that will compel millions of people to leave their homes are largely predicted only for the second half of this century, based on the current state of climate science. However, the broad predictability of the regions where major climate change impacts, such as a rise in sea level, are likely to cause harm and dislocation allows for preparation and planning. We have thus deliberately framed our proposal not in terms of emergency response and disaster relief but in terms of planned and organized voluntary resettlement programmes. In particular, when it comes to a rise in sea level, there is no need to wait for extreme weather events to strike and islands and coastal regions to be flooded. All areas that for practical or economic reasons cannot be protected through increased coastal defences need to be included in early phases of long-term resettlement and reintegration programmes that will make the process acceptable for the people affected. This, however, calls for early action in terms of setting up effective and appropriate governance mechanisms. The planning of a climate refugee protocol and the related institutional settings cannot wait until 2050 when it might be too late for orderly and organized responses. It must begin now.

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16 'Climate Refugees' as Dawning Catastrophe? A Critique of the Dominant Quest for Numbers

Cord Jakobeit and Chris Methmann

*When I was a young girl we would move every two or three months
but now there are no rains. [...] We can't leave from here.
We can't move without milk.*

*A herder of the nomadic Rendille, Kenya,
explaining how extreme drought forces her people to settle down.¹*

16.1 Introduction

While the evidence about climate change is increasingly being corroborated, scientific and public interest in the scale and scope of the social changes associated with global warming is constantly rising. This holds especially true for the impact of climate change on patterns of human flight and migration. However, concern with 'climate refugees'² often appears to be driven by a certain fascination with catastrophic images and results in a quest for ever larger numbers. Paradigmatic in this regard is the prominent assessment of the Oxford-based researcher Norman Myers who predicted more than 200 million climate-induced refugees by 2050 (Myers 2002). Although this figure is certainly only a rough estimate, it is cited by many reports on the social impacts of climate change. In re-

cent years a number of studies have been added to this literature; their conclusions give ambiguous results about the exact figures, with some of them exaggerating the numbers even further: 50 million by 2010 (UNU-EHS 2005), 50 million by 2060 (UNEP 2008), 250 million by 2050 (Christian Aid 2009), to name but a few (for a complete list see [table 16.1](#)). The UN humanitarian affairs office estimates that there are 20 million people displaced by climate-related causes as of today (IDMC/OCHA 2009). It therefore does not come as a surprise that the issue of climate refugees has been put on the political agenda as well, as for instance by UNHCR (Guterres 2008; UNHCR 2009), the "Solana Report" (High Representative and European Commission 2008), the UNFCCC secretariat (UNFCCC 2007), and has even finally become a topic at the UNFCCC climate negotiations (IRIN 2009). Recently, EU development commissioner Karel de Gucht even projected a number as high as 300 million climate refugees by 2010 in his plea for an increase in ODA spending (Raupp 2009).

The history of environmental and development policy suggests that adopting unfounded and dramatic predictions too easily is problematic in at least two ways. On the one hand, it represents an argument for the critics of environmental or development policies in general. Deforestation in Germany is a case in point, where alarmist warnings eventually strengthened the case of the anti-environmentalists. Furthermore, unfounded alarmism may also forestall solving problems. Fairhead and Leach (1996), studying the

1 "The Great Drought: Disaster Looms in East Africa", in: *The Independent*, 3 October 2009: 3.

2 In this chapter the authors use the terms 'refugee', 'migrant' and 'displaced person' as well as 'climate refugee' and 'environmentally induced migrant' synonymously - well aware that this overlooks conceptual and legal nuances and differences among them. This is justified by the fact that actual differences can hardly be distinguished a priori. Environmental change often results in refugees, migrants, and displaced persons alike. Most of the time we apply the term 'climate refugee' because it is used to dramatize the process - something we want to simultaneously highlight and criticize. However, 'environmentally induced migrant' appears to be broadly accepted by now in the more nuanced literature.

role of deforestation policy in Africa, present an instructive example of how ill-founded science can mislead policy and legitimize detrimental top-down measures without local participation.³ The striking ambiguity in numbers and the ubiquity of Myers' projections point to the fact that most of the existing research on climate refugees is equally underdeveloped. In a similar way, framing climate refugees as an issue of large numbers without detailed investigation of contexts and circumstances could have serious political consequences. It might favour large-scale 'migration management' instead of local participation, and turn refugees into victims without agency. From this perspective, it appears all the more necessary to critically review the existing debate on climate refugees and challenge the dominant quest for numbers.

This chapter seeks to undertake a survey of the existing research on the climate-migration nexus and delineates possible directions for further research. It argues that existing approaches too easily adopt a common-sense model of flight and migration and are fundamentally flawed when it comes to projecting future numbers of climate refugees. While climate change will have a severe social impact, whether or not it leads to flight or migration depends on a multiplicity of different social, economic, and political factors. Due to these contextual complexities, the maximalist quest for numbers stretches the predictive capacity of the social sciences beyond its limits.

Building on the insights of the more critical literature⁴, this chapter proposes to leave the path of ever more sophisticated quantitative assessments and turn to better understanding the link between climate change and flight and migration. Analysis should be grounded in detailed and thorough case studies that allow for reconstructing the complex causal mechanisms at work, thereby putting the understanding of a complex phenomenon before its prediction. Since rough estimates are likely to produce rough solutions, such an alternative approach would provide a much

more adequate foundation for political responses to a possible flight and migration crisis.

Section 16.2 reviews the existing research on climate refugees. Starting from the general debate on environmental refugees, it outlines what Suhrke (1994) has called the 'maximalist' and 'minimalist' schools. The authors use the latter's insights to criticize the dominant maximalist quest for numbers in the debate about climate refugees. Section 16.3, building on the results of this discussion, outlines directions for further research and proposes a methodology for case study research based on the insights of critical realism (Bhaskar 1978).

16.2 A Quest for Numbers: The State of the Debate about Climate Refugees

This section critically reviews the current state of the scientific debate about environmental and climate refugees. Since the 1980s, the term 'environmental refugee' has become an object of scientific controversy. Early 'maximalist'⁵ assessments adopted a rather simple "common-sense model" (Perch-Nielsen/Battig/Imboden 2008) of the link between environmental change and migration and projected high numbers of future environmental refugees (El-Hinnawi 1985; Jacobson 1988; Myers 1993). During the 1980s, these findings were challenged by the 'minimalist school' which took a more critical stance towards the phenomenon of environmental refugees. It called for more sophisticated models (Bilsborrow 1992; Suhrke 1994; Hugo 1996; Bates 2002), argued for considering the social, economic, and political context of migration decisions (Loneragan 1998), or even rejected the notion of environmental refugees altogether (Black 2001). But the high number of refugees projected by the maximalists soon brought the topic into the political arena. It appeared in the first IPCC assessment report (IPCC 1990) and was adopted by UNHCR (1993). As early as 1998, Loneragan could conclude that environmental refugees had become a "high politics discourse" (Loneragan 1998: 6).

3 While islands of forests within the savannah were interpreted as symptoms of massive deforestation, they actually represented signs of a *spread* of forest cover beyond the woodlands. The local population, however, was accused of causing this supposed deforestation by massive firewood consumption. This, in turn, led to massive external intervention, disturbing the traditional equilibrium between humans and nature and thereby aggravating environmental and development problems.

4 For an excellent review of the literature on environmental refugees see Morrissey (2009).

5 The terms 'maximalist' and 'minimalist school' have been coined by Suhrke (1994). For a complete picture of the more general debate on environmental refugees see the excellent review by Morrissey (2009).

16.2.1 Climate Refugees: A Maximalist Debate

The current scientific engagement with 'climate refugees' apparently repeats the pattern of this first wave of the debate about environmental refugees. It may come as no surprise that due to the current public awareness of climate change, public interest has been explicitly focused on *climate* refugees. However, it appears remarkable that the debate is closely guided by the findings of early maximalist research and is likewise politicized as if the minimalist objections had never appeared. Over the last few years, several studies have been put forward that project high numbers of 'climate refugees' in the near future. As table 16.1 shows, numbers range from 50 million (UNU-EHS 2005; UNFCCC 2007) or 60 million (UNEP 2008) climate refugees by 2010 to 250 million by 2050 (Brown 2008).⁶

Table 16.1: Projections of future numbers of climate refugees. **Sources:** Myers (2002); UNU-EHS (2005); Tearfund (2006); Stern (2007); UNFCCC (2007); Greenpeace (2008); UNEP (2008); Christian Aid (2009); GHF (2009); Oxfam (2009); * numbers refer to Myers and Kent (1995).

Report	Year	Climate Refugees
Christian Aid*	2050	250 million
Oxfam*	2050	150-200 million 75 million in Asia-Pacific region
Greenpeace*	2100	125 million in India/Bangladesh
Tearfund*	2050	200 million
Myers*	2050	250 million
Stern Report*	2050	150-200 million
UNFCCC	2010	50 million
UNEP	2010	60 million
GHF*	2009 2050	26 million + 25 million (indirect) 150-200 million
UNU-EHS	2010	50 million

6 Accordingly, the issue of 'climate refugees' has become increasingly relevant at the political level (see e.g. Guterres 2008; High Representative and European Commission 2008; IRIN 2009; Raupp 2009). Recently, a debate has begun about possible political solutions for dealing with these high numbers of political refugees (Biermann/Boas 2008; Docherty/Giannini 2009; McAdam/Saul 2009; Moberg 2009).

Common to most of these assessments and political proposals is that many refer explicitly (and the rest sometimes implicitly) to the work of Oxford-based researcher Norman Myers (Myers 1993, 1997, 2002; Myers/Kent 1995). Based on a large-scale study of environmental refugees, Myers projected a total of 212 million people displaced by climate change alone. In a recent interview, Myers even topped this estimate and spoke of a possible 250 million climate refugees by 2050 (Christian Aid 2009). Not all of the reports refer unambiguously to Myers's numbers, and they are almost 15 years old. Moreover, his work has provoked a whole range of fierce critiques (e.g. Lonergan 1998; Black 2001; Tacoli 2009). His work has become a sort of 'orthodoxy' (Tacoli 2009: 516) in the debate about climate refugees and keeps being recited like a mantra.⁷ It is worth taking a closer look at his method of assessment, which seems to be paradigmatic for the dominant quest for numbers. Doing so reveals two major problems of this approach: an ill-defined theoretical framework and a simplistic method of prediction.⁸

Firstly, Myers and Kent do not waste much energy on exploring the interplay between environmental and other drivers of migration. Not unlike El-Hinnawi (1985), they define environmental refugees as "persons who can no longer gain a secure livelihood in their traditional homelands because of environmental factors of unusual scope" and then go on to note that "there can be additional factors that *exacerbate* environmental problems" (Myers/Kent 1995: 18-19, emphasis added). This formulation suggests that environmental factors have to be regarded as main causes while other factors acquire the status of a supplement.

7 The prominence of Myers' numbers might also be due to the fact that most international organisations dealing with the issue lack sufficient empirical data of their own, for example because of a lack of census data (Brauch 2006). Moreover, as there is no commonly agreed legal definition of environmental or climate refugees, it is difficult to assemble official statistics about this group of migrants/refugees. It is precisely this lack of empirical data, though, which makes a detailed inquiry into Myers' numbers necessary, as they are more or less unparalleled.

8 It has to be noted that although Myers and Kent (Myers and Kent 1995: 1) consider their work as a first approximation, as a means to "get a handle [...] on an emergent problem" still in need of further elaboration, it seems remarkable that all their further publications on this topic (Myers 1997, 2002, 2005) are explicitly based on their 1995 work and have basically not been improved since then.

They obviously fail to convincingly distinguish between environmental and social, economic, and political causes of flight and migration. This is not to say that Myers and Kent are absolutely insensitive to the issue of multi-causality, for they acknowledge the role of population growth, poverty, or famine (Myers/Kent 1995: 26). But their framework then fails to adequately account for these socio-economic factors – an apparent lack that is justified by pragmatic reasons (Myers/Kent 1995: 26–28). Moreover, they regard it as irrelevant

whether in any specific instance [environmental factors] are prominent, pre-eminent or predominant, though this report generally assumes they are critical because they are fundamental. There can be a number of intervening contributory factors, indeed an entire cluster of variables, which nonetheless do not negate the link between environmental cause and migration effect (Myers/Kent 1995: 27).

This might be justified if the aim is to explore whether environmental changes influence migration at all. But when it comes to singling out environmental refugees (necessary to predict their numbers), this framework is clearly insufficient.

These shortcomings are mirrored in the empirical application of the framework, for example⁹ in the case of Haiti, which Myers and Kent regard as a “notable instance” (Myers/Kent 1995: 34; Myers 2002: 609), a paradigmatic case for their whole work. It is a case in which the authors suggest a strong link between environmental degradation and flight and migration since deforestation, erosion, and water shortage have led to stagnation in agricultural productivity and this in, in turn, has established severe push conditions for large-scale population movement. They admit, however, that these phenomena are “deeply intertwined” (Myers/Kent 1995: 35) with a high fertility rate, rampant poverty, and very unequal land tenure. But it remains difficult to “separate out these political and economic factors from environmental problems, and hence to determine which is the more potent source of Haiti’s deprivation” (Myers/Kent 1995: 35). The solution for Myers and Kent is now to apply counterfactual reasoning to prove the decisive influence of environmental deterioration: even if all social and political problems in Haiti were to be solved, “there would still be environmental problems aplenty

that would keep large numbers of Haitians in absolute poverty for the foreseeable future. To this substantial extent, people fleeing Haiti can be characterized as primarily environmental refugees” (Myers/Kent 1995: 35). No doubt, environmental problems in Haiti are severe. However, this is a prime example of how counterfactual reasoning can overshoot the mark.

The second flaw in this approach is the very rough way of estimating numbers of future environmental refugees. Basically, they are extrapolated from the population at risk, which is calculated on the basis of future population in the respective area, their estimated vulnerability (mostly in terms of poverty), and the projected changes in environmental quality. For instance, most of the calculations of people fleeing sea-level rise are simply based on the number of people living in an area that is supposed to end up below sea level at a specific point in time (without considering adaptation measures at all). Or take the estimate of people displaced by extreme drought related to climate change, where Myers and Kent (1995: 146–49) assume that a hotspot for this effect will be sub-Saharan Africa. They then give estimated data for population, grain production, water supply, and soil degradation. Their conclusion, however, reads surprisingly simply and so will be quoted at length:

Starvation crises of unprecedented scale in Africa and other regions would surely trigger mass migrations of people from famine-afflicted areas. How many is difficult to say with even a modicum of precision. But for the sake of ‘getting a handle’ on what could become one of the most significant phenomena of the coming decades, it is surely reasonable to hazard an informed estimate of 50 million refugees – *possibly rather fewer (30 million?) or probably many more (80-100 million?)* (Myers/Kent 1995: 148, emphasis added).

One is compelled to ask: Is a little over all right? The whole task of calculating is boiled down to one paragraph of mere speculation. What advantage does such a method of calculation offer compared to reading tea leaves?

An obvious objection to questioning the relationship between climate change and flight or migration is the reference to past climatic changes resulting in large-scale population movement. Indeed there is a remarkable body of literature demonstrating the link between changing population dispersions and temperature shifts, using a variety of methods and techniques (Huang/Zhao/Pang et al. 2003; Fang/Liu 1992). However, the authors do not question the assumption that climate change leads to population movement. They rather claim that so far not enough is known to embark upon the complex task of prediction (they are

9 Similar problems arise in their study of the Philippines (Myers/Kent 1995: 29–31), which they use to discuss the problem of multi-causality, but which they completely fail to resolve.

moreover sceptical that social science will ever be able to make proper predictions). And retrospective explanation is quite a different thing from future prediction. Events as long ago as climatic changes can only be grasped roughly. In providing impressionist pictures, they are not very likely to help human beings better understand the phenomenon at the micro-level of its condition and constitution. This is why large-scale studies of the past might back up the general claim, but do not support rough predictions as made by Myers.

Summing up, what makes the work of Myers and Kent a commendable contribution is the emphasis on the influence of environmental factors on flight and migration. However, their conceptual framework is fundamentally flawed, with two problems: their ill-defined theoretical framework and the problem of causation and prediction. They fail to deal with or even reject the complex social, economic, and political context of seemingly environmentally-induced flight and migration and too easily extrapolate environmental change to future refugee numbers. Since most of the literature that refers to Myers and Kent does not solve or even address these problems, the dominant quest for numbers seems to be trapped in the same maximalist fallacy as was the older debate about environmental refugees.

16.2.2 Solving the Issue through Definitional Clarity?

The debate on environmental refugees took off following the path-breaking UNEP publication by El-Hinnawi (1985). It also provided the first serious attempt to define this category of refugees. Accordingly,

Environmental refugees are those people who have been forced to leave their traditional habitat, temporarily or permanently, because of a marked environmental disruption (natural and/or triggered by people) that jeopardized their existence and/or seriously affected the quality of their life (El-Hinnawi 1985: 5).

However, this definition is still very broad. The concept 'quality of life' apparently includes a very large range of possible phenomena, which could all be labelled as environmental flight. And as we have seen in Myers and Kent, such a lack of definitional clarity runs into serious trouble when confronted with empirical reality.

A clearer approach to the problem of defining environmentally-induced migration has been put forward by Biermann and Boas (2008; 2009). Acknowledging the "lack of conceptual clarity and consensus"

(Biermann/Boas 2009: 5) they seek to construct a scientifically and politically feasible framework for dealing with 'climate refugees'. In particular, they try to develop a more clear-cut definition of 'climate refugees' that can serve both for scientific assessment and for an international convention to protect 'climate refugees'. Biermann and Boas exclude a range of impacts commonly related to climate change, for example the spread of diseases. They restrict the term 'climate refugee' to "three direct, largely undisputed climate change impacts": sea-level rise, extreme weather events, and drought and water scarcity (Biermann/Boas 2009: 7; see also chap. 15 by Biermann and Boas).¹⁰

This simple definition can be seen as an attempt to resolve the definitional problems that have arisen in the writings of El-Hinnawi or Myers and Kent. They also discuss the various methodological problems that may arise in predicting future numbers of climate refugees' - such as definitions that do not allow for comparisons to be made, concepts that are too broad, generalized assumptions about human behaviour, disregard of possible adaptation measures, and the multiple causes of individual migration decisions. They decide to "keep these shortcomings in mind" (Biermann/Boas 2009: 10) - and go on to cite the numbers quoted by Myers and Kent (or other sources that refer to them), just to conclude that "most estimates currently appear to expect an additional number of climate refugees of about 200-250 million by 2050"¹¹ (Biermann/Boas 2009: 10). And although this is only "a rough estimate with a large margin of error" (Biermann/Boas 2009: 12) they state that "these methodological problems are likely to sketch an overly pessimistic picture [and] large migration flows over the course of this century are plausible

10 There is, of course, a significant scientific debate about how to define climate refugees, which cannot be addressed in this paper (Brown 2008: 13-15). Thus, the contribution of Biermann and Boas has been selected as a sort of crucial least-likely case. If such a clear-cut and rigid notion of climate refugees runs into trouble in the face of empirical studies, this is likely also to apply to all other broader definitions of the term.

11 The proximity to the maximalist approach is also reflected in their assessment of people at risk from drought or extreme weather events which in the next paragraph become "these streams of refugees" (Biermann/Boas 2009: 11), implicitly assuming that these undoubtedly severe impacts will directly translate into flight or migration.

ble” (Biermann/Boas 2009: 12).¹² However, they fall short of presenting reasons for this evaluation.

Accordingly, the three supposed main drivers of climate flight and migration are not as clear-cut as the authors suggest. Instead, their approach is equally flawed: while sea-level rise, drought, and extreme weather events – as they correctly assume – are likely to happen as impacts of climate change, their impact *on flight and migration* is not as clear-cut as suggested. That this inference is unfeasible can be shown by reference to a range of studies of recent and past events that are similar to (or early instances of) impacts of climate change – so-called “contemporary analogous studies” (Morrissey 2009: 19).

First, in the case of drought and water scarcity it appears that the linkage to flight and migration is not as obvious.¹³ While most of the analogous contemporary studies find a relationship between environmental stress and outmigration, they paint a much more differentiated picture of the link to migration. Findley (1994), for instance, found that during the 1983–85 drought in Mali, the rate of international outmigration actually declined and was replaced by temporary short-distance migration. Households simply could not afford the costs of long-distance permanent migration as a reaction to environmental degradation. This has been confirmed in studies of similar situations in Burkina Faso (Henry/Piché/Ouédraogo et al. 2004; Wouterse and van den Berg 2004), Ethiopia (Ezra/Kiros 2001), and again Mali (Hampshire 2002). Meze-Hausken (2000), in a study of drought in northern Ethiopia, has emphasized both the importance of political and economic disaster relief mechanisms and shown that extreme climatic events may trigger a number of different coping strategies, outmigration being only one among others. She concludes that “any speculative scenario of mass migration under climate change must be rejected for dryland populations whose main strategies are built on adaptation rather than on resignation” (Meze-Hausken 2000: 402). Moreover, while rural peasants in the Sahel often acknowledge

the impact of climatic change on their livelihoods, they consider political, social, and economic factors as much more important (Hampshire/Randall 1999; de Bruijn/van Dijk 2003; Morrissey 2008; Mertz/Mbow/Reenberg et al. 2009).¹⁴ Together, these studies question a clear-cut and determinate link between climate change, drought, and flight/migration, and prove that “migratory responses to drought might not simply follow linear forms in which a more severe drought leads to more intense migratory response of proportional equivalence” (Morrissey 2009: 25).

Second, most assessments of sea-level rise consider it to be a direct and determinate cause of flight and migration (McGranahan/Balk/Anderson 2007; Locke 2009). Sea-level rise is not a sudden one-time event. Long before the land is permanently submerged, agricultural land and aquifers become salinized. Sea-level rise appears to be a gradual process of environmental change. This implies that, on the one hand, adaptive measures are far more likely to be implemented than in cases of sudden and extreme drought because of the extended time frame for reaction. On the other hand, people will experience sea-level rise in the first instance as an increase in the frequency of major coastal flooding. Haque and Zaman (1989) and Lein (2000) argue in their study of coastal flooding in Bangladesh that most of the people seek to resettle back in the same area due to the high cost of long-distance migration and the existing patronage and social networks that are necessary for disaster relief in the absence of reliable state assistance. Surveys on Funafuti Island (Tuvalu) revealed that climate change is not “a reason to migrate, and that would-be migrants do not cite climate change as a reason to leave. People in Funafuti wish to remain living in Funafuti for reasons of lifestyle, culture, and identity” (Mortreux/Barnett 2009). Moreover, a lot of technical options are available for adaptation to rising sea-levels in most of the low-lying coastal areas which are not located on small islands (Tacoli 2009: 519). Ironically, these (mostly urban) areas are often attractive for in-migration for economic reasons, making the net effect of migration even more unpredictable (Tacoli 2009: 519). Nonetheless, sea-level rise is going to have a significant influence on patterns of population movement, especially because, apart from temporary

12 In a short passage without further clarification, they state that “problems of multicausality [...] should be resolved in a political process” (Biermann/Boas 2009: 7).

13 The category of drought also plays a central role in much of the earlier work of the maximalist school (Jacobson 1988; Myers/Kent 1995) and the more recent alarmist publications presented in [table 16.1](#). In particular, the case of sub-Saharan Africa is commonly referred to, which is why the studies presented here focus on this area.

14 This is also reflected in a historical analysis of the US dustbowl migration of the 1930s (McLeman/Smit 2006), which highlights the importance of socio-economic conditions such as size and tenure agreements of landholdings or the prevalent agricultural methods.

floods and surges, once submerged the land won't come back. Yet these findings suggest that they are unlikely to be determinately linked in a linear relationship.

Third, a closer look at recent or past extreme weather events reveals similar complexities. Belcher and Bates (1983) analysed the impacts of Hurricane David in the Dominican Republic in 1979 and found that while areas that had been completely destroyed were marked by outmigration, in partially damaged areas there was mostly short-distance flight to families and friends in the same neighbourhood. Some of these even experienced in-migration due to relatives and friends coming to help affected people. Moreover, mostly landless people had to flee to refugee camps because in many cases they lost all their property. Frey and Singer (2006) and Smith, Carbone, Pope et al. (2006) confirm the influence of economic and social inequalities on the propensity to migrate in the cases of Hurricanes Katrina and Andrew. In the case of the 2004 Bangladesh Tornado, Paul (2005) estimated that practically no outmigration occurred owing to sufficient and well-planned official disaster relief programmes as an adaptation strategy. Similar effects were observed following natural disasters akin to the ones caused by climate change, as for example the 2004 Indian Ocean tsunami (Naik/Stigter/Laczko 2007). In general, whether or not natural disasters lead to flight or migration depends on existing socio-economic structures. Belcher and Bates (1983), studying the 1976 earthquake in Guatemala, showed that almost 90 per cent of refugees returned to their homes within two years because of their existing property in that area. Other works stress that a lack of property, low household incomes, and poverty in general are important driving factors for migration in the case of natural disasters, while less vulnerable households are less likely to migrate (Osterling 1979; Morrow-Jones/Morrow-Jones 1991).

Together, the findings of these contemporary analogous studies undermine both the recent maximalist assessments and the clear-cut definition of Biermann and Boas. They do not deny the influence of sea-level rise, drought and water scarcity, and extreme weather events as driving factors of flight and migration. But they show that whether or not environmental changes result in large-scale migration depends on a host of different social, economic, and political circumstances. Hence, one cannot easily speak of 'climate refugees'. And if context matters to such an extent the quest for numbers is probably doomed to fail. It is highly questionable whether such complex and

heterogeneous social phenomena as flight and migration can be predicted at all. This conclusion raises questions of scientific methodology and sound research design on 'climate refugees' that will be addressed next.

16.3 Beyond Numbers: The Causal Mechanisms of the Climate-Migration Nexus

Given the severe impact of climate change the authors definitely do not doubt that it will cause flight and migration to a considerable extent. But assessing the state of the art of research on the climate-migration nexus a huge gap can be discerned between the dominant quest for numbers and empirical evidence. We therefore favour a scientifically sound methodology that puts the understanding of a complex phenomenon before its overhasty prediction. This section outlines an agenda for further research. Based on the above discussion of evidence, five general methodological principles are outlined that should guide future research on 'climate refugees'. The authors are well aware that these are not groundbreaking insights but rather obvious suggestions. But given the state of the debate on environmental refugees, it is all the more necessary to highlight their importance.

16.3.1 Focusing on Causal Mechanisms

The flaws found in the large-scale assessments are related to the fact that most of the studies seek to reveal and prove a law-like explanation and prediction in the style of the natural sciences.¹⁵ At the heart of the debate on climate refugees lie general questions of scientific methodology. While there is a long-standing debate on whether or not the natural science ideal is appropriate for the social sciences at all, the discussion so far reveals that it is at least a very problematic approach for dealing with problems of environmental and climate refugees: it fails to account for the richness of the social, political, and economic context that cannot be separated from the phenomenon of environmentally induced migration. It rather seems that there is no such thing as a general 'climate refu-

15 This is probably not incidentally reflected in the fact that one of the leading researchers of the maximalist school, Norman Myers, is a biologist, and most of the research on climate change is very close to the natural sciences, if not dominated by them.

gee' who can be clearly singled out in reality, but that the talk of 'climate refugees' is a conceptual abstraction that applies for a range of similar phenomena embedded in very different social contexts. Yet abstraction is "a powerful tool and hence also a dangerous one if carelessly used" (Sayer 1992: 86). It always involves the isolation of certain properties of different objects while disregarding others. In the case of climate refugees', they argue that it is necessary first to climb down the ladder of abstraction before it is possible to climb up again.

Inspired by the recent move towards more qualitative styles of explanation in the social sciences, they find it necessary to explore the causal mechanisms that bring about climate refugees' in the first place. As the "mechanismic worldview" (Gerring 2007; see also McAdam/Tarrow/Tilly 2008) suggests, the focus should not be on establishing causal laws or correlations, but on understanding the causal mechanisms that account for a specific effect in a particular case.¹⁶ While there is still a great deal of disagreement about what exactly the term 'causal mechanism' refers to, it represents a shared ambition to get "inside the box of causation" (Gerring 2007: 164). In this sense, causal mechanisms are the particular pathways that lead from a cause to an effect. Using this concept "encourages researchers to clarify what a theory is all about, i.e., how X1 might be related to Y" (Gerring 2007: 164). It is precisely this orientation towards the micro-level of causation that is necessary for a better understanding of the climate-migration nexus.

16.3.2 Conducting In-depth Case Study Research

A suitable method for revealing the causal mechanisms of a given social phenomenon is that of in-depth case studies (George/Bennett 2005: 127–29). There are already several works that indicate the merits of case study research specifically designed to understand climate flight and migration (e.g. Meze-Hausken 2000; Jakobeit/Methmann 2007; Reuveny 2008; Locke 2009; Mertz/Mbow/Reenberg et al. 2009).¹⁷ Particularly noteworthy in this regard is the EU-funded two-year research project "Environmental Change and Forced Migration Scenarios" (EACH-FOR 2009). This project builds on 23, mostly fieldwork, case studies of selected hotspots of environ-

mental migration. Based on semi-structured expert interviews and 60 questionnaires, which were administered among refugees and non-refugees in the various regions, the project found that the field of environmental migration represents a nexus of complex interrelations as there are many intervening and contextual variables that influence decisions to migrate (EACH-FOR 2009: 70–71). These findings support a general suspicion about maximalist predictions. EACH-FOR has put forward several directions for further research: e.g. intensifying case studies already carried out and starting further "in-depth and longitudinal studies" in different cases. In general, we suspect that two weeks of fieldwork with a small sample of questionnaires, as was the case in some of the EACH-FOR studies, is not sufficient. Therefore, the authors propose to intensify research on specific instances of flight and migration caused by climate change.

16.3.3 Comparing Most Similar Cases

The talk of causal mechanisms might eventually induce researchers to aggregate them to causal laws. But mechanisms cannot be separated completely from their social context. As Falleti and Lynch argue, "unless causal mechanisms are appropriately contextualized, we run the risk of making faulty causal inferences" (Falleti/Lynch 2009). The research on 'climate refugees' seems to be a case in point. While it is politically and scientifically seductive to lump together all types of 'climate refugees' in a single research design, this runs the risk of comparing apples with oranges. Just as global warming brings about a range of manifold natural and social impacts, the concept of climate refugee' combines instances of environmentally induced migrations in a host of different social and economic contexts. But the Tuvalu fisherman and the Kenyan pastoralist have little in common even in the face of climate change.

The authors therefore propose that further case studies should be concentrated on particular regions so as to be able to dig deeper into the generative mechanisms in a particular context. Such a concentration would allow for a much more profound analysis

16 For the context of a causal mechanism as opposed to the covering-law model see Gerring (2007) and Mayntz (2004).

17 It is beyond the scope of this chapter to assess the research methodology of all of existing case study research. This is why we focus on EACH-FOR as one of the leading and most recent projects and present our own approach, which might be similar to some of the existing work. For an example of quantitative work on climate refugees see Reuveny and Moore (2009).

of selected cases. Studying the causal mechanisms of the climate-migration nexus promises to be particularly successful in most-similar-cases research designs. For example, it would make sense to compare the settings of similar socio-economic conditions affected by related climate change impacts, i.e. drought in sub-Saharan Africa, small-island states facing sea-level rise, or extreme weather events in South Asia.

16.3.4 Towards a Context-sensitive Theoretical Framework

The idea of context-sensitivity also applies to the construction of theoretical frameworks. Other areas of migration research (including those on general environmental degradation, such as for example desertification) found it useful to combine supposed causal mechanisms into more formal models. For example, the OECD, the UN-CSD, and the European Environment Agency all rely on particular models in their research. As Brauch (2006) points out, these models tend to be too approximate to account for the exact linkages between environmental changes and social and political impacts. He puts forward a more comprehensive model, called PEISOR (Brauch 2005, 2006, 2009; Brauch/Oswald 2009). It consists of five stages, pressure, effects, impacts, social outcomes, and responses. While very helpful in systematizing the debate, the model is limited in that it understands the environment-migration nexus as a more or less linear progression from causes to consequences¹⁸, from natural processes to social responses. As the above review of literature suggests, environmental changes are not external to society, but deeply intertwined. For one thing, whether or not changes in livelihoods are attributed to social or environmental processes depends on the very perception of the people being affected (see above). Far from being an issue of 'false

consciousness' or lack of knowledge on the part of the affected population, this rather points to a complex interaction between social and environmental factors. In a study of Indian agriculture, for example, O'Brien, Leichenko, Kelkar et al. (2004) found that farmers are equally affected by droughts as by the liberalization of trade policies. Environmental and climate-related migration is an issue of multi-causality (Gleditsch/Nordas/Salehyan 2007; Laczko/Warner 2009) and can hardly be translated into the stages of a linear model. When it comes to the construction of a theoretical framework, this framework should be grounded in the experiences of affected communities, and not pressed on to the empirical context from the outside.

In this sense, the authors argue for the construction of an empirically based theoretical framework not unlike the idea of "grounded theory" (Glaser/Strauss 1979). While not completely disregarding the literature on theoretical modelling, they propose to pay attention to particular factors and distinctions at work, but not to determine their relationship in advance. These include:

- *individual properties* of local communities: among others, the adaptive capacities and strategies of local, regional, national, and international actors, their institutional performance, and individual features of the people concerned, such as age, education, the nature of social networks (Boyle/Halfacree/Robinson 1998; WBGU 2007);
- *subjective considerations* about real or imagined dangers and vulnerabilities on the basis of experience or traditional venues that come into play;
- differentiation between different *sub-groups* of affected communities and their *cleavages*: to start with, social stratification might play a role in determining the decision whether to stay or to leave (Doevenspeck 2005; PERN 2008), as well as the rivalry among different political groups. Another important criterion for differentiation would be gender. On the one hand, male and female groups might be affected in a different way by environmental changes. On the other hand, their role is likely to differ regarding the responses: women especially are more likely to stay at home, whereas the younger and male members migrate and are hopefully able to send remittances;
- the *scale, scope, and time frame* of environmental changes: with respect to environmentally induced migration, one can distinguish between three relevant developments (IOM 2007): first, gradual environmental change at an early stage (soil erosion),

18 The PEISOR model was presented at many conferences and first published by Brauch (2009) and developed further by Brauch and Oswald (2009: 10) who argued: "The PEISOR model refers under *pressure* to eight factors contributing to GEC. They often interact in a non-linear or chaotic way and impact on earth and human systems. The political and societal contexts may affect socio-economic processes contributing to anthropogenic environmental degradation or resource scarcity that may result in environmental stress." Both versions of this emerging model refer to the specific "global economic and political context or conditions and to the national (socio-economic context and conditions, conflict structure, tradition)" (Brauch 2009: 76).

second, gradual environmental change at an advanced stage (soil degradation, desertification, acute water shortages), and third, extreme weather phenomena (storms, floods, heatwaves, forest fires). As far as the first two scenarios are concerned, it is fair to say that relatively little is known about the specific causal mechanisms because environmental change is itself embedded in a complex network of social, economic, cultural, and political factors. The authors thus argue that it is necessary to concentrate on these instances of climate change;

- *different types of migration*: migration might occur either permanently or temporarily, over a long or short distance. This has to be accounted for as well as the fact that migration has often been a traditional means of coping with social, economic, or ecological problems;
- in relation to such social, economic, or ecological problems, research would also need to pay attention to the fact that there are other forms of *adaptation and creativity*, which might compensate for climatic and environmental changes. In West Africa, migration and circular migration, in particular, form a traditional coping strategy for diversifying risk and maximizing survival strategies for the larger unit. Migration has a long tradition, often forms part of the individual's biography, and is not associated with a societal stigma. Extreme climatic events may trigger many different coping strategies, outmigration being only one among others. Likewise, some of the contemporary analogous studies reviewed have revealed the importance of local and regional political institutions, social networks, and adaptive systems. Including the issue of adaptation by and creativity of local actors would not only allow for a better understanding of the causal mechanisms, but also provide starting points for political counter-strategies that do not place single-edged emphasis on global management but rather encourage local participation;
- *interconnectedness with other problem complexes*: methods and approaches that find ways of isolating the role of environmental variables in the decision to migrate are needed. For example, it is widely accepted in the literature that environmental factors usually accompany other factors (particularly economic) that contribute to the ability of poor people to sustain their livelihoods. But from everything we know, economic factors alone do not necessarily accompany environmental problems in affecting migration. A case study in which

environmental variables were present, but economic variables were not or were less clearly present as drivers of migration, would be a starting point in developing methods for better isolating the role of environmental variables in migration. This type of research can also strengthen the ability to create falsifiable hypotheses.

16.4 Conclusion: A Highly Politicized Debate?

At the beginning, this chapter set itself the task of critically evaluating the social science research on 'climate refugees' and of developing a conceptual framework for understanding the link between climate change and migration. The authors found that the dominant quest for numbers is flawed with conceptual problems regarding definition, causation, and prediction. Neglecting the intense web of social, economic, and political factors in which climate change impacts are embedded, it tends to present an oversimplified influence of climate change on flight and migration. Even narrower approaches such as that of Biermann and Boas (2009) cannot resolve these problems, and they present an overly simplistic picture that does not account for the complexities of reality. This chapter argues for a more careful approach through exploration building on thorough case studies, and explicitly abandons the quest for higher numbers. Due to real world complexities, prediction of future refugee numbers appears to be overambitious and should be replaced by the will to understand the phenomenon at hand.

The scientifically unsound results of many approaches to climate refugees seem to be driven in many cases by the aim of influencing the political agenda. This desire, for example, is mirrored in the work of Myers:

[L]et us not become preoccupied with what can be precisely counted if that is to the detriment of what ultimately counts. [...] In the case of environmental refugees, and by sheer force of circumstance - which is becoming ever-more forceful - it is appropriate to appraise the problem with as much detailed (albeit limited) information as is available - but not to refrain from drawing policy relevant conclusions in a situation of exceptional import and urgency (Myers/Kent 1995: 33).

This points to the fact that the problems discussed in these approaches are not just of a scientific but also of a political nature. Some have criticized the debate on environmental and climate refugees for being highly politicized (Castles 2002; Morrissey 2009). This critique is not supported as it must be acknowledged

that every science carries political implications, be they implicit or explicit, be they voluntary or involuntary. Foucault has coined the term 'power-knowledge' nexus and highlighted how certain ways of turning social phenomena into 'problems' result in different political practices (Foucault 1985: 11-12). To reflect on the issue of politicization does not mean to strive for neutral and de-politicized knowledge, but "a movement of critical analysis in which one tries to see how the different solutions to a problem have been constructed; but also how these different solutions result from a specific form of problematization" (Foucault 1997: 188). In this sense, the authors welcome the maximalist author's will to make their political ambitions explicit. What they criticize, however, is that the maximalists are not aware of the fact that different ways of framing the climate-migration nexus might lead to rather different political responses.

The authors' methodological critique also has political implications. First of all, since Biermann and Boas pretend a conceptual clarity that cannot be maintained regarding the concrete socio-economic circumstances of climate change impacts, their approach becomes a dubious foundation for their proposed international climate refugee convention. If such a one-size-fits-all solution does protect people who, due to the complexities mentioned, do not become refugees, while others who might do so are excluded for the sake of conceptual clarity, this is a major conceptual weakness.

Secondly, if research on the climate-refugees nexus tends to overvalue ecological drivers of flight and migration, if it takes no account of the contextual "social, economic, political and institutional structures" (Lonergan 1998), this might have severe political consequences for the affected population. Representing flight and migration as primarily linked to climate change and thereby constructing it as a global problem might lead to political solutions in the form of global management and hence exclude local strategies and participation by the respective communities (Adger/Benjaminsen/Brown et al. 2001). Depicting refugees as climate refugees could advance extraordinary solutions and reduce affected populations to bare life without human or political rights (Oels 2009). It even might lead to the denial of refugee rights if 'regular' refugees are pushed into the category of environmental refugees (Black 2001). Projections of high numbers of 'climate refugees' could spur anti-immigration discourses, resulting in a "greening of hate" (Lonergan 1998). However, what the privileging of environmental causes of flight and migration

certainly does is to *naturalize* structural causes of inequality and to exclude questions of economic development and social justice from the political agenda. In this sense, we understand the proposed framework as a contribution to a more open debate about 'climate refugees'. This might allow for more emancipatory solutions such as a better global social policy, local autonomy, and a more just migration policy in northern countries. Assessing even urgent problems with the necessary caution will lead to better solutions.

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17 Environmentally-Forced Migration in Rural Areas: Security Risks and Threats in Mexico

Úrsula Oswald Spring

17.1 Introduction¹

This chapter deals with international migration and its geopolitical repercussions between Mexico and the USA. *Climate-induced migration* (CIM) or *environmentally-forced migration* (EFM) is not a new phenomenon, but the different sociopolitical conditions may pose security risks for both countries; the USA and Mexico share the longest border between a highly industrialized and a developing country.

These multiple environmental challenges pose severe human, environmental, water, soil, food, and health security risks, but pose no national or international military security threats either for the countries of origin (Mexico, Central America) or for the receiving countries (Mexico, USA, Canada), and in the light of this, this chapter addresses the following specific research questions:

- What are the possible linkages and feedbacks between the factors of *global environmental change* (GEC) together with the neo-liberal model of socio-economic development and their impact at the local level for Mexican peasants, for indigenous people, and especially for poor rural women living in precarious socio-environmental conditions?

- How does EFM become a coping strategy for communities, families, or individuals facing GEC and who suffer a higher degree of social vulnerability and stress due to the outcomes of this migration?
- How does the militarization of the borders (USA-Mexico, Mexico-Guatemala, Mexico-Belize) and the war against drugs (in Mexico) transform a primarily *soft* human, gender, and environmental security problem into a *hard* political and military security issue? This question links the migration issue to increasing public insecurity in Mexico and in Central America as organized crime (related to the international trafficking of arms, drugs, human beings, children, and organs, and to money laundering) undermines the work of US border controls.

The chapter analyses environmentally-forced migration from rural areas in Mexico to towns (internal rural-urban migration) and to the USA but also to Canada (transnational migration). It first develops the theme of environmentally-forced migration (17.2) and then outlines its sociopolitical context for the specific case of Mexico. The conceptual framework for this highly complex process is based on the PEISOR model (17.4) and the topic will be discussed in the framework of its five consecutive stages: the (*p*)*ressure* from the Earth and the human systems (17.5) that create environmental (*e*)*ffects* such as degradation of soil, water, air, and biodiversity, and – due to increasing demand and population growth – scarcity (17.6). The (*i*)*mpacts* are related to natural and human-induced hazards, where Mexico is seriously threatened by hydrometeorological events, and simultaneously by geophysical hazards (earthquakes, tsunamis, volcanic eruptions) and industrial accidents (17.7). The (*s*)*ocietal (o)utcome* for people, confronted with these old and new threats related to climate change and deterioration of the environment, directly affects the families and community levels that have to cope with the

1 The first draft of this article was presented at the panel on “Human Migration and Geopolitical Conflicts” at the IARU International Scientific Congress on Climate Change: Climate Change, Global Risks, Challenges, and Decisions in Copenhagen, 10–12 March 2009, and later developed further. The author is deeply grateful to Hans Günter Brauch and Serena Eréndira Serrano Oswald for their stimulating comments and their improvement of the English. For financial support of the research, the author thanks projects financed by DGAPA-PAPIIT/UNAM on environmentally-forced migration, number IN304709, and by the National Network for Water from the National Council of Science and Technology (RETAC-CONACYT) with the number 10110/229/09, FON.INST.-37-09.

new threats (17.9). Migration can be an effective adaptation strategy at the personal or societal level (mass migration) but it is often linked with high social and personal costs (depression, rape, organized crime, loss of social networks and community/family integration, persecution, and illegal crossing of borders).

Finally, the interaction and feedback from global political and economic conditions can produce national sociopolitical (*r*)*esponses* that may contribute to reducing the threats from climate change and environmental degradation, thanks to integrated policies that link the government, organized civil society, and the business community (17.9). By means of new scientific and technological knowledge and processes of resilience-building² and adaptation, these policies can be developed and supported by the affected communities. But it is also possible that the situation may worsen due to business-as-usual practices worldwide, corruption at national or local level, and institutional discrimination (Oswald Spring 2011), increasing the social vulnerability of the poorest. This will produce greater inequality and gender discrimination and create loss of livelihood, and may pose a ‘survival dilemma’ (Brauch 2008) for the poor, often the most severely affected. Sometimes these people answer with local violence and conflicts over scarce resources that may spread to entire regions. In these highly complex situations, there are also possibilities that lead to non-violent adaptation processes and peace-building. Finally, in the conclusions the research question will be assessed in light of the empirical evidence and of the societal outcomes of a militarized border where the referent object needs to be changed from the state to the migrants, based on a review of new security threats at different levels (17.10).

2 Resilience was defined by IPCC’s (2007a: 880) second working group as: “The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.” This means that communities threatened with extreme hydrometeorological events have often developed mitigation and adaptation strategies to prevent these events, by reducing their impact in human life and material losses.

17.2 Environmentally-Forced Migration: A Methodological and Conceptual Overview

17.2.1 Methodological Observations

In methodological terms, this chapter explores how the complex linkages between the effects of GEC at the micro level and the push factors at the global level may be empirically explained, where both affect the decisions of rural people to migrate. It also explores how a consistent analysis that combines both the micro-level environmental impacts and global economic pressures may be simultaneously addressed, by taking these multiple feedbacks into account and without confusing the levels of analysis.

These questions will be addressed through a trans-disciplinary approach combining scientific knowledge from the natural and social sciences (Brauch/Oswald Spring 2009a). Its objective is not to test narrow hypotheses developed in the framework of a single discipline of the social sciences or of a single specialized scientific programme, but to integrate different types of knowledge so as to address the interconnections between human-induced environmental causes and physical as well as societal effects. Both have forced millions of poor people to leave their rural livelihoods and to seek a future with an improved income, employment prospects, and sense of well-being, either in urban centres within Mexico or in the United States and Canada.

This trans-disciplinary approach is also qualitative and based on historical-sociological methods. The sources used rely on international and national statistics, on observations and assessments, and also on insights from my own fieldwork in several states of Mexico, especially in Morelos, where the results are based on empirical surveys and focused group discussions with poor rural peasants.³

Many affected people were confronted with a “survival dilemma” either individually, as a family, or as a community (Brauch 2008), and this forced them to choose between several suboptimal alternatives. Emigration was the alternative chosen first by young men, male heads of households, and increasingly by young women. This has resulted in different “survival

3 This research is conducted in the framework of a project financed by DGAPA-PAPIIT/UNAM on environmentally-induced migration and the conceptual and empirical results will be published by Oswald, Estrada, Flores et al. (2012).

strategies” (Oswald 1991), where women are left behind in the rural areas and become heads of households in order to care for their children and elders. This has often led to a feminized agriculture and rural economies that rely to a large extent on remittances from family members in the US and Canada. These multiple interconnections and feedbacks will be analysed in the framework of the PEISOR model, developed in detail below (17.4).

However, the referent object of the conceptual analysis in this chapter is not primarily the state and thus state-centred national or internal approaches to security policy. Nor is it the means and strategies of the national, internal, or ‘homeland’ security forces that try to contain, imprison, or expel the migrants who are both environmentally and economically driven (push factors), nor those who are attracted by family networks or by aspirations towards a better life (pull factors). This chapter addresses the natural and societal causes as well as the physical and societal effects from a *human, environmental, and gender* (HUGE) security perspective, where the migrants themselves are the referent objects (Oswald 2001, 2009). Shifting the focus from the state to human beings and humankind (as a ‘trans-securitization’) as the referent also has major policy consequences. Addressing the migrants primarily as a ‘national security’ threat to be countered by military and repressive means, this approach avoids dealing with the environmental, societal, and economic causes of why people are on the move. Thus, this author argues for shifting the focus of the ‘securitization move’ from the state to the people, and from ‘justice and home affairs’ or ‘homeland security’ to strategies for coping with environmental, societal, and social insecurity as well as rural poverty and underdevelopment. Rural development strategies should be created that can offer alternative livelihoods to people who cannot sustain themselves through traditional subsistence agriculture.

Thus the suggested ‘trans-securitization’ shifts EFM and CIM from a hard to a soft security issue. It requires fundamentally different security responses from the traditional view of securitization as an issue of ‘national’, ‘homeland’, ‘internal’, or ‘border security’ that prevails in scientific discourses and policy debates in the US⁴; it should be seen as an issue of rural

and sustainable development, as suggested by scholars in Mexico and elsewhere.⁵

This requires both a major shift in the *world view* of scientists – especially of over-specialized social scientists – and in their understanding of what science is about. They often fail to understand, explain, and convey their results concerning the interconnections between natural and human systems to society at large and to policymakers. But even greater changes in the *mindsets* of policymakers are needed, and this requires a new *culture* of interactions between scientists and policymakers that should aim at a ‘pragmatic’ (Habermas 1968) science-policy discourse instead of at the ‘technocratic’ hopes of scientists and the ‘decisionist’ strategies of policymakers, who are often limited by Hobbesian perspectives that prefer ‘business-as-usual’ strategies. However, the new multiple security challenges posed by the impacts of global environmental and climate change require a fundamental change in our thinking towards a new “paradigm of sustainability” (Clark/Crutzen/Schellnhuber 2004, 2005) that should aim in the political realm at a ‘fourth sustainability revolution’ during the 21st century. But to implement this new ‘revolution’, new forms of national and global governance must be developed beyond the prevailing Hobbesian obsession (Oswald Spring/Brauch 2011).

This fundamentally necessary change in both scientific thinking and political action is also relevant for the analysis of *climate-induced* (CIM) or *environmentally-forced migration* (EFM). The human security approach requires a shift in the focus of the referent object, while the necessary new paradigm of sustainability requires a fundamental shift in the means of addressing both CIM and EFM phenomena from national and homeland security perspectives. A shift is needed away from fences, walls, sensors, and other observation techniques, not to mention prisons, and towards strategies of sustainable rural development, in order to address the very causes and triggers of why poor rural people have been forced to leave their rural livelihoods.

Thus, a human security perspective for analysing *climate-induced* (CIM) or *environmentally-forced migration* (EFM) requires fundamental changes in scientific world views and political mindsets in order to shift the focus away from the effects (migration as an

4 For the Eurocentric and US-dominant discourse see Shah (2010); Chandler (2009); Rosén (2009); and, for a critical voice against this Westernized view, see Bilgin (2010).

5 The Mexican social movements and especially peasant movements started in 2008 a campaign for increasing the support for rural development called “sin maíz no hay país” (without corn there is no country) (Pérez-ANEC 2010; Villamar 2010).

adaptation and survival strategy) and towards the anthropogenic environmental as well as socio-economic causes, triggers, multipliers, and intensifiers that have forced affected people to be on the move.

17.2.2 Conceptual Comments

Among the many environmental causes, such as pollution of water, land, and air, which force people to leave their rural homes and traditional livelihood, the effects of *global environmental change* (GEC) and in particular global anthropogenic climate change have increasingly figured. *Climate change* (CC) affects poor countries in the tropics more seriously (IPCC 2007). It has increased existing social vulnerabilities and created new ones, with additional security risks (Brauch/Oswald Spring/Mesjasz et al. 2008, 2011; Brauch/Oswald Spring/Grin 2009 et al.; Oswald/Brauch 2009; IRGC 2011). The IPCC (2007) projects a high probability for an intensification of natural disasters, and an increase in temperature with more frequent and longer droughts, affecting agriculture and access to clean water, and creating health problems. Rising sea levels will make coastal areas uninhabitable and force people to abandon disappearing island states or suffer from sea water intrusion into fields and aquifers. These new anthropogenic causes will most likely force additional people to leave their homes and abandon their livelihoods. About 44 per cent of the world population lives within 150 kilometres of the coast and between 15 (*The Global Assessment of Human Induced Soil Degradation: GLASOD-UNEP*) and 24 per cent (*Global Assessment of Land Degradation and Improvement: GLADA*) of agricultural lands have been degraded during the last century, putting 110 countries at risk of losing their rural livelihood. Finally, population growth, especially in badly blighted regions, creates severe competition for natural resources that may lead to conflict and to further displacements and war refugees (Renaud/Bogardi/Dun et al. 2007). More frequent and intensive hydrometeorological events have also shaped regionally diverse coping strategies (Oswald Spring 2008).

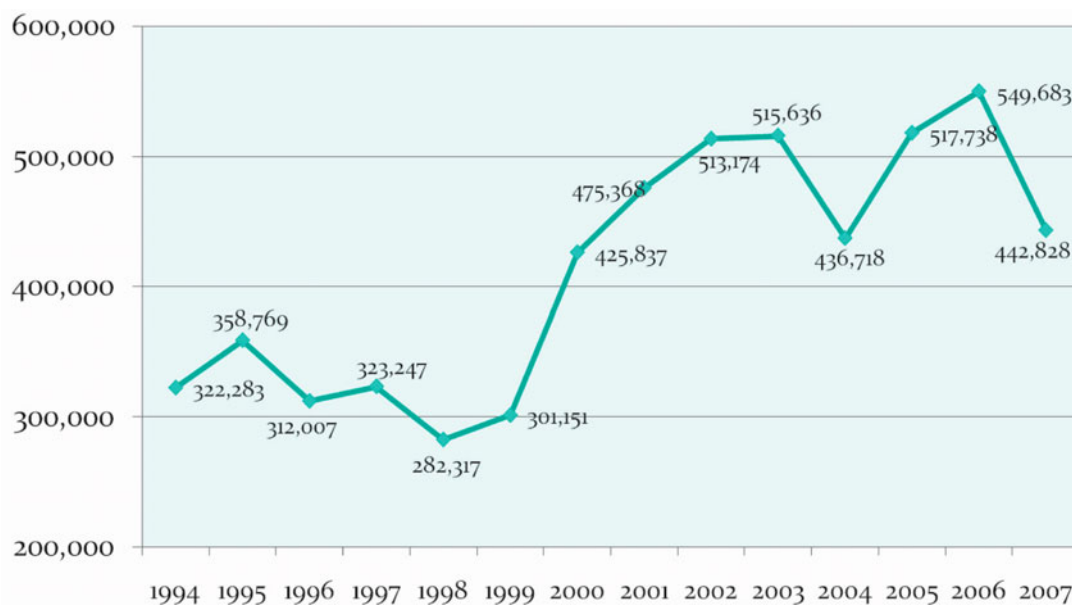
The distinction and the interrelation between environmental and socio-economic reasons for migration are not yet clearly developed, nor their significance clearly defined. The *International Organization on Migration* (IOM) defines *environmentally-forced migrants* (EFM) as “persons or groups of persons who, for compelling reasons of sudden or progressive changes in the environment that adversely affect their lives or living conditions, are obliged to

leave their habitual homes, or choose to do so, either temporarily or permanently, and who move either within their country or abroad” (IOM, MC/INF/288 2007: 2). The movement of people related to changes in the environment is not a new phenomenon. Throughout history human groups have migrated in response to limited resources or to abrupt weather changes in their surroundings, often seasonally, but also permanently. This phenomenon has been responsible for important population movements in the past and it is also one cause of the destruction of highly developed civilizations (Egyptian, Mayan, Chinese cultures, etc.).

Nevertheless, as recent archaeological studies have shown, changes in climate or in the environment are one factor but not the sole explanation for migration or the collapse of civilization. Chinese cave researchers recorded the waning of Asian monsoons together with a temporary weakening of the sun (Science, 6 May 2005: 787) that helped to bring down the Tang dynasty in 907 C.E. (Science, 7 Nov. 2008: 837–8). Zhang et al. (2008) established consistent data based on the ECHO-G *climate model simulation* (SOM) that includes volcanic and solar events for the last millennium. They also linked Chinese cave records for a period of 1,810 years (with $\delta^{18}\text{O}$) and weak monsoon periods with the fall of the late Tang, the Five Dynasties, the Yuan, and the Ming cultures, and the rise of strong monsoons with the consolidation of the Song, the Ming, and the Qing civilizations. During the almost 2,000 years of their analysis they also noted the fall of the Mayan civilization, the advance of Alpine glaciers in Europe, and major population movements.

In Meso-America more than a hundred reasons were given to explain the downfall of the Mayan civilisation (*National Geographic*, August 2007). Mexican archaeologists, environmentalists, and geologists referred to a severe drought at the same time as in China (900 C.E.; Science, 18 May 2001: 1293). The data suggest that a combination of slash-and-burn agriculture and intensive drainage of the wetlands induced local drought, altered the micro-climate, increased the temperature, and therefore affected food production for a densely populated region, where the traditional methods of food production could not sustain the growing population any longer. Food scarcity, heatwaves, and hunger weakened the immune system and fostered diseases and epidemics among the population. Simultaneously, peasant revolts, conflicts among rulers, destruction of harvests, and warfare increased food scarcity in the overpopulated region and triggered the collapse of the Mayan civilization (Blümel

Figure 17.1: Number of Mexican immigrants in the USA by year. **Source:** Estimates by CONAPO based on *Current Population Survey* (1994-2007), developed by F. Lozano (2009).



2008; Webster 2002; Demerest/Rice/Rice 2004; Arz/Haug/Tiedeman 2005).

Therefore, both climate and cultural or sociopolitical factors are too complex to be reduced to a simple cause-and-effect relationship. In this sense *climate-induced* (CIM) or *environmentally-forced migration* (EFM) is a complex phenomenon related to extreme climate events that are often triggered by socio-economic developments, political struggles, and personal interests. After an extreme weather or climate event (e.g. a hurricane or drought) the affected people lose part of or all of their livelihood. First they try to recover by developing survival strategies (Oswald 1991, 2009) and creating resilience processes. However, recurrent flash-floods and droughts destroy their possessions several times and when affected people can no longer recover they decide to leave, even if that means abandoning their land, their other belongings, and especially their community networks and social relations (Renaud/Bogardi/Dun et al. 2007). Frequently, a part of the family - the elderly, women, and children - stay behind, trying to survive in very difficult situations, whereas in extreme cases the whole community or family flees, either temporarily or permanently, and moves either within their country or abroad. EFM can be rural-rural, rural-urban, or international, and borders crossed by land, plane, or boat.

Within the conceptual framework of the PEISOR model (figure 17.6), the objective of this chapter is to deal with the complex causes of internal and interna-

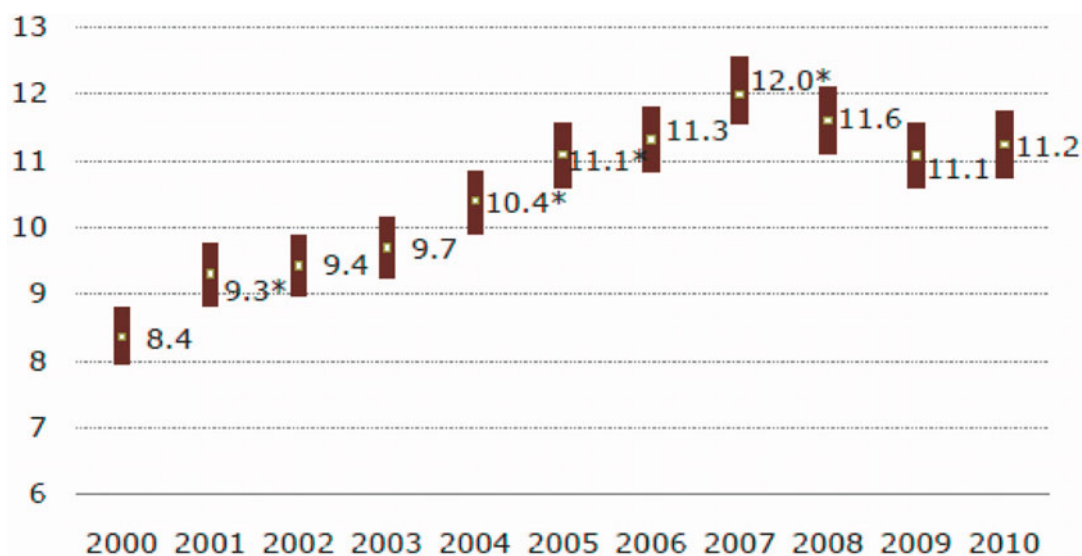
tional *environmentally-forced migration*⁶ and the multiple security implications for Mexico, the USA, and the people affected. *Environmentally-forced migration* (EFM) may pose security risks for both countries, given that a highly industrialized and a developing country share the longest border in the world. Extreme social differences and the demand for cheap labour are ‘pull factors’ that have made Hispanics the largest minority in the USA (figure 17.1).

In 2011, about 50.5 million Hispanics or Latinos in the United States made up 16.3 per cent of the population (American Census 2010). Eight million are estimated to be illegal or ‘unauthorized immigrants’⁷, rep-

6 To achieve this complex objective, the present chapter is the result of a study with a multi-methodological approach, integrating demographic studies, focus groups, deep interviews, participant observation in the field, life histories, police data, and data regarding political and intelligence cooperation between the USA, Mexico, and Central American countries, as well as newspaper reports, climate-related data banks, GIS forecasting, and prospective corn production models to 2050. These methodological tools help us analyze the complexity of internal and external environmental migration - often triggered by socio-economic factors - the coping mechanisms developed to mitigate CC threats, and the destruction of social networks as a result of migration.

7 “Unauthorized immigrants are all foreign-born non-citizens residing in the country who are not legal immigrants”, in: Passel and Cohn (2010: vi).

Figure 17.2: Estimated 'unauthorized migrants' in the USA (in million people). **Source:** Passel/Cohn 2010: 1. Reprinted with permission of the copyright holder.



Note: Bars indicate low and high points of the estimated 90 per cent confidence interval. The symbol * identifies that the change from the previous year is statistically significant.

representing 3.7 per cent of the US population, 5.2 per cent of its labour force, and 28 per cent of its foreign-born population (Passel/Cohn 2011: 9). 'Unauthorized' immigrants are exposed to all kinds of threats and prosecutions. In the economic crisis that started in 2008 they have been especially threatened by a 12.6 per cent unemployment rate in the USA (US Bureau of Labor Statistics 2010). The majority of these 'unauthorized' migrants are Mexicans (figure 17.2).

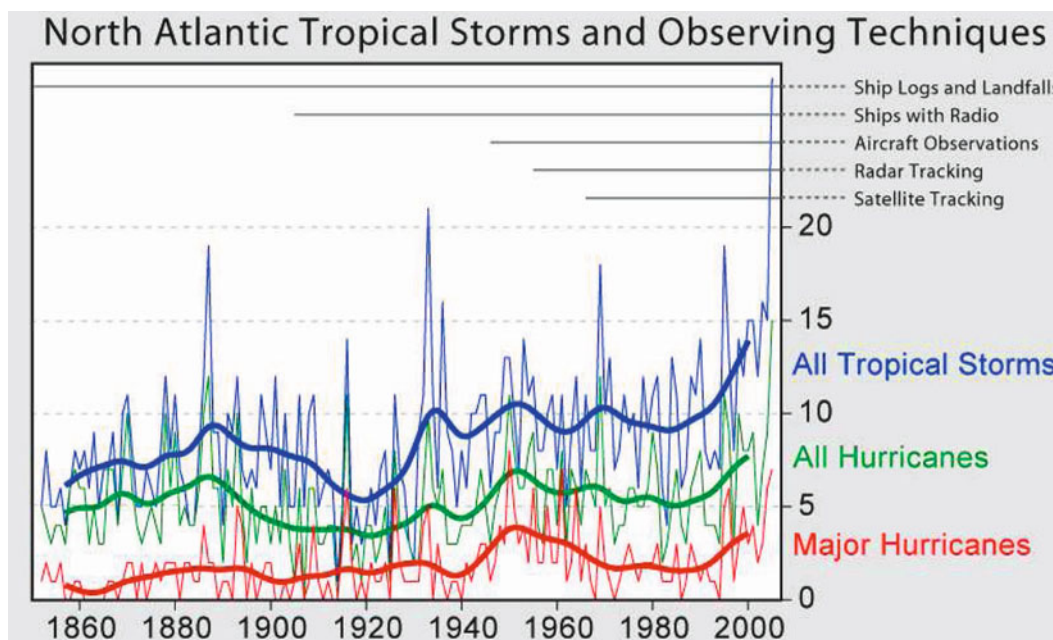
In 2007 they represented seven million immigrants and in 2010 the number dropped to 6.5 million, while between 12.67 (Passel/Cohn 2011a) and 18.5 million (Lozano/Rivera 2009) Mexicans live legally in the USA. The reduction of the number of 'unauthorized' immigrants is probably directly related to a lower immigration rate of Mexicans due to the high unemployment rate in the USA, the crime rate, and the increasing difficulty of crossing the border (Passel/Cohn 2010, 2010a, 2011, 2011a; Passel/Taylor 2010; López/Livingston/ Kochhar 2009).

Furthermore, the fence built between both countries and increased border controls with sophisticated technological equipment installed by the Border Patrol, such as drones and infrared observation systems, have increasingly forced migrants to cross through the most dangerous parts of the Arizona desert, leading to many deaths, or to rely on transnational organized crime (often linked to trafficking of drugs, arms, humans, and organs). The presence of drug gangs and illegal trafficking has transformed the border between

Mexico and the USA into one of the most violent regions in the world, with repercussions for both countries due to prostitution, HIV-AIDS (Klot/DeLargy 2007), public insecurity, organized crime, money laundering, arms trade, drug consumption, and human and drug trafficking.⁸ This current situation of insecurity is basically a result of the high demand for drugs in the USA, of the illegal arms trade⁹ from the north to

8 The complexity of this organized and diversified crime has affected the southern border between Mexico and Guatemala. Mexico is not only a country of emigration, but also of trans-migration from Central America to the USA. Along the porous and highly vulnerable border between Guatemala and Mexico, similar activities occur. The brutal Mexican repression of Central American migrants is partly due to corruption, where gangs, police, and immigration officials have been involved. The outcome has been violence linked to forced prostitution, and the arms, organ, and drug trades that have destabilized the whole region. On 30 December 2010, the governments of Honduras and Mexico established a bilateral high-level commission with the aim of reducing violence in Mexico during this transmigration. Eighteen Latin America countries signed an agreement after the assassination of several hundred and the kidnapping of about 20,000 migrants (Amnesty International 9 November 2010) out of an estimated half a million Latin American transmigrants. This induced the participating countries to collectively combat this 'social cancer' within the framework of the Merida agreement (Kochhar 2007).

Figure 17.3: North Atlantic tropical storms and hurricanes (1851-2004). **Source:** <<http://en.wikipedia.org/wiki/en>User:Dmcdevit>> (2008).



the south, and of money laundering in many North American financial institutions.

17.3 Mexico: An Environmentally Vulnerable and Socially Affected Threshold Country

As a threshold country, Mexico is severely affected by both the natural variability of the climate and by anthropogenic climate change (MunichRe 2009). This process has already diminished its high biological and cultural diversity. Its Atlantic and Pacific coasts extend over 11,000 km, and are severely threatened by hurricanes (figure 17.3), sea level rise, coastal erosion, and floods.

The occurrence of severe storms has significantly increased. In the year 2008 there were 632 heavy storms (with more than 70 mm of rainfall within 24 hours), compared with an average of 469 registered storms

between the years 1996 and 2007; that is, an increase of 34.75 per cent (Arreguín/ López Pérez/Marengo Mogolón 2011: 6-8; National Meteorological Service 2009).

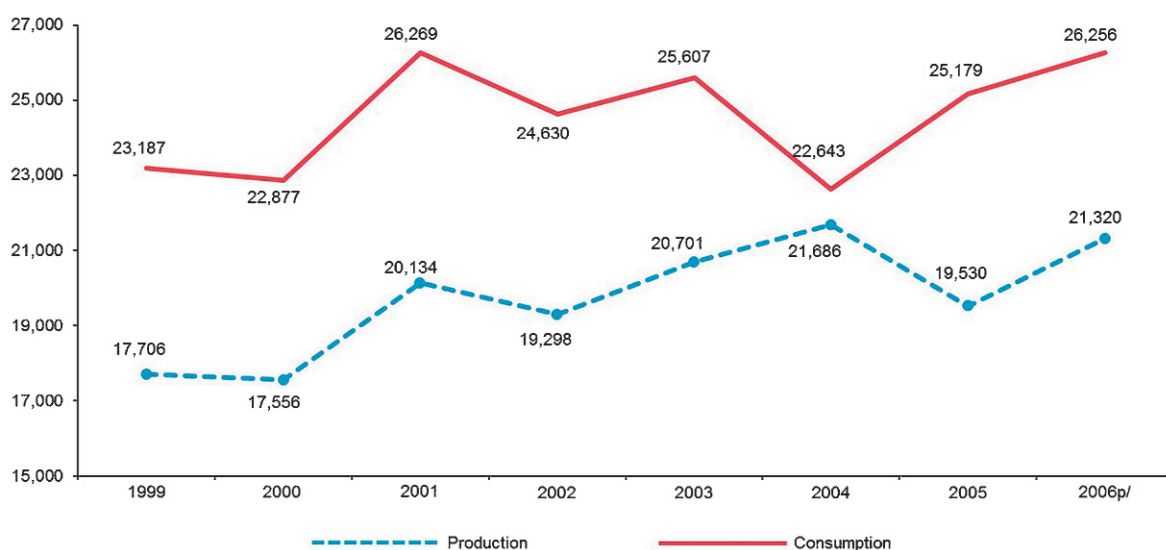
Fifty-eight per cent of the territory of Mexico is drylands (sub-humid, semi-arid, arid, and hyper-arid). SEMARNAT and INE (2006) estimate that these drylands are highly threatened by CC. The vast semi-arid and arid regions in the northern and central parts of Mexico are also threatened by drought, flash floods, and human-induced desertification and land degradation processes which reduce yields and often destroy entire harvests. In these dry regions with no irrigation potential, people face the loss of their livelihood through the adverse weather conditions (Arredondo Moreno/Huber-Sannwald 2011).

From 1994 to 2010 these drylands have been seriously affected by a long-term drought¹⁰ (Sánchez/Oswald/Díaz et al. 2011) that has induced farmers and the authorities to over-exploit aquifers or to reduce agricultural areas due to declining yields (Garatuza/Rodríguez/Watts 2011). The use of more agrochemicals and the pumping of groundwater from deeper layers have increased soil and water pollution. Sea water intrusion into the coastal aquifer owing to the declining

9 The killing of several US officials and agents in Juarez and San Luis Potosi in Mexico demonstrated that the US Bureau of Alcohol, Tobacco, Firearms and Explosions (ATF) within the US Department of Justice was responsible for letting thousands of US guns “walk” into the hands of Mexican organized crime as part of the programme known as “Fast and Furious” (Special Agent John Dodson, Sharyl Atkinson, CBS Evening News, 3 March 2011). These arms killed the US officials as well as thousands of Mexicans.

10 During the last 30 years twice as many people worldwide have been affected by droughts as by storms, a total of 1.6 billion compared with approximately 718 million (Laczko/Aghazarm 2009: 5).

Figure 17.4: Production and consumption of corn in Mexico (in 1000 tonnes). **Source:** Centre of Studies of Public Finances of the Mexican Chamber of Deputies (2007: 7).



water table has been observed along the coast of Hermosillo, Sonora (Rangel/Monreal/Watts 2010), as well as in Veracruz and in the Yucatan Peninsula (Perry/Velázquez/Wagner 2011). This has further limited productive activities and has also affected the availability of drinking water for basic human consumption. Finally, an increase in temperature has raised evapotranspiration and increased the salinization of the fields. All these factors have further diminished the average yield and forced small landholders to abandon their fields. This has had negative repercussions on their income and livelihood, and has often forced them to emigrate.

However, it is not only climatic factors that have been responsible for this massive population movement. Additional factors have been a deficient rural policy, low levels of education and training of vulnerable groups, and even the erratic socio-economic policies of the Mexican government, which have aggravated existing precarious life conditions. In particular, the decrease in public and private spending on rural development, lack of credit and technological support, reduction of the budget for science and technology, and the use of poverty alleviation programmes for political means has increased the poverty level in remote rural areas.¹¹ Waning educational quality at all

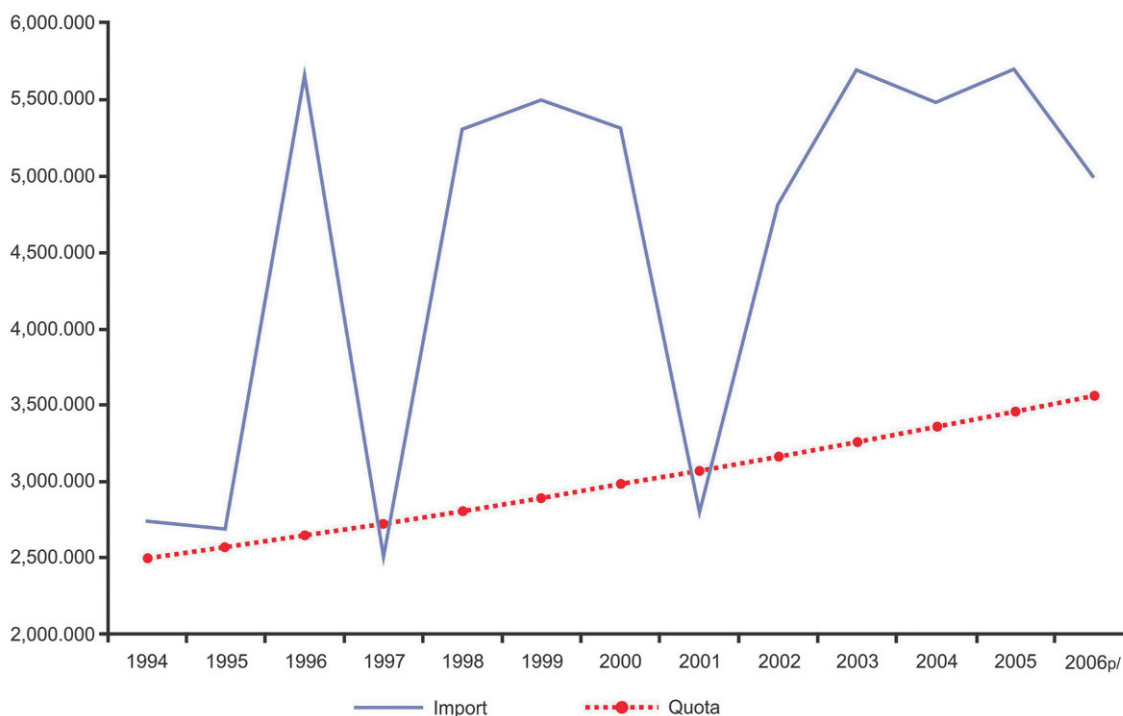
levels has been another triggering factor, together with a stagnating economy during the last three decades. The interrelationship of these processes has reduced the creation of income in a country with more than one million young people per year seeking jobs in an almost non-existent labour market.¹² These policies have also limited the development of self-reliant technologies to counter emerging threats and to overcome past structural problems of rural poverty.

Finally, during the past 17 years dependence on imports of basic foods because of the *North American Free Trade Agreement* (NAFTA) has been an additional pressuring element (Nadal/Wise 2005). From 1994 to 2003 the import of corn – the basic food staple in Mexico – increased from 2.7 to 6 million tonnes and stabilized around this amount until 2010, representing one-third of basic food production (figures 17.2, 17.3). During NAFTA's first decade (1994–2004), about 78 billion dollars were spent on food imports instead of being invested in support for rural development programmes.¹³ Particularly severely affected by this policy were rain-fed farmers in mountainous areas, mostly indigenous and poor peasants. After 2008, the global financial crisis posed additional threats for the Mexican export sector as more than 80 per cent of Mexican exports go to the US market.¹⁴ The drastic reduction of employment opportunities in the *maquila* (assembly) sector has created a critical eco-

11 During the 15 years of the rural development programme called *Procampo* only 10 per cent (240,000 people) benefited out of the 2.4 million people at whom 57 per cent of government resources were aimed (Fundar 2010).

12 Approximately 8.5 million young people are without stable employment, and most of them also without any possibility of further study.

Figure 17.5: Corn imports in Mexico and import quota established by NAFTA (in tonnes). **Source:** Centre of Studies of Public Finances of the Chamber of Deputies of Mexico (2007: 10).



conomic situation in the border region (Barajas/Grijalva/Lara et al. 2009), where people have tried to emigrate to the USA. Nevertheless, high unemployment rates among Hispanics in the USA and the prosecution of illegal Latin immigrants have at the same time limited this opportunity.¹⁵ This contradiction is increasing the tension in the border region, pushing a growing number of young unemployed people into organized crime (González Reyes 2009). As a direct

result, public insecurity has substantially increased in the northern border region, and drug cartels are fighting for dominance, leading to high death tolls and a rapid growth of overall crime (Castillo/Cruz/Santibáñez 2009; Departamento de Estudios Urbanos y Medio Ambiente 2009).

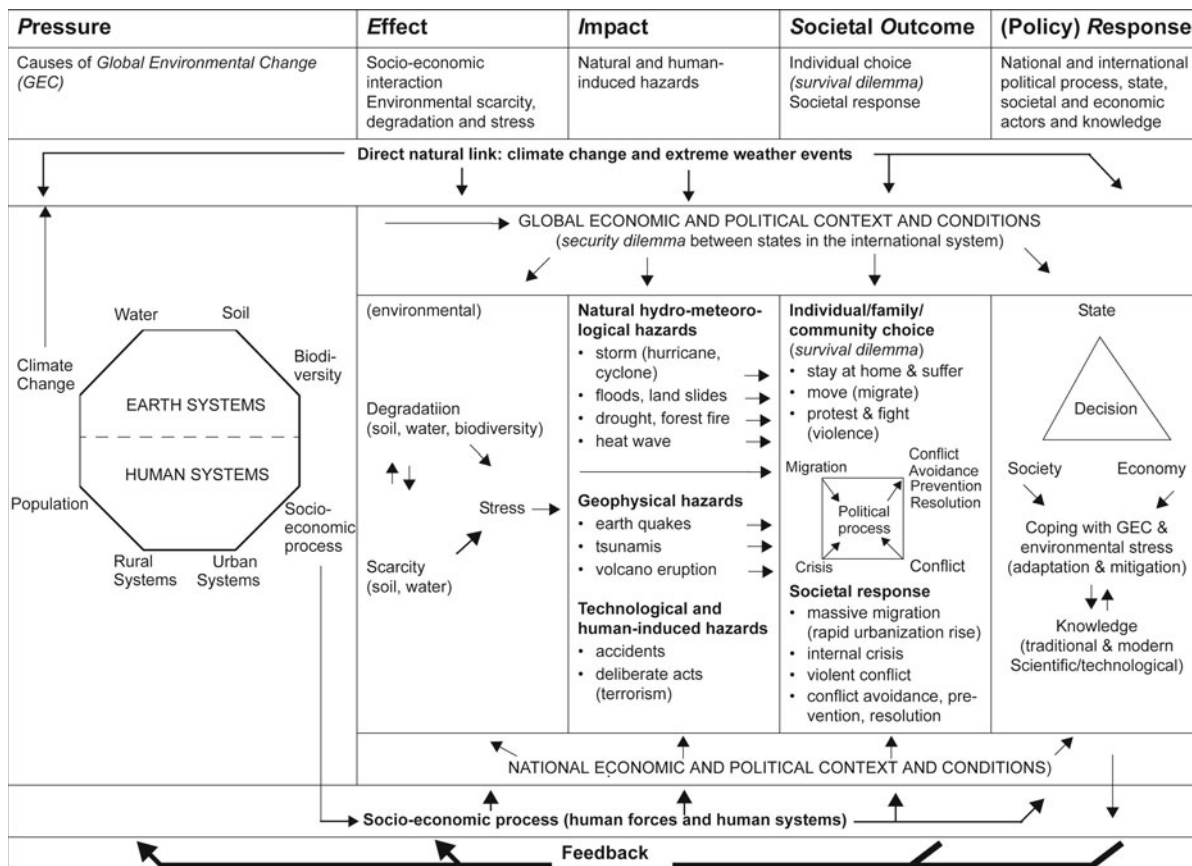
In the rest of Mexico, the already unsafe and precarious conditions of the labour market have deteriorated during the present global financial crisis. Expansión and CNN (2009), a business review, claimed that during 2008 Mexican businesses lost 58 per cent of their investments, and that the level of poverty is affecting half of the population. This intricate scenario pushes an increasing number of desperate unemployed young people into organized crime. Every year,

13 The Mexican government did not charge tax on the corn imports, which exceeded the import quota established by NAFTA, and favoured monopolies of corn importers, US exporters, and urban consumers, as the subsidized corn from the USA was much cheaper. This external pressure on the price of corn in rural areas with higher production costs resulted in lower income for *campesinos*, thus transferring additional resources from rural accumulation to urban areas and to the trade sector.

14 During 2009, Mexico's GDP declined by 7.8 per cent and private consumption diminished by 8.5 per cent, while inflation was officially 4.2 per cent. Industrial GDP dropped by 13.5 per cent as a result of the contraction of the industrial sector in the USA, affecting the *maquila* industry, where approximately one million jobs were lost during the crisis. In 2009 alone about 650,000 people in Mexico lost their formal employment (INEGI 2010).

15 In the USA, the "unemployment rate for foreign-born Hispanics increased from 5.1 per cent to 8.0 per cent, or by 2.9 percentage points, from the fourth quarter of 2007 to the fourth quarter of 2008. During this same period, the unemployment rate for all persons in the labor market increased from 4.6 per cent to 6.6 per cent, or by 2.0 percentage points" (Kochhar 2009: 1). "The working-age population of immigrant Latinos increased 262,000 between the fourth quarters of 2007 and 2008. That represents a 1.6 per cent increase, well below the 5.6 per cent increase in the working-age population of native-born Hispanics" (INEGI 2010: 6).

Figure 17.6: PEISOR Model. Source: Brauch/Oswald Spring (2009: 11).



another million Mexicans try to emigrate to the USA to seek employment. However, only about half succeed, due to severe border controls and to the current lack of opportunities in the USA (Kochhar 2009; Kochhar/Espinoza/Hinze-Pifer 2010; Passel/Cohn 2011).

Hence, Mexico is struggling with multiple forms of structural (Galtung 1971) and physical violence, as a result of a “regressive globalization” (Held/McGrew 2007). This fragmented development process, together with increasing internal social inequalities, gender discrimination, a weak government, an inefficient judicial system, the government’s war against drug cartels, and insufficient social programmes are all further challenged by environmental threats (SEMARNAT 2009), but vulnerable people in rural areas are especially affected.

Many rural people often face a “survival dilemma” (Brauch 2008b), and this is why many choose to migrate with their entire families into urban suburbs or shanty towns. Alternatively, members of the family emigrate to the USA, risking an illegal crossing and often becoming the victims of organized crime. This chapter deals with *environmentally-forced migration*

(EFM) as a complex process with many causes, where the environmental factor is often climate-related.

How can we analyse this complex combination of local and global environmental pressures with global (global financial crisis), regional economic (NAFTA impacts), and national (a lack of a rural development policy) factors? All these factors have impacted on individual decisions to move to urban centres or emigrate, they transcend the knowledge that is being generated by the social sciences, and they cannot be analysed by relying solely on the theoretical approaches and methods that predominate in different social science disciplines.

As no single-cause explanations of environmentally-forced (EFM) or climate-induced migration (CIM) are feasible, the multi-causality of the triggers of EFM and CIM require multi- or transdisciplinary approaches and so we need to combine methods used in different disciplines. To illustrate this causal complexity, the author uses a dynamic flow model that links together changes in the natural and human systems and their multiple feedback loops.

17.4 PEISOR Model: Environmentally-Forced Migration and Security Risks

Various models have been developed in order to analyse the security risks for Mexico and the USA linked to EFM or CIM, and to try to understand the complex human-nature interrelationships and their feedbacks. The PEISOR model (Brauch 2009; Brauch/Oswald 2009: 9) goes further than the *Pressure-State-Response* (PSR) model developed by the OECD (2001), since it also addresses (intended or unintended) societal outcomes such as environmentally-forced migration, slum development, public insecurity, social vulnerability, and hunger riots (figure 17.6)

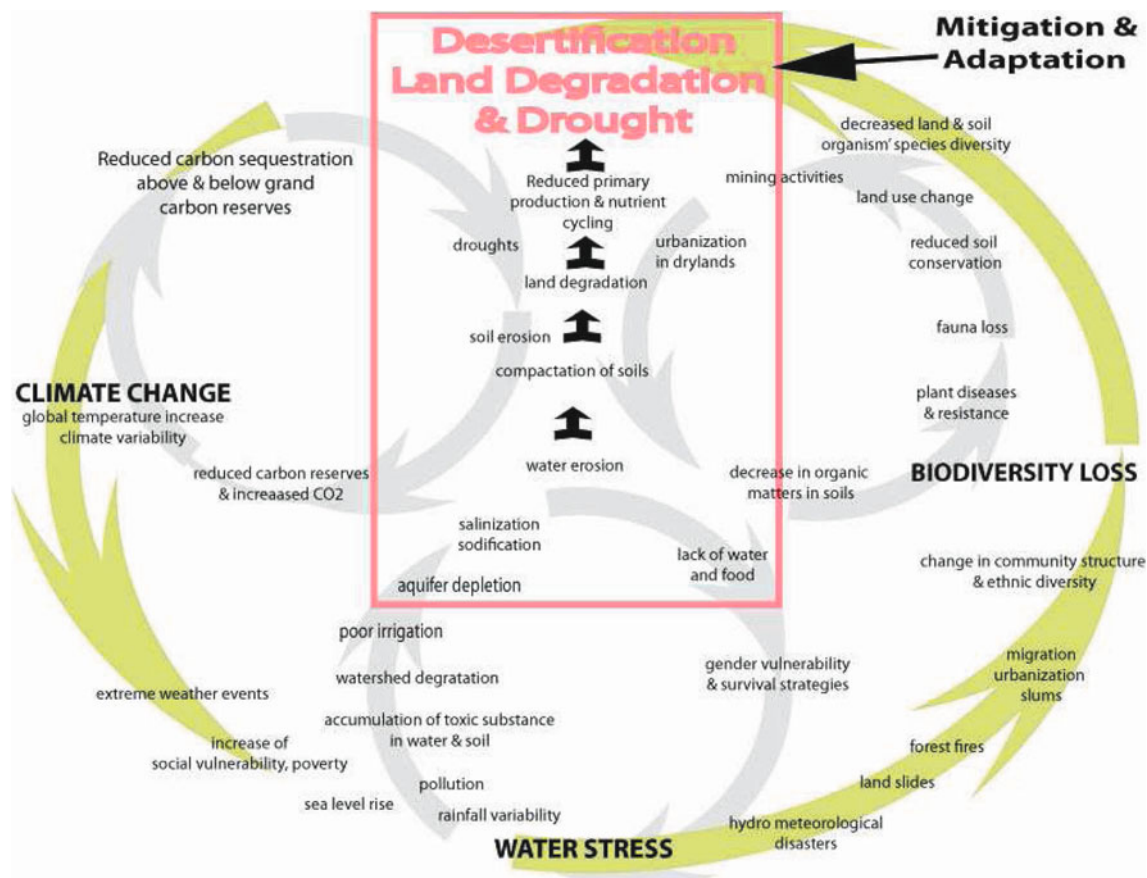
Under *pressure* (P) the model analyses the interactions and feedback between the 'environmental quartet' (air, water, soil, and biodiversity) and the 'social quartet' (population growth, rural and urban systems, and socio-economic processes). Within each of these two systems, interactions and feedbacks exist similar to those between both systems. Anthropogenic pressures trigger environmental effects (E) that produce resource scarcity, environmental degradation, and loss of environmental services, which in turn may create greater stress on nature and society (polluted water creates soil deterioration and human, plant, and animal diseases, etc.). Natural hydrometeorological and human-reinforced hazards as well as technological disasters produce severe *impacts* (I) on the national economy, the political context, and the life conditions of different social groups. Natural conditions are deteriorating, and at the same time most environmental resources are too polluted to be used by humans or to sustain natural development. The lack of or deterioration of environmental services is inducing changes in a highly fragile ecosystem, and also causing health problems and increasing the economic cost of clean water. The *societal outcomes* (SO) fluctuate for different regions of Mexico and have had more effect in those regions that are highly dependent on natural resources or governmental support. The threat of further deterioration may reduce the possibilities for survival of these vulnerable people. Alterations in precipitation, failed agricultural cycles, and an inadequate policy response to extreme events can induce famines¹⁶ and massive migration of people searching for basic living conditions. Since 2008, international price rises for basic food items (FAO 2011) have also triggered many hunger riots worldwide. In Mexico, the major increase in public insecurity (violent robberies, theft of cars, kidnapping, and extortion) is partly

a result of the government's war against drug gangs, but it is also partly triggered by new environmental security threats and the risks from climate change.

Finally, the *policy response* (R) includes decision-making processes among the three key actors - organized society, the state, and the business community (Weber 1987). Together with the use of new scientific and technological knowledge, they can jointly develop adaptation or mitigation strategies and measures to be implemented to diminish risks, but often these are not compatible with existing traditional local knowledge and the level of education of the people affected. The restoration of destroyed ecosystems may avoid further climate threats or may promote faster adaptation to new and often unknown threats. The analysis of risks within the framework of the PEISOR model facilitates a deeper understanding of the multiple dynamic interrelationships between humans, their activities, and environmental factors, and the international, national, and local feedbacks related to both socio-economic and environmental as well as to climate processes.

16 This is not a new phenomenon. During the 19th century, hunger and famine were the major triggers for migration, e.g. from Ireland to the USA (Great Famine, 1845–1848). Drought is also among the most deadly and costly disasters. More recently, and based on the EM-DAT (Guha-Sapir/Vos 2011), droughts in India have caused about 4.25 million deaths since 1900 (especially in 1942 and 1965); in China (1920, 1928) approximately 3.5 million victims; in Bangladesh (1943), 1.9 million deaths were counted; in the former Soviet Union (1921) there were 1.2 million victims; and Sudan (1943) experienced 1.5 million deaths. All these countries have been hit by severe droughts. Among the countries currently most threatened by droughts are India with 1,050 million and China with 239 million people affected. In terms of economic losses (expressed in billion US\$) the following cases were most severe: China in 1984 (13.76), Australia in 1991 (6.0), Spain in 1990 (4.5), Iran in 1999 (3.3), and the USA in 2002 (3.3). With regard to extreme events, gradual environmental changes (desertification, coastal and soil erosion, and soil fertility loss) tend to be less dramatic and attract less attention than storms, floods, tsunamis, or earthquakes. However, these gradually increasing and often slow-onset changes in the environment tend to affect a larger number of people, and will continue to do so. The same databank indicates that during the period 1979 to 2008, 718 million people were affected by storms, compared with 1.6 billion people who were affected by droughts.

Figure 17.7: Human-nature interrelationship. Source: Brauch and Oswald (2009: 10).



17.5 Threats due to Climate Change as a Pressure for Environmentally-forced or Climate-Induced Migration

The complex interactions and feedbacks between the earth and human systems are illustrated in figure 17.7. The external cycle represents *global environmental change* (GEC) and relates to the often chaotic interrelations between the earth and human systems, with unpredictable consequences on the ecosystem dynamics and societal outcomes. The three smaller inner cycles include the factors determining *climate change* (CC), water stress, and biodiversity loss. Owing to their geographical situation, Mexicans are increasingly facing the effects of GEC that is intensifying multiple existing risks and generating new threats. But they are also contributing to new environmental threats through a high level of deforestation, pollution of water, and inadequate management of soils and ecosystems. When confronting the risks from GEC, their

low educational level and rudimentary capacity for social organization place further limits on the development of bottom-up resilience processes and prevent people from better coping with existing and unknown future threats.

17.6 Effects of Climate Change as a Threat and Security Risk

The effects of climate change in Mexico with its human, economic, environmental, and societal implications means that the concept of security, perceived by the realist school of thought as limited to the narrow field of military and political considerations (Waltz 1979, 2000) has broadened to a wider understanding (Wæver 1997; Buzan/Wæver/de Wilde 1998; Buzan 1997, 2004). These authors, representing the Copenhagen School, distinguish five security dimensions: military, political, economic, environmental, and societal; they use different referent objects, ranging from human beings and vulnerable groups to societal, na-

tional, and international issues of both regional and global security. There is also a link between these five dimensions and the different levels of interaction or referent objects (figure 17.19), where environmental security (Dalby 2002, 2004; Dalby/Brauch/Oswald Spring 2009; Oswald Spring/Brauch/Dalby 2009; Brauch 2005, 2008) facilitates understanding of the multiple challenges posed by the effects of global environmental and climate change.

To be precise, using the concepts of environmental security it is possible to analyze the risks related to water, soil, and air pollution, to oil spills, greenhouse gas emissions, deforestation, loss of biodiversity, chemical and biological hazards, etc., as processes that may endanger both human and Earth systems (Brauch/Oswald Spring/Mesjasz et al. 2008, 2011; Brauch/Oswald Spring/Grin et al. 2009; Brauch/Oswald Spring 2009).

Since the industrial revolution, climate change has become increasingly anthropogenic due to the burning of 'cheap' hydrocarbons, facilitating rapid industrialization and globalization, modern life styles, and consumerist behaviour patterns. The dangers no longer come from them, but rather from us and from our behaviour (Brauch/Oswald 2009). The traditional means of combating these threats with military methods have become inefficient, and they can only be controlled by reducing anthropogenic greenhouse gases (GHG) and restoring damaged ecosystems. Nevertheless, overuse of resources, indiscriminate pollution, and the rapid accumulation of GHG in the atmosphere has already endangered the Earth system. Unknown thresholds may be crossed, triggering irreversible "tipping points" (Lenton/Held/Kriegler et al. 2008) that may pose unforeseeable levels of risks for people in affected regions, who may experience the impacts of a "world risk society" (Beck 1999, 2007, 2011).

The effects of extreme events (IPPC 2011) may be mitigated by preventive behaviour and by the empowerment of societal actors and resilience-building, which may jointly reduce human, land, and material losses. Confronted with the new risks (Beck 1999, 2007, 2011) posed by GEC and CC, people must adapt themselves to new environmental threats and be more resilient and prepared for these different circumstances and potentially more difficult situations.

While the people most affected by CC live in developing countries (figure 17.8), adaptation and mitigation strategies also represent an ethical problem for industrialized countries, who have in the past caused anthropogenically induced CC with their excessive burning of fossil fuels. Cooperation and technology

transfer may be in their own interest, as emerging countries, such as China, India, Korea, Mexico, are using more fossil fuels and are adding dangerous amounts of CO₂ to the atmosphere. Furthermore, natural hazards and disasters also affect industrialized countries, where more extreme and intensive hydrometeorological events are taking place, such as the flood and hurricane in Queensland, Australia in 2011, and intensive blizzards in Europe, the USA, and Canada. This is not surprising as the *World Meteorological Organization* (WMO) declared that the year 2010 was the warmest year since standardized global measurements began.

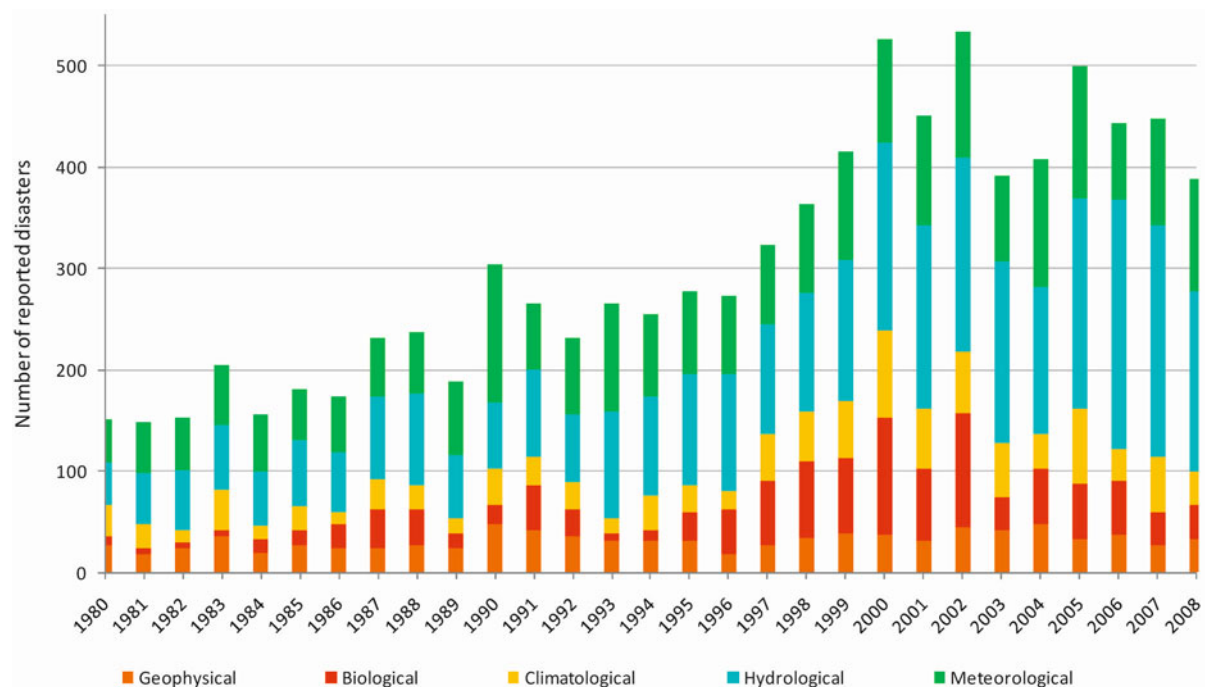
17.7 Effects of Threats Posed by Climate Change as Security Risks for Mexico

Major environmental problems in Mexico are related on the one hand to the ongoing process of climate change with stronger and more frequent hurricanes, intensive rainfalls, flash floods, and droughts, and on the other to the deteriorating quality of soils (soil erosion, loss of soil fertility, desertification, and pollution of soils with agrochemicals) and its salinization (over-exploitation of aquifers) due to intensive agriculture and livestock practices. In addition, the loss of biodiversity, mainly due to deforestation and change in land use, together with pollution of water are key environmental problems. In the drylands the higher temperature, higher variability and reduction in precipitation, longer midsummer (inter-aestival) droughts, and insufficient availability of water and its pollution are key factors for climate-induced threats and environmental security risks. In Mexico, scarcity (17.6.1) and degradation of natural resources (17.6.2) are creating multiple stresses on the availability and quality of environmental services.

17.7.1 Environmental Scarcity

Mexico is one of the countries with significant water stress in many parts of its territory. The average annual precipitation is 711 mm or approximately 1,522 km³ a year. This is equivalent to a swimming pool the size of Mexico City with a depth of one kilometre. The northern region receives only 25 per cent of this rainfall, while 25.7 per cent of the territory in the south and south-east receives 49.6 per cent of the rainfall in the poor states of Chiapas, Oaxaca, Campeche, Quintana Roo, Yucatan, Veracruz, and Ta-

Figure 17.8: Trend in global reported natural disaster occurrence per sub-group. **Source:** Guha-Sapir and Vos (2011: 701) based on CRED, Em-DAT.



basco. Nevertheless, 72 per cent or 1.084 km³ of this precipitation evaporates and the rest drains, sometimes torrentially, from the mountains to the sea. This causes serious threats of floods during the rainy season in almost all parts of the country, but especially in Tabasco, Veracruz, and Oaxaca. It also causes drought during the rest of the year, a trend that is accelerated in the northern states and in the central high plateau. In Mexico, precipitation is concentrated during the months of July to September, while during the dry season the country receives only 5 per cent of the total rainfall. The distribution of the population in the national territory has created pressures on water supply. Since 1950, an intensive urbanization process has created the biggest megalopolis in a developing country, with increasing demands for environmental services, and also high levels of water, soil, and air pollution.

Mexico has 837 major river basins; most of them discharge into the Atlantic, some into the Pacific and into lakes and reservoirs in the interior of the country. The *National Commission of Water* (CONAGUA) has divided the country into 13 hydro and administrative regions, often embracing several states. This causes permanent conflicts between neighbouring states and their local water management and legal autonomy. As 68 per cent of the rainfall occurs between June and September, the aquifers are crucial for do-

mestic services, industries, and agriculture. From the existing 653 aquifers, 104 have already been over-exploited; the one in Valley of Mexico City is among the seven most damaged aquifers, since the authorities extract 67 per cent of the water for the capital from these aquifers. The UN found in December 2008 that Texcoco (Central Valley of Mexico City) was the most over-exploited aquifer in the world, with an over-exploitation of 850 per cent over the annual recharge; the average for the seven aquifers is an over-exploitation of 200 per cent, which is threatening water services in the medium term.¹⁷ There are 3,300 legal permissions to exploit groundwater, but the city has more than 6,800 wells. Only by closing down these illegal wells would it be possible to reduce subsidence and allow the aquifer to recover, but opportunities to implement the law are limited due to corruption within the federal authorities responsible for the management of aquifers and for extraction permissions. The local authorities are affected by these processes.

In addition, environmental threats are greater for humans living in drylands. Highly affected are vulnerable small farmers and indigenous people in remote mountain regions with insufficient possibilities for communication, where early warning processes are often limited or not transmitted in a way that these people can understand (e.g. they are announced in Spanish while most people only speak their indige-

nous language). Nevertheless, the slow processes of degradation and desertification are not included in the early warning processes and get little attention from the government. But these are the phenomena which influence the loss of livelihood and force people to migrate. In terms of efficient preventive evacuation and early warning, there is also a lack of trust in government advice because of past manipulations of information and corruption. Often these people do not believe the advice given by the government and trust more alternative channels of communication such as schools and churches.

17.7.2 Environmental Degradation

The central valley of Mexico City is an extreme case when it comes to the lack of sewage water treatment for more than 19.2 million inhabitants. Generally, water management in Mexico is underdeveloped: 77 per cent of the water is still used in the agricultural sector (CONAGUA 2009) for 6.3 million hectares with an irrigation efficiency of less than 40 per cent (Sánchez/Oswald/Díaz 2010). Industry uses 10 per cent and often discharges highly polluted sewage water due to insufficient enforcement of water laws. The domestic sector consumes 13 per cent of the available water and most cities lack sewage treatment facilities. The north receives only 25 per cent of the monsoon and from 1994 to 2009 this region experienced a severe drought. In 2010, several flash floods were caused by Hurricane Alex which flooded Monterrey, causing more than 800 million US\$ of economic damage, and affected several other northern arid regions. Hurricane Karl (2010) affected Veracruz, Puebla, and other

coastal areas of the Atlantic, and affected 68% of the state of Veracruz; a state of emergency was declared in 117 out of 212 municipalities. Governor Herrera estimated that the total damage in Veracruz alone amounted to 14 victims and material damage amounting to 50 billion Mexican pesos (3.85 billion US\$).

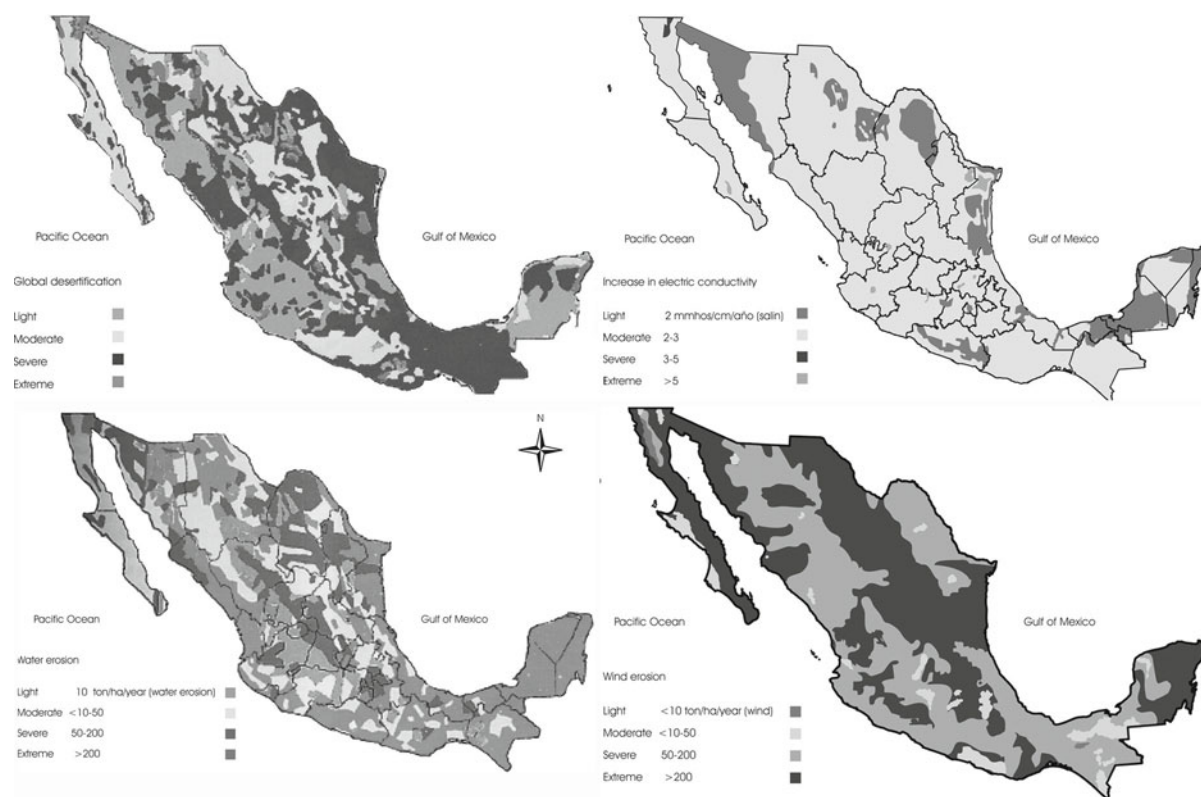
The effects of these natural changes are a lack of safe drinking water and an increase in polluted water, which has degraded soils, rivers, lakes, the oceans on both coasts, the aquifers, and the different ecosystems and their biodiversity, creating socio-environmental stress. According to the census of 2010 the population of Mexico is estimated at 108.3 million inhabitants with a density of about 54 inhabitants/km² (INEGI 2010), but the major part of the population is concentrated in the high plateau of the central valleys and the semi-arid and arid drylands. Pressures from population, industry, and agriculture have direct impacts on soil fertility and its capacity to retain humidity, thus reinforcing anthropogenic desertification.¹⁸ This process can be accelerated by long periods of drought (resulting from the effects of anthropogenic CC), flash floods causing water erosion, and the loss of vegetation cover due to inadequate agricultural practices, deforestation, mono-cultivation, and overgrazing of pastoral land. While natural hazards (drought, storms) cannot be prevented, processes of land degradation, desertification, water pollution, deforestation, and anthropogenic carbon emissions can be mitigated by proactive human activities. An ecosystem that has been damaged can probably not be restored to its previous complexity, but may be treated in such a way that the lost environmental services are regenerated.

Mexico is seriously affected by desertification and the degradation of soils, reinforced by a long-term drought starting in 1994 and aggravated between 2006 and 2010. The Ministry of the Environment (SEMARNAT 2006) claims that 47 per cent of the territory of Mexico is experiencing a process of desertification. Riod.MEX (2008), a research association of

17 The recuperation of these seven aquifers would be feasible if the valley were to treat all its sewage water and permit re-infiltration to the underground. Capture of rainfall, the closure of illegal wells, the control of leakage which is estimated to amount to 40 per cent of the drinking water, as well as tariffs that would cover the extraction and treatment costs and operate a transparent measurement system for real water use, may recover the depleted aquifers. Since 1925, the Mexico City Valley has experienced subsidence in the subsoil, which is affecting the metro, the drainage system, and the drinking water pipes. Xochimilco and the historical centre have experienced a soil subsidence of more than 40 cm. The situation is even worse for the international airport, with an annual subsidence of more than 5 cm. A reduction in extraction of 5 m³/sec would also reduce the content of salts in the groundwater and avoid the building-up of galleries, which exert extreme negative effects during earthquakes, since houses may collapse totally.

18 *Desertification* is the extreme deterioration of land in arid and dry sub-humid areas due to a loss of vegetative cover that reduces the soil moisture. It includes destructive use of the land, deforestation of tropical areas where the soil is exposed directly to sunlight, losses to the nutrient value, and erosion because there are no leaves and plant material or roots to hold the soil together and wind and rainfall wash the soil away. Together with inappropriate agricultural management, overgrazing and overuse of agrochemicals, and irrigation with brackish water, the land has seriously deteriorated and lost its fertility.

Figure 17.9: Soil erosion (wind and water), salinization, and desertification processes in Mexico. **Source:** SEMARNAT and INE (2006).



soil specialists, argues that as much as 120 million hectares are affected and that 93 per cent of this deterioration is the result of inadequate soil management. The key reasons are: 18 per cent is due to a loss of natural fertility resulting from over-fertilization and over-grazing, 12 per cent is the result of water erosion, 11 per cent wind erosion, and 8 per cent due to salinization, which is increasing due to the over-exploitation of groundwater (figures 17.9a, b, c, d).

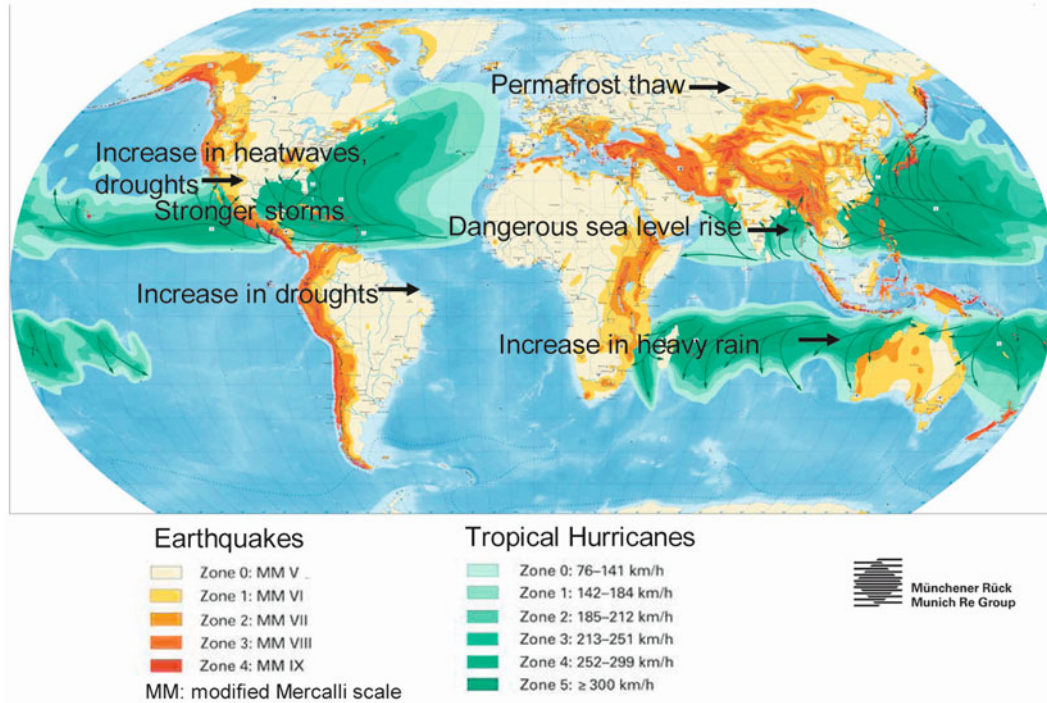
17.7.3 Environmental Stress

In Mexico desertification and land degradation are crucial push factors for emigration, contrary to the findings of the study on the state of Tlaxcala (Schmidt-Verkerk 2010). Based on our own field research which relied on focus group discussions in Morelos, Sonora, Chihuahua, and Guerrero, we found that the key driver of cross-national and internal rural-urban migration is the loss of soil fertility, a lack of water, and the decline in crop yields. Similar results were obtained by research teams from INIFAP (a governmental research institute responsible for agricultural and forest studies). Most municipalities in

drylands have lost people due to drought, loss of soil fertility, and inadequate soil management and agricultural practices (Sánchez/Oswald Spring/Díaz 2011; Chávez/Lozano 2008). Polluted and scarce water and soil resources have also created local conflicts on the access to communal grassland for private livestock. The lack of transparent property rights often generates overgrazing of the common land reserves, since local landlords do not respect the natural recovery of the tropical dryland (Oswald et al. *in press*).

Social networks are crucial for people who lack governmental support and live in precarious socio-economic conditions. During extreme hydrometeorological events, disasters, or desertification processes, the community networks often disintegrate, and people must find ways to face these new threats on their own. These critical situations are especially difficult for women and children. During evacuation and migration they are often the victims of human traffickers, driven into prostitution, being kidnapped, or have their belongings stolen. With regard to migration to a town or to the USA, it is existing social networks that usually define the place to migrate to; they finance the illegal crossing or pay for the release of a kidnapped

Figure 17.10: Climate threats, disasters, and impacts. **Source:** Adapted by the author from MunichRe (2009).



migrant and the support of the family when the remittances arrive (Fuentes Flores/Peña Medina 2005). Regarding internal rural-urban migration, members of the community and of family networks in the town help the new migrants to find a place to stay, protect them from corrupt authorities, and help them build a temporary house and earn some income in a new unknown environment (Ojeda de la Peña/López Estrada/Ceballos 1994; Ceballos Ramírez 2003; Anguiano Téllez/Hernández Madrid 2003; Oswald Spring 1991). But family networks also support children who emigrate to other family members living in the USA in the hope of a better education or health care. If a migrant in the USA becomes ill or dies, the family supports the repatriation and buries the migrant in his home town. These social networks among migrants in the USA have also been termed transnational communities (Castillo/Cruz/Santibáñez 2009).

17.8 The Impact of Climate Change

Climate change is only one of several environmental factors, besides global environmental change, that has forced people to migrate. Mexico is exposed to all the climate-related, geophysical, and technological threats (figure 17.10). Rising sea levels along the Pacific and Atlantic coasts are creating coastal erosion, sea water

intrusion into fertile lands and aquifers, and wave surges. Hurricanes emerge from both oceans with great severity,¹⁹ making deforested mountains prone to landslides. Floods are the most evident natural and human-aggravated threats.

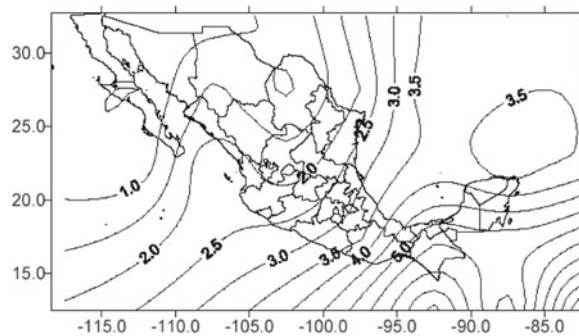
Future scenarios of precipitation and temperature changes indicate that precisely these drylands will become hotter and drier (figures 17.11, 17.12). This will especially impact on the highly fragile drylands with poor agricultural conditions, where *environmentally-forced migration* (EFM) is often the sole solution for sustaining a household and adapting to such adverse conditions.

Anthropogenic CC is having serious effects in Mexico. Since 1994, a lengthy drought has reduced average agricultural yields, and forced farmers and the authorities to extract water from aquifers, often over-exploiting them and allowing associated sea water intrusion and salinization of aquifers and land (Garatuza Payán/Rodríguez/Watts 2010). The precipitation scenarios for 2050 predict less precipitation in the dry-

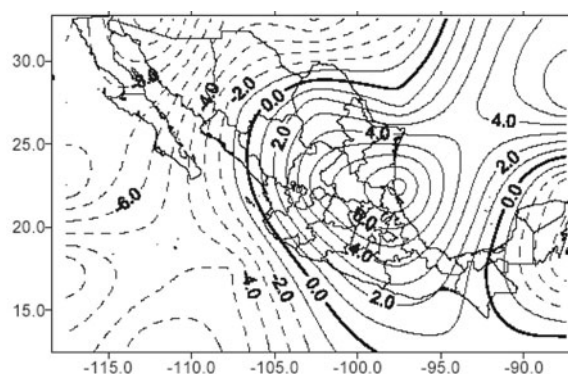
¹⁹ For example, in 2008 Hurricane Dean crossed the country from side to side. The death toll was greater on the high plateau due to the lack of resilience processes in the inner states of the country, and because coastal regions had already evacuated their populations.

Figure 17.11: Precipitation change scenarios by 2050. **Source:** CCA (2009).

Medium scenario (1961-1990) of annual precipitation (day)



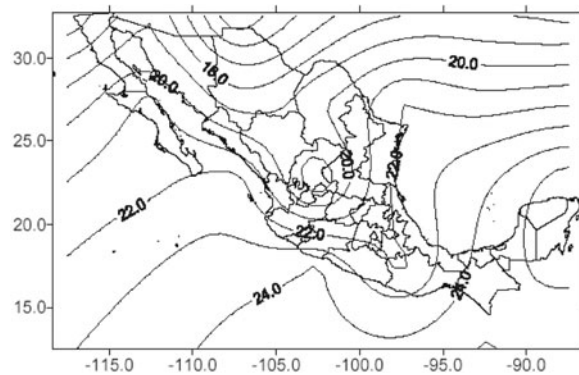
Changes in yearly precipitation average (per cent) with medium effect (ECHAM4 Model)



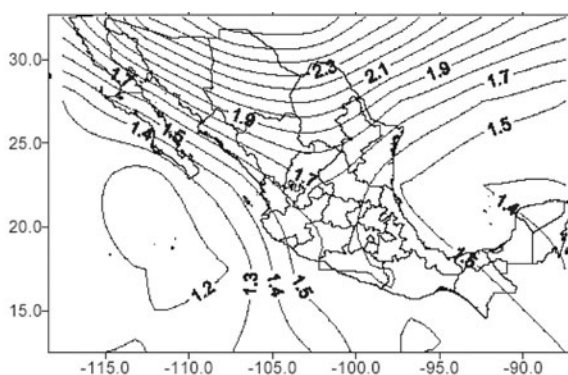
— less precipitation

Figure 17.12: Average temperature/year change scenarios (°C) by 2050. **Source:** CCA (2009).

Based on data 1961-1990, average temperature/ year



Changes of average temperature/year (°C) with the ECHAM4 Model, medium impact



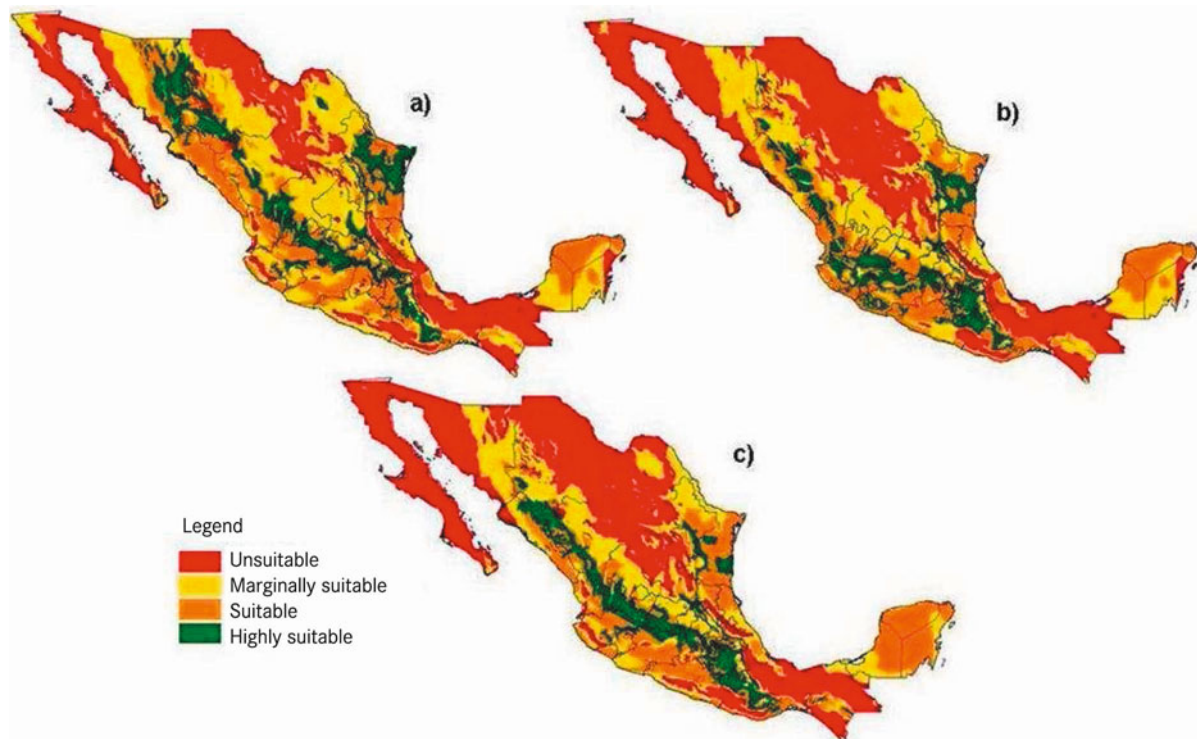
lands and an increase in the tropical humid area, related to stronger and probably more numerous hurricanes and tropical storms (figure 17.11).

The scenario for temperature increase predicts an average increase of up to 2.3 °C for the next four decades, while drylands (figure 17.12) are projected to have higher temperature increases. Less rain and higher temperatures affect the green cover and the soils and therefore intensify the ongoing desertification processes. A negative interaction with less plant cover and drier soils also indicates less capture of CO₂ and therefore higher GHG emissions.

If the maps of precipitation and temperature projections are linked to the existing conditions of land deterioration, it is in drylands where we find the highest human-induced deterioration processes. Desertification combined with salinization, water erosion, and wind erosion is also affecting fertile coastal areas in Sonora and Tamaulipas, and the more precipitous

mountain regions of Durango, Zacatecas, Durango, Jalisco, and Michoacan.

The impacts of climatic change will accelerate the human-induced processes of soil deterioration that are already affecting Mexico, considering that nearly two-thirds of the land belongs to semi-arid, arid, and hyper-arid ecosystems or drylands. Drought, changes in precipitation, floods in coastal areas during the rainy season, plagues and crop illnesses, together with the salinization of soil and aquifers, are resulting in declining crop yields, which in turn make livelihood unsustainable. These processes are primarily affecting peasants depending on rain-fed and subsistence crops, who represent almost 78 per cent of all rural producers. Their productive activities cannot guarantee a livelihood even in conditions of extreme poverty, and this puts pressure on younger people and eventually on the whole family to abandon their communities of origin. Lack of government support has often forced

Figure 17.13: Potential effects of CC on corn cultivation. **Source:** Monterroso and Rosales (2006).

smallholders to produce illegal crops. Another option has been a massive environmentally-forced migration that represents an additional risk for the degraded ecosystem services. Soils without vegetation in precipitous areas are prone to erode faster, reducing rain infiltration capacity and consequently increasing the threat of floods and landslides in lower basins. This combination is also reducing the recharge capacities of the aquifers, and this increases the over-exploitation of aquifer and the salinization of groundwater and land, which then affects human health through an unsafe water supply. An increasing number of heat-waves and cold spells characterized by sudden temperature changes frequently have an effect on the immune system of humans, plants, and animals, causing their health and immune-resistance processes to deteriorate.

The maps of prospective models of corn production for the three IPCC-related scenarios in figure 17.13 indicate that the availability of land for producing basic foodstuffs will be reduced between 13 and 27 per cent by 2050. Above all, it will affect the rain-fed subsistence production of poor peasants, who at present cultivate corn for self-consumption. In the future, these areas could also include irrigated farming in places where aquifers are already over-exploited, and lands will become salinized due to brackish water

use, for example in the peninsula of Baja California, Sonora, Sinaloa, Sonora etc., as well as leading to sea water intrusion into the aquifers, particularly on the coast of Hermosillo, Sonora (Rangel Medina/Monreal Saavedra/Watts 2011; Garatuzza Payán/Rodríguez/Watts 2011).

These maps also indicate the geological conditions of semi-arid and arid regions in Mexico, where CC is affecting more than 58 per cent of the country's land area due to prolonged drought, land degradation, and desertification processes, mostly related to human activities in highly vulnerable lands with precipitous mountains. These smallholders represent 80 per cent of the extremely poor people in Mexico and their high social vulnerability will increase with climate-related threats.

17.9 Societal Outcome: Environmentally-Forced Migration

Insecure land and water rights have also generated conflicts and produced "complex emergencies" (Oswald/Brauch 2006) within communities and regions at the local level. These factors, combined with public insecurity and organized crime, suggest that a signifi-

cant proportion of the people living in villages are fleeing from physical and structural violence. However, the women who stay behind as de facto household heads have to survive in perilous conditions. This complex crisis combination may experience further security risks due to aggravated CC conditions.

But the traditional system of *ejido* lands has changed with the modification of Article 27 of the Mexican Constitution that transforms collective land tenure into private property.²⁰ This legal change has substantially increased land conflicts and between 1992 and 2003 the Ministry of Land Reform has counted a total of 631,314 land conflicts²¹, often linked also to water disputes. Of these, 104 conflicts are considered as hotspots with armed confrontations, and they represent security risks for an entire region.

At present this legal provision also grants the General Assembly of local peasants the right to sell or rent these *ejido* lands to private parties. Thus, the dominance of economic interests and a patriarchal mindset are frequently depriving women of their legitimate rights to land ownership, leaving them with the responsibility of providing for their children and extended families without the right to own the lands they cultivate. Combined with local public insecurity and the absence of their migrant husbands or partners, women are confronted with the need to develop survival strategies, with the task of protecting and supporting their extended family, but with very few technological and personal tools. The decline in socio-economic conditions and the disintegration of traditional support networks linked to migration has contributed to a loss of social cohesion and often to a loss of livelihood in poor families (Serrano Oswald 2010).

20 *Ejido* refers to the assignation of land rights after the Mexican Revolution for peasant collectives who did not own communal titles to land. From 1992 the modification to Article 27 of the Mexican Constitution has allowed peasants to sell their collectively-owned land or rent it with the agreement of the General Assembly of the *Ejido*; so the collective land rights were changed into private property rights.

21 Of the 631,314 conflicts, 432,785 are related to individual possession of land (33.4 per cent related to possession; 31.9 per cent to inheritance problems, and 11.7 per cent to urban plots of land). The other 105,744 are related to conflicts between communities (problems of boundaries) and to women who were deprived of their legal right by the General Assembly of *Ejido*, the decision-making entity at local level; 55,789 problems are related to communitarian rights.

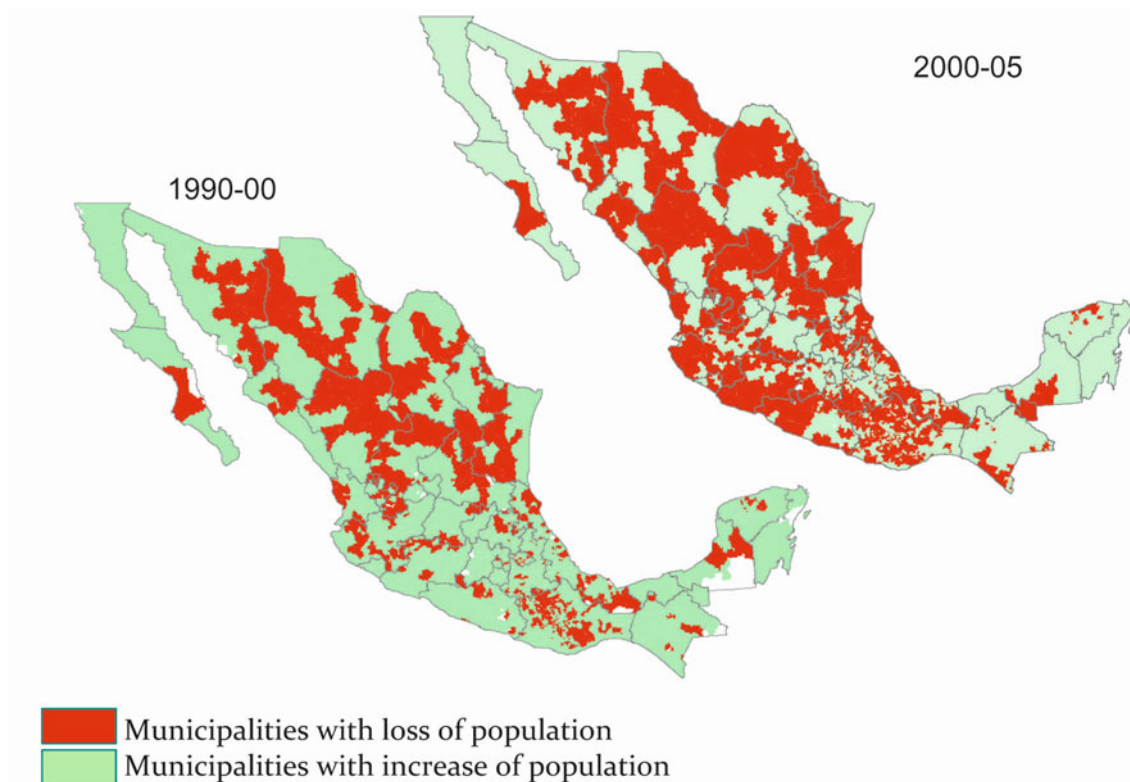
As indicated above, a combination of climate and socio-economic factors has created large urban slums in Mexico City and in other large urban centres. These factors, together with a persistent socio-economic crisis since the 1980s, insufficient job offers, a lack of economic stimulus for small businesses, poor educational standards, and limited social programmes have all contributed to a steady increase in the massive emigration to the USA. For both internal and international migration it is impossible to separate these environmental triggers from the socio-economic motivations of the migrants. Therefore, environmentally-forced migration is a complex, multi-causal, and interactive phenomenon, often with negative outcomes that may destroy both family and community networks, and increase the social vulnerability of women. These women assume the role of heads of household. They must work in the fields, care for their children, pay the debts for the migration of their husbands and other family members, and support the extended family at home, relying partly on remittances or on savings when these are insufficient. Often their social vulnerability increases and their psycho-physical stress is sometimes expressed as illness and depression, but on the other hand this experience can also empower these women (Flores/Wagner 2011; Serrano Oswald 2010). Remittances from family members working in the USA or Canada have often improved the livelihood, housing, clothing, and nutrition of the family left behind in the villages and these transfers by the migrants have also opened new opportunities for jobs and micro-businesses (Each-For 2009).

17.9.1 Internal Migration

During the last decade, more than five million small-scale farmers have been affected by climate-related problems combined with low prices for their produce, and consequently many of them have left their communities. They have migrated to state capitals and to the three megalopolises (Valley of Mexico City, Guadalajara and Monterrey), but increasingly also to the *United States* (USA). Migration processes are highly chaotic and have not allowed for planning in urban areas and border regions due to the massive movement of people. Newcomers often have had to settle in risky marginal lands and they often survive in precarious conditions.

Figure 17.14 indicates the demographic movements within Mexico by comparing the loss and increase of population for the time period 1990 to 2000 with that of 2000 to 2005. This is a preliminary

Figure 17.14: Demographic dynamics in Mexico. **Source:** Designed by Lozano (2009) based on data by INEGI (1995, 2000, 2005). Permission was granted by the author.



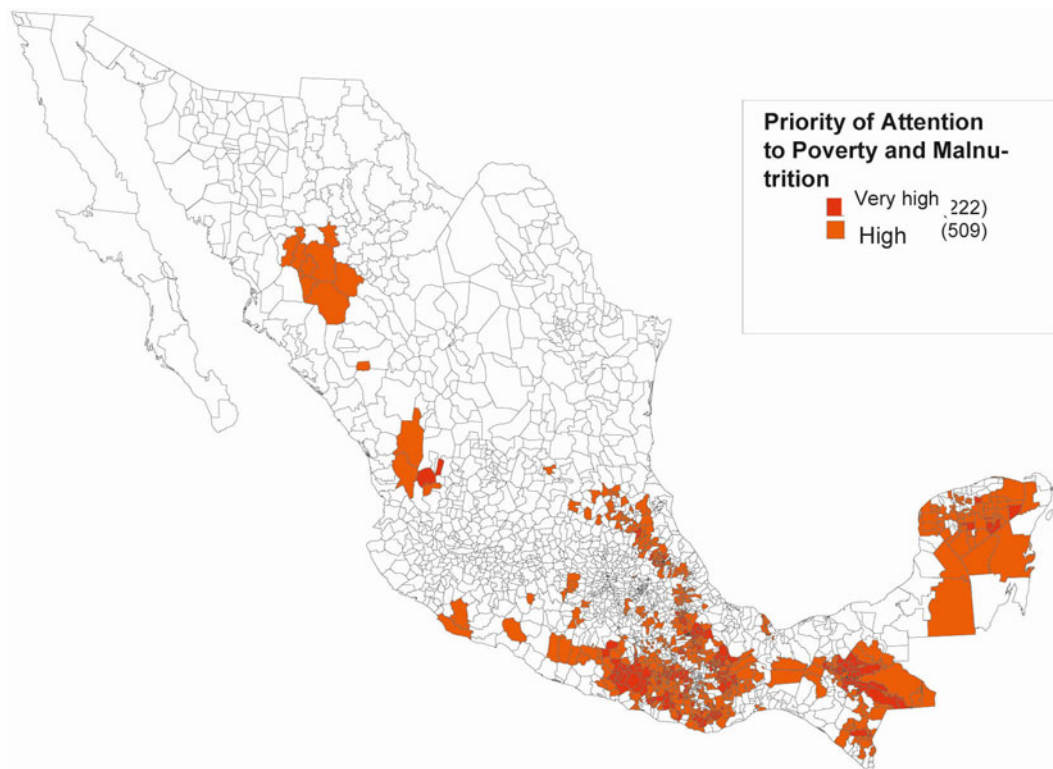
approach, examining the changes in demographic variables without distinguishing between changes in fertility rates, mortality, and migration. The abrupt demographic change in drylands from 2000 to 2005 is also linked to the political shift from the one-party system of the *Party of the Institutionalized Revolution* (PRI) to the conservative government formed by the *Party of National Action* (PAN), and this is a global indicator that an intensive population displacement has taken place. Nevertheless, the dramatic demographic change in only five years indicates serious problems for the people affected.

A comparison with [figure 17.13](#) leads to a second conclusion. Initially internal and later also cross-national migration is more related to climate-induced processes in drylands and to the loss of livelihood than to marginalization and poverty ([figure 17.15](#)). Several demographic studies (Boltvinik 2009; INEGI 2009) have analysed internal differences between regions. While the people living in poverty in Mexico City amount to 32 per cent of the population, in the three poorest southern states - Guerrero, Oaxaca, and Chiapas - it is as much as 72 per cent. Their income is also five times less than that in the capital (World Bank/BM 2009; CONEVAL 2009). Neverthe-

less, cross-national migration is higher in the north compared with the poor states in the south, possibly because the border is near by (Sánchez/Oswald Spring/Díaz 2011) or possibly because job opportunities are better in the USA (Fuentes Flores/Peña Medina 2005).

One hypothesis is that the meagre economic situation associated with the loss of harvests, increasing production costs, lack of credit and rural technological support, combined with uncertain rainfall patterns have pushed these peasants out of their communities of origin into shanty towns and to the USA. Taking the projection on corn production due to CC into account ([figure 17.13](#)), between 3.25 and 6.75 million small peasants will be further pushed out of their lands and may become EFM due to the lack of soil fertility, desertification, and loss of livelihood. In addition to the lack of urban development policies and the lack of job creation, better-trained young people are leaving the country, while another 500,000 have been drawn into illegal activities during the last three years (México, Congreso de la Unión 2008) and become involved with drug gangs (AFI 2009; México, Congreso de la Unión 2008, González Reyes 2009).

Figure 17.15: Marginalization map at the municipal level in Mexico. **Source:** Chávez, Ávila, and Shamah (2006).



17.9.2 International Migration

Migration from Mexico to the USA has been a result of many factors including enormous socio-economic differences between the two countries, environmental threats due to climate variations, economic crises, lack of job opportunities, and public insecurity. Since 1986, the legal status of Latin migrants in the USA has changed, and at present most migrants cross the border unauthorized. Although the reasons for environmentally-forced migration are complex, the number of Mexican migrants has increased annually since 1993 following the signing of the NAFTA agreement (figures 17.1 and 17.2).

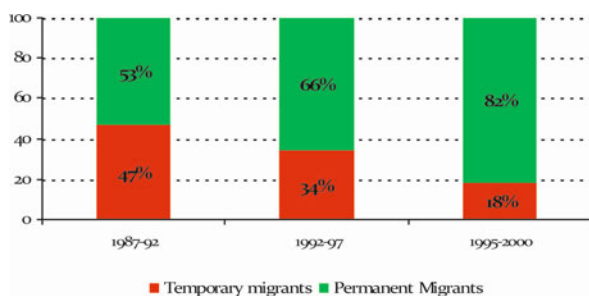
A total of 30.7 million Hispanics, most of them of Mexican origin, reside in the United States. 37.0 per cent were born abroad and 63.4 per cent arrived in the USA after 1990. Only 22.0 per cent of all people identifying themselves as Mexican are US citizens, 78 per cent have an illegal migratory status and 48.2 per cent are married. The median age is 25 years, 53 per cent are men, and 47 per cent women. Their educational level is low, only 9 per cent having a bachelor's degree. Only 24 per cent of the Mexicans in the USA speak English at home, while 76 per cent speak Spanish; more than half speak very poor English or none

at all. These are some of the structural disadvantages many migrants face. Many of them work in the lowest-paid and most risky jobs. The median annual earnings for Mexicans over 16 years of age in the USA in 2008 was \$20,368 (\$21,488 for other Hispanics), the lowest average for all working national groups; and 34.8 per cent have no health insurance. Therefore, 22.3 per cent are considered poor (compared with 12.7 per cent of the US population as a whole). Confronted with these structural disadvantages, the Mexican population relies heavily on their social networks of family or community members. For this reason, illegal migrants are especially concentrated in specific regions: 36.7 per cent of them live in California and 25.2 per cent in Texas (Census Bureau's American Community Survey 2008).

Within the USA, legal, socio-economic, and physical obstacles have created new difficulties that in turn have increased the vulnerability of Mexican and Latino immigrants, who have migrated to seek better living conditions in the neighbouring country. Despite the fence and its sophisticated electronic observation system – including drones and infrared search equipment – nevertheless about 450,000 to 500,000 Mexicans cross the border illegally every year (figure 17.2). They account for about 85 per cent of all estimated il-

legal migrants in the USA. At the same time, the arms trade operates on the border from north to south, with an increase in demand from the Mexican side. The increasing difficulties on the border have also changed the pattern of migration (17.16) from temporary to permanent. The economic crisis has benefited female employment and therefore migration of women has increased since 2008 (Passel/Cohn 2011).

Figure 17.16: Permanent and temporary migrants.
Source: Based on data from Passel 2005: 4.



Surveys and interviews (Serrano Oswald 2010; Castañeda Salgado 2010; Oswald Spring/Estrada/Flores et al. in press) have further shown that cross-national migration requires money, some skills, basic education, and, especially, a social network of family and friends at the destination in the USA who will know how to get a room, food, a social security card, and the other legal documents needed for a job. Due to the difficult conditions for crossing the border in spite of the wall or fence separating the USA and Mexico, the sophisticated technological equipment of the Border Patrol, and the role of organized crime that is trying to overcome it, migrants must rely on trusted people, usually related to their family and community networks.

A final goal of many migrants is to send remittances to their family members in Mexico. These have substantially increased up to 2008, and despite the global financial crisis they still represent the second largest source of foreign income in Mexico, just behind the income from oil exports; they are higher than direct foreign investments (figure 17.17). In 2000 they amounted to US\$ 7.24 billion, but in 2008 they rose to US\$ 25.145 billion and in 2009 – due to the global financial and economic crisis and the high unemployment rates – they dropped by 15 per cent to US\$ 21.181 billion and in 2010 to US\$ 21.271 billion (Bank of Mexico 2010). The construction sector was especially affected by the crisis as it employs a large number of illegal Mexican immigrants. In Mexico, these remittances reach many of the most marginal

households and they often enable the survival of family members left at home.

17.10 Societal Outcome and Security Threats

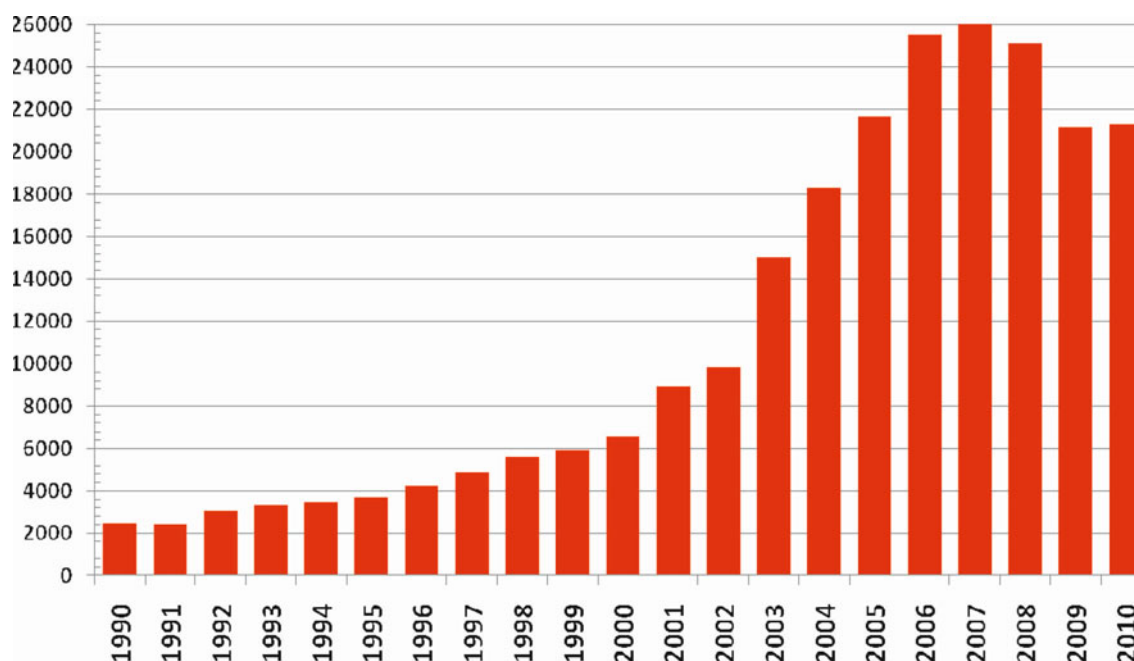
Environmentally-forced (EFM) and also *climate-induced migration* (CIM) have brought about both positive and negative societal outcomes. EFM and CIM may represent an adaptation strategy for coping with the deteriorating socio-environmental conditions of Mexicans. In 2009, the socio-economic and food crises in Mexico led to an increase of three million in the number of hungry people, causing estimates of people in extreme poverty to be raised by five million (ENIGH 2008).²² The present marginality of almost half of the population (47.4 per cent, Minister of Finance in April 2010) is in contrast with the richest 10 per cent of the Mexican upper classes, who have increased their share of national income from 35.4 to 41.3 per cent.

To cope with this extreme poverty in the light of the global crisis, and because of the lack of credibility of the government for many citizens, would require the Mexican government to fundamentally change its neo-liberal policy, its NAFTA-related food imports, and the budget priorities favouring the ‘war against drug trafficking’ over education and public services. Public policies should shift to job creation, food sovereignty (Via Campesina 1996), environmental services, and supporting small farmers and marginalized women. These policies would help Mexico to achieve the Millennium Development Goals and a sustainable policy of food and social development (Oswald 2009), where the land and increasingly scarce water resources would be optimized to produce healthy food and to improve living conditions for everybody. This would simultaneously reinforce ecosystem services and mitigate GHG.

Public insecurity, under- and unemployment²³, and environmental deterioration in Mexico are push factors, while better labour conditions and higher pay-

22 The financial crisis from 2008 onwards has reduced the positive trends of poverty alleviation in Latin America, where from 2002 to 2008, 60 million people had overcome their condition of poverty, basically in Brazil, Chile, and Venezuela. In Latin America between 2008 and 2009, 10 million people again fell into the poverty trap (half of them in Mexico, due to the high dependency on the US economy and the recession in the *maquila* export industry).

Figure 17.17: Remittances sent from the USA to Mexico. **Source:** Developed using data from the Bank of Mexico (2011).



ments in the USA are pull factors for migration. When climate change is further destroying the livelihood of thousands of people, as cities are crowded and lack employment opportunities, and as the border between Mexico and the US is closed for migration, an explosive combination of organized crime gangs specializing in illegal activities offer their services to get these people into the US. As EFM and socio-economic migration is a fact, but there are no legal ways for poor people to cross the border, increasingly complex security problems have emerged in both countries. In addition, internal corruption, complicity between organized crime and some public authorities at all levels, environmentally-forced migration, and an unjust bi-national migration policy have created complex security risks, especially for the highly vulnerable

groups who are trying to survive in precarious conditions in both countries.

These negative societal outcomes are directly linked with the criminalization of migration and have also resulted in a decline in social cohesion. Improved surveillance by the US border patrols has not only increased the vulnerability of these people and corruption on either side of the border, but has also generated a cycle of violence and insecurity both in the USA and in Mexico. The illegal crossings controlled by transnational crime gangs and other illegal activities in a militarily-controlled zone have transformed the border region – and increasingly other areas of the country – into a region where a *low intensity war* occurs.

The border towns between Mexico and the US are extreme examples of this violence, and they are becoming even more insecure with the military presence brought about by the war between the drug cartels for controlling entry into the USA. In 2010, Ciudad Juárez was considered the most dangerous town in the world; thousands of police and military forces are exacerbating the state of war there. In this town, murders per year have been: 1,619 in 2008; 2,635 in 2009, and 3,156 in 2010 (Vice-General Attorney of Justice of the state of Chihuahua, January 2011).

Furthermore, in this border town, more than 500 women have been kidnapped and assassinated during the past decade, with an additional 57 young women

23 Unemployment rates rose significantly in Mexico, and more than half of the economically active population is at present working in the informal sector of the economy. According to official statistics, 7 per cent are unemployed and forced to survive without any unemployment benefits. Additionally, partly due to the impact of AH1N1 influenza, more than a million jobs were lost during 2009 (300,000 of them in the tourist sector alone). Annually, more than one million young people enter the labour market, increasing demand for employment; often they are better trained than currently employed people.

killed during 2008, and 130 in 2009 (National Commission of Human Rights 2009), and between 306 (Vice-General Attorney of Justice of the state of Chihuahua, January 2011) and 400 (National Commission of Human Rights 2011) in 2010. These crimes have not been fully investigated, and the local population accuse the highest levels of the government of being involved with the drug gangs, thus further increasing the violence and instability (Hernández 2010). Local people have also denounced the increased public insecurity since large contingents of the federal police and of military forces have arrived, and many have requested that they should leave.

However, this direct violence is not limited to the border. During 2009, the number of people assassinated at the national level was estimated at 7,724, and during the first three years of the government of President Calderón from 2007 to June 2011 more than 40,000 people were killed in Mexico (CISEN August 2010 and June 2011). The authorities explain this insecurity as due to the struggles between drug barons, but unfortunately hundreds of innocent people have also been killed, sometimes by crossfire.²⁴ In this high number of deaths, resulting from the 'war against drug trafficking', more than 45,000 military, federal, state, and local police forces are involved. The number of innocent victims has been described by the government as 'collateral damage', which must be paid for winning the 'drug war'. Mexico has also become the country with the highest number of murdered journalists, especially those researching and denouncing the links between drug barons and the authorities.

Without doubt, existing data on public insecurity indicate another phenomenon that causes insecurity. Corruption has penetrated the local, state, and federal police forces, the military, public authorities, judges, and immigration authorities. Corruption, combined with the lack of an effective system of justice and laws that are not implemented or enforced, has done away with the rule of law. People no longer trust the executive, judicial, and legal powers, and private self-protection is inefficiently trying to fill the gap left by the lack of public security. However, this complex interrelationship and the involvement of police and military forces in criminal activities have increased the number and types of illegal activities.

²⁴ In January 2010, 849 people were assassinated; this is the highest number of deaths in a month. See the newspaper *El Universal*, 1 February 2010 and in November 2010 the number rise to 701 executions.

They include kidnapping, human trafficking (including children and babies), trade in organs, arms, and drugs, robberies of private property, extortion, and the selling of protection. In all these illegal activities, billions of dollars are at stake (González Reyes 2009). A permanent fight among the biggest drug 'capos' is taking place over the control of Mexican territory, its trafficking routes, and the US drug market. In Mexico, and also in parts of Latin America, this economy of crime is controlled by three main opposed groups, the cartel of Sinaloa, the Gulf cartel and the Zetas. Money derived from these criminal activities must be cleaned, and hence money laundering, drug consumption, and illegal arms trafficking directly involve the USA, its financial institutions, and its people (Departamento de Estudios Urbanos y Medio Ambiente 2009).

Independent of this increasing public insecurity, the security threats in Mexico related to CC and EFM may increase, as a significant number of people will be displaced from their homes, either temporarily or permanently, as a direct consequence of global warming. The impact of climate change on human populations, although it has been relatively neglected compared with its ecological effects, presents an urgent problem for the local, national, bi-national, and international community. The causes for leaving traditional communities of origin are a combination of human-induced factors together with climate-related environmental deterioration, an economic standstill and negative GDP growth rates, a failed rural policy, populist poverty alleviation programmes that are primarily oriented at maintaining the key political parties in power, a reduction in investments in science and technology, an inefficient basic education system,²⁵ low investments in infrastructure, and a failed employment policy. This neo-liberal model imposed by Mexican political elites and that partly reflects international pressures is further exacerbated by a corrupt process of privatization where justice can be negotiated, creating a state of injustice and absence of the rule of law.

²⁵ The Rector of the National Autonomous University of Mexico (UNAM), José Narro Robles, indicated in February 2010 that in the past decade only one out of every four students of high school age can attend school. Furthermore, out of 35 million Mexican young people (between 12 and 29 years), approximately 22 per cent "lack access to education and employment". He warned that this is a matter "that ought to worry Mexican society enormously", and added that Mexico needs more and better education, and that the educational system must be diversified and amplified and become more flexible.

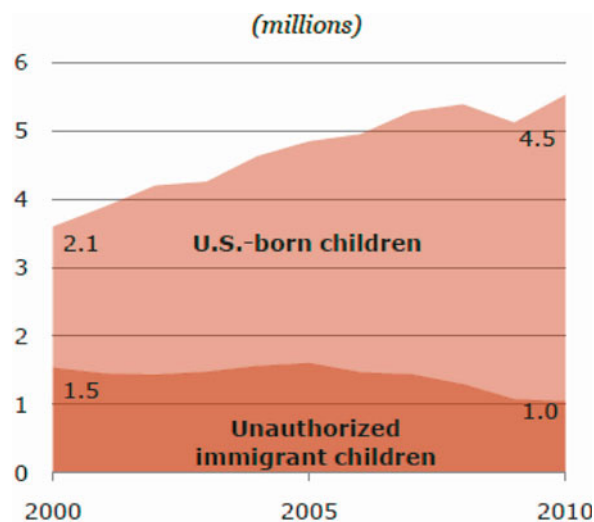
Furthermore, an additional 41 million people living in Mexican towns face high or very high risks of recurrent natural hazards (SEGOB 2009). All these factors have increased the number of illegal migrants to the USA since the year 2000 and only the global crisis since 2008 has limited the growth rate (Kochhar 2009) and resulted in a temporary decline. As multifaceted interrelations exist between environmentally-forced migration (Myers [2002] called them environmental refugees) and socio-economic motivations (Chávez/Lozano 2008), both processes are deeply intertwined.

Migration has often resulted in negative personal outcomes that can destroy families and community life (Escala Rabadán 2004) and increase the social vulnerability of those women who stay behind and must work in the fields, care for their children, and sustain their extended family economically. During the process of cross-national unauthorized migration between Mexico and the USA, the social vulnerability of women is even greater: between 70 and 80 per cent of female migrants are raped; a significant number end up in prostitution (Catholic Church 2008) with a high risk of HIV-AIDS (Klot/DeLargy 2007; Flores Palacios/Wagner 2011). But remittances, changing household roles, and economic incomes may also empower women and make them more independent and entrepreneurial (Maier/Lebon 2010).

The prosecution and forced repatriation of adults has left one child behind for every five deported people, and this has seriously weakened family bonds (Passel/Taylor 2008). These children are often born in the USA and are thus US citizens (figure x.16), but their parents and families cannot register them, fearing that they themselves will be deported. A negative situation is also created by US 'repatriation' policies, for example when they repatriate migrant families separately, such as parents through Tijuana and their children via Juarez, despite the binding protocol for child protection that the US government has never ratified. This has also destroyed family bonds (Cremades 2008), threatened the physical and psychological survival of migrants, and exposed children and women to rape, human and drug trafficking, and forced prostitution (WTO 2004).

Migrant children are particularly vulnerable. The Census Bureau's American Community Survey (2008) estimates that 17 per cent of undocumented Mexicans are children. Of the 5.5 million Hispanic children in USA, about 4.5 million were born in the USA and have the right to a passport (figure 17.18). Nevertheless, they are threatened with deportation as they

Figure 17.18: Children born with at least one unauthorized immigrant parent. **Source:** Passel and Cohn (2011: 13). This figure is in the public domain for scientific purposes.



often lack legal documents. From January to September 2008, more than 90,000 children were deported, mostly without their families. For every five adults that are deported, one Mexican child is abandoned in the USA, and for every three deported adults one child is returned to Mexico on the other side of the border, and has to try to survive on its own. In the border region in December 2008, there were 123,500 children trying to join their parents in the USA or being deported, surviving by strategies such as begging, prostitution, and illegal activities, mostly without any family support.

17.11 Policy Response to Environmentally-Forced Migration

The international and national political response to potential conflicts and security threats in the border region and between Mexico and the USA is limited. The Mexican government has been unable to create jobs for its young people, and the drug war is more a response to North American pressure to combat the trafficking of drugs in Mexico instead of in the USA. The Merida agreement has committed Mexico to buy new technology and obtain military advice, and this has contributed to the complex socio-economic problem within Mexico caused by a narrow approach to military and political security.

The 'drug war' in Mexico has triggered a wide consensus opposing it. This includes all opposition parties and many academics and social groups. Nevertheless, US Secretary of State Hillary Clinton insisted during her visit in February 2011 that it is an appropriate way for dealing with the problem and she supported Mexican President Felipe Calderón. But simultaneously, the US State Department advised its citizens to avoid travelling to the cities most affected by the drug war. Similar advice came from various European countries. This external policy response expresses the geopolitical interests of the USA, where the deaths and social instability from the 'drug war' occur on the Mexican side, while the illegal arms trade and the money laundering has been beneficial for some business and financial organizations in the USA.

There is a second security problem related to cross-national migration that is linked to the Merida agreement between the USA and Central America. The southern border of Mexico has become a highly unstable region. Organized crime gangs are infiltrating migrant communities in Central America and kidnapping their members, often colluded with Mexican authorities. Around 350,000 to 400,000 people from neighbouring countries cross illegally through Mexico to the USA and 200,000 are deported by the Institute of Migration (Arámbula Reyes/Santos Villarreal, 2007: 5). Amnesty International in Mexico and Human Rights Watch reported that in 2010 around 25,000 migrants were kidnapped. A massacre of 72 migrants in Tamaulipas in October 2010 conducted by the 'Zetas' criminal gang was closely linked to 'Mara Salvatrucha' in El Salvador (many of its members were former child soldiers from the civil war), and this increased the pressure on Mexico. Further studies and new mass graves indicate that several hundred migrants were killed, when their families in the USA or in Guatemala, El Salvador, and Honduras could not or would not pay for their rescue. A significant group became involved with the crime gangs and helped to engage and kidnap their compatriots.

On 9 January 2011 the governments of Honduras and Mexico signed an agreement with 18 Latin-American countries to reduce violence against transnational migrants and to coordinate efforts in their own countries to counter the activities of organized crime. The Honduran authorities estimated that of the 25,000 kidnapped migrants about 10,000 may have come from Honduras. They also accepted that the Zeta gang is active in Honduras and Guatemala and that the security of the migrants can only be improved

through international cooperation. Due to international pressure on Mexico and the claims of corruption against the immigration authorities in almost all its states in 2010, the Ministry of Interior of Mexico replaced the General Director of Immigration, but in January 2011 the PAN party elected the same person as its General Secretary.

Currently, the war against drug trafficking has forced both governments to cooperate,²⁶ to exchange intelligence, and to coordinate their policies against these gangs. But due to improved surveillance by the US border patrols and to the lack of employment opportunities, many illegal migrants increasingly rely on organized crime for crossing the border, and this has further consolidated these illegal activities. The links between human, arms, and drug trafficking have also increased corruption on both sides and created geopolitical conflicts between Mexico and the US.²⁷

On the US side, the demands to legalize immigration have been rejected. The change to US immigration laws and the growing prosecution and criminalization of migrants have created new conflicts between the USA, Mexico, and Central America. In 2007, US opposition to legalizing migrants, and in 2010 the opposition by the US Congress to allowing children from unauthorized families to study legally at universities has increased the social vulnerability of this group. As well as this, the present financial crisis has hit the Hispanic migrants' communities most severely. The unemployment rate is higher among Mexicans: 7.4 per cent compared with 6.4 per cent for the US labour force (Passel/Cohn 2011). Furthermore, the wall or fence and other increasing obstacles for crossing the border have reoriented migration streams to more dangerous environmental regions, resulting in high death tolls due to dehydration, venomous snake bites, and extreme temperatures in the Arizona desert (Castillo/Cruz/Santibáñez 2009; Ceballos Ramírez 2003). The other alternative crossing the border is to link up

26 There is also a new initiative in the discussions about legalizing immigrants in the USA. This proposal is strongly opposed by the right wing of American society, which benefits from the present system and the low salary paid to unauthorized. The US Treasury has explained that 1 per cent of GDP growth is related to the work of illegal immigrants who have to pay for social welfare, but are unable to benefit from these services due to their unauthorized status and to the US legal system.

27 In April 2010, the consulate in Laredo was closed because American officials were attacked by criminal gangs.

with human traffickers, and in the case of a lack of money, with organized crime (González Reyes 2009).

17.12 Conclusions and Policy Outlook

Environmental and social problems converge and account for the complexity of cross-national migration and the increasing number of illegal people living in the USA and in precarious urban slums. Environmental (Myers 2002, 2005; IOM 2003, 2007, 2008; Castles 2002; Black 2001; chap. 15 by Biermann/Boas, and chap. 16 by Jakobeit/Methmann in this volume) or socio-economic migration (Chávez/Lozano 2008; Lozano/Rivera 2009) are interlinked, and environmentally-forced migration must be understood as a complex, multi-causal, and interactive phenomenon, often with non-linear outcomes that affect community life and increase the social vulnerability of all groups, especially of women and children (Passel/Cohn 2011; Ariyabandu/Fonseca 2009; Serrano Oswald 2009), but that can also be a valid adaptive strategy for moving to a new livelihood (UNDP 2009).

17.12.1 Framing EFM in a Wider Soft Security Context

Preventive migration practices and international cooperation must focus more on development, on livelihood improvements, and on environmental services, for example in remote rural areas, including the creation of jobs for young people and a strong social and environmental policy in Mexico. Together with the legalization of drugs and a bilateral migrant agreement, the strategy for countering rising crime rates could be improved (Tickner 2008; UNODC 2003, 2005), enhancing the potential for peaceful living together between both countries.

Since the administration of George W. Bush, the emphasis has shifted to geopolitical conflicts between both countries – including also Central America – thus tightening the military security paradigm; this strategy was addressed and implemented through the Merida Agreement. This narrow understanding of security has failed to take into account the underlying factors of threats and risks for human, gender, and environmental security (HUGE; Oswald Spring 2009).

In [figure 17.19](#) the non-military threats for security associated with CC are systematized for both internal and international migration. This has resulted in a loss of social networks, high social vulnerability for women and children, and concrete adaptation proc-

esses for reversing socio-environmental conditions. In order to improve public security in Mexico, the security dimension can no longer be understood predominantly from a military standpoint or from a neo-liberal model of development.

Both have created economic insecurity with deep repercussions for political, environmental, societal, and community security, which have been aggravated by North American pressure and also by some of the policies adopted by NAFTA. The deterioration of natural conditions due to climate change and the inadequate management of soils, water, and biodiversity have changed the focus from narrow national and international military security approaches to an understanding that humans are at the same time the cause and the victims of their loss of human, gender, and environmental security. This widened understanding of security shifts the focus to the crucial problems of livelihood related to food, water, energy, and health security that have been exacerbated during the present financial crises by high levels of unemployment and loss of property and well-being.

17.12.2 Policy Outlook: ‘Demilitarizing’ Migration Policies by Shifting the Referent Objects from the State to the Migrants

A first step towards a combined *human, gender, and environmental* (HUGE) security (Oswald Spring 2009) could be an agreement between Mexico and USA, where a contingent of low-qualified people are legally accepted annually in order to meet the US demand for cheap manual labour. This would reduce the social vulnerability of migrants during the crossing, to some extent diminish illegal and criminal activities, and improve the life conditions of immigrants in the USA, as was proposed in an initiative sent by President Obama to the US Congress.

The trafficking of arms from the US to Mexico, the high consumption of drugs in the US, and money laundering in both the USA and Mexico must be simultaneously addressed. A following step might be the legalization of drugs and medical treatment for drug-dependent people in the US, which would reduce the pressure on Mexico and the drug-producing countries and undercut the business of the drug cartels.

On the Mexican side, environmentally-forced migration could be lessened by the adoption of a rural development policy, by preventive learning, early warning, and appropriate adaptation and mitigation mechanisms for coping with the multiple physical and

Figure 17.19: Widening, Deepening, and Sectoralization of Security. **Source:** Based on Brauch, slightly modified (2008: 29).

Security dimension ↓ Level of interaction	Military	Political	Economic	Environmental ↓	Societal
Human and social groups (women, children, elderly) Human security ⇒	Drug war, human, organ, arms, drug, trafficking collateral damages of civilians	Failed state public insecurity, crime, HR abuses	Food and health security employment, income security	Cause and Victim of business-as-usual and consumerism	Food, water and health security, gender vulnerability and security
Societal, community security	Border control	Public (in)security, organized crime	Water, Food & Health sec.	↑↓ Water, soil food, health and climate security	↑↓ Social networks Freedom from want
National security	'War on terror' since 2001 shrinking (in USA since 2001 and since 2009 widening) Wall between Mexico and USA Since 2008 pressure from USA for a 'drug war'		Energy & economic security for elite, <i>maquila</i> , cheap labour force for poor	↑↓ Disasters Rio Grande Treaty 1944 Wall limiting fauna reproduction	Energy food, water & health security Freedom from fear
International and regional security	Merida Agreement including Central America Southern border agreement		Water & virtual water security	↑↓ Electrical inter-connection with CA	Water and soil security, unauthorized migrants both borders
Global and planetary security ⇒	Terrorism	Intern. migration, drug, organs, arms and human trafficking, crime, massive immigration	Financial crisis, money laundering, massive socio-economic migration	CC; GEC; biodiversity loss, desertification, food crisis, massive EFM	Health security, pandemics, malnutrition, obesity

↓ Deepening from human to global and vice versa

societal effects triggered by anthropogenic CC during this century.

Cooperation between the USA and Mexico should support the weaker country as an ethical compensation for historical and currently higher levels of GHG emissions, which have affected Mexico more seriously than the USA. These compensation mechanisms should also include the acceptance of a negotiated number of EFM, who are de facto obliged to leave their communities due to the irreversible effects of CC. Within this new environmental ethic, a constructive bilateral cooperation could emerge, benefiting both nations and setting an important example for a peaceful conflict resolution agenda and the preventive management of a potential complex emergency process. Both countries and their people are interested in a widening and deepening security policy

that incorporates economic, environmental, and societal dimensions, as well as the shifting of the present military budget towards sustainable social and environmental development (Oswald Spring/Brauch 2011).

However, such a shift in policy is highly unlikely as long as the present world view of scientists prevails, and while they focus more and more on smaller segments of reality and thus become increasingly unable to integrate knowledge from different disciplines. At present the prevailing Hobbesian mindset of many policymakers and the narrow focus of 'national' security experts on the political and military dimension of security has reproduced policies that reflect strategies of 'business as usual'.

As long as a majority of scientists remain victims of their world views, reflected in theoretical and

methodological approaches aimed at the generation of even more specialized knowledge, they will remain unable to explain the complexity and the multicausality of EFM and CIM, and their links with other push and pull factors that are often economic. A more holistic scientific approach is a precondition for a wider policy response that will shift the focus from the state to human beings by 'trans-securing' EFM and CIM from issues of national and homeland or internal security towards a wider 'HUGE' approach (Oswald 2009).

However, such a process of 'trans-securing' requires a fundamental shift from the prevailing 'business-as-usual paradigm' towards a 'new sustainability paradigm' and an innovative 'political geo-ecology for the Anthropocene' (Brauch/Dalby/Oswald Spring 2011), where the social sciences must become open to reflecting the results of the earth sciences and of physical geography (geo-ecology), but where the natural sciences must also integrate into their thinking the societal and HUGE security impacts of GEC.

However, this requires new ways of thinking and action within the framework of a 'fourth sustainability revolution', similar in scope and intensity to the industrial revolution that overcame the ideological and theological domination of science in the Middle Ages, and opened the way for the fundamentally different scientific world view that has gradually evolved since the 16th century. Only by thinking within such an alternative paradigm of sustainability will it be possible to develop the sophisticated political strategies that are needed to address the causes of EFM and CIM at their origin instead of militarizing their societal consequences within the framework of the Merida Agreement.

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18 Policing Borders in a Time of Rapid Climate Change

Steve Wright

18.1 Introduction

This chapter argues that the process of securitization is already underway because of well funded and well founded concerns about internal state security and international terrorism. Security responses to climate induced migration are unlikely to be legitimated as climate security measures. They may be rather found under arcane programmes and conferences on protecting critical state infrastructure.¹ The central thesis of this chapter is that a new arsenal of technologies of political control evolved in the last century. These weapons together with new military doctrines, will result in their active deployment against civilians in new public order roles, including negative human responses to climate change.

A central tenet of this chapter is that unless the environmental research community pays more attention to the broader security architecture, it will miss the flexible state security designs which will shape many policy options in this debate too. Whilst past *Intergovernmental Panel on Climate Change* (IPCC) meetings have provided some of the best scientific data available on the complex systems dynamics of the impact of carbon emissions on weather systems, that has proved insufficient. If eventually temperature rises of 4 °C or beyond are to be anticipated then most states will be aware what that might mean in terms of negative future economic growth and the associated security implications.

This chapter explores the risk that enhanced border control and crowd control initiatives, together with the massive funding for future security technology innovations provided in the wake of 9/11, is going to be rapidly redeployed. Any such re-orientation of this security control capacity towards technically fix-

ing the ‘problem’ of climate induced migration, requires no new legislation. Anyone leaving their borders because of climate change induced weather turbulence, failure of food, water, energy and health systems or associated conflicts has no special legal status – except as a potentially illegal migrant (see chap. 17 by Oswald Spring; chap. 15 by Biermann/Boas; chap 16 by Jakobeit/Methmann in this vol.). All Western states now have well lubricated systems of preventing illegal migration, especially since many of those would-be migrants into Western Europe for example, will be non-Christian. In the current xenophobic climate, all Muslims are potentially subject to enhanced profiling associated with state security prejudice and paranoia linking that religion with a potential security risk status.

Whilst the scientific communities understand the need for sustainable solutions, recent economic, political and military crises indicate how far humankind is from achieving such governance. Poverty, water, food and fuel scarcity are part of a system of global ‘structural violence’ (Pilisuk 2008). Very poor people will bear the brunt of the consequences of climate change and they may rightly accuse their political leadership of corruption and being unmoved by the peoples fate and suffering. The convergence of such perceptions can provoke a security crisis that will despatch thousands or even hundreds of thousands of people on to the streets, as in Egypt in January 2011.² Any climate induced conflicts of the future are unlikely to be pure types but consist of a complex mixed amalgam of causes and consequences (chap. 2 by Bulhaug/Theisen; chap. 3 by Nardulli/Leetaru; chap. 4 by Smith/Vivekananda; chap. 5 by Scheffran/Link/Schilling).

However, the major thesis of this chapter is that state responses to such turmoil will converge initially around broadly similar public order policing options and weapons. If and when these fail, states may be

1 In January 2011 in the North of England, *Northern Defence Industries* (NDI) was organizing a conference for March 2011 covering “Future Threat – Protecting Critical National Infrastructure”.

2 See at: <<http://www.bbc.co.uk/news/world-africa-12308243>> (31 January 2011).

quickly tempted to field more lethal options associated with the deployment of military force. The political control technologies discussed below have not been designed to deal specifically with either climate change induced migration or for that matter, terrorism. Politically, these are flexible response weapons often used to maintain authoritarian regimes in power against the legitimate wrath of their populations (Rapert/Wright 2000). Their key rationale is to avoid giving the impression that the authorities are using excessive force but this can quickly backfire. The point of this chapter is that this would characterize refugee movements as well, many of whom would be Muslims heading North to non-Muslim countries who have perhaps xenophobic security agendas.

How probable is this? Well what must be said is that there is no intellectual consensus on the extent to which climate change will induce migration and conflicts. Many however, including senior UN staff, identify certain conflicts like that in Dharfu with climate change, because it pits farmers against pastoralists (Nordas/Gleditsch 2007). On migration, the IPCC has changed its earlier 1990 position. Raleigh, Jordan and Salehyan (2008) challenge the notion of mass migration induced by climate change, arguing most displacement so far has been internal following traditional behaviour associated with areas subjected to repetitive natural disasters. They note that people's responses are complex and mediated by perceived vulnerability and overall levels of resilience. Such conclusions are rooted in past experiences, however. Part of the uncertainty surrounding the projected social effects of climate change, is adequately modelling catastrophic change where significant percentages of a country or region's population are affected for prolonged periods of time, without any hope of external aid or intervention. Others have argued that the end of this century a quarter of Bangladesh will be inundated displacing over 15 million people - the equivalent of LA, New York and Chicago.³ What we can be sure of is that any major dislocation will bring unpredictable security issues, not just at borders, but on the streets, at food, fuel, and water distribution points; road rail and transport nodes. The accountability of the procedures made in the planning of such eventualities then becomes crucial.

If we simply allow the drift towards a militarization of future climate change response with all the social and political reductionism that entails, we will

3 L. Friedman: "Climate Change Makes Refugees in Bangladesh", in: *Scientific American*, 3 March 2009.

lose the opportunity to try to collectively manage the social and political consequences, as if people mattered. This chapter identifies the so called 'revolution in military affairs' and the need to fight asymmetrical wars with mixed populations of civilians and combatants, as a breeding ground for the weapons and systems which will face and forestall future climate induced migration. The discussion is focussed on weapons designed to be less than lethal since they will mask the level of violence actually being deployed and therefore generate less public outrage than simply deploying troops with rifles. But military supplied lethal force is always a state option if the police fail to restore order using legal means. Many of the technologies named in the discussion below, are already beyond prototype or actually being sold now on the international arms and security markets. The climate change debate has largely neglected these specific security dimensions which are traditionally associated with other agendas.

Figure 18.1: Advertising Modern Riot Control. Asia Pacific Police Expo Beijing (2008). **Source:** Photo taken by the author.



The danger is that as the economic and environmental crises deepen, journalists will simply be fed glossy images of hi-tech 'humane' control systems for pro-

protecting critical state infrastructure like borders, ports, transport nodes and various buffer zones between other countries, where human displacement has been a problem in the past. Most will miss the reality of advanced political control systems being fielded in preparation. This prospect is likely to increase if the ongoing bureaucratic capture of EU security policy by the manufacturers of such technologies continues unchecked (Hayes 2009). This chapter attempts to cover some of these developments and their contexts and justifications as well as the under explored ethical areas. Whilst the inherent difficulties in predicting with any precision how climate change will impact on future population movements, need to be acknowledged but changes in military ideologies and technologies for controlling crowds can and should be audited and legally assessed. This is not to say that such systems will inevitably be deployed in a technologically deterministic fashion. What is clear, is that not all policing is necessarily a universal social good. The military, industrial, police, university, security complex can make significant short term profit from climate induced conflict, which may unduly sway future options and choices. This chapter highlights some of these complicating, moral, legal and ethical factors. It concludes with some suggestions and mechanisms for calling such security decision making to democratic account, including the potential role of 'research activism'.

18.2 The Revolution in Sub-Lethal Military Affairs

Modern weapons have become more powerful, more precise and even more intelligent in seeking and destroying their targets. In certain areas, technological innovations have also started to erode traditional notions of what is permissible. Theories and ideas of what is fair, just and proportionate use of violence have diverged in the new rules of asymmetric warfare that have emerged in the terrorist attacks on New York of 9/11. Of course this works on all sides. The US has no competitor and to attempt to match it militarily on its own terms would be to use the words of one Chinese officer, "like throwing eggs at a rock" (Sorabji/Rodin 2006). Accompanying this trend has been a Hollywood inspired sanitization of weapons technology and its effects - some of which impose avoidable risks on enemy non-combatants. Public Relations spin has crept in. We now have manufacturers claiming their weapons are safer or more environmen-

tally friendly. For example, *Bae Systems* (BAe), is now promoting its 'green' lead-reduced bullets, its 'reduced smoke' grenades and rockets with fewer toxins.⁴

A defining characteristic of these moves is that they appear to have no legal validity. Nuclear weapons have been judged illegal but continue to be presented as the ultimate non-lethal weapon since they are deemed to deter but no longer have a believable target. They are just too disproportionate, too indiscriminate.⁵ One of the problems is that advances in technology defy our imagination as a single H Bomb can have the equivalent explosive power to all the explosive devices exploded in all wars, by all sides, since gunpowder was invented. Who can imagine that? Conversely, can a world be imagined where the targets of deadly cluster bombs can be challenged because they were not used ethically? For example, the ancient US cluster bombs supplied to Israel for the recent conflict in Lebanon were over thirty years old and well past their 'bomb by date'.

Can the ethics of war ever be tested unless there is a legal framework against which countries, commanders, combatants and corporates can be brought to account? Humankind used to think so but in a post 9/11 world that situation has become a little more elastic. However, as will be argued below, NGO's such as the *Academie de Droit International Humanitaire* (ADH) in Geneva, have recently revisited such searching questions (Casey-Maslow 2010). Firmly fitting the deployment of each variety of weapons technology into specific treaty obligations may offer a powerful legal counterweight to any panic driven response when responding to any future mass migration. But a short history of this technology may help to clarify some of the key challenges.

A wide variety of sub-lethal capabilities have now evolved, thanks both to innovation from defence companies and solicitations from government, military, police and homeland security departments. The agencies using these tools want more, since in present day contexts, they appear to offer a growing set of utilities especially in mixed civilian/combatant contexts. And yet a wide range of informed media, public interest agencies and NGO's like Amnesty International, remain implacably opposed.

One fear is that any future time of climate change will involve not only extensive migration, but rapidly

4 See for details at: <<http://www.timesonline.co.uk/article/0,,2087-2361516,00.html>>.

5 For a discussion see papers at recent ISODARCO conferences; at: <<http://www.isodarco.it/>> (31 January 2011).

increased social tensions leading to insurrection and outright insurgency as the full implications of state security programmes sink in. This chapter focuses on the intersection between new technologies, human rights abuse and the rules designed to protect civilians from all military and security force violations. This focus is frequently presented as an ethical choice in itself – a magical silver bullet, a tool from a movie, like a star trek phaser, a weapon which stuns but does not kill.⁶ Anyone fleeing future climate change and associated civil unrest may be easily redefined as targets, if they threaten border security on mass. But how could they not?

Sub-lethal weapons are easier to fire since they work on the notion of pain compliance. However, if those targeted fight back, standard military operating procedures can easily kick in justifying a lethal response, or in plain English, a massacre. And yet these developments are not originally malign in intent. A modern challenge is how the human costs of war can be reduced?⁷ Much of what has been written about emerging sub-lethal weaponry is as a benevolent alternative to lethal force. Of course the extent to which they are harmless weapons has as much to do with policy, democratic accountability and personnel training as it does with technics (Orbons 2010).

But in the next phase of the ‘revolution in military affairs’ there is a real risk that some of these weapons will be turned on the most vulnerable of human casualties of war, civilian refugees and will lend themselves to facilitating, rather than obviating, the special vulnerability of woman to the most barbaric forms of unrestrained violent male behaviour. But first it is worth looking at their recent history.

18.2.1 Evolution of Technology in Search of a New Mission: Applications, Justifications and Markets

Sub-lethal weapons started off as essentially police technologies for crowd control which had been modified from colonial policing weapons used for riot operations by military forces engaged in peacekeeping operations. The first major critique appeared in the mid 1970s by members of the *British Society for Social Responsibility in Science* (BSSRS) who defined the weapons as a technology of political control since it was capable of being modified to yield greater pain

and damage to upgrade the power of state security forces as the political situation deteriorated (Ackroyd/Margolis/Shallice et al. 1977).

The dynamics of deploying these weapons were further explored by the Council for Science and Society who in 1978 said that the risks included both proliferation, decision drift and technological creep (Council for Science and Society (CSS) 1978; Barry Rose Publishers). These notions were taken further by Wright (1998) who examined some of the political dangers of these weapons as technical fixes with a capacity to destabilize conflicts (Wright 2006), by Amnesty International (1997, 2003) who mapped their negative impacts on human rights and by Rappert (2003), who examined their role as legitimating forces.

There is actually quite a wide variety of sub-lethal weapons now available on the market. Whilst it is difficult to generalise, their essential function is a force multiplier enabling fewer officers to control significantly larger numbers of people than they could by matching numbers alone. Whilst presented as a substitute for lethal force this is rarely the case. They usually augment it and often in situations where the use of lethal force would be illegal. In countries where citizens can bear arms such as the US, or in hostage situations, these weapons can play a significant role in ending a conflict which would otherwise end in fatalities. However, when used against large crowds, the technology can yield an advanced form of repression which can break the firewall between sub-lethal and lethal force. Not all policing is a social good, and when the security forces are so minded, these weapons can become instruments of compliance to usher unwilling crowds into harms way including coercive levels of street punishment, torture, cruel and inhumane treatment and extra-judicial execution. These dangers are enhanced when new military ideologies emerge for deploying so called ‘rheostatic’ weapons or so called ‘tuneable lethality’, especially when there is a lack of clear democratic accountability. The situation changed in the early 1990s when futurologists Alvin and Heidi Toffler cooperated with Col. John Alexander, who has special forces’ expertise from the Vietnam era and science fiction writers Janet and Chris Morris. These people set about moving the debate on from sub-lethal technologies for police use to a new era of warfare, bloodless warfare where military forces shoot, but not to kill.

So called non-lethal weapons went from tactical to strategic weapons once this group had persuaded the *US Department of Defense* (DoD) about their military

6 See for example Mandel (2004: 209) for an examination of this thesis.

7 A key concern of Oxfam see Cairns (1997).

utility (Toffler/Toffler 1993). The result was a national US initiative led by the Marine Corps at Quantico and their *Joint Non-Lethal Weapons Directorate* (JNLWD).⁸

18.2.2 Securitization of Climate Change Impacts

In discussing ‘non-lethal’ weapons and the ethics of policing the tensions arising from future climate change induced conflicts, there is the risk of conflating and confusing several different areas of the use of force, namely in law enforcement, peacekeeping, military operations other than war, combat and counter-insurgency operations. These difficulties are further compounded by the fact that the police and the military are beginning to acquire similar sub-lethal weapons – but quite often their rules of engagement are subject to different legal criteria. For example, the use of chemical irritants is permissible in domestic riot control operations but the Chemical Weapons Convention outlaws such weapons for use in war.

The US so called ‘War against Terror’ has further muddied the water since the grey areas between peace enforcement, war and counter-revolutionary operations has been combined with questioning of just how applicable are the old conventions to ‘new wars.’ In the discussion which follows, an effort is made to clarify some of the various legal and ethical norms which govern the use of these technologies; the variety of equipment on the market; the ways in which some of these weapons are used and abused; together with measures which have and can be taken to control their vertical and horizontal proliferation. The budgets here are so huge for the war in Iraq and Afghanistan (The US Congress authorized US\$70 billion⁹ with at total cost of \$549 billions after 2007 appropriations – roughly \$230,000 per minute¹⁰) new testing grounds for alternative weaponry inevitably emerge. Paul Rogers (2002) has called this drift towards technically fixing the crisis in global security in the 21st Century as “liddism,” i.e. attempting to keep the lid on a political pressure cooker via “technical fixes”,

thus fixing symptoms rather than causes and this inevitably means eventually losing control.

In many senses, the US has already evolved the required forms of border surveillance it requires to police its territory and bases on land sea and air. Initially, this was via its need to police illegal immigration along its border with Mexico, and the favoured solution was unmanned aerial drones. Then armed Predator drones were deployed on military combat missions in Iraq, Afghanistan and Pakistan. Since September 2009, in a telling example of technological drift, a decision was made to deploy these Predator Drones along the full length of the Mexican Border.¹¹ NGO’s alarmed by these developments of an armed reductionist approach to illegal migration, see a new spectre on the horizon: that of fully autonomous armed algorithmic robots who as individuals or pre-programmed gangs can decide whom to kill and whom to spare, autonomously.¹²

In the meantime, the US military have gradually woken up to their coming role in climate change and entering into debate with think-tanks.¹³ In August 2008 *National Defense Industrial Association* (NDIA’s) magazine *National Defence* had a front cover on “Climate Wars – Violence, chaos fueled by global warming” and asked “Is the Military ready?” Its leader concluded that climate change, national security and energy dependence are a related set of global challenges. Unfortunately what this could mean in practice, is that military forces are deployed to fix the symptoms to provide the politicians with a breathing space to find solutions to the causes, at a future time which never arrives.

A similar process is evolving in Europe, especially in the case of the UK, which enjoys several related security information sharing agreements with the USA. Several of the borders into Europe such as Turkey and Greece as well as Spain and Morocco are infested by anti-personnel landmines and already refugees from Africa are attempting to gain entry via the Canary Islands. The process of negotiating new commercial border exclusion contracts with buffer states to Europe has already begun, a notable case in point being Libya where <www.defencenews.com reported> in

8 See the Joint Non-Lethal Weapons Programme Website at: <<https://www.jnlwp.com>>.

9 See for details at: <<http://www.fas.org/sgp/crs/natsec/RL33110.pdf#search=%22The%20Cost%20of%20Iraq%20C%20Afghanistan%20and%20Other%20Global%20War%20on%20Terror%20Operations%22>>.

10 See at: <<http://www.washingtonpost.com/wp-dyn/content/article/2006/09/29/AR2006092900425.html>>.

11 See at: <<http://www.google.com/hostednews/afp/article/ALeqM5i62b7VF4r3TUnsAGAvBsYHkGof0w>> (31 January 2011).

12 ICRAC, see at: <<http://www.icrac.co.cc/>> (31 January 2011).

13 See at: <<http://www.yesmagazine.org/peace-justice/military-leaders-call-for-urgent-climate-action>>.

October 2010 that Libya has signed a €300 million (US\$441.3 million) contract with Italy's *Finmeccanica* for a border control and security system. According to the report, "the deal between *Finmeccanica* unit *Selex Sistemi Integrati* and the Libyan General People's Committee for General Security, is split into tranches, with the first €150 million tranche of work already under way. Meanwhile, Statewatch reported that the Greek Government plans to build a 206 km long wall with its Turkish neighbour to keep out unwanted migrants based on the US and Mexico model.¹⁴

Inside the EU, new surveillance projects like IN-DECT are being proposed by commercial companies seeking to redefine the security agenda.¹⁵ At the borders, a new €20 million Talos project is seen as the solution. Talos will develop and field test "a mobile, modular, scalable, autonomous and adaptive system for protecting European borders" using "aerial and ground unmanned vehicles, supervised by a command and control centre". According to the project brief, specially adapted combat robots "will undertake the proper measures to stop the illegal action almost autonomously with supervision of border guard officers".

It has to be questioned where such scenarios are coming from. Ben Hayes (2009) from *Statewatch* pointed to the EUROSUR programme, which is an EU wide border surveillance system. Working Group 3 of the European Commission (EC) is led by Frontex, together with *Finmeccanica*, which is setting up the Libyan fence, and from 2007 it has worked with another EU defence 'prime', Thales, on maritime management. Hayes lists a plethora of security research projects under EUROSUR including STABOSEC (*Standards for Border Security Enhancement*); OPERMAR (*strategic research roadmap*); SOCBAH (Thales, Galileo, *Finmeccanica* unmanned aerial surveillance project for border control) and EFFISEC (a €16 million integrated security checkpoints project). Hayes' (2009) report NeoConOpticon analyses the way that this package is being configured with the support of satellite surveillance for border control via the European Space Agency *Maritime Security Services Project* (MARISS), providing monitoring capabilities for non-co-operative vessels. This has already begun and in November 2010 Statewatch noted that Frontex, the European Agency that

is "fighting undocumented migration" was soliciting for surveillance drones.¹⁶

In this world of state-centred EU sponsored security research, it is impossible to expect labels to accurately describe future actual deployment scenarios. For example, in Germany, the €3 million Air Shield project is ostensibly about researching and developing "drone swarm applications for 'airborne remote sensing for hazard inspection". However, Statewatch revealed that project partner Microdrone has developed a so-called Quadrocopter in conjunction with Diel BGT Defence and they have been used to monitor anti-nuclear protests in Saxonia and Lower Saxony (Topfer 2010). It is not such a big leap towards remote viewing of migration patterns towards fortified borders.

According to Statewatch, within Europe, a new system of red zones and green zones are emerging "behind integrated land, air, maritime, space and cyber surveillance systems". Crisis management missions are emerging "which make no operational distinction between the suburbs of Basra or the Banlieue; and the increasing integration of defence and national security functions at home and abroad" (Hayes 2009). What is more worrying is Statewatch's conclusion that because of processes of bureaucratic capture, it is now the EU security industrial complex, financed with large grants from the European Commission, that is setting the agenda of future EU border control and management processes, rather than politicians.

18.3 Future Area Denial Weapons and Systems

There is now a considerable arsenal of sub-lethal weapons covering a wide variety of technological devices and deployment mechanisms. These include conventional riot weapons including water cannon; kinetic energy rounds such as rubber and plastic bullets; tear gases including CN, CS, CR, OC & PAVA; malodorous substances including skunk rounds; narcotic guns based on animal incapacitation or anaesthetics such as fentanyl; electric shock weapons including stun batons, tasers and electric riot shields with induced lightning flowing down their surfaces¹⁷.

More recently this arsenal has begun to change and now incorporates sub-lethal area denial munitions such as alternative land mines including taser mines,

14 "Greece to build wall on EU-Turkey border"; at: <<http://euobserver.com/9/31588?print=1>>.

15 See at: <<http://database.statewatch.org/article.asp?aid=30086>> (7 February 2011).

16 See at: <<http://neoconopticon.wordpress.com/2009/10/03/pr-video-for-orwellian-eu-surveillance-project/>>.

Figure 18.2: Chinese Water Cannon. Asia Pacific Police Expo Beijing (2008). **Source:** Photo taken by the author.



rubber ball filled claymore mines, sphinx systems, metal-storm satellite guided virtual mine fields that target anyone crossing specified locations as observed from space; kill and stun electric fencing, robotic self deciding vehicles, drone mounted gas dispersal devices; electrified capture nets and so on.¹⁸

A third generation of technology is on the horizon which deliberately targets human pain receptors in either skin or brain. Some of this weaponry sound like science fiction but is already beyond prototype stage.¹⁹ It includes directed energy weapons including ultra violet lasers, which can ionise air so that it can

carry an electric shock over several hundred metres (currently being fielded by US company Ionatron); Vortex Ring sound projection systems built by the Fraunhofer Institut Chemische Technologie; High powered microwave systems for paralysing humans and vehicles such as the Active Denial, Vigilant Eagle and Silent Guardian systems being developed by US missile manufacturer Raytheon²⁰, Pulsed Energy Projectiles (based on a previously tunable kill laser); lightning projection weapons (being researched by German company Rheinmetall W&M).²¹ This state of the art is rapidly changing (Lewer, 2002; Davison 2009).

Other areas where new sub-lethal weapons are being spawned are in the military quest for sub-lethal

17 For a comprehensive introduction see the European Parliament, Report to the *Scientific & Technological Options Assessment* (STOA) on: "Crowd Control Technology Options For the European Union"; at: <<http://www.xs4all.nl/~ac/crowdcontrol.pdf#search=%22stoa%20%2B%20crowd%20control%20weapons%20%20%22>>.

18 For a summary see Wright (1998); and more recently: Allison, Graham and Kelley (2004); Davidson (2009); at: <http://www.cfr.org/pdf/Nonlethal_TF.pdf>.

19 For an ongoing report of current developments, see *Bradford Non Lethal Weapons Research Project* (BNL-WRP). Bradford, University of Bradford (2003); at: <<http://www.bradford.ac.uk/acad/nlw/>>.

20 See for example at: <<http://technology.guardian.co.uk/weekly/story/0,,1887256,00.html>>.

21 For a commentary on new systems see: *JNLWP newsletter*; at: <<https://www.jnlwp.com/publications.asp>>.

chemicals and biological and genomic weapons to facilitate incapacitation, interrogation compliance and public order submission (Pearson/Chevrier/Wheelis 2007). Following the disastrous loss of life during the Moscow Theatre siege in 2002 when the Russian authorities used fentanyl based derivatives without proper levels of appropriate antidotes being on hand, work has continued for chemicals which facilitate mass paralysis. Schreiberova (2005) for example, working in a hospital in Prague has undertaken research on immobilizing agents mixed with their antidotes on both Macaque monkeys and children, which would never be countenanced by medical ethics committees elsewhere.

Indeed, the *British Medical Association* (BMA), concluded in a recent report: “In a tactical situation, it is not feasible to deliver the right agent in the right dose to the right individuals in a manner that is both effective and without significant lethality.” It goes on to warn that the

“use of drugs as weapons presents healthcare professionals with a unique set of ethical considerations. Using medicines and medical knowledge for purposes such as harming or incapacitating people in combat situations has significant implications for the ethics and status of medicine and how doctors are perceived by the societies in which they work.” (BMA 2007).

This is a highly sensitive area where denials operate as a routine matter of official secrecy but the very dubious ethics which govern this work include obviating existing treaties, targeting civilians and combatants with the same weapons despite the likely hood of fatalities, generating weapons beyond the pale which select effects based on racial genotypes.²²

All new weapons technologies require resources, organizational co-operation and expensive research and development. In the US, funds have been made available by the DoD through the *Joint Non-lethal Weapons Directorate* (JNLWD), which solicits for both corporate innovation as well as commercial off the shelf products. And since its formation, JNLWD has persuaded all branches of the armed services to adopt, integrate and deploy sub-lethal weapons.²³ The EU has forged similar institutionalized research programmes with the larger multinational primes such as BAe Systems, Thales, Raytheon and Lockheed Martin, diversifying into robotics and related border con-

trol systems (Hayes 2009). It might be thought that there would be fierce competition for new markets between Europe and America, yet both have distinctive historical markets and information is actually shared via informal gatherings at conferences such as NLW at Ettlingen,²⁴ or in the case of the UK, more formally via information sharing agreements.

This chapter argues that many of these developments, far from enabling a more humane form of ethical warfare, will lead to their obviation. What follows is a discussion of the claimed role of such weapons as ethical weapons, followed by a set of examples to illustrate how these weapons are used to abuse prisoners, crowds and combatants. To understand the manner in which this technology may or will be deployed against those responding to the negative impacts of climate change, it is necessary to examine and understand how they are currently used or abused.

18.4 Ethical Weapons?

The official definition, coined by the US Department of Defense, defines ‘non-lethal’ weapons as:

Weapons that are explicitly designed and primarily employed so as to incapacitate personnel or materiel, while minimizing fatalities, permanent injury to personnel, and undesired damage to property and the environment. Unlike conventional lethal weapons that destroy their targets principally through blast, penetration and fragmentation, non-lethal weapons employ means other than gross physical destruction to prevent the target from functioning. Non-lethal weapons are intended to have one, or both, of the following characteristics: a. they have relatively reversible effects on personnel or materiel, b. they affect objects differently within their area of influence.²⁵

Whilst many of the technologies being touted for current and future crowd and area control duties are promoted on their alleged non-lethality, they are almost always backed up by more lethal weapons technology. Critics, such as (Wright 2002) and in the case of incapacitating chemical weapons (Loye 2010), have questioned this definition arguing that many of these weapons are actually capable of maiming or capable of being used to upgrade lethality and that the label is

22 See at: <<http://www.amazon.co.uk/Biotechnology-Weapons-Humanity-Malcolm-Dando/dp/0954861507>>.

23 For details see the JNLWD website; at: <<https://www.jnlwp.usmc.mil/>> (7 February 2011).

24 See at: <<http://www.non-lethal-weapons.com/ettlingen.html>>.

25 U.S. Department of Defense Directive, 1996: *Policy for Non-Lethal Weapons*. No. 3000.3 (Washington, D.C.: DoD, 9 July); cited in: Bunker (1997); at: <<http://www.angelfire.com/or/mctrl/nonlethal.html>>.

Figure 18.3: Capture Nets. Asia Pacific Police Expo Beijing (2008). **Source:** Photo taken by the author.



but a mask to make weapons appear rather to be safe. Examples of these weapons being used either improperly or beyond the limits set by their rules of engagement are provided in section 18.5 below. Are these sub-lethal, less than lethal or even pre-lethal weapons systems? Within these elastic limits the ethics of the laws of war can also become flexible.

Harmlessness is actually a much more difficult state to achieve in any weapon, depending on a complex interaction of a number of factors including:

1. An adequate technical evaluation of the characteristics of the weapons, such as muzzle velocity, concentration of a chemical irritant, pulse dynamics of an incapacitating electroshock, heating effects of direct energy waves, accuracy, impacts on human health (both short, medium and long term).
2. Whether the assertions of non-lethality are based on absolute adherence to rules of engagement re distance to the target, avoidance of vulnerable spots etc.?
3. Has the weapons system been sufficiently well designed to avoid abuse?
4. Were there sufficiently adequate quality control specifications to ensure that the weapon actually delivers technical effects as specified?
5. If a weapon is capable of delivering sub-lethal effects, are these permanently debilitating, maiming or yielding long term disablement, disease or mental impairment?
6. Are the security forces responsible for deploying the technology democratically accountable or do they have a track record of torture, grave human rights abuses and extra-judicial killings?
7. If the weapon is used in an unethical way, is there a credible legal route for seeking redress which works? (Wright 2007: 82).

The answers to these questions will determine how harmful a particular weapon system actually is. But the processes of technological, mission and decision creep should also be taken into consideration. What starts out as a relatively mundane system can gradually undergo a series of cumulative transitions into something much more sinister, which would have been rejected at the outset if it had originally appeared in that format. In the sections which follow, brief accounts

are given of specific sub-lethal technologies and the many and varied ways they can be used for delivering pain as an instrument of torture, maiming as a process of street punishment and pushing people into harms way to facilitate extra-judicial execution. There is also the vexed issue of when is a non-lethal weapon a non-lethal weapon if it isn't really non-lethal? This is not as flippant a question as it sounds since a submachine gun wounds statistically more often than it kills - is it therefore a non-lethal weapon? It is just these issues that have persuaded the *International Committee of the Red Cross* (ICRC 2006) not to judge a weapon's impact on its stated sub-lethal design objectives.

Such alleged ethical design claims will become even more important as armed robotics and self deciding algorithmic systems for border control become more prominent. Insider defenders of such developments such as John Arquilla, executive director of Information Operations Center at the Naval Postgraduate School, have been quoted as saying: "A lot of people fear artificial intelligence" but "I will stand by my artificial intelligence against your human any day of the week and tell you that my AI will pay more attention to the rules of engagement and create fewer ethical lapses than are human forces."²⁶ Critics like Noel Sharkey of Sheffield University respond that most robots have the intelligence of a fridge and can not differentiate between combatants and innocent children. The *International Committee for Robot Arms Control* (ICRAC) campaigns against the deployment of automated killing systems.²⁷

The final sections below, explore to which extent international human rights law and treaties are actually protecting civilians and non-combatants, as the technology changes and becomes more powerful and sophisticated. Specific examples of future border control systems are used to create likely scenarios for their future deployment, which would undermine, for example, the Geneva conventions, the *Chemical Weapons Convention* (CWC) and the world-wide prohibition of torture.

18.5 Use and Abuse: Past, Present and Future

The first consideration in judging the ethical use of these sub-lethal weapons is their political construction

²⁶ This quote has been cited by Markoff (2010).

²⁷ See at: <<http://www.icrac.co.cc/mission.html>> (7 February 2011).

and design. When rubber bullets were first introduced into Northern Ireland in the 1970's, the wooden colonial alternative, which had been used in Hong Kong, was rejected. This was not because Irish skulls were any thinner than the Asian variety; it was because there was a different political and legal sense of what was acceptable (Ackroyd/Margolis/Shallice et al. 1977). Soldiers put batteries and razor blades in the hollow baton rounds but no one was ever disciplined. The weapons were capable of scalping, blinding and causing internal injuries and death - results which were from credible sources, surgeons dealing with casualties in Belfast hospitals. They reported their findings to the Army, who promptly stamped secret over the report, which was subsequently leaked. The lesson from this saga is that official sources can simply not be trusted. The replacement plastic baton round was even more dangerous so the authorities could not even get the technics right. But the weapons were used for street punishment when there was not even any trouble on the street - people leaving discos or restaurants entering what the authorities had deemed to be a control zone - but didn't tell anyone.²⁸

The Patten Commission report which looked into the policing of Northern Ireland recommended a replacement of the plastic bullet.²⁹ It was typical of the failure of the authorities to control this technology that the British Army deployed a replacement outside of the committee's oversight, which was even more dangerous because of high speed ricochets than all the previous baton rounds. Indeed their rationale for replacement was safety of operatives rather than targets since the old system began to jam in hot weather causing backfire - opening up the authorities to prosecution under health and safety rules. There were many cases in Northern Ireland of these weapons being used outside of the official rules of engagement - making them highly dangerous potentially lethal devices - but no-one was ever prosecuted when things went wrong - the chosen method was to pay

²⁸ See *Campaign for the Administration of Justice* (CAJ), 1998: "Plastic Bullets: A Briefing Paper", highlighting the case for banning plastic bullets including the problems with guidelines for their use and the lack of accountability; see also CAJ (1996): *The Misrule of Law*, Report on policing of events during summer 1996 in Northern Ireland collected from first hand observer reports and eyewitness statements.

²⁹ A report of the Independent Commission on Policing in Northern Ireland (1999): *A New Beginning: Policing in Northern Ireland*: at: <http://www.nio.gov.uk/a_new_beginning_in_policing_in_northern_ireland.pdf>.

compensation rather than bring individual security force personnel to court – leading many to suggest that a culture of impunity had evolved.³⁰ Such indiscriminate use of crowd control weapons removes the people's right of assembly.

These patterns have been repeated elsewhere, for example in Miami and Seattle to punish anti-world trade meeting protests. Plastic bullets were fired at the heads of protestors contrary to all the rules of engagement. The reported police attitude afterwards was to consider people in the crowd as “scurrying cockroaches”.³¹ These dynamics need much greater scrutiny if a trend towards the industrialization of human rights violations, as human survival niches becomes increasingly challenged. Zimbardo (2007) has found evidence of what he calls the ‘lucifer effect’ at work in the micro-organisation of violence during the so called US ‘War on Terror’.

In the wrong hands, e.g. in Indonesia, where British dye filled Tactica water cannon were exported to in recent years, the marking feature was used as part of a larger capture process. Often with these weapons there is a criminal lack of imagination about how they will be actually used.³² This also applies to so-called tear gas, because in higher doses, chemical irritants cause vomiting and even death. There would be much more of a shock reaction if the newspapers said the security forces decided to use vomit gas today. It should not be forgotten that so-called tear gases were the original war gases first used to create mass casualties in WWI and more recently as the precursor to Saddam Hussein's use of nerve gas to kill thousands of Kurds in Halabja, Iraq.

A report by the Omega Foundation (2000) to the European Parliament noted that at least six EU members (Belgium, France, Germany, Italy, Spain and the UK) have exported crowd control weapons to countries, where human rights violations have been committed with such technologies, for instance to Bahrain, Egypt, Guatemala, Indonesia, Jordan, Kenya, Nigeria, Sri Lanka, Turkey, Zambia and Zimbabwe. The report also covered episodes, where sub-lethal

weapons were used along with lethal weapons – often flushing civilians into harms way.³³

When it comes to prison-use of such weaponry, there is extensive documentation of pain inducing electroshock weapons being used systematically for torture (Amnesty International 1997, 1999). Some weapons by their inherent characteristics will create permanent damage in an operational mode where they have the most severe effects. For example there is a risk of permanent ear damage when acoustic weapons are used in many of their effective ranges (Altmann 2001). Rappert (2002) has provided a more sophisticated approach to assessing what he terms affordances, i.e. perceived properties on these weapons to examine the multiple interpretations surrounding how a specific technology may be used. He provides a check list which includes nature, severity, duration, indiscriminate vs. discriminate, effects of repeated vs. single use, groups vs. individuals, reliability, gaugability and tunability, to remind the reader that assessments of features of technology are not hard and fast characteristics.

The *International Committee of the Red Cross* (ICRC) has attempted to further define, what constitutes an inherently abhorrent weapon, via its SIRUS (*Superfluous Injury and unnecessary suffering*) project. Based on the ‘health effects’ of weapons, these ICRC criteria are explicitly about foreseeable effects, e.g. superfluous injury or unnecessary suffering resulting from: (i) specific diseases, specific abnormal physiological states, specific abnormal psychological states, specific disability or disfigurement; field mortality of more than 25 per cent or a hospital mortality of more than 5 per cent; grade 3 wounds as measured by Red Cross Classifications; effects for which there is no well recognized and proven treatment (ICRC (1997)). Thus the use of mass paralysis chemicals such as the fentanyl compounds used in the Moscow Theatre siege of 23 October 2002, would breach these criteria since the lethality rate was comparable with battlefield casualties (Dupont 2003). Yet at that time, US research laboratories were actively researching so-called orphan pharmaceuticals for such calmatives (Lakoski/Murray/Kenny 2000), and the search goes on – though there is some suspicion that some of the research is currently being outsourced into East European states, like the Czech Republic.

30 For an extended analysis, See Omega Foundation (2003)

31 Fantz A. (2006) Attorney incensed after viewing FTAA police video. A police training video showed high-ranking Broward deputies laughing about shooting rubber bullets at a Coral Gables attorney at the free-trade summit in Miami. <http://www.miami.com/mld/miamiherald/news/front/15228898.htm>.

32 See http://www.zmag.org/content/print_article.cfm?itemID=3832§ionID=44.

33 See at: <<http://www.ljudmila.org/globala/knjiznica/Crowd%20Control%20Technologies.pdf#search=%22st-ate-watch%20crowd%20control%20technology%22>>.

Figure 18.4: US manufactured and banned acoustic weapon on display in China. **Source:** Photo taken by the author.



Figure 18.5: US acoustic weapon on display in China. **Source:** Photo taken by the author.



The *Chemical Weapons Convention* (CWC) has left considerable loopholes to enable the expansion of the

law enforcement clause to allow the creation of new incapacitating technologies. Indeed two influential

CBW experts have argued that the US withheld its agreement to progress the Biological Weapons & Toxins Convention was because it wanted to pursue active new programmes to deploy these technologies.³⁴ Early warnings from key scientists have already claimed emerging new paralysis weapons based on calmatives, will yield new forms of warfare. These include facilitating military ops in urban terrain, so that “access/escape routes can be blocked in building ... to ... channel movements through established firing zones, to protect areas from entry” (Dando 1996). Dando (2002) also highlighted the prospects of the Genome project being used to provide human targeting and exclusion by ethnic genotypes.

Some of the more advanced second and third generation of these weapons using pain induction almost lend themselves to mass abuse.³⁵ For example, considerable resources have been devoted into converting taser technology into an alternative anti-personnel land mine which can operate to paralyse a victim for up to 1 hour. Given the high level of pain caused by even a few seconds of taser shocks, the consequences of many minutes of shock are truly horrific, and would most likely result in post-traumatic stress disorder if not worse. Other variants of mass paralysis using induced electric shock, laser projected plasma, microwave heating of targets are entering new ground where non-combatants are opened up to the risk of street punishment or worse since many of these mechanisms have rheostatic options – so-called ‘tunable lethality’. Worse still, is the move towards area denial via robotic systems, which are victim activated. Such algorithmic systems can bypass any tribunal who would decide that indiscriminate or disproportionate force had been applied (Landmine Action 2001). Since 2009 due to the War in Afghanistan, the Obama Administration has considerably accelerated the funding, development and deployment or remote killing drones along critical borders.³⁶

18.6 Legal Controls - Necessary But Insufficient

To recap, much of this technology transcends existing notions and contexts of weapons, which violate international norms, existing conventions or international human rights legislation, but some do not (Fiddler 2001). The *International Committee of the Red Cross* (ICRC) was one of the first NGO’s to recognize that indiscriminate use of various emergent so called ‘non-lethal’ weapons, would violate the Geneva Conventions.

18.6.1 ICRC Approaches

The ICRC was particularly worried about these new weapons breaching established principles such as the clauses against weapons that: (i) cause superfluous injury or unnecessary suffering; (ii) breach the principle of distinction between civilians and combatants; and (iii) the so-called Martens Clause, which states that even when neither treaty nor customary law clearly applies, civilians and combatants remain under the protection and authority of the principles of international law derived from established custom, from the principles of humanity and from the dictates of public conscience (Coupland 1997).

Other conventions also apply to the development and deployment of this class of technology including the Ottawa Anti-Personnel Landmine Treaty of 1997, the prohibition on ‘booby traps contained in Protocol II to Convention on Restrictions on the Use of Certain Conventional Weapons of May 1996; the 1993 Chemical Weapons Conventions; the Biological and Toxins Convention of 1972; and the 1980 UN Inhumane Weapons Convention (Wallace 2002). There is considerable controversy and ICRC published an update on this question of what constitutes a prohibited weapon.³⁷

34 See at: <http://www.thebulletin.org/article.php?art_ofn=jfo3wheelis>.

35 See at: <www.statewatch.org/news/2002/nov/torture.pdf>.

36 See at: <<http://www.icrac.co.cc/index.html>> (7 February 2011).

37 ICRC (2006) which largely focuses on a legal review of new weapons, means and methods of warfare, particularly measures to implement article 36 to the Geneva protocols of 1949 which relate to new weapons, means and methods of warfare. A useful idea of how this might clarify the challenge is for example the commercially patented ‘Taser Mines’ do not have explosives and are therefore not covered by the Ottawa Treaty. They would however be covered by the provisions of article 36 against boobytraps.

18.6.2 International Humanitarian Law Approaches

This debate on *International Humanitarian Law* (IHL) and emergent disabling weapons is vital if the achievements of past decisions are to be protected on what is or is not a permitted weapon. Of course a much more detailed examination of the issues is required if existing IHL is not to be eroded by the short-sighted demands of an emergent war-fighting doctrine in a tiny minority of states.

The prospects do not look good if these debates are examined in the context of recent efforts to control the proliferation of even the most medieval military supplies, such as instruments of torture. Europe is justifiably proud of its democratic traditions. It might be thought that surely we have legal frameworks sufficiently robust to resist any border technologies capable of facilitating human rights abuse. It would be comforting to think so. It still seems astonishing that even in western liberal democracies, states have failed to prevent corporate bodies supplying torture technologies, either by sale, licensed production or via brokerage.³⁸ And even when a decision is made in principle to outlaw equipment of abuse, official foot dragging still enables business as usual.³⁹ And yet the then UN Special Rapporteur on Torture, Theo Van Boeven, in his final report identified 15 European companies manufacturing electro-shock weapons but

38 The brutal trade in leg shackles, guillotines, gas chambers, hanging ropes, gallows and electronic shock prods is not worth much monetarily. Medieval restraints such as leg-irons, are made by just 8 European companies – at least one serviced the first slave trades. On moral grounds the need for control is a ‘no brainer’. 50,000 volt pulsed shock prods symbolize human rights abuse – Amnesty International calls them the ‘universal tool of the torturer’.

39 Why did the E.C. for example take from January 2003, till the summer of 2005 to agree measures controlling technologies which facilitate execution, torture and human rights abuse? Strong lobbying by NGO’s pressured the Council of Ministers to belatedly approve diluted new export controls. Death penalty equipment and technologies which can be solely used for torture will be banned. Perhaps it was the fear of centralized Brussels controls? Earlier drafts giving the Commission ultimate oversight, were stripped out – policing of these regulations and whether some are banned or simply ‘controlled’ will now be at member states’ discretion. The UK’s House of Commons, European Scrutiny Committee, (2005): *Trade in products used for capital punishment, torture etc*, ESC, 11th Report, 2004-2005, Document Considered by Committee 15 March, para 11.5.

said a total 255 were involved in their manufacture, brokerage and distribution.⁴⁰

He was disappointed that rewritten regulations will not now cover brokering deals via ‘third countries’ – the weakest link will permit business-as-usual – especially if trade is regulated but not banned. Why does this matter? Well if the supply-lines of the crudest, medieval technologies cannot be controlled that are used to violate human rights, then prospects of controlling the really hi-tech third generation immobilizing weapons may defy existing political will and imagination – until it is too late. The EC regulations are necessary but still insufficient to address innovation in systems designed to induce compliance via pain. No one calls these products torture technologies. Instead jaw cracking Orwellian euphemisms are used, such as e.g. *electro muscular disruption technology* (EMDT; IACP 2005). Yet despite new regulations, many states just ignored them. (Amnesty International/Omega Foundation 2010).

If states are unwilling to control the grisly medieval stuff, then the prospect of humankind facing algorithmic, advanced, mass human pain inducing or rendering systems at borders, or on the streets during future military operations, may increase. Will these weapons really be legal and non-lethal – ask a lawyer to calculate what the charges would be for firing specific devices at a senior politician. Most would plump on ‘attempted murder’ rather than a charge of ‘grievous bodily harm’ (GBH)!⁴¹

The most exhaustive exploration of these legal issues to date has been conducted by an expert meeting of the Academie de droit international humanitaire AdH in Geneva, who examined a wide range of operational scenarios and specifically the general

40 UN Economic and Social Council (2004), Commission on Human Rights, Civil and Political Rights, Including the Questions of Torture & Detention – Torture and other cruel, inhuman or degrading treatment, Report of the Special Rapporteur on the question of torture, Theo van Boven, 61st Session, Item 11a,E/CN.4/2005/62, 15 December.

41 Before resigning in 2005, the Special Rapporteur expressed his concern that new products were being marketed internationally whose use in practice had revealed a substantial risk of abuse or unwarranted injury and suggested that the ‘effects of these products should have been subject to rigorous inquiries by medical, scientific and law enforcement experts who are fully independent of the manufacturers, traders and law enforcement agencies promoting them, and whose proceedings and conclusions are transparent and subject to peer review in public scientific literature.’

rules on the use of weapons in armed conflict; the use of specific weapons; international human rights law in relation to the right of life; freedom from torture; liberty and security; to protest; to health and the need for appropriate training of security officials in regard to sub-lethal weapons. It is the best source for environmentalists to check for key security dimensions, if climate change induces severe political and social turbulence (Casey-Maslen 2010).

18.6.3 Approaches From Security Industry Practitioners

This proposal is far from current practice. Indeed delegates at the Non-lethal Defence IV conference (March 2005)⁴² were advised by a representative from the Office of the Assistant Secretary of Defence for Public Affairs, to really go after their critics not to inform them.⁴³ This has certainly been the case with Taser, whose stock took a tumble after Amnesty International said their weapon was involved in over 70 fatalities in North America (Amnesty International 2004). In March 2006 Taser sued two forensic scientists who raised safety concerns. According to *The Guardian*, both men, facing legal action, say they have been putting forward legitimate technical arguments “and the company is using the courts to extinguish dissent.”⁴⁴ This is a worrying case since if successful; it introduces a precedent which could help silence future critics of the more complex technologies discussed here.

Therefore, thorough research into their effects on people, stringent training and restrictions on their transfer need to be considered (UN ECOSOC 2004). There may be some time for the law to catch up with burgeoning technological changes. A new report by Michael Crowley (2009) explicitly criticizes the *Organization for the Prevention of Chemical Warfare* (OPCW) for its failure to effectively monitor the implementation of the Chemical Warfare Convention for possible breaches in connection with incapacitating chemicals and riot control agents and its lack of formal mechanisms to receive or act upon information provided by the media, NGOs or academia. Al-

42 See at: <<http://www.dtic.mil/ndia/2005nonlethdef/2005nonlethdef.html>>.

43 See at: <http://www.bradford.ac.uk/acad/nlw/research_reports/docs/BNLWRPResearchReportNo7_May05.pdf>.

44 J. Randerson: “Stun gun makers sue experts over safety criticisms”, in: *The Guardian*, 9 March 2006.

ready such sub-lethal weapons are being mounted on robotic platforms like MAARS, which are ideal for patrolling territorial boundaries (Markoff 2010).

18.7 Critical Human Rights Perspectives

The human rights community is currently ill equipped to deal with the ethical challenges posed by this new class of weaponry. Some of this un-preparedness is simply a matter of disbelief: could things really move this fast? A few NGOs have done pioneering work, such as the *Omega Foundation* that has researched for two decades such transfers through fieldwork and Statewatch who have comprehensively documented security practices, which transgress the law.⁴⁵

Other NGOs, like *Amnesty International*, have changed their mandate in recognition of the role that military security and police technologies now play in human rights violations. However, they have their hands full simply recording existing violations and attempting to call, what it terms the pain merchants, to democratic and legal account (Amnesty International (2003, 2004, 2000, 2010). How could more experts, who are aware of some of the dangers on the horizon, network their research more effectively to make a difference?

One response was the formation of the *Threshold Group* that was launched on 31 January 2006 at Leeds Metropolitan University in the U.K., as a group of national and international experts researching unconventional new paralysing and incapacitating weapons technologies. These sub-lethal weapons, together with notions of a full spectrum dominance, tuneable lethality and layered defence pose a substantial threat to human well-being. Threshold recognized that civilian and military technical developments are enabling substantial capabilities for developing technologies of violence purportedly for reducing deaths and injury. In part, this is coupled with the institutionalization of weapons programmes, where ‘technical fixes’ are aggressively marketed. By incremental or radical change (such as those induced by anthropogenic climate change), this situation might lead to wide-ranging socio-political changes that redefine existing standards of cruelty, democracy, and undermine legal arrangements.

Participating experts realized that the existing oversight and control mechanisms are inadequate and

45 See at: <<http://www.statewatch.org/>> (7 February 2011),

in urgent need of revision. But what could be done? Concerned analysts such as those brought together by the *Threshold Group* can only be effective if their work is part of a wider capacity-building initiative which, through efficient networking, can lead to the appropriate education, awareness and policy shifts. A network of weapons' scientists working with climate scientists and activists could pool collective scientific and sociological expertise to make a difference to the public understanding of the political dangers posed by emergent unconventional weapons technologies. It can also provide technical expertise to decision-makers in order to properly evaluate the unanticipated affects of these technologies and facilitate appropriate public oversight and evaluation.

Of course the manufacturers together with the strategic deployers of these weapons will gain no strategic advantage of announcing their imminent or actual deployment. Therefore NGO groups such as *Threshold* will have a role to play in building matrices of technical questions to ascertain when or if an unconventional system has been deployed. This will become increasingly important as medical experts and pathologists are confronted with unusual injuries or symptoms. This will become apparent in regard to mass paralysis weapons using directed energy systems or the so-called whitecoat weapons, which target the bio-regulation systems of the human brain. Some *Threshold* members are analysing the extent to which incapacitating bio-weapons can afford the non-consensual manipulation of human physiology. But if genomics do open such weapons up to racial targeting (Dando 2002; Pearson/Chevrier/Wheelis 2007; Wheelis/Dando 2005): some time will pass until the law catches up with such burgeoning technological changes (Rappert 2006).

18.8 Proliferation of The Techno-Politics of Exclusion

The proliferation of this technology may rapidly accelerate as new 'homeland security' funding emerges and the processes of procuring it become further institutionalized. Part of the challenge is getting a wider audience to understand the risks but that is an extremely slow process unless the mass media become further engaged. A key growth area will be the strengthening of border controls associated with militarizing area denial systems also in response to climate change (Martin/Wright 2006).

How should NGOs, the peace research, human rights and environmental research communities respond? Some of the challenges must be met by tracking specific technological innovations then building plausible scenarios around its use. Here is a recent example from the *Guardian*:⁴⁶

Imagine you're at a protest - at a nuclear plant, perhaps, or a military installation. You approach the perimeter fence, carrying your placard. The loudhailers warn you to keep away. But you ignore them; this is a protest, after all. And then it happens. Your skin feels as if it's on fire - a burning, relentless, intense pain as if you were touching a frying pan. You scream and jump back, trying to escape the sudden agony.

Such media stories have the potential to raise searching questions in the minds of a sceptical public but much more is needed to make a difference in the cynical world of security procurement in a time of terror. Much of this weaponry seems unbelievable to an audience viewing the various systems altogether for the first time or even facing the recognition that this is not science fiction but that many of these weapons are receiving significant government grants and have already reached a status beyond prototype. The strategic military plans for such 'layered defence' approaches to state security are far more advanced than the collective political decisions which would have been necessary to obviate military action.⁴⁷

But a heavily war-censored Western media has shied away from broadcasting the modern methods of close battle combat where civilians are killed on an industrial scale whether it is in Iraq, Afghanistan or Chechnya. The methods and morality of mass civilian killings are documented by NGOs but largely hidden from the general public, which fails to understand that these human sacrifices, rapes, displacement, famine and disease have a deliberate design (Slim 2007).

What the environmental, the peace and disarmament movement have largely missed is the emergence of new military doctrines of urban warfare, which involve taking out or switching off urban spaces. The key insights have come from urban geographers, who show how western armies are transforming into high tech urban counter-insurgency forces with a specific agenda of frontier surveillance and control via tuneable levels of force (Graham 2010). New recruits are taught the ropes of urbicide via gaming consoles and

46 Wright S. & Arthur C., (2006) Targeting the Pain Business, *The Guardian* 5 October.

47 Wright S., Preparing For Mass refugee Flows -The Corporate Military Sector, in Levene, M. Pluto 2007.

such detachment can and will easily be converted into future migration management and control at borders on land, sea and air.

The international arms market has been transformed by the “War on Terror” as billions of dollars in new grants have been poured in to create innovations in security technologies of all kinds and governments have bought into this paradigm. This market is already promoted as an excellent capital investment and we can anticipate that it will rapidly reorientate and adapt to the specific requirements of border exclusion and control for states wishing to reinforce their border control operations with new equipment including security fences, unmanned aerial vehicles and armed drones and eventually robotics as well as the whole array of public order technologies and weapons.⁴⁸

One key area of rapid innovation is in robotics and IROBOT in the United States has already mounted tasers on to their robotic systems. Meanwhile new algorithms have been solicited by the Pentagon to enable packs of robots ‘to hunt unco-operative humans’. Such developments could become even more sinister if these algorithms are coupled with human heart beat detection so that sensors detect, find and immobilize any human deemed to be illegal.⁴⁹ Noel Sharkey has argued that terminator style robot guards could make civilian deaths more likely and that there should be some form of international debate and control regime on the ethics of using self-deciding autonomous killing machines.⁵⁰ Given the vast distances covered by many state borders many of these border exclusion systems can be expected to be robotized and subject to autonomous or algorithmic, semi-intelligent control by machines.

Solicitations associated with such initiatives (either by government or because of market opportunities perceived by corporate military and security players), will accelerate deployment of the state of the art innovations. We are already seeing new kinds of human neuro-muscular incapacitation technology emerge including taser shotguns,⁵¹ and portable pain beam weapons based on infra-red lasers.⁵² International arms fairs and security exhibitions from Asia Police

and Security in China, to FPED in Virginia are already there to service new security demands, displaying electrified fences, human capture nets, riot weapons and unmanned armed vehicles and robotics.

18.9 Conclusion – What Happens Next?

How will the countries challenged most by climate change respond to the societal tensions induced by its physical impacts? Should the securitization or even more so the militarization of the responses to climate change be observed and monitored? Bangladesh for example, is one of the worst affected with most of the country less than 20 feet below sea level and scientists estimate by 2050 about 15 million people could be displaced thus possibly bringing about more climate-induced migrants than any other country. India is taking no chances and has so far completed 1600 miles of a hi-tech 2100 border fence with Bangladesh, expected to be completed by March 2010, parts of which are electrified (Ahmed 2009).⁵³

Graham (2010) advocates counter-geographies to de-legitimate the power of militaries to penetrate and reorder societies en masse, from afar, through war, through ‘modernization’ (or indeed demodernization) or through the violent imposition of ‘democracy’ or ‘civilization’. Thus, it is the space in-between, where climate change and research activists can most directly challenge any military and security ‘solutions’ to climate change. Of course information alone is necessary but not sufficient. Brian Martin (2007) advocates backfire techniques to cause outrage against the excesses of any official injustices. Such techniques actively use non-violent approaches including humour to pierce the profile and strength of a political opponent and mobilize mass opposition as Gandhi did against British rule in India. In the UK, important lessons were learnt in regard to halting the official arms trade to human rights violators in the 1990’s. Powerful NGOs such as Oxfam and Amnesty International waded in with well-argued demands for tighter arms control, but very little happened. Ironically, in the UK, the most powerful ground breaking challenge eventually came from a standup comedian, Mark Thomas (2006) who said brokering modern weapons, ad-

48 See ASD Reports (2009).

49 See at: <<http://www.newscientist.com/blogs/shortsharp-science/2008/10/packs-of-robots-will-hunt-down.html>>.

50 See at: <<http://www.telegraph.co.uk/news/newstopping/politics/defence/5966243/Military-killer-robots-could-endanger-civilians.html>>.

51 See at: <<http://www.newscientist.com/article/mg20327236300-longrange-taser-reignites-safety-debate.html>>.

52 See at: <<http://www.newscientist.com/article/mg20327236300-longrange-taser-reignites-safety-debate.html>>.

53 See at: <<http://www.eenews.net/public/climatewire/2009/03/23/1>>.

vanced pain technology and small arms was so easy, a child could do it. He helped underline the point by enabling school children to set up an “after school arms dealing” club to prove it. When their TV programme was broadcast in 2006,⁵⁴ the Irish Government was so shocked it promised to bring in new legislation.

In resisting a possible militarization of climate change impacts, the role of accurate information will be vital. The well funded internal security markets can reorient their focus to newly defined security threats, including the social consequences of badly managed political responses to climate change. It is important that future debates and decisions on building sustainable futures, thoroughly examine and mediate proposed security measures early on. The key is to avoid the worst case scenarios inherent in any last ditch attempt to technically fix climate change. This dimension is likely to grow very fast as the related international crisis deepens.

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54 See broadcast channel 4, 3 April 2006. The kids were able to successfully set up brokerage deals involving weapons and torture equipment even though the stated destinations were ostensibly embargoed.

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Part V Climate Change and Security in the Middle East

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19 Climate Change on the Arabian Peninsula – Regional Security, Sustainability Strategies, and Research Needs

Dennis Kumetat

19.1 Introduction

In recent years, most Western governments have integrated climate change into their national security agendas.¹ These topics have also become of key interest on an international level, as can be seen in the envisaged new NATO general strategy² and the 2007 climate change debate in the UN Security Council.³ In June 2009, the UN General Assembly passed a resolution asking “the relevant organs of the United Nations ..., to intensify their efforts in considering and addressing climate change, including its possible security implications”, and requesting that the Secretary-General submit a comprehensive report to the next General Assembly on “the possible security implications of climate change”.⁴

That being said, the Arab states and particularly those in the Gulf region⁵ are yet to spell out these policies for their citizens.⁶ In light of the fact that these countries are likely to witness strong direct and indirect impacts of climate change in the coming decades, it is even more urgent as Gulf governments have to prepare to deal with additional stress on their already fragile political systems.

This chapter will sketch the potential implications of climate change for the Gulf countries. This will be linked to the changing security dynamics of the region, and the case of Yemen will be examined before sustainability strategies that some Gulf States are currently implementing are discussed. Highlighting a number of related aspects, the chapter will thus have the character rather of a policy brief than an in-depth discussion of one single cause or impact of climate change in the Gulf. The chapter will conclude with a substantial section identifying fields for future research into climate change and its impacts on the Arabian Peninsula.

19.2 Climate Change and the Gulf Region

The impacts of anthropogenic climate change in the Lower Gulf are already noticeable. As Riegl’s research on coral reefs in Abu Dhabi, Dubai, and Sharjah demonstrates, local marine ecosystems in the Arabian Gulf are substantially affected by climate change and must be placed amongst the “most stressed reef environments on earth” (Riegl 2003: 434). In a local climate of increasingly frequent temperature anomalies⁷, unprecedented bleaching events and a heightened coral mortality rate could have been traced. In fact, some coral species have already begun to adapt themselves to a continuously warmer climate (Riegl 2003:

1 Cf. the 2008 UK National Security Strategy or France’s national security white paper (July 2008). The Obama administration has not issued a comprehensive national strategy as yet, but US publications such as the 2007 CNA report, at: <www.securityandclimate.cna.org> (15 October 2009) recommend the immediate integration of climate change into their national security strategy.

2 Cf. de Hoop Scheffer (2008).

3 UN SC S/PV.5663 and S/PV.5663 (Resumption), 17 April 2007.

4 UN GA RES/63/281, 11 June 2009.

5 In this chapter the Gulf is defined as consisting of the *Gulf Cooperation Council* (GCC) states (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) as well as Yemen.

6 Apart from Kuwait, Oman, and Qatar, the other Gulf States (UAE, Saudi Arabia, Bahrain, and Yemen) have submitted at least one national communication to the UNFCCC. In these communications, the states assess climate change vulnerability and sketch adaptation measures. However, the security dimension remains largely unaddressed in these documents. All national communications can be retrieved from the following website: <http://unfccc.int/national_reports/non-annex_i_natcom/items/2979.php> (10 September 2010).

441). This, in addition to a projected sea level rise for the Lower Gulf of between 0.09 and 0.88 metres by 2100, sets the argumentative framework for Riegl's statement that "the Arabian Gulf perhaps provides us with some aspects which might be described as a 'glimpse into the future'". However, the author considers that these scenarios do not take into account potential climactic tipping points leading to major changes in ocean water chemistry or sea level rise.

Other authors (Launay 2006; Richer 2008) further discuss climate-related environmental risks for certain areas of the Gulf. Richer, for instance, predicts in her paper on environmental risks in Qatar major climate-change-related losses of regional flora and fauna. She states that "model predictions for temperature and humidity all show an increase for the Arabian Peninsula, the only question being how large a temperature increase" (Richer 2008).

Apart from potentially devastating effects on the non-human environment, it is justifiable to predict in line with the *Intergovernmental Panel on Climate Change* (IPCC 2007) and other key meteorological models (Met Office 2009) that climate change will place additional stress on the regional political and economic systems in three ways:

Initially, a decrease in precipitation in combination with a projected temperature rise of 1.8°C by 2040 and 3.6°C by 2070 (Met Office 2009) will render even wider areas of the Gulf States unfit for agriculture and uninhabitable for a non-nomad population. Richer's observation of the phenomenon she calls "desertification in the desert" (Richer 2008: 8) will undoubtedly be witnessed. This will raise the stakes for existing water supplies in the region, accelerating the depletion of non-renewable saline aquifers. Most fossil water resources on the Arabian Peninsula are between 10,000 and 30,000 years old. With domestic water use in the Gulf currently about six times the natural renewal rate, here also the question seems to be *when* rather than *if* aquifers deplete (Brook/Al Houqani/Al Mugrin 2006).⁸ Already, their over-exploitation has resulted in an increase of salinity levels in groundwater from saltwater intrusion and made desert springs disappear on the Peninsula. Water tables have dropped sharply as demand from rap-

idly urbanizing and industrializing populations has outstripped supply from fossil water and local aquifers (Raouf 2009a). Currently, more than half of the water used originates from desalination or wastewater treatment. However, in the mid-term perspective, the growing freshwater demand of the region cannot be sustained by reliance on fossil water reserves, which is why both the relative and absolute amounts of desalinated water are going to rise. The 15 desalination plants that are currently operating in the GCC on the Arabian Gulf alone are already having adverse environmental effects such as releasing gases, hot brine, treatment chemicals, and other trace elements. Next to the production costs⁹ and carbon emissions of this energy-intensive industry, their impact on marine life might become a liability. Abderrahman and Husain (2006) demonstrate in their study the devastating effects of hot water release by a power plant and a desalination plant in Kuwait.

A second likely climate-change-related impact, rise in sea level, could threaten up to 15 km of coastline in Bahrain (Raouf 2008) and endanger the reclaimed islands and buildings in the coastal areas of the Lower Gulf, especially in the United Arab Emirates (UAE). This will put further stress on the already existing socio-economic and demographic fault lines. Increased and more dangerous river (*wadi*) flooding, a major problem in many parts of the world, is not of key concern to meteorologists. However, sudden, locally contained floods might still occur, particularly if the oceanic changes lead to more frequent and intensive storms in the coastal regions (Met Office 2009).

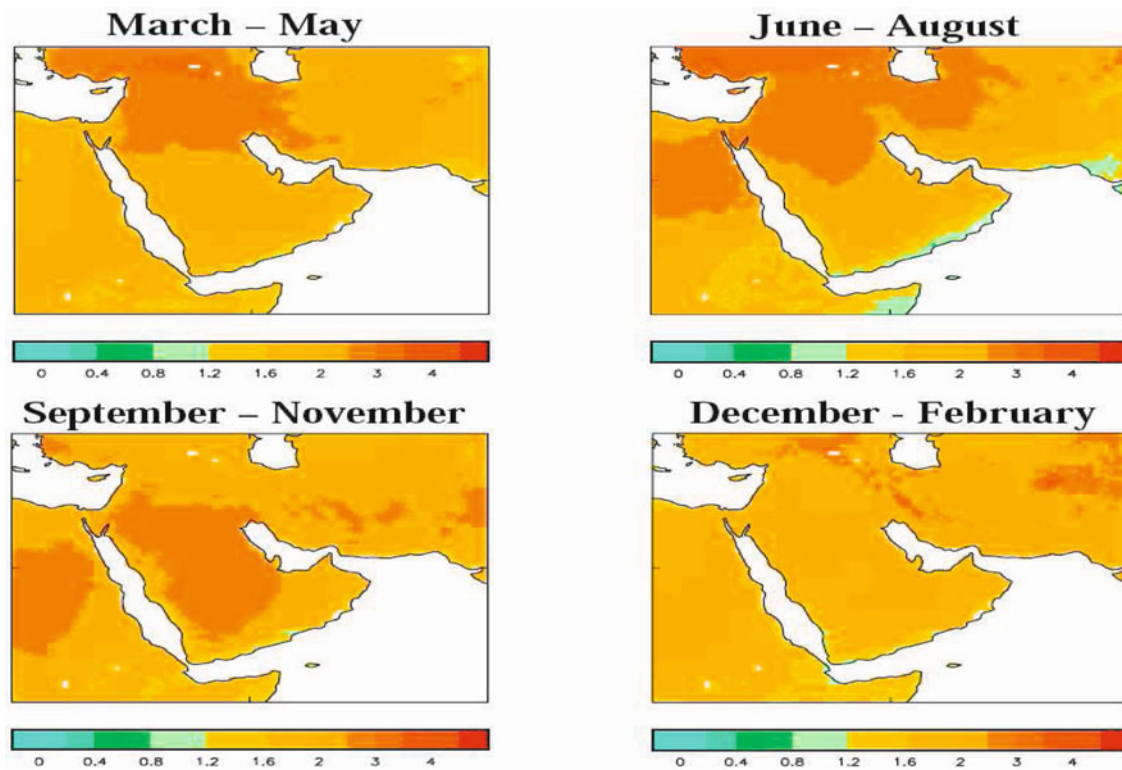
Thirdly, next to these endogenous stress factors, the geographical position of the Gulf needs to be taken into account. The densely populated, poorer,

7 In 1998, average temperatures exceeded 37.3°C in central regions of the Gulf, more than 2°C above average. This was the largest temperature rise in the southern Gulf since 1870 and emphasizes the increase in sea surface temperature in the Gulf of at least 0.2°C per decade over the last 50 years (Richer 2008).

8 It should be noted that the fossil water reservoirs in the Gulf are significantly smaller than in North Africa. Thus, mega-projects like Libya's 'Great Man-made River' tapping the world's largest fossil water reservoir in the Nubian sandstone aquifer system - a source that can supply Libya's urban centres with water for between 100 and 1000 years - cannot be realized on the Peninsula. This is not to suggest that the realization of such a project would be particularly desirable. However, in the Gulf, it is not even possible from a resource perspective. For more information on Libya's project, cf. at: <<http://www.water-technology.net/projects/gmr>> (1 October 2009).

9 By 2020, Saudi Arabia alone will have invested US\$50bn in desalination projects, while an overall investment volume of US\$200bn has been earmarked for water and energy infrastructure projects. Cf. *The Saudi Gazette* (1 May 2008).

Figure 19.1: Changes in Regional Climate Model projections of seasonal average temperature (°C) across the Gulf region for the 2040s relative to the 1990s. **Source:** Met Office (2009).



and conflict-prone neighbouring regions of North and East Africa will face harsher consequences than the Gulf economies, and this might cause destabilization and potentially also violent conflict and mass migration. Additionally, weak governance structures and much smaller funds will prevent the regional governments from developing robust adaptive capacities to effectively cope with such situations.¹⁰ It is not clearly foreseeable as to how far the GCC states are able to develop these capacities for their own states (Spiess 2008; chap. 20 in this vol.), but chances are that the funds of the GCC states will at least have an impact on the preparedness of worst-case events and resilience to worst-case scenarios.

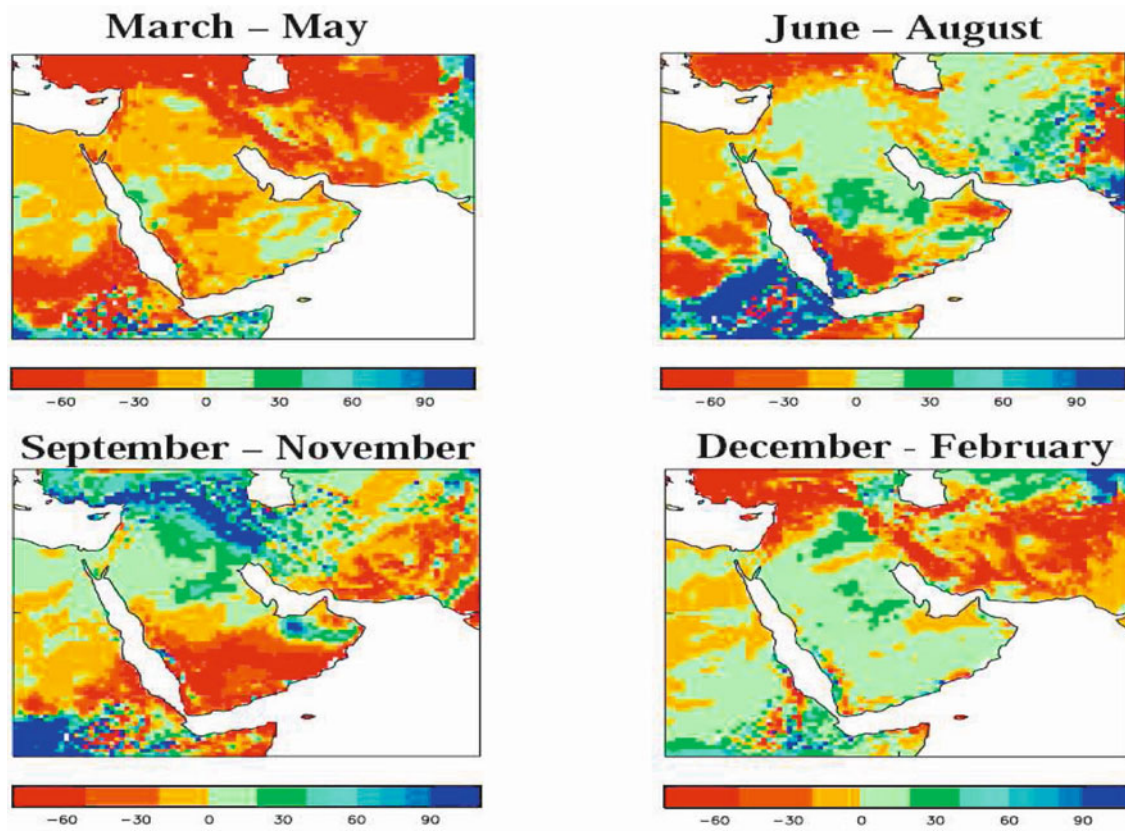
Egypt can be presented as a showcase scenario: a possible increase of the average temperature by 3 to 4 degrees would raise the sea level by approximately

one metre, creating up to 6 million migrants from the densely populated Nile delta region. Even a sea level rise of 50 cm could lead to up to two million refugees and cause up to US\$35bn economic losses (UNDP 2009: 49)¹¹. Any such waves of migration and food shortages will form a major challenge to national, regional, and human security regimes in North Africa and in the Horn. African urban centres could become ever more overwhelmed by both the immediate effects of climate change and by a stream of refugees from regions that can no longer sustain people's subsistence through agriculture (Brown/Crawford 2009). As various other studies show (Morton/Boncour/Laczko 2008; CARE International 2009), the multifaceted problem of climate-change-related human displacement (with the legal question of whether to

10 Admittedly, it is uncertain and methodologically difficult to scope exact socio-economic and political developments in two or three decades as too many unknown variables blur the picture. It seems however not unlikely that some aspects of the scenarios discussed below will actually materialize and that certain destabilizing phenomena will indeed have spillover effects on the Gulf region.

11 These figures seem to be more balanced than the numbers quoted in a recent study by CARE International, (CARE 2009: 17; based on Afifi [2009]). In this publication, it is claimed that an area of 518,000 ha and living space for 10.7 million lives would be inundated by a rise in sea level of two metres. This calculation may well be correct, but the likelihood that the sea level of the Mediterranean will rise by two metres within this century is rather small.

Figure 19.2: Changes in Regional Climate Model projections of seasonal precipitation (mm/season) across the Gulf region for the 2040s relative to the 1990s. **Source:** Met Office (2009).



classify these people as merely economic migrants or as refugees with a particular set of rights to UNHCR support) caused by heightened stakes for local resources and accompanied by an increased probability of violent conflict has already begun, with consequences that have yet to be mapped out.

This potential influx of large groups of the population attempting to reach the oil states would place exogenous stress factors on the Gulf region. As is the case today with Yemen and Iraq, refugees may attempt to identify the weakest spot in the Gulf security umbrella to enter the Peninsula (Leghari 2007). As in other regions affected by potential mass movements of migrants, regional decision-makers might respond with a combination of civil and military measures (Smith 2007). One could argue that the European Union is in a similar situation today and its citizens live comfortable, stable lives despite the fact that substantial numbers of migrants die on its doorstep during their journeys to the EU. Thus, there should also be no reason why a future military response by the GCC states necessarily results in related domestic unrest or economic hardship for the target countries. However,

if the numbers of refugees attempting to enter the EU were of a higher order of magnitude, this would put countries under significant pressure. In principle, such a scenario could also be applicable to the Gulf States.¹²

Lastly, it should be stressed that the projected impacts of climate change will begin to take effect in several decades. By this time, oil and gas rents for the Gulf States are likely to be on the decline either due to resource depletion or to post-fossil-fuel world energy consumption.¹³ While several Gulf diversification

¹² It remains however doubtful as to how far these gloomy scenarios are realistic. In many cases, internal refugees could have the potential to destabilize their own country, but most likely most of the weakest victims of migration would not be able to leave their countries in great numbers. Thus, the spillover to third countries might be a constant trickle of small groups over an extended period of time rather than large numbers of refugees at short intervals. Albeit to the cost of the refugees, such a situation would be much easier to contain for 'receiving' states and would thus carry in itself much less potential for the destabilization of third countries.

¹³ Cf. the more detailed discussion of these issues below.

and sustainability strategies will be discussed below, the next section presents a concrete example of how the Gulf States are beginning to devise adaptive measures.

19.3 Strategic Overseas Investments in Agro-industry

The concern about dwindling water reserves also has implications for agro-industry in the GCC. This has recently induced Saudi Arabia and the United Arab Emirates to abandon their ambitious agricultural programmes launched in the 1970s and 1980s. These highly-subsidized schemes that made Saudi Arabia a net wheat exporter in the 1980s have been rendered ecologically undesirable and economically unattractive. While Saudi Arabia has announced that it will phase out domestic wheat production by 2016 (Wortz 2009), this does not mean that the country will entirely abandon agro-industry. Instead, this must be seen as an attempt to move away from crops with a relatively high amount of water per unit of value added to higher-value crops like fruits and vegetables in combination with upgraded greenhouse and irrigation facilities. This will result in a rising import quota for the basic foods of the population.

GCC states actively seek measures to ensure their water and food security by negotiating strategic partnerships with countries in Africa and South Asia.¹⁴ The most important partners currently are Sudan and Pakistan, followed by numerous south-east Asian (Burma, Cambodia, Indonesia, Laos, Philippines, Thailand, and Vietnam) and other countries, such as Turkey, Kazakhstan, Uganda, Ukraine, Georgia, and Brazil (GRAIN 2008).

One reason for the latest focus on food security is the recent food crisis which has led researchers to stress the future effects of climate change on global food security (Dupont/Thirlwell 2009). Gulf States like the United Arab Emirates, which import 80 per cent of their consumables, were strongly affected by the rise in prices on the world market, particularly since their dollar-pegged currencies suffered greatly from the simultaneous weakness of the US currency.

Approximately two-thirds of the severe GCC inflation is home-made, so that around one-third has been due to the weakening dollar and rising commodity prices up to summer 2008. The GCC food bill was inflated from US\$8bn to US\$20bn between 2003 and 2008 alone (GRAIN 2008).

Food inflation can turn into a source of major unrest. As witnessed globally in 2008¹⁵, a rise in basic food prices hits lower-income groups on the margin of subsistence particularly hard, pushing many below the absolute poverty line as they have to spend a high proportion of their income on food. This could become a double liability for the Gulf. Whereas the smaller Gulf States could have difficulties in coping with the underprivileged expatriate blue-collar workforce that forms the majority of these states' inhabitants, the larger Gulf States such as Saudi Arabia, where significant pockets of poverty among Saudi nationals exist, could face social unrest from within their society, rendering all measures to quell potential food riots more sensitive.

Before the current crisis, GCC administrations have reacted defensively to price peaks, using traditional measures such as food subsidies, price controls, or wage bonuses to mitigate food price effects on the population. Analysts have viewed these remedies as temporary and even as potentially accelerating national inflation. This phase, however, seems to have come to an end, with Gulf leaders pursuing a more proactive food policy by investing billions of dollars in the agricultural sector of the above-mentioned African and South Asian countries (Cotula/Vermeulen 2009). While officials have not yet spelled out the guiding principles of this new direction for GCC food policy, related high-level working sessions have been scheduled for 2010, when an official GCC food policy is to be expected.

In all likelihood, these policies will contain strong incentives for the respective partner countries to fulfil their parts of the agreements as well as robust mechanisms in case they fail to do so. From a Gulf development perspective, ensuring food security and freeing scarce water resources for domestic and industrial consumption is a legitimate goal. However, it remains

14 "Water Concerns Prompt Saudis to Cease Grain Production", in: *Financial Times* (27 February 2008); "Saudis Setting Up Fund to Buy Agricultural Land Abroad", in: *Gulf Times* (26 August 2008); "Pakistan offers farmland to Saudi Arabia, UAE", in: *Saudi Gazette* (4 September 2008).

15 In the course of the 2008 global food crisis, food riots were reported from many countries, among them Haiti, Bangladesh, and Egypt. In Egypt, more than 200 people were arrested, cf. at: <http://blog.foreignpolicy.com/posts/2008/04/07/food_riot_watch_egypt_protests_spook_government> and <<http://www.cnn.com/2008/WORLD/americas/04/14/world.food.crisis>> (10 September 2009).

to be seen how mutually beneficial these ‘food for oil’ programmes will turn out to be¹⁶. Although GCC and ASEAN have stepped up their bilateral relations in most business-related areas¹⁷, reports of domestic ‘special forces’ that will be deployed in order to guard the farmland of the foreign investors sound particularly worrying.¹⁸

This trend has been interpreted by international organizations and NGOs with great concern. Jacques Diouf, director of the United Nations Food and Agriculture Organisation (FAO) expressed the opinion: “I have no problem in Arabs doing the investment, but land is a political hot potato” (GRAIN 2008: 4).

Some Gulf experts have deemed the investment of funds in Europe and Latin America, which both boast more developed markets with greater safety of *foreign direct investments* (FDI), rule of law, and world-leading agro-industrial technologies (Woertz 2009: 240), a safer option and a diversification of investment risks. So far, however, nothing has materialized. If the Gulf States were prepared for large-scale agro-investments in developed countries, they would need to be careful not to get entangled in the web of emotionalized national food security debates in the respective target country. Only in this way can incidents like the 2006 Dubai Ports fiasco be prevented.¹⁹

16 The question of how best to develop national economies is an open one and cannot be discussed in this context. It should, however, be noted that the success of western models of development policy strongly connected with the export of western-style good governance models is debatable. A Gulf notion of development assistance might rather be closer to Chinese development concepts. These focus on China’s interests on the one hand, and infrastructure development and capital accumulation with no humanitarian strings attached on the other. Such models are also defended by Africa specialists who closely analyze the history of African oil policy (e.g. Clarke 2008).

17 At the first joint meeting of GCC and ASEAN foreign ministers in Bahrain (June 2009), ASEAN General Secretary Suring Pitsuan enthusiastically proclaimed: “You have what we don’t have, and we have in plenty of what you don’t have, so we need each other”, in: *The Peninsula* (1 July 2009).

18 The article “Saudi in talks to lease Pakistan farmland” notes succinctly: “In April, Pakistan said it would offer foreign investors one million acres of farmland for lease or sale and deploy special security forces to protect it.”, in: *Reuters* (2 September 2008); at: <http://in.reuters.com/article/southAsiaNews/idINIndia-42140420090901> (10 October 2009).

19.4 Divergent Trajectories and Security Paradigms

The GCC is by no means a monolithic bloc. Recognition of its diverse characteristics will be important in shaping strategies towards climate change and energy security.²⁰ Although all six states remain reliant on revenues from hydrocarbons, they exhibit changing political economies and different pathways toward political liberalization and economic diversification (Saif 2009). Oil rents have transformed the political economies of the GCC states and shaped their economic development over the past four decades. However, oil and natural gas reserves are not distributed evenly throughout the Gulf, and pockets of energy poverty and reliance on imported natural gas (primarily from Qatar) have already emerged. Even Abu Dhabi, which itself controls 3.4 per cent of global natural gas reserves, faces long-term shortages of gas to meet rapidly-rising domestic consumption demands, and is reliant on imported Qatari gas from the Dolphin project, alongside fellow net importers Dubai, Bahrain, and Oman (Davidson 2009).

The intra-regional distinction between energy-rich and energy-poor states will play a critical role in shaping future relations with external actors. At 2006 production rates, Bahrain and Oman, together with non-GCC member Yemen, are projected to exhaust existing oil reserves by 2025. They consequently face imminent transition to post-oil states. Redistributive states are especially vulnerable to erosion of the ruling bargain and loss of regime legitimacy if mechanisms for co-opting support and depoliticizing society begin to break down (Kaldor/Karl/Said 2007). In Bahrain, the existence of sectarian fault lines further complicates state-society relations and sharpens competition for access to resources and services (Wright 2008: 9). The situation of these countries is thus very different from Qatar, the United Arab Emirates, and Kuwait, which have projected reserves-production ratios of 62.8 years, 91.9 years, and up to 110 years respectively from 2008.²¹

19 In 2006, Dubai’s state-owned ports operator DP World purchased the management rights for 6 major US ports. This sparked a national security debate in the United States with Congress blocking the already-signed deal and DP World withdrawing its activities from the US.

20 I am very grateful for the collaboration of Dr. Kristian Coates Ulrichsen, Deputy Director of the LSE Kuwait Programme, and his extensive contributions to the sections on Gulf issues and on Yemen.

Saudi Arabia, by virtue of its size and large population, lies in a third category. The kingdom is the linchpin of the GCC, but ossified state structures and fiercely competitive and overlapping bureaucratic fiefdoms act as a powerful brake on the processes of incremental reform currently under way (Hertog 2007: 555). Existing power structures are less able to use oil rents to respond effectively to societal demands for a more equitable distribution of wealth. Per capita incomes more than halved between 1980 (US\$16,650) and 2000 (US\$7,239) and current levels of welfare redistribution are unsustainable in the longer term (Dresch 2005: 16). This reflects the scale of the demographic challenges facing the kingdom as it confronts high population growth and unemployment, alongside a significant youth bulge entering the labour market (Janardhan 2008). The ageing leadership faces the task of addressing the problems of incomplete modernization as well as ensuring that change is incremental and progressive rather than sudden, violent, and radical.

Moving beyond these differences, a number of underlying problems in all GCC states may increase their vulnerability to external shocks or stresses. These include bloated public and weak private sectors, severe deficiencies in local education systems that hinder the creation of knowledge economies, stratified labour markets, and the presence of large numbers of migrant labourers (Coates Ulrichsen 2009: 48). In November 2007, a study by McKinsey laid bare the scale of the challenges posed by mounting unemployment in the GCC as it estimated that the real unemployment rates in Bahrain, Oman, and Saudi Arabia exceeded 15 per cent.²¹ Since then, the double impact of falling oil prices and the global financial and economic crisis has jeopardized many development plans that formed the core of regional plans for economic diversification and job creation.²³

21 Figures for reserve-production ratios are drawn from the *BP Statistical Review* (British Petroleum 2008: 6). Although no figures are given for Kuwait, a similar projection made in 2006 by Christian Koch of the Gulf Research Centre estimated it at 110 years.

22 “GCC Unemployment Rates Skyrocketing”, in: *Bahrain Tribune* (24 November 2007).

23 “Questions Surround Implementation of Saudi Arabia’s Economic Cities”, in: *zawya.com* (12 January 2009); “Gulf markets plunge on disclosure worries”, in: *Saudi Gazette* (14 July 2009); “UAE banks assess Saudi exposure”, in: *The Peninsula* (17 July 2009); “Scrutiny turns to family firms”, in: *24/7 Emirates Business* (17 July 2009).

These multiple sources of human insecurity may interact with growing resource scarcities and unequal patterns of resource distribution, of which access to water and food security are the most severe. Nevertheless, the deep structural challenges posed by dwindling levels of, and unequal access to, resources will not be tackled so easily or effectively.

19.5 The Case of Yemen

Although not a member of the GCC, Yemen offers a stark example of how climate change can become an external variable that acts as a driver of conflict by placing additional stresses on existing points of weakness. With all necessary methodological caveats it could be argued that the case of Yemen offers other Gulf States the opportunity to observe the blueprint of a negative future whose elements might well also occur within their own borders. The current deteriorating internal situation is a cause and consequence of the contraction of state control and a symptom of the broader crisis of governance. Yemen is one of the poorest countries in the Middle East, with a population of 23 million and a GDP per capita in 2007 of just US\$2,500.²⁴ Its government faces a combination of armed rebellion, deep-seated socio-economic problems, and mass opposition to government policies.²⁵ The cumulative impact of poor governance and endemic corruption, inadequate economic development, dwindling oil reserves, poverty and unemployment rates of over 40 per cent, and rapid population growth forms an endemic social and economic crisis that has left Yemen perilously close to collapse (Day 2008: 431).

The Yemeni example provides an illustration of how climate change and resource depletion can sharpen tensions and exacerbate conflict over access to scarce resources. Water tables are dropping by as much as six to ten feet each year as annual rains cannot keep up with demand for water and long-term decline in rates of precipitation.²⁶ However, growing scarcities have not resulted in better regulation of water management. Instead, individuals and groups have

24 Figures taken from the CIA’s *World Factbook 2008*, at: <<https://www.cia.gov/library/publications/the-world-factbook/geos/ym.html>> (23 July 2009).

25 Intissar Fakir, “The ignored causes of Yemeni instability”, in: *Daily Star* (25 August 2008).

26 Borzou Daragahi, “In Yemen, a Race for Profit is Hastening a Water Crisis”, in: *Los Angeles Times* (3 August 2008).

rushed to extract as much water as they can in order to translate it into short-term profit, primarily through the growth of qat. This mildly narcotic plant consumes more than two-thirds of the annual water consumption in Yemen and its cultivation causes rapid soil erosion in addition to depleting scarce water reserves.²⁷

In December 2008, the then UK Secretary of State for Defence John Hutton visited Bahrain and pointedly listed climate change as one of the new threats to the GCC, along with the proliferation of weapons of mass destruction and the rise of terrorist havens in failed states.²⁸ Yemen currently meets all of these criteria and its failing political economy will be closely watched in the GCC as a barometer for the transition to post-oil economies under conditions of possible climate stress. Saudi Arabia and Bahrain especially will monitor any fragmentation along tribal and sectarian lines for indications of possible societal fracturing in their own polities. However, a much more detailed identification of the threats and challenges posed by climate change and energy insecurity must first take place in every GCC state. There is currently an acute gap in the availability of information and public awareness of climate change in the region, and its mainstreaming into policymaking and implementation is virtually non-existent (Raouf 2008).²⁹

19.6 A Sustainable Future for the Gulf?

While strategic overseas agro-investments can be regarded as a form of adaptation³⁰, these steps cannot replace much-needed mitigation measures that must also occur in the Gulf region. While the Gulf States' per capita CO₂ emissions are remarkably high (see below), the Gulf's contribution to anthropogenic climate change is small in absolute terms. Thus, a low-carbon development in the Gulf States is much more likely to be spurred (and financed) through the strate-

gic need to diversify Gulf economies. The question that seems to pose itself is: is there a realistic chance for thriving future economies in the Gulf that will cope with the internal and external pressures of climate change without exacerbating existing or future fault-lines? It is essential for the Gulf States to identify and establish forms of future wealth production that are sustainable in the long term. As is widely known, definitions of sustainability differ substantially (Neumayer 2003), and consequently so do proposed strategies to enhance it. Of the many possible dimensions of sustainability, the countries' current role in the international climate regime will be briefly presented, their educational and industry initiatives will be analysed, and selected renewable energy and energy efficiency programmes of states as part of their climate change mitigation efforts will be examined.

As mentioned, the GCC countries rank amongst the highest per capita CO₂ emitters in the world (figure 19.3, figure 19.4). Thus, for the Gulf States, sustainability in relation to climate change protection begins with cutting their carbon emissions. In spite of much criticism directed towards it, a potential method of funding this reduction would be the UNFCCC's *Clean Development Mechanism* (CDM). However, Gulf States have so far failed to capitalize on the incentives given in the Kyoto protocol, which they have only ratified as non-Annex I countries recently³¹. So far, Qatar has submitted a proposal for its al-Shaheen oilfield gas recovery and utilization project in 2007³² and the UAE's Masdar Carbon unit is also active in that field. In the international negotiations of 2009, Saudi Arabia in particular has attempted to stall the current post-Kyoto process, mainly by quoting existential economic concerns and attempting to undermine the scientific basis of climate change science (Depledge: 2008). A stronger cooperative role from the Kingdom – and the region as a whole – would certainly be welcomed by the international community. The chances for the oil states to co-develop the post-Kyoto (and post-Copenhagen) climate regime are important and should not be easily dismissed (Luomi 2009, 2010).

27 Fakir (see footnote 25) ignored the causes of Yemeni instability.

28 "Terrorism, Nuke Arms Spread, Climate Change Key Challenges in Gulf Region", in: *Kuwait News Agency* (14 December 2008).

29 The recent attacks by Yemeni Hothi insurgents on Saudi military at the heavily fortified Saudi-Yemen border is not immediately related to climate change. However, it clearly shows future military fault lines on the Peninsula. "Offensive to continue till intruders retreat: Prince Khalid", in: *Saudi Gazette* (11 November 2009).

30 See the reference to food security in the UAE's 2nd National Communication to the UNFCCC in 2010.

31 Qatar, the UAE, Saudi Arabia, Oman, Yemen, and Kuwait in 2005; Bahrain in 2006; at: <http://unfccc.int/files/kyoto_protocol/status_of_ratification/application/pdf/kp_ratification.pdf> (2 September 2009).

32 This CDM project is of a large size with a targeted reduction of 2,499,649 metric tonnes CO₂ equivalent per annum; at: <<http://cdm.unfccc.int/Projects/DB/DNV-CUK1162979371.3/view>> (2 September 2009).

Figure 19.3: Per capita CO₂ emissions in 2004. **Source:** Hertog and Luciani (2009).

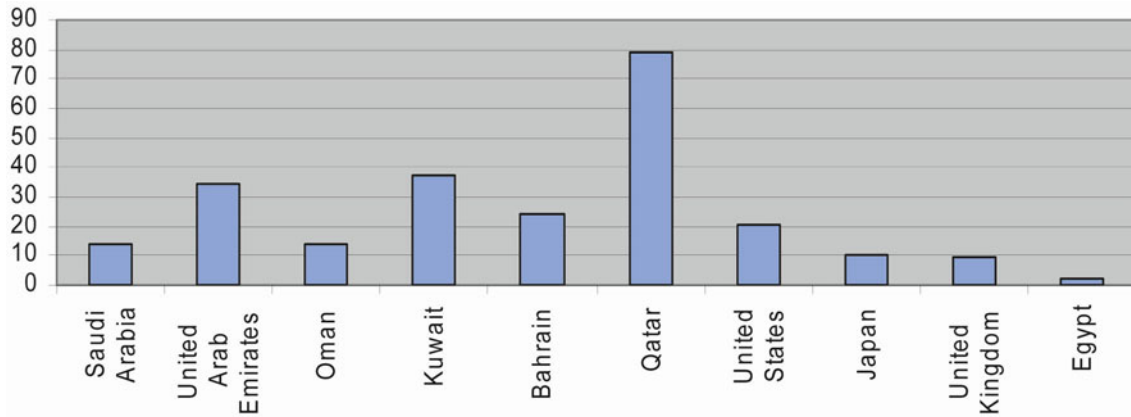
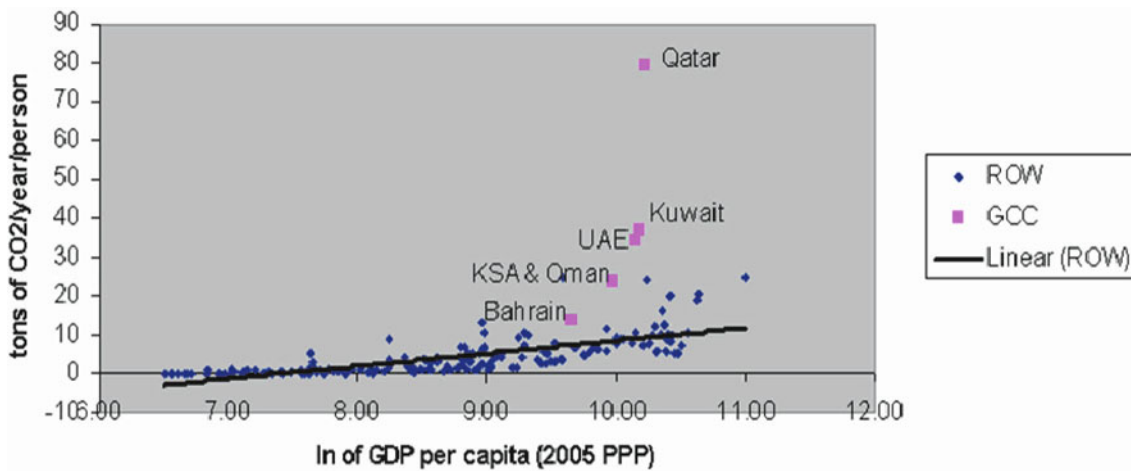


Figure 19.4: 2004 GCC CO₂ emissions relative to GDP. **Source:** Hertog and Luciani (2009).



In terms of industry policy, Gulf rulers have not been idle and have announced various plans to diversify their economies. Numerous initiatives for a more sustainable future of the Gulf States have emerged, the most comprehensive being the ‘future strategies’ of Qatar, Oman, and Abu Dhabi (Qatar National Vision 2030; Oman 2020; Abu Dhabi Economic Vision 2030, Plan Abu Dhabi 2030). There has been a special focus on the attempt to create a rise in the value chain of domestically produced petrochemical products (Shochat 2008). In particular, Saudi Arabia has announced a multi-billion-dollar infrastructure investment programme including the two newly-founded industrial cities of Yanbu and Jubail, which are meant to become centres of Saudi Arabia’s trade and upgraded polymer production (Dill 2009). In the field of research, the newly established *King Abdullah University of Science and Technology* (KAUST) attempts to set new standards in regional science education. This domestically much-loathed institution promotes co-education

and allows women to drive their vehicles on campus. It is a direct competitor to Qatar’s Education City and various UAE-based attempts to put the country on the map for world-class research and tertiary education.³³ Time will tell whether these institutions will generate sufficient research output and succeed in attracting a critical mass of high-calibre Arab students and faculty to compete with the American Universities in Beirut and Cairo and renowned institutions of higher education worldwide.³⁴

33 For an in-depth discussion of higher education in the Gulf cf. Davidson and Smith (2008).

34 It is noticeable that Gulf research institutions streamline science and technology research – arts and humanities are not nearly as high on the research funding agenda. Bearing in mind that the majority of modern Muslim thinkers and politicians have a science education, it would be premature to conclude that no social change could be triggered by graduates of these institutions.

In theoretical terms, many Gulf innovation processes can be described by the concept of strategic niche management (Kemp/Schot/Hoogma 1998) attempting to induce socio-technological change bottom-up in order to prepare and instigate change on a technological regime level. This reading is parallel to Hertog and Luciani's description that government-sponsored Gulf innovation typically takes place in protected environments, in specifically designed socio-political spaces in which hand-picked, often foreign researchers or executives are to register significant progress. This is often made possible by the strong personal support of a member of the ruling elite, allowing the respective undertaking to become an "island of efficiency" (Hertog/Luciani 2009). Under this special protection, shielded from competition, and with robust financial support, they are able to bypass inefficient administrative procedures and fast-track the development of their respective niche. However, what remains uncertain is whether these "islands of efficiency" have the power to feed their innovative dynamics back into the Gulf socio-technical regimes beyond the protected niches, inform policy processes, and develop significant momentum for progress. If not, O'Riordan's dictum could still be valid today. He characterized innovation as the "handmaiden of control of the elites" (O'Riordan 1981: 379), designed to contain rather than to trigger innovation.

A further way to reduce carbon footprints and to boost industrial innovation is the use of renewable energy sources. Oman and Saudi Arabia have recently begun to explore renewable energy power production.³⁵ In May 2008, the Authority for Electricity Regulation issued a major study on renewable energy in the country, assessing suitable technologies, locations, and policy instruments (Authority for Electricity Regulation, Oman 2008). Saudi Arabia has also stepped up its efforts in that regard by announcing the new King Abdullah Nuclear and Renewable Energy City, but no official plans have been published at the time of writing.

However, the best-known renewable energy initiative in the Gulf is undoubtedly Abu Dhabi's Masdar Initiative. It has been received very warmly by politicians, academics, and industrialists, some researchers even characterizing it as a "new paradigm for environmental policy in high-income countries" (O'Brien/Keivan/Glasson 2007). Launched in 2008, its blend of industrial initiative, research centre (*Masdar Insti-*

tute for Science and Technology [MIST]), and architectural novelty (the design of the world's first entirely carbon-free city (Reiche 2010), housing the newly-founded *International Renewable Energy Agency* (IRENA) is truly exceptional. The projected overall investment for Masdar City is US\$22bn, in addition to US\$15bn for Masdar renewable energy projects, which the state hopes will lead to international joint ventures channelled through the Masdar Initiative, a company established to develop and commercialize clean energy technologies. In cooperation with Credit Suisse and *Mubadala* (Arabic for 'exchange'), one of Abu Dhabi's smaller dynamic *Sovereign Wealth Funds* (SWFs), the Masdar Cleantech Fund also invests overseas, e.g. in the German state of Thuringia a PV plant has been constructed for US\$230m as part of a total of US\$2bn planned PV investments. At the same time, Masdar has announced a joint venture with the Finnish wind turbine producer WinWinD to set up business in Abu Dhabi through a €120m investment in the company.

However, Masdar could become an example of the domestic containment of innovation rather than its spread. Albeit an initiative of impressive size and dimensions, it could eventually become extremely difficult to alter path dependencies over the long term in the power sector and in the very structure of energy production in the UAE and the Gulf States as a whole. Spillover effects on the domestic system of power production are yet to be noted. Moreover, in view of the fact that in line with the country's nuclear white paper (Government of the United Arab Emirates 2006), the UAE have commissioned Korea's KEPCO (*Korea Electric Power Corporation*) to construct four 1,500 MW nuclear reactors by 2020 (Schneider/Steve/Frogatt 2009: 26), Masdar might become an asset for country marketing, yet just a fig leaf for renewable energy policy. The relationship between Masdar and nuclear energy is particularly challenging since Hélène Pelosse, the former director general of IRENA, has explicitly excluded any promotion of nuclear power through this agency.³⁶ This should be seen in the context of the overall rise of civil nuclear programmes in the region (IISS 2008; Jackson 2009).

Researchers have voiced criticism towards the Gulf's energy efficiency initiatives, undoubtedly one of the best and easiest forms of mitigation of carbon emissions. Supersberger, Tänzler, and Kumetat et al. are rather pessimistic about the UAE (Supersberger/

35 Cf. "Aramco, Show a to study solar power plan", in: *AME Info* (25 June 2009).

36 "IRENA will not support nuclear energy, says chief", in: *Khaleej Times* (30 July 2009).

Tänzler/Kumetat et al. 2009) while others concede that “GCC countries face the quality/price trade-off dilemma in many areas ... with the exception of industrial investment, the preference for cost minimization has almost always prevailed” (Hertog/Luciani 2009).

Another potentially new method of energy-related income generation is *Carbon Capture and Storage* (CCS). Many regional oil producers, particularly Saudi Arabia, promote CCS as part of a post-Kyoto climate agreement. Former or nearly depleted oil and gas formations are generally regarded as potential storage facilities, and geological research has found that Omani peridotite is particularly capable of absorbing large quantities of carbon (Kelemen/Matter 2008). *Petroleum Development Oman*, the country’s national oil company, has expressed interest in an exploratory study.

Petrochemicals, trade, utilities, large-scale energy-related goods in combination with rather uncritical paradigms of growth and market performance – these areas have become the key vehicles of Gulf innovation and sustainability policies. Climate change in the Gulf ought not to have too many direct implications on these businesses. However, these models strongly capitalize on comparative advantages that can only be played out in a globalized economy where carbon intensity in production and transport processes plays but a little role. The Gulf would be truly hit should these product characteristics be priced into goods in the future – as indeed many scholars suggest.

19.7 Future Research Agendas

The need for further research can be identified in all areas that this chapter has touched upon. The following is therefore merely a sketch of potential topics and by no means exhaustive.

With regard to climate change research: while, largely thanks to the IPCC and the multitude of in-depth studies it uses, the global and continental effects of climate change are well-known, the question of downscaling remains an issue. In order to inform national policy – particularly in a world region where there are many doubts about the validity of climate change science as a whole – maps and climate model results of all kinds need to be as localized and as exact as possible.³⁷

The vulnerability of infrastructure, investments, and the man-made islands in the UAE and the smaller Gulf States should serve as an enticing incentive to study the local and regional effects of climate change

in greater depth. Moreover, the broader influence of climate change, a greater likelihood of extreme weather events, and even less annual precipitation should trigger more research about climate change impacts on Gulf economies, industries, urban centres, and development plans as a whole. Innovative research in that field could serve as an excellent field for all the newly-established Gulf institutions of higher education to put themselves on the map. The financial backing for such projects should not be an issue in this region: next to Gulf governments who could polish up their profiles by Masdar-style climate-related projects, an ambitious sovereign wealth fund could use this opportunity to dedicate a minor part of its assets and fund an ambitious research project with a Stern-Report-like impact on policies in the region.

A further very relevant field of research is the potential number of climate-change-related migrants, their legal status, and the sketch of an international agreement spelling out the rights of these groups and the duties of neighbouring states. So far, researchers differ greatly about the estimated numbers. As Morton, Boncour, and Laczko state:

There are currently several million environmental migrants, and this number will rise to tens of millions within the next 20 years, or hundreds of millions within the next 50 years. These figures, however, are largely the result of ‘educated guesswork’, based on extrapolations from scattered case studies and a few highly speculative academic papers. Credible, evidence-based forecasts are needed to raise awareness, analyse impacts and direct corrective action but work has yet to start on targeted research to develop valid estimates of potential migration and to correlate them with climate models and predictions (Morton/Boncour/Laczko 2008: 6).

In relation to the Gulf region, possible patterns of migration and human trafficking into the region in the case of large-scale population movement in North and East Africa will be of key interest to governments. If these movements actually take place, governments might also quietly ask for designs of military response measures to keep unwanted ‘intruders’ at bay.

Thirdly, a way ought to be found to integrate the oil-wealthy Gulf States into a global climate deal, providing them with an incentive to abandon their obstinate positions and to actively use their vast leverage in

³⁷ Bearing in mind the probability issues of downscaling, for instance, the last IPCC report’s work in UN sub-regions and continents is undoubtedly of key importance; for policymakers of small states in the Lower Gulf, this is simply not sufficient (IPCC 2007).

the region to help the rest of the Arab world agree on a post-Kyoto deal.

Since the phenomenon of large-scale international agricultural investments and land purchases as part of national food policy is rather new, research in all fields needs to progress quickly: at first, more needs to be discovered at the material level since most details of these memoranda are not open to the general public. Research needs to play its role in enhancing accountability and transparency in global agro-investments, ensuring that the mutual benefits investors often quote actually become reality. Apart from this, research into the legal status of these territories in relation to foreign national investors needs to be conducted: are they part of the national territory? Who defends them in case of conflict? What happens in case of famine in the country in which the investments have been made? Will these issues of Gulf food security trigger new conflicts because of newly-defined American-style 'vital interests'? Agricultural investments also raise pertinent questions about the definition of national sovereignty over territory since both rather well-defined terms are being deconstructed: what is territoriality in such a case, where is 'the' national territory? If this land has been bought by a foreign national government, which sovereignty will have precedence and in which cases?

In the field of research into the internal security and climate change dynamics in Yemen, concepts need to be found for an upgrade of the relations between Yemen and the GCC. For a prosperous and secure Arabian Peninsula, the goal can only be to integrate Yemen under a comprehensive regional umbrella. However, GCC states have so far shown little interest in stabilizing this failing state, knowing that such an undertaking would be a costly long-term commitment that could turn into a Gulf Afghanistan. On the other hand, if the GCC were able to stabilize its south-eastern neighbour (and the same is true for the Horn of Africa), the organization would greatly enhance its role and reputation in issues of global governance as an organization ready to take up this role and aware of the fact that it is in its own interest to invest in regional stability in neighbouring countries, if not out of humanitarianism then very much so for the sake of the GCC itself. Research concerned with developing patterns of how to empower the Gulf States to live up to such expectations would be of key relevance.

Finally, in the fields of broader Gulf sustainability and renewable energy policy, the key question is to develop strategies to undo barriers of contained inno-

vation and transitions into sustainable Gulf futures. So far, only a few policy models adapted to the GCC exist, such as Raouf's concept of economic instruments as an environmental policy tool for the GCC (Raouf 2007). Many scholars have analysed energy transition processes in European liberal democracies in order to identify and then remove structural barriers for the promotion of renewable energy in these countries (Reiche: 2004; Lafferty/Ruud 2008). In the Gulf States with their hierarchic governance structures, powerful energy ministries, and national oil companies, changes of path dependencies might not be brought about with policy instruments developed for the West. In the Gulf, personal appeals to leading figures in the ruling elite might be a more successful starting point than attempting to create pressure via the barely-existing independent public sphere. In any case, the refinement of models of sustainability transition needs to be streamlined. Also, the long-term diversification and (in part) the already-mentioned sustainability strategies of many Gulf States would warrant further scrutiny, in terms of both what visions are actually considered to be desirable and of an analysis of how far these visions are actually implemented or whether they merely serve rhetoric and marketing purposes.

On the material level, analysts should look into why the Gulf's SWFs are not more active in promoting regional development of any kind. With their major funds invested in carefully chosen projects they could spearhead technology innovations of a substantial kind and thus help bring about much-needed changes in the era of climate change.

Finally, researchers should be careful not to overlook that they are dealing with the human victims of *collectively inflicted* global climate change. The securitization of the climate change migrants or refugees discourse and the militarization of the considered response measures is a dangerous path that should be avoided. The author has, at times, taken these possible development trajectories into account because these issues need to be appropriately addressed and dealt with beforehand in order to prevent them in case of emergency. It will be one of the most challenging tasks for researchers to monitor and contribute to national discourses in such a way as to make sure that this awareness constantly remains.

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20 Environmental Degradation, Climate Uncertainties, and Human Vulnerabilities: Realm of Possible Actions toward a Shifting Security Paradigm in the Arab Gulf Monarchies

Andy Spiess

20.1 Introduction

In view of the expected persistence and resilience of the driving forces of human-induced climate change, it is generally acknowledged that even a far-reaching global mitigation effort will need to be complemented by national proactive actions towards adapting to cope with the impacts of future climate uncertainty and its imminent threat to human security. There seems to be a consensus among social scientists that without tenacious preventive measures, prolonged environmental degradation along with climate change will overstretch many societies' adaptive capacities, which may result in internal destabilization processes with diffuse conflict structures.

Particularly in the water-scarce Gulf Arab rentier economies, which have been pursuing inefficient resource allocation combined with an unprecedented population growth rate and disputed economic diversification as well as development pathways, meeting these challenges will require policies and significant societal transformations that have the potential to strike at the heart of the social contract and the redistributive mechanisms that bind state and society in this political environment. With often highly politicized data manipulation and in the absence of reliable assessments, there is a considerable need for additional interdisciplinary research on the ways environmental degradation and climate change might undermine human security in these oil economies. Thus far the level of understanding of people's vulnerability as well as their own perception of this situation are both still insufficient for the purposes of designing effective response strategies. While achieving human security¹ involves resources, ability, and rights to adapt, the deficient performance in governance continuously afflicting the region, especially in the 'voice and accountability' component, will certainly not be condu-

cive to encouraging an open dialogue to confront such sensitive security scenarios or to adopt the urgently needed 'no regrets' policy. Nevertheless, to identify possible spaces for interventions and improve governance a much deeper understanding is required of the way societies operate and the way decisions are made, instead of continuously assuming that our Western-derived standards of conduct be adopted in non-Western politico-cultural contexts.

This chapter will attempt to take a holistic and critical view by showing the multiple effects that further environmental degradation, resource depletion, and climate uncertainties will have in respect of future human security in the region, and will outline their limited adaptation capacities in the absence of an informed and enabled society. Comparative cases will be drawn from Saudi Arabia, Bahrain, and the United Arab Emirates (UAE) to illustrate some of the outstanding differences and to show that each Gulf country needs to be assessed separately. Conclusions will highlight the fact that, while the Arab oil monarchies

1 This chapter applies the broad definition of human security which has been used by the *Arab Human Development Report* (AHDR), 2009: *Challenges to Human Security in Arab Countries*. It defines the concept as "the liberation of human beings from those intense, extensive, prolonged, and comprehensive threats to which their lives and freedom are vulnerable". (UNDP/RBAS 2009: 17) Acknowledging that this concept must be dynamic, this chapter views human security as a precondition for the achievement as well as the safeguarding of state and national security. A comprehensive overview of the global discourse on the reconceptualization of security can be found in the three volumes of the *Global Environmental and Human Security Handbook for the Anthropocene* (Brauch/Oswald Spring/Mesjasz et al. 2008; Brauch/Oswald Spring/Grin et al. 2009; Brauch/Oswald Spring/Mesjasz et al. 2011).

Figure 20.1: Countries of the Gulf Cooperation Council. **Source:** GCC Network for Drylands Research and Development (NDRD).



urgently need to include these new threats in their regional security discourse, their realm of possible actions may already be trapped in a vicious circle, and most apparently well-meant suggestions will trigger a further cascade of negative effects, will take too long, or will simply be unrealistic in some of the Gulf economies.

20.2 Thematic Rationale

There is evidence that the existing progressive resource degradation in the *Gulf Cooperation Council* (GCC) member states² will not only have severe

socio-economic and environmental consequences, but will be further intensified by climate uncertainties (see chap. 19 by Kumetat).

Alongside extreme scarcity³ (UNDP/RBAS 2009: 39), prolonged water extraction, production, as well as utilization, particularly in the municipal, industrial, and highly subsidized agricultural sectors has led not only to severe groundwater depletion in both quantity and quality, but also to soil and water salinization, thermal and chemical pollution (Al-Zubari 2009: 5; Dawoud 2007: 14; Walters/Kadragic/Walters 2006: 85; Al-Kolibi 2002: 225), loss of habitat and biological diversity, declining productivity, and irreversible ecosystem degradation such as topical destruction of

2 The *Gulf Cooperation Council* (GCC) is a 'loose' political and economic alliance formed in 1981 with the main objective of confronting their security challenges collectively and strengthening cooperation. Its members include Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates (UAE).

3 Four GCC member states are rated among the 10 most water-scarce countries in the world. Kuwait (10 m³ p.a.), the UAE (58 m³ p.a.), Qatar (94 m³ p.a.), and Saudi Arabia (118 m³ p.a.) rank as the first, third, fifth, and eighth water-deficient countries respectively.

rangeland vegetation through prolonged processes of desertification (UNEP 2006: 75; Brown/Peacock/Loughland et al. 2006: 92; Erskine/Moustafa/Osman et al. 2004: 1; Al-Awadhi/Misak/Omar et al. 2003: 107). Projections indicate novel 21st-century climates for the eastern Arabian Peninsula (Williams/Jackson/Kutzbach 2007: 5739) and along with global climate uncertainties will come enormously increased risks of water scarcity and contamination, species extinction, rise in sea level, extreme weather events, aggregate impacts, and risk of large-scale discontinuities (Kotwicki/Al-Sulaimani 2009: 306). There is widespread consensus among academics that anthropogenic causes of global and regional environmental change are determined by population growth, demographic shifts, economic and technological development, cultural forces, values and beliefs, institutions, and governance structures, as well as by the interactions between all these underlying driving factors (Nelson/Bennett/Berhe et al. 2006: 2; MA 2005: 74).⁴ Understanding these mechanisms and conditions, including both past and possible future evolution, is a prerequisite for developing successful mitigation as well as viable adaptation policies that will reach their stated objectives.⁵ The challenge entails linking a broad range of actors in a variety of combinations to deal with the interrelated dynamics in a context of uncertainty (Folke/Hahn/Olsson et al. 2005: 462). Since the effects of climate uncertainties on societies and states will be mediated through existing economic, social, and political systems, an assessment of the status quo in the Gulf monarchies becomes even more essential.⁶

Policies that implicitly subsidize or even endorse an environmentally irresponsible and destructive use of resources still pervade the GCC (Russell 2009: 96; Elhadj 2006: 190), while any sustainable progress of note faces formidable political, socio-cultural, and institutional constraints on the necessary far-reaching and multi-sectoral approach to adaptation (ESCWA 2006: 9).⁷ However, adaptation will not only depend

upon the capacity of systems to adapt (Adger/Agrawala/Mirza et al. 2007: 733), but also on the recognition of the need (Burton/Diringer/Smith 2002: 155) or intent of the leadership to deploy adaptive capacity to reduce vulnerability (Adger/Vincent 2005: 403).

From a security perspective, climate change should be discussed in terms of both human security and the established field of security studies, and it should be emphasized that the probable associations between climate change and security are indirect and highly contingent on the future political decisions of Gulf regimes. The literature concerned with human security, however, tends to be dismissive of the traditional security concepts of geopolitics and nation-state and lays stress on the need to confront and resolve the challenges created by the changing nature of state systems rather than, for instance, on internal tensions, power balancing, and armed conflict. In respect of the Gulf economies, such an approach can be misleading and potentially dangerous, since the effects of climate change have the potential to exacerbate existing problems of instability. The new emerging security threats in the Gulf economies will therefore be directly and indirectly intensified by future developments in the entire Middle East region.⁸ Similarly, the solution to the problems of climate change will create novel challenges in the field of national and international security.

20.3 From 'Elusive' Development to a Shifting Security Paradigm

Mapping out the socio-political and economic variables can reveal something useful about the prospects for environmentally conscious reform in the Gulf. The first step in this process would be to demystify the false perception of political reform and development in this context. Contemporary discourse on

4 For a comprehensive overview of what the *Millennium Ecosystem Assessment* (MA) calls "indirect and direct drivers" please refer to Nelson, Bennett, Berhe et al. (2006).

5 A portfolio of strategies that represent the most successful methods for overcoming or circumventing the obstacles facing efforts to build knowledge in this area has been provided by Young, Lambin, Alcock et al. (2006).

6 Likewise, the need to conduct additional studies and develop scenarios for the Arabian peninsula was recognized by Maas and Tänzler (2009: 16) in their recent synopsis.

7 Besides multiplication, overlap, and the low level of integration of various state agencies, there is an absence of effective coordination and participatory decision-making processes, as well as dysfunctional legal frameworks, short-sighted planning, extremely low monitoring and data-gathering compliance, inefficient national research strategies, and inadequate capacity building and enabling of society.

8 These have been conscientiously listed by Oli Brown and Alec Crawford (2009) in their study on *Climate change and the risk of violent conflict in the Middle East*.

democratic transformation in the Gulf monarchies often lacks a critical assessment of the kind of progress that is taking place on the ground, whereas the process of development is overshadowed by highly politicized data manipulation and the contested reliance on human development indicators. Conversely, per capita income, life expectancy, and education do not produce an adequate indication of a society's progress or of whether this development is simply 'elusive'. If education is a question of "quantity not quality" (Lord 2008: 8; World Bank 2008: 176), 'life expectancy' merely a consequence of procured foreign skills, and finally 'per capita income' certainly not an adequate reflection of equity and freedom, the perception that comes with high-ranking development indicators should urgently be reconsidered. The distinguished *émigré* Arab economist, Sayigh, showed as early as 1991 that development cannot be bought, and warned that it must instead be soundly oriented and sought with tenacity by the society's leadership and by a people enjoying a large measure of freedom and political participation (Sayigh 1991: 148, 225). This is even more imperative when the ability to generate adaptive capacity to cope with climate change is associated with levels of national development, including political stability, economic well-being, human and social capital, and effective institutional and regulatory frameworks (Stern 2007: 488-489). When exploring how the people-centred human security approach affects the way we should think about key challenges, we should not forget that the United Arab Emirates, despite the glittering façade often associated with them, cannot sustain themselves without foreign help⁹ (Ali 2010: 166), while both Bahrain and Saudi Arabia have reached a development level that not only shows "islands of excellence" (Niblock 2007: 225), but has also produced a national human agency that is often underestimated by foreign analysts.¹⁰ Presuming that the overall adaptive capacity can be increased by enhancing the ability of both individuals and organiza-

tions to withstand and recover from negative climate impacts or shocks to the system (Lemos/Boyd/Tompkins et al. 2007: 1), such an endeavour eventually requires broad-based interaction with and participation by various stakeholders in the planning and implementation of the policy.¹¹

Furthermore, the GCC states are not as homogeneous as is often claimed in scholarly work; on the contrary, they have wide-ranging socio-economic and demographic conditions impacting on their development. Saudi Arabia is, besides being a G20 member, one of the largest countries in the world, covering an area approximately the size of western Europe. The current estimated population of 28.7 million¹² includes 5.5 million or roughly 19 per cent resident foreigners (PRB 2009: 8); whereas the archipelago of Bahrain, located off the eastern coast of Saudi Arabia, is one of the smallest countries, covering 665 km² (257 sq mi), approximately four times the size of Washington, DC and making the country smaller than the nearby King Fahd International Airport.¹³ Out of Bahrain's estimated 1.2 million inhabitants, 49 per cent are foreign nationals, while the UAE has an estimated population of 6.7 million, consisting of roughly 85 per cent expatriates.¹⁴ According to the *Population Reference Bureau* (PRB) the projected population increase between 2009 and 2050 will be 74 per cent for

9 The private sector in the UAE is staffed by 99.6 per cent foreign labour, while the public sector hosts 90 per cent expatriates (Ali 2010: 166). Given the theoretical scenario that all foreign nationals left (from south-east Asian workers to foreign experts), the country would fall into archaic disarray.

10 This aspect becomes relevant when scholarly work is not limited to detached desktop research, but has the objective of establishing a science-policy interface that will increase response capacity, encourage proactive adaptation, and mitigate environmental change in the region.

11 For an overview of the different approaches and definitions of concepts see the editorial by Janssen and Ostrom (2006).

12 By contrast, the *World Factbook 2010* published by the *Central Intelligence Agency* (CIA) presents a population based on July 2010 estimates of 29.21 million (which includes 5,576,076 non-nationals) for Saudi Arabia (CIA 2010).

13 Located north-west of Dammam (Saudi Arabia) King Fahd International is at 780 km² the world's largest airport in terms of land area - a subtle "superlative" that did not receive adequate branding - archetypal for the clandestine kingdom that prefers not to reveal its secrets to foreigners. By contrast, the United States Department of State Bureau of Near Eastern Affairs (2010a) gives Bahrain an area of 727 km² (274 sq. mi.), possible as a result of aggressive land reclamation.

14 The figures are based on estimates from *Population Reference Bureau* (PRB); United States Department of State Bureau of Near Eastern Affairs (2010a, 2010b, 2010c) (esp. for Bahrain); and the *CIA World Fact Book*. By contrast, based on the 1 July 2009 estimate by the *United Nations Department of Economic and Social Affairs* (UNDESA), Population Division Department (2009) the estimated population figures are as follows: 25.7 m for Saudi Arabia, 791,000 for Bahrain, 4.6 m for the UAE. See UNDESA (2009).

Saudi Arabia, 61 per cent for Bahrain, and 79 per cent for the UAE (PRB 2009: 7,8).¹⁵ When comparing the GDP at *purchasing power parity* (PPP) per capita, the UAE leads with US\$39,900, followed by Bahrain with US\$37,300, and Saudi Arabia with US\$20,500.¹⁶ To conclude, the Saudi economy is far bigger than any other in the GCC, producing 55 per cent of the region's total GDP (IEA 2009: 75). The scale of the economy, the physical range, and different demographics should all be taken into account when comparing Saudi Arabia with the rest of the Gulf monarchies.

The prevalent characteristics of the current Gulf Arab reality which pose serious obstacles to sustainable human development and the development of appropriate responses to environmental threats have been adequately discussed in several Arab Human Development Reports (UNDP/RBAS 2002 to 2009). This probing, self-critical look at issues such as the knowledge deficit and the weak institutional structures has engendered a hostile reaction and thereby highlighted one of the essential deficiencies in the region, namely widespread ignorance as well as misinformation, due to the identified knowledge deficit and consequent disregard for these constraints. Hunaidi explicitly warns about this in his foreword: "turning a blind eye to the weaknesses and shortfalls of the region, instead of decisively identifying and overcoming them, can only increase its vulnerability and leave it more exposed" (UNDP/RBAS 2003: III).

Ever since 9/11, while numerous Western self-proclaimed 'experts' have been debating what exactly constitutes 'political reform' in this part of the world, courageous and unobtrusive local voices have been making an effort to provide us with a clear understanding of the delusional transformation in the GCC.¹⁷ The few established foreign scholars have offered instead a careful and comprehensive analysis of the reform landscape, the current precarious impasse,

the imperatives for societal progress, and the immense challenges ahead.¹⁸ It should be noted that none of these respected authors included the progressive environmental degradation and climate uncertainties as either a security or a development challenge for the region. This is especially perplexing since the concept of 'sustainability', requiring that the three dimensions of economic growth, social development, and environmental protection must be considered in any assessment, has been around since the Club of Rome commissioned the infamous landmark publication *The Limits to Growth*, and the United Nations Conference on the Human Environment in Stockholm established a consensus on the urgent need to respond to the global problem of environmental deterioration in 1972. Certainly the evolution of a more responsible approach to development issues had many important key events and an even longer record of failures, but with the discovery that the scenarios of Meadows and his team have been relatively accurate - they relate to economic growth, trade, use of resources, population growth, and the environmental impacts listed in the Fourth *Intergovernmental Panel on Climate Change* (IPCC) Assessment¹⁹ - the question of 'environmental sustainability' deserves to be no longer ignored.

The environmental facet of development, the most salient issue facing the world in the 21st century, was featured by the *Arab Forum for Environment and Development* (AFED) in a comprehensive report in 2008. The authors note in the introduction that the unprecedented growth in the oil economies has come at a cost and they have serious concerns about the region's ability to sustain the livelihood of future generations if present development patterns continue (Tolba/Saab 2008: VIII). A year later, the complex interactions of environmental change were analyzed by leading Arab intellectuals in the Arab Human Devel-

15 Projected population change between 2009 and 2050 in neighbouring or key illegal migrant countries will be as follows: Yemen 124 per cent, Iraq 106 per cent, Palestinian Territory 140 per cent (transit via Jordan), Jordan 62 per cent, and Syria 68 per cent.

16 Data is based on estimates for 2008 provided by the CIA. The *International Monetary Fund* (IMF) provides similar data, but has Oman slightly above Saudi Arabia.

17 For Saudi Arabia see for instance Yamani and Mai: "The mirage of reform", in: *The Guardian*, 3 April 2007; at: <<http://www.guardian.co.uk/commentisfree/2007/apr/03/renovatingthehouseofsaud>> (20 June 2010), for the UAE see Al-Yousef (2008).

18 See Cordesman (2010); Peterson (2009a, 2009b); Burke (2008); Niblock (2007); Nonneman (2006).

19 In 2008 the Australian senior analyst Graham Turner, currently with the National Futures Group at CSIRO Sustainable Ecosystems, published a paper "A Comparison of 'The Limits to Growth' with Thirty Years of Reality", which compared the past thirty years of reality with the predictions made in 1972 and found that changes in industrial and food production as well as pollution are all in line with the book's scenarios of economic and societal collapse in the 21st century; see also as part of CSIRO Working Paper Series. 2008-09 [Socio-Economics and the Environment in Discussion]; at: <<http://www.csiro.au/files/files/plje.pdf>> (27 June 2010).

opment Report 2009, which argues that the concept of human security is a useful lens for viewing challenges to and envisioning solutions for human development in the Arab region and should be used as an operational tool for policy formulation and implementation. Influenced by Amartya Sen's concept of "capabilities", they define human security as "the liberation of human beings from those intense, extensive, prolonged and comprehensive threats to which their lives and freedom are vulnerable" (UNDP 2009: 2) and expand the agenda of Arab reform in an integrated manner to include such diverse challenges as water scarcity, pollution, climate change, demographic imbalances, systematic oppression, the imbalance of the oil economy, and food insecurity. The report attempts to move away from the obsolete tendency to think of security only in military or state security terms and recognizes that the security of people themselves is also threatened by environmental degradation, oppression, inequity, unemployment, and poverty. It concludes that progress in human development will only be possible in the Arab world if these sources of insecurity are addressed in a holistic manner. Khadduri, a core team member for the report, reminded readers that the fabled oil wealth presents a misleading picture of the economic situation, masking the typical structural weaknesses of many Arab economies and the resulting insecurity of countries and citizens alike. The current misperception of the Gulf states must however also be attributed to the continuous politicization of science that is principally fostered by foreigners to suit their personal or institutional economic interests as well as Western foreign policy per se. This trend is encouraged by those governments that use legal or economic pressure to influence the findings of scientific research or the way it is disseminated, reported, or interpreted, albeit to different degrees in the different GCC states.

The threat, while ignored, is certainly real, and the necessary remedies such as the scaling back of subsidies, the introduction of tariffs, taxes or charges, and major policy reforms may easily trigger social tensions and internal instability to become a conventional national security question. Existing threats to security will be amplified as climate change has increasing impacts on regional water supplies, agricultural productivity, human and ecosystem health, infrastructure, financial flows and economies, and patterns of international migration. Traditional responses to security threats cannot address the root of such problems, and related impacts could persist even if global emissions

are cut dramatically, because of the significant time lag between cause and effect.

The first scholar to provide a synopsis of the environmental aspect of human security as part of the overall concept of national security in the Arab world was Mohammad El-Sayed Selim. He concluded that Arabs need a paradigm shift toward 'securitizing' their conception of the environment (Selim 2004: 20), while Kristian Ulrichsen in his contribution "Gulf security: changing internal and external dynamics" was a pioneer in providing a comprehensive analysis of the security landscape in the Gulf by suggesting that the future will be framed by the need to find a novel sustainable equilibrium between traditional security and human security approaches. In his view a balance between "competing visions of the national and regional security architecture, between incremental reforms to political and economic structures and the deeper systemic problems which undermine long-term solutions, and between rising demands for, and falling supplies of, natural resources" must be found (Ulrichsen 2009: 30).

20.4 Setting the Frame: Social Contract, Rentier Mentality, and Disillusionment

The changing political situation in the Middle East and the scale of socio-economic problems are presenting new challenges to the modern oil monarchies. One of the factors that shaped Gulf economies in the past and continuously seems to impede political liberalization efforts is the lack of government dependence on citizen support. The major function of the authorities in this so-called 'rentier' or allocation state (Luciani 1990: 72) is to employ a policy of expenditure around its oil revenues, while the distinction between public service and private interest becomes increasingly vague. Such a system fosters a 'rentier mentality', essentially characterized by a disjunction of position and reward from their causal relationship with talent and work (Beblawi 1990: 88) and has therefore led to the emergence and prevalence of an unhealthy attitude towards the acquisition and exercise of authority, to rightful representation based on merit, to the ethical superiority of work, fairness, and equity, as well as to responsibility and freedom.²⁰

20 See Cheema (2009: 454); Noreng (2004: 11); Moaddel (2002: 377); Amuzegar (2001: 201, 217, 218); Ayubi (1999: 225).

Generally this has created a condition of ‘preference falsification’ or ‘negative consent’, in other words the decline of participation on the part of the people at large, thus resulting in a situation where citizens are sinking into a morass of individual interests at the expense of collective welfare (Noland/Pack 2007: 201; Fergany 2000: 84). Contracts are commonly awarded as an expression of gratitude rather than as a reflection of economic or environmental rationale. In extreme cases, income is derived simply from citizenship and in this respect a study revealed that a male UAE national receives an average of US\$55,000 per year in benefits from the government.²¹ The phenomenon was first studied by Zakaria, who described how rentier states frequently create a new bargain in which access to extensive social welfare programmes is exchanged for the political submission of its citizenry (Smith 2004: 233). Furthermore, it has been argued that the regional shortcomings of the education system and the low output of science²² (Fasano/Goyal 2004: 15; Nour 2005: 22) bring about many manifestations of the weaknesses of the society, but undeniably the rentier mentality would flourish and acquiesce in such a system of uncritical thinking (Fergany 2006: 33,34; Giles 2006: 28). The contemporary situation has been best described by Niblock as “primarily living in a cocoon created by apparently unearned income, divorced from the problems facing other peoples, sets a population apart from the global community – creating attitudes and mentalities out of touch with international realities” (Niblock 2007: 1). Certainly it is this internalized mentality that needs to be altered, and change will come about only if ethical and normative standards are revived and respected.

Nevertheless the performance of traditional patron-client networks and wealth redistribution is increasingly vulnerable not only to the inherent uncertainty implied by dependence on oil revenues, but also to a population explosion aggravated by structural deficiencies, environmental degradation, and fu-

ture climate uncertainties. If these new security challenges are ignored or inadequately tackled, they have the potential to strike at the heart of the social contract and redistributive mechanisms which currently define state-society relations, and will leave a legacy of fractured polities with a greater susceptibility to future external and global threats to security from issues such as climate change (Ulrichsen 2009: 20). As a consequence, all Gulf monarchies have made some progress in adopting more participatory forms of governance, even if these could easily be labelled as an exercise in political decompression designed to renew legitimacy and co-opt potential opponents in a carefully managed, top-down process of incremental change while the balance of political power remains vested in the ruling families (Yamani 2008: 144; Burke 2008: 1). Any current reform movement will be based on an objective analysis of the aspirations and desires of an influential faction in the ruling family, supported by their neo-patrimonial networks linked with the merchant middle class and powerful individuals who want to maintain a status quo that serves their interests and enables them to achieve their political and economic goals (Heydemann 2007: 15). In other words, when rulers eventually opt to promote reforms, it is not because they have come to accept the possibility of having to relinquish power one day, but rather because they want to maintain their current status (Nonneman 2006: 31²³; Neep 2004: 81; Ehteshami 2003: 81). Subsequently, if reform is defined by the redistribution of power from the centre, the question of whether any meaningful political reform has taken place in Bahrain, the United Arab Emirates, or Saudi Arabia can unequivocally be denied.

20.5 Scientific Ethics for Sale: Despotism, Profit, and the Manipulation of Science

Contemporary Gulf governments are finding themselves in a vicious spiral driven by the necessity to reduce public spending to avoid budget deficits and by the immense social pressure to provide public services. The massive state-organized welfare polity of the

21 See Brown, Matthew, 2007: “UAE's Drive for Emirati-Run Economy Is Thwarted by Handouts”, in: *Bloomberg.com*, 3 October 2007; at: <<http://www.bloomberg.com/apps/news?pid=20601085&sid=axmdijbZMj5k&refer=europe>> (21 June 2010).

22 Consequently, despite its enormous wealth and huge spending on education, the GCC region scores worst in the world when it comes to research and development, and the situation is deteriorating. This should trigger some questions about the real purpose of those foreign university campuses.

23 Gerd Nonneman describes this as a ‘divide and rule’ tactic. In Bahrain, for instance, former opposition leaders are given access to limited parliamentary institutions and hence are upgraded to stakeholders. In return they seek the favour of the ruling elites to implement their differing objectives in state structures.

past has unintentionally expanded the citizens' view and expectation of consumption, concurrently with a low personal level of commitment towards the welfare state. Any reformulation of the social contract through the introduction of complex and context-specific social and economic reforms will especially affect the younger generation who have internalized the above-mentioned 'rentier mentality' and hence take the current redistributive mechanisms and generous provision of public services for granted. With an average estimated population of roughly 50 per cent under the age of 30 in 2025 who lack any experience with the pre-oil hardships, rising income distortions, inflation, and declining individual living standards will certainly trigger frustration and open a potential challenge to regime legitimacy.²⁴ In the absence of employment opportunities and legal means of expression, and other growing socio-economic stresses, conditions will be ripe for disaffection, growing dogmatic religiosity, and eventually even a shift to radicalism.

The fact that crude oil prices more than quadrupled between 2002 and 2008 allowed the Gulf monarchies to accumulate huge capital reserves and also allowed the elites to ignore or delay some of the domestically challenging socio-economic reform measures they had contemplated, albeit to different degrees, prior to the boom. They simply resorted to substantially increasing domestic spending on current and capital expenditure by, for instance, allocating more resources to subsidies, infrastructure development, vocational training, education, and government salaries for nationals. Nevertheless, recent wealth accumulation masks mounting wealth disparities and alienation in the Gulf. This trend is particularly noticeable in Bahrain, especially between Shias and Sunnis (Wright 2008: 9; Peterson 2009b: 179), and Saudi Arabia (Champion 2003: 142), but emerging discontent can also be observed in the Emirates. Peterson concludes in his latest publication that what he refers to as the "third transformation" may be the last opportunity for these regimes to reform (Peterson 2009a: 2). Other analysts provide a much gloomier projection for the next 15 years and claim that the odds are that one or two of the states will end up with civil disorder and conflict because rulers have miscalculated the trade-offs or taken gambles that didn't pay off. In these pessimistic scenarios, authoritarian leaders will

24 By contrast, Basedau and Lacher (2006: 16) identified this downward trend in stability as a result of a poorly-managed rapid population growth only for Saudi Arabia.

fail to prepare their bulging populations to participate productively in the global economy, regimes will hold tightly to power and become even more repressive, and regional conflicts will remain unresolved as population growth strains natural resources that are further diminished by climate change (NIC 2008: 64). Regrettably, the first signs of this worst-case scenario were already witnessed in the form of a recent "fierce deterioration of the freedom of expression" in Bahrain and the United Arab Emirates according to the latest World Press Freedom Index 2009 (RWB 2009: 1).²⁵ Based on the latest *Worldwide Governance Indicators* (WGI), the situation is further deteriorating in the 'voice and accountability' component, which measures the extent of basic civil liberties, political and human rights, and media freedoms (Kaufmann/Kraay/Mastruzzi 2009: 80, 82). The latest Arab Human Development report continues to highlight the spectrum of interlinked deficiencies that retard meaningful and sustainable Arab development by emphasizing the role of the behaviour of the state security sector. As Al-Rasheed, a Saudi professor at King's College in London, notes: "The civil state ruled by laws that respect human rights is the best guarantor of human security. In the Arab region, states are far from this ideal."²⁶

This orientation towards growth, instead of sustainability and basic civil liberties such as freedom of speech, press, assembly, and association, was demonstrated by the Emirates when confronted with the consequences of the global economic recession in a display of extreme media censorship (Ali 2010: 56-59; Davidson 2009: 13), threats, and intimidation towards any criticism from foreign scholars and especially against the national intellectual elite that refuses to be coerced by the government. Al-Yousef, a prominent

25 According to Freedom House's Freedom of the Press index in 2009 all three countries fall into the category "not free" (Freedom House 2009); at: <http://www.freedomhouse.org/uploads/fop/2009/FreedomofthePress2009_MOPF.pdf> (23 June 2010). For the situation in the UAE see also *Arabic Network for Human Rights Information* (ANHRI): "United Arab Emirates: Freedom of expression is missing despite a decision banning imprisonment for press crimes", 27 November 2007; at: <<http://anhri.net/en/reports/2007/pr1127.shtml>> (23 June 2010).

26 See *United Nations Development Programme* (UNDP), 2009: "'Human Security' offers new way to understand development challenges in the Arab region" - Press Release, Beirut, 21 July 2009; at: <www.undp.ps/en/newsroom/pressreleasespdf/2009/18.pdf> (23 June 2010).

Emirati professor, describes the current situation as follows:

the government has not ceased to impede its own, where there are groups among the citizens of the nation possessed of sufficient qualifications who are barred from teaching or writing in local newspapers or from discussion with local and regional media and subject to other than these among the means of pressure and terrorizing that the rest of the world has left behind (Al-Yousef 2008: 636).

He further reminds his readers of the ongoing politicization of science when it comes to the production of knowledge with respect to the Gulf States, and that foreigners who glorify the achievements of the Gulf regimes while hoping for worldly gains are pursuing an unethical approach characterized by “injustice and slander” (Al-Yousef 2008: 639).

This deliberate ignorance of the reality can be witnessed in almost any analysis of the UAE and it is certainly reprehensible when respected journalists are capable of giving us an exhaustive picture of the unsustainable ecocide, while academics are busy praising the ‘green leadership’ and visionary future ideologies. The latest data from the *Global Footprint Network* (GFN) may serve as an almost incomprehensible example of this scholarly trend. According to previous reports the per capita *ecological footprint* (EF) of the UAE based on data from 2003 showed an ecological deficit of 11 global hectares (gha) per capita.²⁷ Following a so-called partnership with the UAE government, their ecological footprint has undergone a mysterious decline in the period between 2003 and 2008 to a deficit of 8.38 gha per capita and an EF of consumption of 9.52 gha per capita, with claims being made that the government review of national footprint accounts is partial or in progress (Ewing/Goldfinger/Wackernagel et al. 2008: 42).²⁸ Furthermore, the analysis was based on a dated population figure of 4.5 million, consisting of an estimated 2.7 million impoverished

migrant workers many of whom work in the construction and domestic service industries and who are certainly not responsible for the predominant excessive lifestyle and hyper-consumption.²⁹

In comparison Bahrain, which is undeniably more liberal than the UAE, both socially and politically (Wright 2008: 14), gets little attention, albeit of a more critical kind, from both local and foreign scholars, while Saudi Arabia remains in modest isolation and in return polarizes the academic community into various extremes. In reviews of scholarly contributions Al-Rasheed and Peterson both explain that balanced and sensible discourse on Saudi politics, economic situation, culture, and society is rare, and its absence tends to validate hostile and outrageous opinions routinely expressed as fact by journalists, politicians, and think tank advisors, but also by scholars.³⁰ As a refreshing exception, it has been pragmatically noted by Wilson that Saudi Arabia faces development challenges comparable with those of other middle-income economies (Wilson/Al-Salamah/Malik et al. 2004: i). In a further best-practice critical assessment of Saudi Arabia, Cordesman found in 2003 that the persistent unwillingness to develop realistic data was a deliberate failure to come to grips with some of the critical problems with Saudi demographics. He labelled this strategy as a crippling deficiency from the viewpoint of development planning and said that the problems created were further compounded by a recent tendency to politicize other aspects of econometric data (Cordesman 2003: 244).

So while the Gulf monarchies have to a various degree silenced any local critical views, manipulated global public opinion, proliferated false perceptions of their accomplishments, or kept secretly quiet, and

27 Per capita *ecological footprint* (EF) is a means of comparing consumption and lifestyles, and checking this against nature’s ability to provide for this consumption. In comparison Saudi Arabia’s was 3.7 gha and Bahrain was ignored (GFN 2006).

28 In their most recent report the GFN corrected this deliberate data manipulation a little and at least mentioned that “Residents of the United Arab Emirates have the world’s highest average Ecological Footprint, at 10.3 gha per person” (Ewing/Goldfinger/Oursler et al. 2009: 46). However, the methodology remains mysterious with respect to the UAE and the population that the data was based on was further reduced to 4.2 million.

29 For further information on the exploitation of labourers in the UAE see the *Human Rights Watch* (HRW) report “Building towers, cheating workers. Exploitation of Migrant Construction Workers in the United Arab Emirates” (HRW 2006); at: <<http://www.hrw.org/sites/default/files/reports/uaer106webwcover.pdf>> (20 June 2010). An update on how the global financial crisis has made their situation even worse was published on Al Arabiya.net “Returning home means wasted life savings and poverty - Dubai’s labourers bear the brunt of financial crisis” (Moussly 2009); at: <<http://www.alarabiya.net/articles/2009/03/01/67503.html>> (20 June 2010).

30 See Peterson (2006: 147–156); and Al-Rasheed and Madawi (2006): Review of “The Paradoxical Kingdom: Saudi Arabia and the Momentum of Reform” by Daryl Champion; at: <<http://www.madawialrasheed.org/index.php/site/more/70/>> (20 June 2010).

successfully coerced the majority of foreign “producers of knowledge”, the fragility of the region’s political, social, economic, and environmental structures, as well as its lack of people-centred development policies and its increasing impact on the likely severe impact of global warming remain.

20.6 Outsourcing Food Insecurity: Short Term Responses to an Enduring Challenge

The first noticeable reaction of Gulf monarchies to a changing security landscape, in other words their increasing vulnerability to transnational threats, came with the sudden spike in food prices in 2008. While that abrupt rise in world market prices was widely acknowledged to be a result of the untimely convergence of multiple structural and cyclical factors, sustained high prices, and increased volatility created concerns about food security in the GCC. As an immediate response, several Gulf States introduced price controls, including food subsidies and caps on rent increases, as well as public sector pay rises, to offset the impact of rising food prices on their citizens.³¹ In Bahrain for instance the government raised the salary of public sector employees by 15 per cent, as well as including other important products in its subsidy programme and granting families around US\$120 in monthly assistance.³² In comparison, the UAE announced a massive 70 per cent public-sector wage increase and Saudi Arabia introduced an entire list of sophisticated new measures including the lowering of custom duties on key staples and a prudent incremental increase in wage allowance (Sfakianakis 2008: 1). However, with a region or country being considered as food secure “when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (FAO 2009: 8), inflation at the macro level increasing at more than twice the speed of the world average will have an especially disproportionate impact on low-in-

come groups.³³ Thus with the current food import dependency exceeding 90 per cent according to some estimates, neither the current quick fixes nor the piecemeal policy approaches will suffice.³⁴ According to the Economist Intelligence Unit, GCC spending on food imports is projected to more than double from US\$24.1 billion in 2009 to US\$53.1 billion by 2020 (EIU 2010: 16). By contrast, the International Trade Statistics 2009 published by the *World Trade Organization* (WTO) show that the UAE alone imported food (SITC sections 0, 1, 4 and division 22) worth US\$15.28 billion in 2008, representing an annual percentage increase of 47 per cent to 2007, while Saudi Arabia imported food worth US\$15.25 billion in 2008, representing an annual increase of 29 per cent (WTO 2009: 54).

However, instead of giving certain proactive adaptation measures some serious thought, the Gulf governments opted for a new strategic choice that raised grave international concern: the purchase or long-term lease of agricultural land for offshore food production from highly volatile nations, predominantly by state-owned and private investors, is seen as the best possible option for securing the increasing local demand (NIC 2008: 12).³⁵ Given that the World Food Programme is trying to feed millions of refugees and drought-stricken impoverished populations in Sudan and across the countries of the Horn of Africa, it certainly is problematic that Gulf governments are buying up farmland to produce and export inexpensive food

31 See for instance Joanna Hartley, 2009: “Food prices to halve as part of UAE gov’t plan”, in: *ArabianBusiness*, 4 February 2009; at: <<http://www.arabianbusiness.com/545656-food-prices-to-half-as-part-of-uae-govt-plan>> (23 June 2010).

32 See Oxford Business Group, 2008: “Bahrain - Investing in Food Security”, 22 August 2008; at: <<http://www.zawya.com/pdfstory.cfm?storyid=ZAWYA20080822131715&cl=131700080822>> (25 June 2010).

33 Elevated food prices were a driving force for the substantial inflation in the Gulf, eventually outpacing overall inflation by several percentage points. In the UAE food prices increased by an estimated 40 per cent, in Bahrain by 20 per cent, and this certainly places immense stress on the large migrant blue-collar workforce in the Emirates and Bahrain. This may serve as an additional concern about the possibility of social unrest, next to the pressures on citizens’ households. Consequently, since the FAO definition of food security includes all residents in a given locality, it can be stated with certainty that large segments of those currently living in the Gulf, especially lower income expatriates, are food insecure.

34 See “GCC Becomes the Largest Food Importer”, in: *TOBOC - An International Initiative for Global Trade*, 17 February 2010; at: <<http://www.toboc.com/trade-news/gcc-becomes-the-largest-food-importer/1451.aspx>> (25 June 2010) The profound dependence on external markets also makes the GCC extremely vulnerable not only to price variations but also to the increasingly changing food policies of the exporting countries such as a blanket ban on the exports of certain food commodities.

for their own citizens as well as millions of foreigners (GRAIN 2008: 4).³⁶ The myth that there are abundant unused land resources in Africa and that for instance Sudan's underachievement in productivity could be dramatically improved without compromising further environmental degradation has received extensive coverage in the literature in the past two decades. The 'Post-Conflict Environmental Assessment of Sudan' prepared by the *United Nations Environment Programme* (UNEP) provides a detailed analysis and clearly describes how issues of conflict and displacement and environmental degradation and Sudan's rising population are considered to be intrinsically linked. The contemporary situation in the more arid regions can according to the report "only be described as an intense and unremitting competition amongst an impoverished population for scarce and diminishing natural resources" (UNEP 2007: 163).

Concerns also come from Pakistan, after recent media reports announced that private companies have acquired large areas of arable land on behalf of the UAE government.³⁷ While Pakistani officials provide

the same inexorable rhetoric heard in other troubled developing nations, notably that there is no threat of the displacement of indigenous communities or the erosion of local food sovereignty, the environmental hazards posed due to deforestation, land degradation, and increased water consumption never seem to be considered in any such confident claims. In the light of this, Ali warns about the repercussions of corporate farming and that countries which remain willing to capitalize on their natural resources are not facing up to their acute water scarcity problems.³⁸

A recent collaborative effort between the *International Institute for the Environment and Development* (IIED), the *UN Food and Agriculture Organization* (FAO), and the *International Fund for Agriculture and Development* (IFAD) confirms these worries by emphasizing that these large-scale land acquisitions have the potential to directly dispossess and displace large numbers of rural people from land that they consider their long-standing heritage and who crucially depend on this land for sustaining their livelihoods (Cotula/Vermeulen/Leonard et al. 2009: 15). Smaller and Mann take the discussion further by examining the uncertainties and impacts relating to the commodification of land and water in such deals, keeping in mind that the local tenure situation may be very complex, involving customary rights. They conclude that if governments are determined that an investment should take place despite the opposition of a land or rights holder, expropriation of land rights or water use rights might be possible and that the fulfilment of compensation requirements will be unlikely in the event of diminishing water resources (Smaller/Mann 2009: 15).

In May 2009 the Geneva Academy of International Humanitarian Law and Human Rights organized an international seminar on "The Global Land Grab: A Human Rights Approach" to take an urgently-needed closer look at this emerging trend and the potential and actual consequences on the realization of human rights.³⁹ Among the objectives were exploring ways of promoting human-rights-consistent investment in land and the question of how food security can be secured in the future in ways that do not undermine human rights in other countries.⁴⁰ The loopholes in international law that enable domestic

35 Saudi Arabia bought 500,000 hectares of land in Tanzania, Sudan already hosts 400,000 hectares of wheat fields leased to the United Arab Emirates, and Bahrain is looking at south-east Asia. Government involvement in recent or planned international business events also reflects growing interest from the Gulf economies, particularly the Gulf-Africa Strategy Forum 2009 (Cape Town) and 2010 (Riyadh), convened by the Gulf Research Centre, the seminar on "Climate Change, Energy, Water, and Food Security in the Arab Region", sponsored by the Zayed Charitable Foundation (UAE government) and hosted by the Arabian Gulf University in Bahrain in May 2009, and the Joint Afro-Arab Ministerial Meeting on Agricultural Development and Food Security hosted by the African Union and the Arab League in October 2009 in Sharm El Sheik, Egypt (according to the draft schedule 'food security' was postponed till 2010).

36 These include millions of inclusive package deal tourists. For instance, for the UAE there were roughly 10 million tourists in 2008.

37 In the south-western province of Balochistan as much as 800,000 acres of farm land were purchased near the Mirani Dam. See for instance Kerr, Simeon & Bokhari, Farhan, 2008: "UAE investors buy Pakistan farmland", in: *Financial Times*, 11 May; at: <<http://www.ahrc.se/new/index.php/src/news/sub/article/action/ShowMedia/id/4461>> (June 25 2010) or Khan, Sarmad, 2008: "UAE investors acquire land in Pakistan for food production", in: *The National*, 27 October; at: <<http://www.thenational.ae/article/20081027/BUSINESS/618179339>> (June 26 2010). Many other examples can be found.

38 See Syed Mohammad Ali, 2009: "The dangers of corporate farming - Pakistan's bid to open its agricultural sector to foreign corporations may accentuate rural poverty and inequity", in: *OpenDemocracy*, 11 May; at: <<http://www.opendemocracy.net/print/47903>> (26 June 2010).

legislation and human rights obligations to be overridden must be addressed immediately, and hopefully the risk to their image involved in such practices will not be underestimated by the Gulf monarchies.⁴¹ In the coming years the depletion of oil reserves may also substantially reduce the extent to which current oil exporters are shielded from the negative fiscal impacts of high food prices, and this will be especially true for Bahrain. Nevertheless, with food prices tied to a host of resource scarcity issues, notably climate change and water depletion, the issue of food security will be a lasting challenge. Despite serious political hazards involved with safety nets and the ‘quick-fix’ responses already mentioned, there have been no real policy shifts towards addressing the core problems or any of the suggested proactive adaptation measures, in particular that family planning and education about the consequences of an unhealthy diet could provide sustainable long-term benefits (World Bank 2009: 23).

20.7 Beyond Silenced Voices: Scrutinizing the Stressors

The political reality already described clarifies the motives for some of the nonconformist policies in the region which are entangled with supporting different sections of society. Water allocation and pricing policies are often based on supporting special interest groups, next to specific tribal, traditional, or economic activities.⁴² The global economic downturn and lower crude prices showed the Gulf monarchies that their current capacities for meeting the rising demands of their fast-growing populations at the same

time as investing in their development initiatives can easily be overstretched. The Kingdom’s budget for the fiscal year 2009 showed an increased spending as well as the first deficit since 2002, based on a very modest oil price projection, and can primarily be seen as a response to public expectations and decline in sentiment.⁴³ The continuous focus is primarily on welfare distribution as a means of ensuring legitimacy, even if the official claim refers to making best use of available resources and giving priority to projects that ensure sustainable and balanced development. The same analysis can be made of the zero-deficit UAE budget, which projects a further increase in public spending by 3.4 per cent in the 2010 draft budget.⁴⁴ Bahrain has already faced its future post-oil challenging economic reality by displaying immense budget deficits, while parliament demanded even higher welfare spending from the authorities.

There is little doubt that meeting the future expectations of growing populations will prove to be increasingly difficult, but the fear of the possible social tensions and instability that might result from the scaling back of subsidies and introduction of charges is even higher and in view of past experiences around the globe certainly not unfounded.⁴⁵

When King, the former chief scientific adviser to the UK Government, emphasized in 2004 that climate change is graver even than the threat of terrorism and is the most serious challenge facing humanity today (King 2004: 176), he was certainly correct, but oversimplified the causal relationship. In other words, the urgently needed climate change mitigation and adaptation implementation measures in the Gulf econo-

39 See *Geneva Academy of International Humanitarian Law and Human Rights* (Geneva: ADH), 2009: “The Global Land Grab: A Human Rights Approach”. Conference at the Graduate Institute of International and Development Studies, 16 May 2009, Geneva; at: <http://www.3dthree.org/pdf_3D/globallandgrab_seminar2009_programme.pdf> (27 June 2010).

40 Given the involvement in these large-scale land acquisitions and the grave importance of food security in the GCC states, the *GCC Network for Drylands Research and Development* (NDRD) is currently preparing a publication on this topic entitled “Prioritizing Climate Change Adaptation Needs for Food Security: Constraints to New Initiatives for the Arabian Peninsula” with a focus on a rights-based approach.

41 See Joanne Bladd: “Call for GCC ‘land grab’ policy to stop – experts”, in: *ArabianBusiness*, 7 September 2009; at: <<http://www.arabianbusiness.com/call-for-gcc-land-grab-policy-stop-experts-t3103.html>> (12 Februar 2011).

42 For a comprehensive analysis of the situation in Saudi Arabia see Elhadj 2006: 38. While in the UAE the combination of agriculture and fisheries accounts for only 2.5 per cent of GDP, it continues to be the prime water-consuming sector, accounting for 80 per cent freshwater use.

43 Analysts projected that U.S. benchmark crude prices would have to average somewhere between US\$43 and US\$55 per barrel in 2009 to cover the budgeted revenue projection (depending on output of course). However, Saudi Arabia traditionally presents extremely conservative government budget estimates based on lower energy prices than the market forecasts.

44 See “UAE to increase spending in 2010”, in: *AmeInfo*, 27 October 2009; at: <<http://www.ameinfo.com/213873.html>> (26 June 2010).

45 In particular, the removal of federal subsidies for agricultural products or fuel prices has proved to be an immense source of friction in numerous states, often leading to escalations of violence

mies could easily trigger a shift to radicalization, a security aspect that should not be underestimated. Accordingly, climate change should conceivably best be seen as a 'threat multiplier' that intensifies existing problems and vulnerabilities (CNA 2007: 6). With the UAE currently being one of the highest per capita water consumers on a global scale⁴⁶, the introduction of tariffs to curb the persistent consumption patterns were long overdue when finally introduced in spring 2008. However, the inherent correlation with the social contract could not be more evident, since UAE nationals who are proportionally the highest consumers will be exempt from the changes and will continue to pay significantly lower rates than expatriates.⁴⁷ Saudi Arabia opted for an endless debate on the issue in order to evade uncomfortable policy changes, claiming the subject to be "too political an issue to touch" (Harrison 2004: 45).

Nevertheless, there has been substantial criticism in the Kingdom from Saudi academics as well as published research that states the obvious: the adopted bloc structure provides a substantial subsidy that will cover water costs even to the middle class (Al-Mogrin/Al-Maziad 2002: 12). Some corrective measures seem to be on the way and in January 2009 the ministry announced its plan to increase the water tariff to SR5 per cubic metre. This measure would be applied to certain groups of clients and low-income consumers would be exempted. With a critical lobby for sustainability, including members of the royal family, as well as the privatization of the water sector, some type of change is on the way; the question is when it will finally be realized. In Bahrain water is also 75 per cent subsidized, while an incremental water tariff was introduced in 1985 and revised in 1992. The currently utilized "lifeline rate schedule" tariff policies in the domestic sector does not apparently provide any incentives for consumers to save water (Smith/Al-Maskati 2007: 119). Like Saudi Arabia, Bahrain has several exceptional scientists who disseminate the inconvenient truth through publications, in the media,

and at conferences. Noteworthy in this context is Al-Zubari, a hydrogeologist, who has opted for a multi-disciplinary approach. While other natural scientists in the Gulf tend to be extremely apolitical and stick firmly to their disciplines, he has designed three water policy scenarios for the period 1995–2025. His findings show that the Gulf Cooperation Council countries would continue to experience a deficit in their water resources for all three scenarios, although less so in the third scenario, which includes supply augmentation and policy remedies (Al-Zubari 2003: 163).⁴⁸

Needless to say, the idea of imposing electricity tariffs intended to act as a deterrent to the over-consumption of resources and as an incentive to invest in energy efficiency measures is missing from Gulf ideologies. The data from the recently-released International Energy Agency report presents a disconcerting exposé of the growth of CO₂ emissions, their source, and their spatial distribution in the region. In the world rankings, Qatar (58.01 tonnes CO₂/capita), UAE (29.91), Bahrain (28.23) and Kuwait (25.09) occupy the first four places as worst-case scenarios on a global scale. In comparison, Saudi Arabia emits 14.79 tonnes CO₂/capita and Oman 13.79 (IEA 2009: 90).⁴⁹

Being highly dependent on oil exports and faced with difficult challenges at home, it is not surprising that petroleum exporters have long used delaying tactics during climate talks. In general it can be said that all GCC states, particularly the four OPEC members Saudi Arabia, Kuwait, the UAE, and Qatar, identify climate change mitigation as a threat to their economies. However, such perceived security threats, re-

46 Data is inconclusive, but a number of sources claim that the domestic water consumption of 550 litres per capita per day, the UAE's water consumption, is among the highest in the world. See for example Erika Solomon, 2010: "As tiny UAE's water tab grows, resources run dry", in: *Reuters*, 21 Jun 2010: at: <<http://www.reuters.com/article/idUSTRE65K3MK20100621>> (26 June 2010).

47 These charges for UAE nationals are extremely low. They currently pay AED0.07 per kWh for electricity and AED0.015 for a gallon for water.

48 There are certainly many other great scientists in Bahrain, so this should be considered a best practice example. Waleed Al-Zubari (2009) is one of the vice-presidents of the Arabian Gulf University (Bahrain), editor-in-chief of the Arab Gulf Journal of Scientific Research, and runs an NGO called *Water Science and Technology Association* (WSTA). In a later publication he described four scenarios that were mainly based on the United Nations Environment Programme's *Global Environmental Outlook* (GEO) scenarios (GEO-4).

49 In comparison the annual per capita CO₂ emissions (tonnes CO₂/capita) based on data from 2007 is: for Germany (9.71), UK (8.60), Japan (9.68), US (19.10), Canada (17.37) and Israel (9.19). See IEA (2009: 90, 89); at: <http://www.iea.org/publications/free_new_Desc.asp?PUBS_ID=2143> (26 June 2010). The estimates calculated by the US Department of Energy's *Carbon Dioxide Information Analysis Center* (CDIAC), mostly based on data collected from country agencies by the United Nations Statistics Division, will show even higher per capita emissions for these Gulf economies.

ardless of how unrealistic they may be, have often been used by governments trying to divert attention away from internal problems.⁵⁰ Yet, following Haldén, we should ensure that climate change policy and international agreements do not cause problems in the international security setting by undermining the economies of the countries that produce oil and gas (Haldén 2009: 5).⁵¹ With this in mind, it is not productive for the Saudi oil minister, Ali Al-Naimi, to be continually quoted out of context. While certainly never labelling renewable energies as ‘catastrophic’⁵², he has made it very clear in several public statements that Saudi Arabia is currently undertaking feasibility studies to find the most sustainable approach to position itself in a cleaner field of energy by investing in research and in solar power. This approach concurs with a warning from former director of the London School of Economics, Anthony Giddens, who calls attention to the need for detailed risk assessment procedures, because the far-reaching transition to renewable sources will embody extensively complex social and economic effects (Giddens 2009: 13). The research focus on making renewable energies more efficient and economical dates back several decades in the Kingdom, and a number of solar-power projects, including desalination plants and greenhouse air-conditioning systems using solar energy, were commissioned. As far back as 1974 an association called “Arab Circle Renewable Energy” was established in Jeddah with the objective of increasing awareness among the local and international community of the need for the use of renewable energy and to enhance Saudi Arabia’s image as a responsible user of energy and a promoter of future clean energies. Certainly they did not achieve those objectives, but the fact that Saudi sci-

tists and engineers completed the design of a solar-powered car in 1999 and developed it locally is largely unknown (Al-Shibani/Elani 2001: 233).⁵³ Furthermore, the country invests in carbon capture and storage programmes to develop technology that allows carbon dioxide to be extracted from the atmosphere and stored in subterranean geological formations such as depleted oil wells.⁵⁴ Moreover, an overview on renewable energy initiatives and potential in the GCC was recently published by two Bahraini scientists (Al-Naser/Al-Naser 2009). For the UAE and the alleged ecocity ‘Masdar’, there is little to say in view of the fact that even in the unlikely case that the initiative achieves all its objectives, any decreases in GHG emissions will be offset by the continued unsustainable growth in the rest of the country (Stilwell/Lindabury 2008: 7). In this context Droege asks: “When the oil is ‘gone’, what will Masdar produce that can justify the bloated population in the desert metropolis?”⁵⁵

Undeniably this will be another extremely commercialized project populated by imported foreigners and totally disconnected from its local surroundings, while the same government is currently building a 3.5 km (2.17 miles) long artificial ski slope on Jebel Ha-fect in Al Ain and the developer hopes that the ski

50 Propaganda disinformation has really worked, because even highly educated Gulf colleagues tend to claim that “climate change is something the West made up in order to impose on their sovereignty” (or similar challenging statements).

51 While far-reaching global mitigation programmes are needed, it must be realized that the Gulf economies are already struggling with their internal situations. Thus far all they have to support their economies is unfortunately ‘oil and gas’ or in the case of one exception something that is much worse: ‘millions of tourists’.

52 Here is what he actually said: “In years to come, if traditional energy supplies should prove inadequate because capital expenditure was curtailed due to unsustainable prices, unreliable indications of future demand, or hopes for a substitute for oil cannot deliver, such a supply crunch would be catastrophic.” There is certainly nothing wrong with this sentence.

53 The paper by Al-Shibani and Elani examines the long-term performance of a silicon solar car. Being sceptical following all the rhetoric in the Gulf, the author was surprised to find several research papers online that confirmed that some research really has taken place over the years and that a local solar energy research group does exist. Moreover, in May 2010 the consortium of Hamburg-based solar experts and Saudi Arabia’s leading solar system integrator, *National Solar Systems* (NSS), completed a US\$15 million two-megawatt solar power plant on the rooftop of the *King Abdullah University of Science and Technology* (KAUST) that generates enough power for about 500 homes.

54 At a summit in Riyadh in November 2007, Gulf OPEC members pledged US\$750 million to a new fund to tackle global warming through financing research for clean technologies, with the emphasis on carbon capture and storage.

55 Peter Droege is a professor for urban sustainability, climate, and planning education at the Institute of Architecture and Planning - Hochschule Liechtenstein. The quote was part of a round table discussion on MASDAR, organized by TreeHugger; at: <<http://www.treehugger.com/files/2008/03/masdar-roundtable.php>> (27 June 2010); see also Taflin Laylin: “What’s Sustainable about Masdar’s Foster+Partners?”, in: *Green Prophet*, 17 March 2010; at: <<http://www.greenprophet.com/2010/03/27/19020/foster-partners-sustainable-architecture/>> (27 June 2010).

slope will meet the criteria for Olympic events, creating a year-round training facility for top-class skiing.⁵⁶

The integrity of the glittering GCC climate rhetoric can be easily traced when looking at the conference “Climate Change: Global Risks, Challenges and Decisions” that was held in March 2009 to recapitulate existing and emerging scientific knowledge necessary in order to make intelligent societal decisions concerning the application of mitigation and adaptation strategies in response to climate change.⁵⁷ Approximately 2,500 participants from nearly 80 different countries attended the conference and contributed more than 1,400 scientific presentations to the climate change discourse (Richardson/Steffen/Schellnhuber et al. 2009: 5), but according to the participant list not a single delegate came from any of the GCC countries.

What is even more worrying is that the development of nuclear power in the Gulf, potentially under the umbrella of climate change adaptation, could trigger a series of nuclear energy programmes, significantly increasing the threat of proliferation. This certainly should have been considered before the new *International Renewable Energy Agency* (IRENA) became once again the redundant outcome of economic and strategic interests, in particular with selfish, short-term benefits for France and Britain through dubious

backroom deals, something that will only play into the hands of the oil and nuclear lobbies. The fact that the interim Director-General of IRENA, H el ene Pelosse, resigned in October 2010 as a result of severe intimidation by the UAE government, may simply confirm negative expectations in this context.⁵⁸

Mainstreaming climate change into conventional policy should be a top priority, while both mitigation and in particular proactive adaptation strategies need to be audaciously pursued and emphasized in all policy sectors (Al-Zubari 2009: 17). To conclude, it can be said that gradual environmental governance in some of the GCC states is taking place, but the consensus has stressed that the extent of these changes is somewhat limited and often subject to suspension or reversal as a result of potential changes in domestic, regional, or international circumstances.

20.8 Climate Threats and National Security: The Critical Role of Stakeholder Engagement

While the discourse concerned with the Arab Gulf economies remains highly politicized and polarized, the approach of the Gulf elites will have to change radically to be able to cope with their exploding populations and climate change while avoiding social breakdown and environmental collapse. Neither the current quick fixes nor the piecemeal policy approaches will suffice. Long-term subsidies are inefficient and also provide fiscal distortions and governance imbalances. Subsidies in the food, water, and power sector in particular, once in place, are difficult to remove, as disposable incomes adjust to different spending patterns and consumer perceptions. Cer-

56 See Rob Jones: “Ski slope to be built on Jebel Hafet”, in: *AMEInfo*, 24 July 2008; at: <<http://www.ameinfo.com/164526.html>> (27 June 2010). This is in addition to three other planned ski slopes, notably the snow dome at Dubailand.

57 The congress was hosted by the University of Copenhagen and organized in cooperation with nine other universities in the *International Alliance of Research Universities* (IARU), namely Australian National University, ETH Z urich, National University of Singapore, Peking University, University of California - Berkeley, University of Cambridge, University of Copenhagen, University of Oxford, University of Tokyo and Yale University. Considered as a supplement to the work of the *Intergovernmental Panel on Climate Change* (IPCC) two years after the fourth IPCC report, the findings were published as a book on climate change, and a synthesis report was presented to policy-makers before the United Nations Climate Change Conference talks (COP15) with the stated intention of scientifically informing the political negotiations. For further information, see at: <www.climatecongress.ku.dk>. The Synthesis Report has been available since June 2009 in English; at: <<http://climatecongress.ku.dk/pdf/synthesisreport>> or in Arabic; at: <http://climatecongress.ku.dk/pdf/Synthesis_Report_-_Arabic.pdf> (13 February 2011).

58 French national H el ene Pelosse did not back the UAE nuclear plans and publicly accused the UAE of delaying payments and jeopardizing the financial future of the agency. See e.g. AFP: “‘Fearful’ Frenchwoman replaced as renewables agency chief”, in: AFP, 25 October 2010; at: <http://www.google.com/hostednews/afp/article/ALeqM5j-7MN8SSgCVP4bcAPKr682_exj5w?docId=CNG.135bb89cab5c7dfce021f53c3286a72b.471> (26 October 2010); Eva Fernandes: “Masdar, IRENA ... why can’t going green go right?”, in: *Kippreport*, 26 October 2010; at: <<http://www.kippreport.com/2010/10/masdarirena%e2%80%a6-why-can%e2%80%99t-going-green-go-right/>> (27 October 2010); Joyce Njeri: “H el ene Pelosse: Irena will not back UAE nuclear plans”, in: *Alroya*, 24 January 2010; at: <<http://english.alroya.com/content/h/C3%A9!%C3%A8ne-pelosse-irena-will-not-back-uae-nuclear-plans>> (27 October 2010).

tainly it cannot be a policy option to steer the foreign agricultural sectors of impoverished and already deeply troubled nations towards their own domestic markets.

Rapid population growth, wealth disparities, food insecurity, inadequate education, and increasing indigenous unemployment are major threats to long-term security in the GCC. The dependence on and existence of large numbers of foreign nationals is not only a serious stress factor for the carrying capacity of the already highly sensitive Gulf environments, but in itself presents a serious traditional security risk that could lead to further instability in an already volatile environment. Reports state that crime is on the increase in all of the GCC states, especially among youth, where drug addiction is a grave cause for concern. Both Bahrain and Saudi Arabia have, however, been more insightful and have initiated various reforms that genuinely address the labour issue; the continual reduction of the foreign workforce in Saudi Arabia and groundbreaking initiatives in Bahrain show evidence of sincerity.⁵⁹ Hence, it does not need any further finance, new technologies, or a global climate change deal to succeed, but will depend on local complex and context-specific social, economic, and political factors, in other words the formal and informal rules affecting policy design, implementation, and outcomes.

Findings were put forward by Bahraini and Saudi colleagues who indicated that technology transfer had an important role and could provide alternative means for excessive growth and sustaining development by substituting capital for labour. However, they did mention that political will along with vigorous policy measures were prerequisites (Al-Roubaie/Al-Zayer 2006: 187).⁶⁰

Whereas the emergence of some form of more or less institutionalized social cohesion is critical for human security to emerge as an integral part of sustainable human and economic development, the establishment of functioning civil society by GCC nationals remains underdeveloped, with only limited prospects that the pace for change will increase substantially in the coming years (Samad 2007: 23; Jill 2005: 7). While both Bahrain and Saudi Arabia saw a very small emergence of local civil society, the creation of independent non-artificial organizations has

⁵⁹ Bahrain's labour minister, Majeed al-Alawi, recently received praise from *Human Rights Watch* (HRW) for the abolition of the restrictive sponsorship system (HRW 2009).

been totally stifled by the ruling families in the UAE (Davidson 2008: 210). Any assessment of the social cohesion of a society in order to develop adaptive capacity must take into account political contexts, including the relationships between associations, their leaders, and political institutions (Spiess 2008: 249). Developing adaptive capacity is thus primarily a function of promoting the creation and dissemination of knowledge and the existence of power structures with a key moral imperative that "inaction is inexcusable" and that are responsive and bear in mind the needs of all the involved stakeholders, as well as engendering a creative flexibility in decision-making and conflict-solving (Burton/Diringer/Smith 2006: 9; McGray/Hammill/Bradley 2007: 27).

It should further be emphasized that human security does not seek to supplant national security, but rather to complement it. The objective should be to articulate possible security threats and consider risk preparedness, proactive adaptation measures, and mitigation steps, and integrate them into an all-encompassing national security plan. Unless mitigated and adapted to by insightful and forceful policies, environmental degradation and climate change are likely to be calamitous in terms of human security on an unprecedented scale.

When Saudi Arabia marked its 79th National Day, Prince Sultan bin Salman bin Abdulaziz Al-Saud made a thought-provoking remark: "By celebrating this day we are not just remembering the history but we take it as an opportunity to think about what we should do to have a brighter future."⁶¹

From someone with an exceptional environmental stewardship record, these are encouraging words.

⁶⁰ With this in mind, it was encouraging news that most GCC firms are starting to outsource their IT process (Saudi Gazette, 2009) and hopefully in the future more of the work that is still done by foreign experts should, as a matter of urgency, be carried out by virtual teaming from overseas, to avoid further stress on these fragile environments. With e-learning in place and the necessary infrastructure available, the Gulf economies should reconsider their approach to investing in massive showcase universities that will import even more people and add further environmental stress. See "Most GCC firms outsource IT process", in: *Saudi Gazette*, 7 November, 2009, at: <<http://www.saudigazette.com.sa/index.cfm?method=home.regcon&contentID=2009110753786>> (27 June 2010).

⁶¹ See Abdul Ghafour: "National Day of achievements", in: *Arab News*, 23 September 2009; at: <<http://www.arabnews.com/?page=1§ion=0&article=126666&cd=23&m=9&y=2009>> (27 June 2010).

There should be some optimism that at least Saudi Arabia as a “pivotal state” is on the right track, in their habitual carefully manoeuvring manner, to tackling this immense challenge that will eventually determine the survival and success of the surrounding region with the social sensitivity it requires.

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21 Altering Security Dynamics? Climate Change Impacts on Iraq

Achim Maas and Kerstin Fritzsche

21.1 Introduction¹

Since the *Fourth Assessment Report* (AR4) of the *Intergovernmental Panel on Climate Change* (IPCC), there is little doubt left that anthropogenic climate change occurs (IPCC 2007). Several authors assume that in case of insufficient mitigation, climate change impacts could have severe implications for societies (Adger/Lorenzoni/O'Brien 2009). While AR4 only addressed issues of conflict to a limited extent, the next IPCC report will do so more directly.² A large number of approaches and methods have already been developed to seek an understanding of the links between climate change and conflict. Despite offering certain advantages in the understanding of this complex matter, the existing approaches have a variety of limitations. In addition, regional dynamics are often not included to a sufficient degree when sub-national conflict risks are analysed.

The purpose of this chapter is to develop an analytical framework that allows a better understanding of how climate change may lead to insecurity, in particular to violent conflict and political fragility, with the aim of creating synergies between existing approaches. The chapter is structured as follows. The next section provides a brief overview of the main concepts of and approaches to climate change and security (21.2). Next, an analytical framework drawing on the current climate change and security literature will be developed (21.3). To better understand how climate change may alter security interactions at different levels, the *Regional Security Complex Theory* (RSCT) developed by Barry Buzan and Ole Wæver (2003) will be added to the analysis (21.4). This frame-

work will then be used to analyse the case of Iraq and to answer the question of how climate change could induce (further) instability within the country as well as on an interstate level with its neighbouring countries. Iraq was chosen because of its political relevance in the region and as an example of a downstream country that most likely will be negatively impacted by climate change. Furthermore it has been rarely discussed within the current climate change and security literature. Finally, section five provides a critical reflection on the findings of the case study and the application of the framework developed (21.6). Regarding terminology, this paper focuses on violent or armed conflict, but broadly follows a non-traditional approach to security as laid out by Barry Buzan and his colleagues (Buzan/Wæver/de Wilde 1998) and which forms the basis for RSCT.

21.2 Review of the Climate Change and Security Literature

Research into how climate change may in the future relate to violent conflict is essentially a branch of future studies. This is challenging in three ways: *first*, the relative decrease in the value of historical data renders the past a limited advisor for the future (Desai/Hulme/Lempert et al. 2009); *second*, the onset of new violent conflict is a low-probability high-impact event that makes assessing its likelihood very challenging (Nassim 2009); and *third*, the role that agencies and institutions play regarding the outcomes of climate change, i.e. how individuals and organizations perceive and react in the context of a changing climate (Welzer 2008).

A trend analysis such as that by Burke, Miguel, Satyanath et al. (2009), who correlated conflicts with climate data in Africa for the period 1981 to 2002 and extrapolated this trend to the future, may not be particularly useful. While they concluded that the incidence of violent conflict may increase by over 50 per

1 The authors would like to thank Michael Brzoska, Hans Günter Brauch, and the anonymous reviewers for their comments and suggestions.

2 In chapter 12 on human security in the report of Working Group II on impacts, adaptation, and vulnerability; at: <<http://www.ipcc-wg2.gov/AR5/ar5-outline.html#12>> (21 December 2010).

cent by 2030, the number of actual conflicts dropped sharply between 2002 and 2009³ while climate change continued (IPCC 2007). If Burke, Miguel, Satyanath et al. had included the years after 2002, the predicted increase might have been far less or the conclusion might even have been that climate change is associated with conflict cessation. Drawing the latter conclusion, however, might be premature as well. The WBGU for instance expects that significant impacts may be felt as early as 2020–2030 and onwards (WBGU 2008; Halden 2007). A limiting factor is the uncertainty of climate data, which increases with higher resolution (Dessai/Hulme/Lempert et al. 2009). Predictions or assumptions about national or sub-national developments based on climate data may seem plausible, but are mostly informed speculation. On the other hand, decision-making is essentially an exercise in informed speculation, as decisions are taken with the intention of producing a particular future outcome, rarely with full certainty or knowledge of all the possible consequences (Dessai/Hulme/Lempert et al. 2009). Consequently, the important question is not necessarily to debate levels of certainty, but instead to decide how the possible future impacts can be taken into account in contemporary decision-making processes, to allow for robust actions useful across a range of climate scenarios.

A useful starting point is therefore to turn the analysis around and focus on ‘fragility’, defined as the vulnerability of a given situation to climate-induced stresses (Lee 2009). ‘Fragility’ means in the context of this chapter the extent to which a situation is conducive to the outbreak of violent conflict as a direct or indirect consequence of climate change. The focus is then less on uncertain climate data, but rather on how present-day communities and regions may become affected across a range of possible climate impacts (Dessai/Hulme/Lempert 2009; Eakin/Tompkins/Nelson et al. 2009). From the perspective of conflict prevention it also becomes more manageable, as there is little or no experience of operating multi-decade or centennial time scales (Dessai/Hulme/Lempert 2009). The results can then be broken down to identify possible critical issues which need to be addressed in order to make a situation less prone to violent conflict as a result of climate change. Ideally, it may be possi-

ble to identify so-called “threat minimizers” (UNSG 2009), i.e. via targeted policies that focus on strengthening conflict-mitigating factors.

Within the climate change and security literature, two main approaches can be identified for analysing the links between climate change and conflict: the *overlay* approach and the *factor* approach. The *overlay approach* consists quite literally of overlaying maps of likely climate change impacts on contemporary maps of state fragility, conflict risk, poverty, resource scarcity, or similar issues (Smith/Vivekanda 2007; Lee 2009; WBGU 2008). Conclusions are derived from the overlay approach by analysing how well the applied maps match with each other: the better the match between severe climate change and current hotspots, the more likely the future of these regions will be fragile or violent as well. An underlying assumption of this approach is that those regions currently suffering from poverty, fragility, and violent conflict will be less able to cope with climate change impacts. As a consequence, the countries become trapped in this condition or may even experience further deterioration – such as post-conflict societies relapsing into conflict. However, Swatuk (2007) argues that further worsening of an already severe situation may not necessarily result in more conflict. Nonetheless, the *overlay approach* may provide a starting point for identifying areas where climate change may fuel instability, if no action were to be taken.

In contrast, the *factor approach* focuses on how climate change may relate to specific factors or variables and how this could lead to violent conflict. An example of this is the concept of ‘threat multipliers’. It focuses on possible threats and how they could become magnified by climate change (CNA 2007; EU 2008; UNSG 2009). Instead of directly resulting in violent conflict, so this approach claims, the impact of climate change may increase the risk of violent conflict by adding to existing stresses or creating new ones. An example how the *threat multiplier* concept is used as an analytical framework is the project by the *Sahel and West African Club* (SWAC) of the *Organization for Economic Co-Operation and Development* (OECD): based on the threat multiplier concept used by the EU – the so-called ‘Solana criteria’ – they assess the security implications of climate change in the Sahel region (SWAC/OECD 2009; Salliot 2009).

Other authors, such as Buhaug, Gleditsch, and Theisen (2008) have examined how climate change may relate to various factors that can be correlated with violent conflict, such as regime type and ethnic diversity (chap. 2 by Buhaug/Theisen). There are in

3 The *Heidelberg Institute for International Conflict Research* (HIIC) for instance counts nine severe crises and seven wars in sub-Saharan Africa in 2002 (HIIC 2002), but eight crises and one war in 2009 (HIIC 2009).

addition several attempts to analyse such an interplay of factors retrospectively by linking violent conflict to historical climate data – such as precipitation or temperature changes over time spans of several decades (Zhang/Zhang/Lee et al. 2007; Zhang/Brecke/Lee et al. 2007a). However, due to the lack of data, the alteration of productive landscapes, and the radical change of the physical contexts of societies, these scenarios are difficult to analyse retrospectively. As for future scenarios, it is important to keep in mind that current and future developments related to climate change are unprecedented in history, e.g. the savannization of the Amazon, the vanishing Arctic, the move towards a low-carbon/non-fossil-fuel economy, or the potential direct, intentional alteration of the climate as a response to climate change.⁴

Yet, whether directed at the past, present, or future, most authors concede that climate change rarely results directly in violent conflict or alters any one single factor that significantly contributes to doing so (Brauch 2002; WBGU 2008; Carius/Tänzler/Maas 2008). Violent conflicts tend to have multiple and often interacting causes (Körppen/Schmelzle/Wisl 2008). Hence the idea of ‘channels’ surfaced: climate change impacts may trigger processes which may lead to violent conflict, i.e. conflict would not be a first-order, but possibly a second- or third-order consequence (Maas/Briggs/Cheterian et al. 2010). The *channel approach* is very useful for carrying out an analysis, since it begins by dissecting and assessing the basic impacts of climate change. The WBGU further explored the concept and developed so-called conflict constellations: these outline how the impact of climate change on a specific issue – such as the availability of fresh water – may lead to violence through the interaction of a set of factors (WBGU 2008). The *constellation approach* also highlights the number of possible factors necessary for carrying out an analysis: in the case of the conflict constellation “climate-induced degradation of freshwater resources” (WBGU 2008: 79), the WBGU identifies five clusters of factors such as political stability and governance and provides examples for three additional sub-factors for each cluster, such as provision of public goods for the governance cluster (WBGU 2008: 83). Each of the four conflict constellations identified by the WBGU is of similar complexity and while factors may overlap – such as the role of governance – the actual relevance for each

conflict constellation may vary (WBGU 2008). However, these factors may also have a mitigating effect: as Brown and Crawford (2009a) highlight in their work on West Africa, governance and institutions are significant in mediating resource scarcities or other conflict risks where those institutions are available and perceived as legitimate.

In comparison, the overlay approach allows for a relatively rapid identification of potential regions at risk. However, it may also create ‘blind spots’ by overlooking potential regions at risk. Additionally, it requires more in-depth analysis as its resolution is likely to be too coarse. Herein lies the merit of the *factor approach* with its different strands in identifying fragility and the potential trajectory of the region. The factor approach may serve to validate the rapid assessment carried out using the *overlay approach*. The factor approach may also be applied without the overlay approach, particularly if the aim is to conduct a systematic assessment with no pre-selection bias. Both approaches, however, focus more on ‘snapshots’ of current situations with a particular focus on structures and less on agencies. This is particularly important, as climate change is dynamic, non-linear, and transnational in nature. Both approaches therefore require further embedding in a given regional context so that fragility vis-à-vis climate impacts can be more comprehensively understood.

21.3 Altering Security Dynamics: Climate Change and Regional Security Complexes

Barry Buzan and Ole Wæver (2003) elaborated the concept of *regional security complexes* (RSCs), which builds on developing an alternative framework for analysis by suggesting that a sector-specific approach to security is taken (Buzan/Wæver/de Wilde 1998).

The regional security complexes approach focuses on (changing) interactions between states within a certain geographical context. However, while the focus is on states, its definition is quite flexible: a regional security complex is defined as “a set of units whose major processes of securitization, desecuritization, or both are so interlinked that their security problems cannot be reasonably analysed or resolved apart from one another” (Buzan/Wæver 2003: 44). By sets of units, Buzan and Wæver mean states, although the term *unit* could potentially apply to any actor, including sub-national entities or international organizations. This makes their approach more flexi-

4 Commonly known as geo-engineering or more recently as climate engineering. For an overview, see Royal Society (2009).

ble and also more comprehensive than the concepts outlined above.

The designs of complexes vary depending on their constituents, the number of external actors, such as superpowers involved in the region, and the sectors where securitization or desecuritization occurs.⁵ An RSC may change over time and experience internal transformation (changes in the relationships between its constituent units) or external transformation (changes in the boundaries of the RSC), and may also dissolve over time. Historically, securitization and desecuritization processes mostly occur between states in close proximity to each other, with the exception of great or superpowers, who get involved in distant areas as well. RSC is inherently a geographical and, as the authors affirm, geopolitical perspective. By definition, an RSC is the result of processes conducted by actors capable of securitizing or desecuritizing.

Geun Lee (2008) offers an approach linking environment and security with regional complexes. He developed the concept of the *Regional Environment Security Complex* (RESC). In contrast to Buzan and Wæver, Lee defines an RESC as a “set of states whose environmental problems and problem-solving efforts impact other states” (Lee 2008: 28). In addition, for Lee, awareness and problem-solving are central to defining the structure of an RESC. In his approach, complexes may range from latent complexes, where only expert communities would be aware of environmental problems, through interstate disputes over environmental affairs to regional environment security complexes, where joint regional action is formulated and implemented in response to a perceived environmental problem in one of the constituent parts of the complex. However, though awareness is important in Lee’s approach, he assumes that environmental problems exist whether they are recognized or not.

The particular value of the concept of ‘RSC’ (and by extension ‘RESC’) with regard to climate change lies in its utility for making assumptions about possible future developments based on the existing regional infrastructure of relationships (Buzan/Wæver 2003). A first application in the context of climate change can be found in the study by Halden (2007). He reviews world regions – following the definition of Buzan and Wæver (2003) – and explores the possible impacts of climate change on each region. In essence,

5 Sectors include political, military, environment, economy, and society. For a detailed explanation, see Buzan, Wæver, and de Wilde (1998).

this is an application of the *overlay approach* (2I.2). Additionally, the dynamic element of RSC as described above is largely absent in Halden’s study. The question remains as to how climate change could reshape an RSC, including its geographical and intra-region dynamics. Linking RSC and RESC may provide an analytical framework for improving the understanding of the security implications of climate change.

There is little doubt that climate change may significantly redraw the distribution of natural resources, alter patterns of precipitation, and change socio-economic landscapes as well as the boundaries of ecosystems. Being a source of comprehensive alteration, climate change may lead to the *internal transformation* of an RSC and RESC by redefining the relationships between constituent parts. For instance, the impacts of climate change may leave some countries less affected and indeed more economically viable than their neighbours who witness the adverse effects of climate change. The impacts of climate change may alter the interdependencies of countries with regard to the environment or access to natural resources.

However, climate change may also result in an *external transformation* by altering the borders of an RSC and RESC. This could be particularly true for complexes that are strongly affected by the issue of water availability: building on the example mentioned above, downstream countries such as Egypt may increasingly take an interest in the actions of upstream countries (Adly/Ahmed 2009). This may not be limited to immediate neighbours but may also include far-distant upstream countries, which then become part of the securitization process and of the extent of the original complex.

Both internal and external transformations of RSCs – and by extension RESCs – can be violent in nature, e.g. when a state destabilizes, or when disputes between states escalate (Buzan/Wæver 2003). Here, the overlay and factor approaches outlined previously help to identify the possible impacts of climate change.

21.4 Framework Development and Case Study Selection

Drawing on the preceding sections, an analytical framework can be proposed that has four building blocks at its core:

- First, the *overlay approach*, which focuses on mapping possible climate impacts against situations of fragility to identify potential hot spots.
- Second, the *factor approach*, which focuses on identifying possible 'critical issues', which may make the outbreak of violent conflict more likely to be caused by climate change. The first assessment of factors – or constellation or channels – is based on the overlay approach. For instance, sea-level rise and possible displacement of coastal communities is of limited relevance for landlocked countries.
- Third, the concept of *regional security complexes*. The concept is useful for understanding current security dynamics and the interactions between different units – whether sub-national entities, such as armed groups, or countries – and what may drive escalation or de-escalation processes in the region under study.
- Fourth, the concept of *regional environmental security complexes*. This concept allows firstly an understanding of how environmental issues are interwoven within a RSC, and secondly, drawing on the knowledge from the first two building blocks, it allows for an analysis of how the trajectory of the RSC being analysed may change or may possibly result in internal and/or external transformations.

In the following section, this analytical framework will be applied to the case of Iraq, including sub-national entities as well as neighbouring states (particularly Turkey and Iran). Iraq has been chosen because of its regional political relevance and the projected climate change implications for the region. In this assessment, the authors take a narrative approach, drawing on available secondary literature published by late 2009 or early 2010, as well as a set of interviews conducted in the latter half of 2009 as part of a research project.⁶

21.5 Climate Change and Security in Iraq

21.5.1 Iraq as a potential hotspot for climate-induced conflicts

Iraq is situated in a region which will experience reductions in precipitation plus strong regional warm-

ing (Carius/Maas 2009). It is therefore highly likely that climate change will put further stress on Iraq's water resources and overall ecological system. Predictions based on a moderate regional warming of 2.6°C estimate that the water in the River Euphrates will decrease by 30 per cent; if higher warming of +4°C occurs, water run-off from the Euphrates may even decline by 70 per cent (Kitoh/Yatagai/Alpert 2008). The Euphrates and the Tigris are Iraq's lifelines, as 53 per cent of its renewable freshwater resources are drawn from the two rivers and the majority of all large cities – including Baghdad – are situated along the Euphrates and the Tigris (Granit/Löfgren 2010). Studies of how climate change may affect the extensive dam systems of the Euphrates and Tigris are lacking so far (Arab Water Council 2009). Yet climate change may increase water scarcity not only by decreasing river run-off, lowering precipitation, and increasing evaporation, but also by increasing water demand for agriculture, industrial cooling, and hydro-power (Arab Water Council 2009).

In addition, although Iraq has only a short coastline on the Arabian Gulf, it is highly vulnerable to sea-level rise (El Raey 2010). Due to its low elevation, soil salinization and inundation by invasive salt water are major threats to the Shatt el-Arab region and could even affect the city of Basra (El Raey 2010). Furthermore, sea-level rise threatens major harbour infrastructure along Iraq's coastline and could lead to disputes with neighbouring Kuwait and Iran over the location of shipping as their maritime borders are defined by the lowest low-water mark (El Raey 2010).

Politically, after the 2003 invasion, Iraq became a fragile and unstable state with high internal unrest and state institutions with a low capacity for policy implementation. Though foreign troops have started to withdraw, Iraq's institutional recovery is still incomplete and deficient in many sectors (BTI 2010). It is challenged by a number of difficulties as the violence accompanying the 2010 parliamentary elections and the long and troublesome process of forming a new government emphasize (Fürting 2010). While the withdrawal of foreign troops is an important step towards releasing Iraq into autonomy, worries have been expressed that the country could relapse into violence and even civil war once the foreign troops are gone. Though the situation has improved over the past years, a political stabilization and pacification of Iraq seems an unrealistic prospect for the near future and probably beyond.

At the same time, Iraq's institutions are ill-prepared to cope with the substantial impacts climate

⁶ See Carius and Maas (2009) for the scope of the project and final report.

Box 21.1: Research gaps on climate change in the region of the Euphrates and Tigris. **Source:** The authors.

An extensive body of literature on the problem of water governance in the Euphrates and Tigris Basin has been produced over the past few years (Aydin/Ereker 2009; Scheumann 2003). The environmental damage wreaked by the Gulf wars has also received attention (UNEP 2003). Yet despite the fact that the water issue is generally recognized as likely to be aggravated by climate change (Assaf 2010; Saleh/Jayyousi/Almasri 2010), publications focusing on climate change and Iraq are largely absent. Current studies of the security and socio-economic effects of climate change in the Arab countries either discuss the region as a whole (Tolba/Saab 2009; Elasha 2010) or focus on the Mediterranean (Brauch 2010, Brown/Crawford 2009, Cheterian 2009) and the Arab Gulf region (Raouf 2008; chap. 19 by Kumetat and chap. 20 by Spiess in this volume). In addition, global reports such as the IPCC only provide a superficial overview of the region between Euphrates and Tigris, with little detailed material.

The lack of detailed research, in particular field research, and reliable data for assessing the impacts of climate change – a general problem for the whole region – will stand as an explanation. Only a few publications (Kitoh/Yatagai/Alpert 2008) deal with the effects of climate change in any depth, and offer specific projections. Furthermore, so far only the first of four National Communications to the UNFCCC has been provided by upstream countries such as Iran and Turkey, as well as by the Arab Gulf countries, but this is lacking in the case of Iraq. This can be explained by the desolate situation of relevant Iraqi institutions following the last war and the previous decade of sanctions. Given the current rate of reconstruction, it may take years until national bodies are able to engage in complex climate research (BTI 2010). In summary, while there is an evolving body of literature and research on the areas and countries surrounding Iraq – from which some inferences can be drawn – critical gaps remain with regard to climate impacts within Iraq.

change may exert on its water resources – and by extension on agriculture, energy, and other sectors. Given the politically unstable situation, further investigation is necessary whether climate change may become an additional driver for violent conflict. Factors potentially leading to and encouraging conflict will be explored in the following section (box 21.1).

21.5.2 Identifying Critical Issues for Climate Change and Conflict in Iraq

Iraq's population of approximately 31.5 million people is divided along ethnic, religious, and tribal lines. The Kurdish-Arab and the Sunni-Shi'ite divides are the two major cleavages within the population playing a decisive role in the political process of Iraq (Brown 2005). Sunni Arab populations are concentrated in central and western Iraq, especially in the so-called 'Sunni Triangle'. These areas are less well endowed with oil resources than other parts of the country. Major oil fields are located in the southern provinces, which are mainly inhabited by Shi'ite Arabs, as well as in the northern region, where the population is largely Kurdish. Disputes between Iraqi Kurds and the federal Iraqi government centre on territorial claims, especially with regard to the oil-rich region surrounding Kirkuk. There is a strong secession movement in Iraqi Kurdistan; a robust solution to the territorial conflicts is not yet in sight (ICG 2009, 2009a). Apart from the uneven distribution of oil resources, water issues further complicate Arab-Kurdish relations, as the rivers running from Turkey and Syria pass Iraqi Kurdistan

before entering the regions dominated by Arab populations.

State structures and institutions at the national level are weak and prone to the two major default lines in Iraq, the Sunni-Shi'ite and the Arab-Kurdish divides. Federalism as a new concept is still in a developing phase in Iraq and few experiences exist of how conflicts between different federal states can be managed.⁷ National dialogue is still in its beginnings and concepts of how to share the country's wealth are so far lacking. Regions may therefore push forward their own agendas largely independent of each other, polarizing the situation even further.

While the Arab-Kurdish disputes are over autonomy and resource distribution, the tensions between Sunni and Shi'ite Iraqis are linked to the distribution of political power. The reorganization of Iraq's institutional setting along ethnic and religious lines led to a decline of secular and national political forces, deepened the frictions between the two religious groups, and fostered the spread of sectarian violence (Fürtig 2010). As the 2010 parliamentary election showed, national issues and perspectives seem to be gaining importance again (Fürtig 2010). However, given weak state security forces and institutions, a high level of violence continues to overshadow everyday life in Iraq.

Efforts towards economic, industrial, and infrastructural recovery are challenged by both the fragile security situation and by the frictions between the

⁷ Interview with UNEP representative, 13 August 2009.

main political actors and regions. Unemployment is high in Iraq and may even be exacerbated by high population growth. By 2050, Iraq's population may have more than doubled and increased to approximately 63 million people if present trends continue (UNPD 2008). More than 40 per cent of the population will be younger than 15 years (UNPD 2008). This youth bulge combined with low employment levels, low standards of education, and poor future prospects are likely to be the cause of civil unrest and to contribute to a further destabilizing of Iraq, by fostering insurgency and radicalization (Urdal 2009; Beehner 2007).

Apart from political and socio-economic challenges, the country faces severe environmental degradation. Iraq's natural environment is already heavily stressed by inefficient and unsustainable resource management (UNEP 2003). The country's surface water resources in particular are heavily affected by extensive upstream dam-building projects and the remnants of three wars on Iraqi territory since the 1980s. Water scarcity in Iraq is also partly due to very low water efficiency: approximately 90 per cent of Iraq's water resources are used for agricultural irrigation (UNDP 2007). In addition, a severe drought has hit Iraq over the past few years (UNWFP 2008) and has increased food insecurity in Iraq as it has ruined crops and kept displaced farmers from returning to their farms, especially in northern Iraq. Lack of precipitation and decreased run-off from the Euphrates and Tigris and their tributaries are increasing desertification and the degradation of arable land. Farming has become increasingly difficult as it relies largely on surface water, and groundwater reserves are eventually exhausted. In addition, heavy sandstorms hit the country with increased frequency, causing severe health problems in the population (Ennahar online, 13 July 2009).⁸

The impacts of climate change differ across Iraq. Southern Shi'ite and Sunni provinces may experience climate change as a threat from two sides: on the one hand by lower run-off from upstream Iraqi Kurdistan; on the other hand by sea-level rise and the intrusion of salt water, rendering groundwater useless and leading to salinization of soil in agricultural regions. State capacities for providing services – such as access to

water, energy, food, etc. – to its citizens are low. The court system is still considered illegitimate in certain communities of Iraq (BTI 2010). Impartial institutions for the settlement and mediation of disputes, such as traditional bodies, exist, but polarization and the post-conflict transition process has left these too weakened. Large numbers of small arms exist in Iraq plus networks of militant and extremist groups, making the means of violence easily available. This mixture provides incentives for groups to resort to violence, as non-violent means may either not work satisfactorily or are expected to fail. In the past there have already been reports of small-scale violent clashes between tribes over water and land resources.⁹

Climate change could furthermore affect internal displacement and the return of internally displaced people. For example, Marsh Arabs inhabiting the Iraqi wetlands situated in the lower Euphrates-Tigris basin may face the need to migrate to other parts of the country again after they have just returned to their land in the past few years. Following the 2003 invasion, the Marshes, a unique natural habitat, were largely restored after they had been intentionally destroyed under the rule of Saddam Hussein (UNEP 2003). Due to lowered river discharge and water salinization, however, the region once more faces severe challenges (El Raey 2010; IRIN 2009), underlining its vulnerability towards the predicted climate change effects. In the receiving communities Marsh Arabs are likely to face rejection and strong difficulties in integrating into the local economies and labour market.

In summary, Iraq is characterized by a highly fragmented and polarized population, unevenly distributed natural resources, weak state institutions, a high level of insecurity and violence, and a natural environment already under stress. As a consequence, the situation is conducive to violent conflicts induced by climate change, and may become more so. In particular, two conflict constellations developed by the WBGU – on climate-induced reduction of freshwater resources and climate-induced food crises – appear plausible: many relevant factors, such as rapidly increasing demand, weak institutional capacities, pre-existing political instability, and high dependency on agriculture are present in Iraq (WBGU 2008). However, in both cases the regional situation is also important, particularly as Iraq is strongly dependent on two rivers originating externally while external political interference heavily impacts on the security situation in Iraq. These

8 It is assumed that the higher frequency of sandstorms could be related to the destruction of the thin crust covering the desert sand caused by heavy war equipment. This allows small sand particles to be lifted up in the air more easily (Raphaeli 2009).

9 Interview with UNEP expert, 13 August 2009; see also IRIN (2010).

regional dynamics will be explored in the next two sections.

21.5.3 Understanding Iraq's Regional Security Complex

The Middle East is an archetypical regional security complex with its powerful enmity and amity relations between the regional states (Buzan/Wæver 2003; Halden 2007). With the 2003 invasion, the RSC was transformed as Iraq was removed as a credible threat and counterbalance to its neighbours. Due to internal frictions and instability, the Iraqi central government is nowhere close to being considered a similar force by its neighbours as it was during the preceding regime. Instead, Iraq has become a playing field for regional powers striving for hegemony in the Middle East. It is therefore useful to consider Iraq as being at the centre of a 'sub-complex'. This sub-complex includes in particular Iraq, Iran, Turkey, Syria, and Saudi Arabia, as well as the United States of America as an outside force yet strong presence in the region.

Within this sub-complex, it is useful to distinguish two types of units: first, states, and second, sub-national entities, such as armed groups or regional governments. The sub-national entities within Iraq, however, focus their attention in terms of securitization and desecuritization mostly towards each other and less towards the outside. However, the sub-national entities are of key importance in understanding interference by outside powers within Iraq, as e.g. Kurdish aspirations for independence in northern Iraq are viewed as a threat by Turkey (BTI 2010). Similarly, Iran and Saudi Arabia watch the situation and support proxies directly and indirectly. As a consequence, it is not meaningful to further separate the interactions of sub-national units within Iraq from interactions at the state level, as both are deeply intertwined. As the interactions and divides at the sub-national level in Iraq have been discussed in the preceding section, the following section will focus on the interests and interrelationships of the main states involved in the regional security sub-complex.

One of the major fault lines of the suggested security sub-complex runs between Saudi Arabia and Iran. Their struggle over economic and political hegemony in the region has led to a strong involvement of both states in post-Saddam Iraq. To Saudi Arabia, the 2003 invasion posed several dilemmas. While relations between Iraq and Saudi Arabia have never been uncomplicated, the deteriorating security situation in Iraq and growing anti-Americanism in Saudi Arabia

threaten the kingdom's internal stability and may foster extremism and political opposition (Sirriyeh 2007). In this regard, Saudi Arabia shares the stabilization of Iraq as a common interest with the US. However, after the fall of the Sunni Ba'ath regime, Saudi Arabia as well as Iran intervened in Iraq to support sectarian groups in the political reconstruction process in order to influence a future political setting in their favour. This engagement further destabilized and weakened the country, as the support for Saudi Arabian and Iranian proxies further polarized Iraqi population groups.

Having lost Iraq as a strong counterbalance, Iran actually gained strength as a regional power (Asseburg/Steinberg 2007), expanded its influence, and now plays a crucial role for the security and internal political dynamics of Iraq (Zimmermann 2007). It still has an interest in Iraq's territorial integrity as the Iranian territory bordering Iraq is inhabited by a Kurdish minority (Sirriyeh 2007). Iran shares this interest with Turkey and Syria. Turkey furthermore intervened militarily to curb insurgents hiding in northern Iraq (Jenkins 2008), but it eventually turned to dedicating its efforts to the reconstruction of Iraq, which led to an improvement of its relations with Iraqi Kurds (Alessandri 2010). This re-orientation of Turkey's foreign policy towards Iraq allowed Turkey the opportunity to position itself as a strong regional actor and to open up new energy and trade relations with post-Saddam Iraq (Alessandri 2010). Turkey shares a broad range of interests with Iran, from energy issues to future political developments in the region (Alessandri 2010).

The invasion of Iraq in 2003 also strongly affected Syria especially with regard to its internal stability and, again, the question of ethnic, especially Kurdish, and sectarian aspirations (Sirriyeh 2007). Following the war, Syria faced an influx of large numbers of Iraqi refugees, putting additional pressure on Syria's economy, infrastructure, and public services, and posing a major threat to the stability of the country (Yacoubian 2007). Against this background, Syria has a major interest in the reconstruction of Iraq which would allow the refugees to return. Nonetheless, Syria, as well as Iran, was accused of fostering insurgency in post-Saddam Iraq, leading to its labelling as a 'rogue state'. Recently, the rapprochement between Turkey and Syria provided the possibility for Syria to eventually take a more responsible role in the region adding to overall regional stability (Alessandri 2010).

The US as an external political, military, and economic force is another stakeholder in the regional

security sub-complex. While it was the major driver of transformation by Iraq, its military presence had even wider implications for the other units of the sub-complex. For Saudi Arabia, the US presence in the region posed an internal dilemma, as it increased anti-American sentiments and potentially heightened internal opposition and extremism, so threatening Saudi Arabia's stability (Sirriyeh 2007). On the other hand, the military presence in the Gulf and its perception as a threat offered Iran a motive for its aggressive policy, e.g. towards Israel, for its involvement in Iraq, and also with regard to its nuclear energy programme. Even with the withdrawal of its troops, the US will likely continue to play a major role for security in the region by supporting its regional partners and the newly-built Iraqi state politically and economically.

Before exploring the impacts of climate change on the regional security complex just outlined, it is useful first to explore the interconnections within the regional environmental security complex.

21.5.4 Understanding Iraq's Regional Environmental Security Complex

A regional environmental security complex can also be identified. It includes in particular Iraq, Iran, Turkey, and to a lesser extent Syria, which are linked through the Euphrates and Tigris rivers. It strongly overlaps with the regional security sub-complex identified above, yet excludes Saudi Arabia. The Euphrates and Tigris both originate in Turkey; the Euphrates runs for 680 km through Syria before entering Iraq, while the Tigris runs a short distance along the Syrian border and then flows into the country. Iran has to be included in the complex as important tributaries of the Tigris originate within its territory. Both rivers are crucial for satisfying the increasing irrigation demands of the riparian countries. Therefore, the distribution of the Euphrates and Tigris waters has always played an essential role in the external relations of Turkey, Syria, and Iraq (Aydin/Ereker 2009). Being the downstream country, Iraq depends heavily on the water policy of its upstream neighbours: it is especially vulnerable to damming projects, increased water withdrawal, and upstream pollution of water (El-Fadel/Bou-Zeid 2001). Ironically, about 80 per cent of the agricultural products Iraq needs to import originate from Iran, Turkey, and Syria – exactly those countries whose water policies it is most vulnerable to and with whom tensions over water sharing already existed in the past (figure 21.1).¹⁰

Figure 21.1: The Euphrates and Tigris. **Source:** Figure by Philippe Rekacewicz, UNEP/GRID-Arendal; at <http://maps.grida.no/go/graphic/regulation_of_the_tigris_and_euphrates_rivers> (11 January 2011). Reprinted with permission of UNEP/GRID-Arendal.



A comprehensive regional agreement on the sharing of the Euphrates and Tigris rivers is currently not in place between Iraq, Syria, and Turkey (Aydin/Ereker 2009; Arab Water Council 2009). During the 1950s and 1960s, the countries of the region developed their dam projects largely independent of each other. Although there exist several bilateral agreements between Iraq and its neighbours, consultation processes on the shared water resources are slow, established committees meet irregularly, and seem unable to reach solutions to urgent questions (Arab Water

¹⁰ Interview with UNEP representative, 13 August 2009.

Council 2009). The negotiated water quantities are undermined by hydro-meteorological fluctuations such as droughts and further water development projects in Syria, Iran, and Turkey, which is why Iraq in particular has accused its neighbours on several occasions of ‘stealing’ water and not abiding by agreements.¹¹ In the 1970s Iraq had already threatened Syria with a strike against dams if the country did not allow more water from the Euphrates to flow into Iraq (Gleick 1994).

As climate-induced challenges mainly originate from water problems, it is easily understandable to solve them by demanding more water from Iran, Syria, and Turkey as the Euphrates and Tigris are fed from there. As described above, institutional capacities for water-sharing management are low, no sufficient agreements are provided, and reactions to extreme water shortages occur mostly spontaneously. This was the case in the 2009 drought as Turkey agreed to release more water to the downstream countries (Reuters 2009, 2009a). However, a comprehensive water-sharing agreement is still far from coming into place, mainly due to the uncertain future of Iraq and the zero-sum character of water distribution between the riparian countries (Aydin/ Ereker 2009). With temperatures rising and water stress also being exacerbated in the upstream countries, the dispute over water between Iraq and its neighbours could gain in intensity.

21.5.5 Understanding Climate Change in Iraq – Altering Regional Security Dynamics?

Summarizing the findings of the preceding sections, it is plausible that climate change makes the situation in Iraq more conducive to the outbreak of violent conflict. In particular, conflict constellations related to access to food and water may emerge. Climate change, however, will not create a ‘new situation’, but exacerbate the existing issues. Whatever the possible reduction of the flow of the Euphrates or Tigris, the issue already exists today. Even the threat of military force to coerce upstream countries to release water has

been issued as long ago as the 1970s. Interstate water wars, however, would require a militarily more powerful downstream country (see WBGU 2008), which Iraq is currently not. Consequently, the regional security complex and the regional environmental security complex in which Iraq is located are unlikely to experience an internal or external transformation as a result of climate change.

A possible exception would be if the central government in Iraq identified the water policies of Turkey, Iran, and Syria as a key threat to Iraq and its population and united the various factions against them by successfully securitizing the situation. It could internally transform the regional security sub-complex in two ways. First, it would contribute to the internal pacification of Iraq or at least severely reduce internal struggles, thus freeing up central government resources for other activities. Second, Saudi Arabia could then act as a supporter or ally of Iraq against the latter’s neighbours, as there are no water issues between Saudi Arabia and Iraq and Iran becomes seen as a ‘common foe’ of Iraq and Saudi Arabia, though for different reasons. What makes such a development unlikely is the level of influence the neighbouring countries have to prevent such a unification of factions in Iraq occurring. This would be accelerated if the upstream countries chose to mitigate the situation by releasing more water and thus removing the glue of such an alliance.

Avoiding this development will require preparation and adaptation to climate change impacts in Iraq. Quite a range of activities are conceivable in improving water efficiency, not least because of inefficient current practice (World Bank 2007). This will not lead to the pacification of Iraq, but diminishes the role of climate change as a possible driver for violent conflict. Of course, the possibilities of implementing effective policies are difficult to envisage given the current situation in Iraq. A more viable alternative may be to seek improved resource efficiency within Turkey, Iran, and Syria, and to increase awareness in these countries of the situation in Iraq and its possible consequences. Concluding a regional water-sharing agreement would be useful in this regard and could transform the regional environmental security complex into one of amity and cooperation (Granit/Löfgren 2010). However, the extent to which the regional security complex will be affected is debatable, as the concerns of Turkey vis-à-vis the Kurdish areas of Iraq are not necessarily touched on, and the rivalry between Iran and Saudi Arabia persists. At the sub-national level, it would possibly mitigate climate change as a driver for

11 There are several news items on this issue; for a selection: Al Jazeera video on Iraq accusing Iran of stealing water; at: <<http://english.aljazeera.net/news/middleeast/2009/10/20091023161843699258.html>> (22 December 2010); WASH News Middle East & North Africa; at: <<http://washmena.wordpress.com/2009/06/16/iraq-warns-turkey-on-euphrates-water-supplies/>> (22 December 2010).

conflict, but would not remove the existing polarization and fragmentation.

The absence of transformation is not necessarily good news either: should climate-induced conflict constellations materialize, they will keep Iraq unstable and may result in further external interference on behalf of proxies. This will add to hostility and polarization within Iraq's society, in turn making pacification more difficult to achieve. A continuously unstable Iraq is likely to have destabilizing effects on its neighbours, who, however, as shown above do not have an interest in the situation in Iraq deteriorating further, and this may lead to temporarily more cooperative behaviour. Essentially, climate change would then contribute to the conservation of the current situation by intensifying its dynamics.

21.6 Summary and Conclusions

Climate change has been identified as a major driver for transformation and as a possible trigger for conflicts. A multitude of different perspectives on the interlinkages between climate change and conflict emerged in the literature in just a few years. The purpose of this chapter was to develop an analytical framework based on existing approaches and to add further depth by connecting it with regional security complex theory. It started with present-day vulnerabilities and fragilities, and gradually included potential climate change impacts.

The analytical framework that was applied to the case of Iraq yielded a number of results: first, it was established that climate change may indeed make the situation in Iraq more conducive to the outbreak or continuation of violent conflict. Water in particular, and by extension agriculture and other related sectors, were identified as key issues. Looking into the existing regional security dynamics and environmental linkages between the countries, three possible developments were identified: first, that climate change does not significantly affect the quality of regional dynamics, yet contributes to their conservation – in the case of Iraq, this implies that climate change would hinder pacification and stabilization. The other two developments may result in either a transformation of the RSC or the RESC in which Iraq is involved, with the former likely leading to the internal pacification of Iraq – but with increased antagonism with its upstream neighbours – and the latter not changing the security situation, but mitigating climate change as a possible driver for conflict. While the desirability of

each development is subject to debate, the last one would at least diminish the role of climate change in stalling Iraq's recovery. The three possible developments identified provide a starting point for the development of robust policy measures, i.e. actions which may be beneficial across a range of scenarios. Of course, implementing them effectively in present-day Iraq is a daunting challenge.

Reflecting on the application of the framework, the following issues emerge as useful next steps and future research areas:

- First, the number of cases. This chapter only focused on one single case study and more case studies need to be conducted to validate the merits of the analytical framework. In particular, a comparative approach should be taken, using research into a wide range of possible climate change impacts. For instance, while in the case of Iraq climate change creates essentially no new issues but only exacerbates them, the melting of the Arctic makes new areas available for navigation and resource exploitation. Would this create a new RESC or RSC as well?
- Second, the application of methods. This chapter is mainly conceptual and largely based on secondary literature and selected interviews. Further research regarding methodology, in particular linking natural science and social science to capture the complexity of socio-ecological systems, will be valuable. The analysis of co-evolutions of RSC and RESC against the background of climate change merits further in-depth research, in particular the relationships between their constituent parts and their assessment.
- Third, the development of 'robust' recommendations and policy measures – applicable across a range of possible developments – requires further research. The different trade-offs against the background of evolving and transforming security complexes would be an eminently suitable field for further research, in particular into how they might be transformed in a non-violent way.

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22 Nothing New in the Middle East – Reality and Discourses of Climate Change in the Israeli-Palestinian Conflict

Clemens Messerschmid

22.1 Introduction

Climate change (CC) and water is a fascinating discursive terrain as it is both highly visible and becoming increasingly tangible, while at the same time remaining conspicuously fluid, dealing with incremental changes and ‘substantial uncertainties’ in speed, spatial variability, scale, depth, and impacts. This chapter lays out CC implications in the Middle East for Israel and the occupied Palestinian territories (oPt) in its discourse and in particular with respect to the socio-political consequences for water conflict.

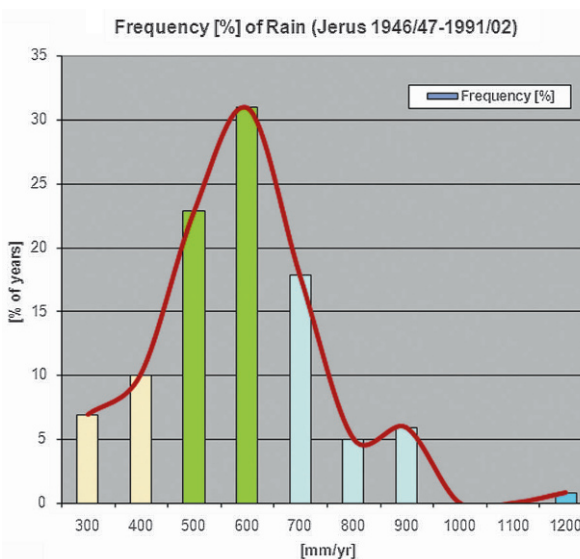
Although considered by some as a new paradigm, CC is rather a new theme that draws on the existing securitized discourse. The chapter will explore the long-standing myths, storylines, and epistemic figures of the discourse, and its new expansion CC. The chapter provides a critical discourse analysis but also a crucial assessment of the political factors, drivers, and interests on the ground. Special attention is given to the theme of cooperation under CC, promoted by most donor states.

This chapter will introduce the metaphor of CC as an empty canvas, a projection screen for entirely different, even contrary discourses. Methodologically, this analysis is informed by Robert Cox’s insight that “theory and knowledge are always written by someone and for some purpose” (Cox 1985: 207) and applies this concept directly to the CC discourse, as a field not merely of scientific interaction but of fierce political, socio-economic, and not least hydrostrategic rivalry. The diverging myths and metaphors, vocabularies, and epistemic figures (Hajer/Wagenaar 2003: 106) under such discourses are considered instrumental and indicative for the diverging interests.

Water in Israel has long been deeply securitized (Dombrowsky 2003, 2007; Jägerskog 2003, 2009; Libiszewski 1995; Selby 2009; Warner 2006; Zeitoun 2008). This chapter argues that it is being reframed under the current and emerging CC discourse. Here,

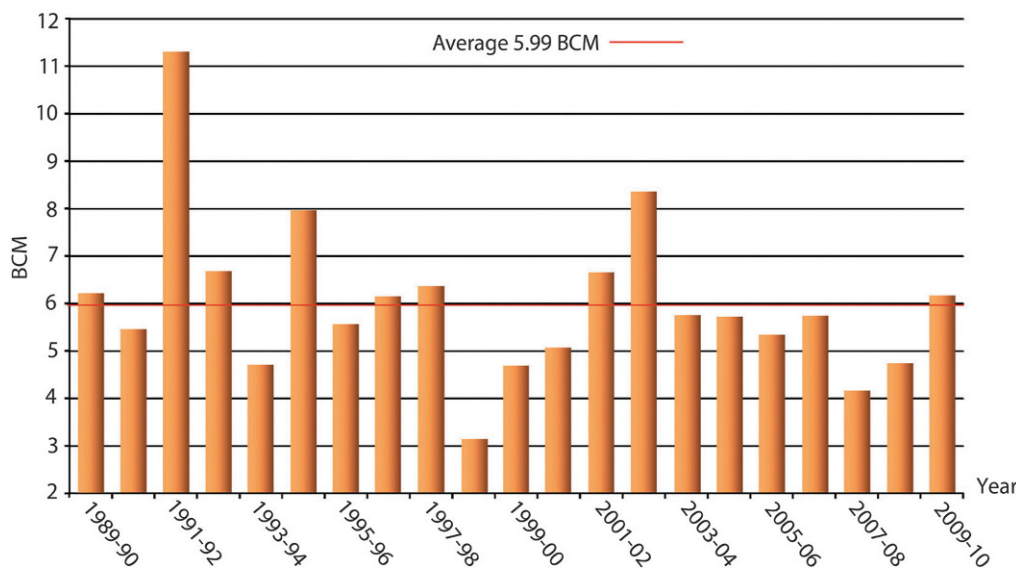
it does not matter whether a ‘narrow’ (Wæver 1998) or a ‘wider’ (Brauch 2004, 2008) security concept is applied – the examples given below fit both categories, ‘state security’ (Wæver 1998) as well as ‘environmental’, ‘societal’, ‘economic’, or of course ‘climate security’.

Figure 22.1: Rain frequency (145 yrs: 1847-1992) in Jerusalem. **Source:** This figure was prepared by the author based on Bachmat and Abdul-Latif (2003: 9).



Many authors (elsewhere in this volume) have warned against the ‘securitization of CC’. The author agrees. But this chapter differs as it argues that what is new and taking place in the current context of the Palestinian-Israeli water conflict is not so much a ‘securitization of CC’ but rather a ‘climate changeization’ of an indeed very old¹ political discourse on ‘water security’, or more correctly of a securitized hydrostrategic discourse on water resources allocation, access, and control. This implies that securitization is not an alien

Figure 22.2: Annual rainfall volume in Israel (billion cubic metres, BCM). **Source:** Israeli Meteorological Service in Israel's 2nd National Communication on Climate Change (INC 2010: 37), which is in the public domain.



Note: This record closely matches the statistics of Bachmat and Abdul-Latif (figure 22.1): Half of the years are within the average range.

element to CC discourses introduced a posteriori, but rather the opposite – that CC discourses are being moulded into pre-existing discourses, hardened by the ongoing water conflict.

So far, insufficient attention has been given to the question of how the CC discourse – allegedly aimed at addressing the ills and impacts of global warming – can be hijacked and instrumentalized for non-scientific hydrostrategic agendas. The chapter will try to show that CC is skilfully and successfully employed to excuse the obvious injustice in water relations under the Israeli occupation. The critical CC discourse analysis (22.3) is juxtaposed with the scientific and political background of the conflict (22.2). The solutions proposed for adaptation and mitigation are discussed in sections four and five, together with the respective discourses on cooperation (22.6). This will lead to a critique of the emerging CC discourse that will ask: how, by whom, and to what ends is CC employed? What is wrong with it and how could CC as a discourse and a practical task be improved? Further research needs are described and conclusions drawn (in 22.7 and 22.8).

Table 22.1: Annual rain frequency, Jerusalem. **Source:** This table was prepared by the author based on Bachmat and Abdul-Latif (2003: 9).

Scale	Annual rain [mm]	Frequency
Dry years	200-300	6.9 %
	-400	10 %
Average	-500	22.8 %
	-600	30.9 %
Wet years	-700	17.8 %
	-800	5 %
	-900	5.9 %
Very wet years	-1000	none
	-1100	none
	-1200	0.8 %

22.2 Climate Change: Background on the Current State

I am the de facto Palestinian water regulator.
Uri Shani, head of the Israeli Water Authority (IWA) in 2008

22.2.1 Current Climate

The Mediterranean climate is characterized by seasonality (winter rain) and variability or “random variation

1 “Access to water is imperative for the Zionist land grab” and “Zionist demands at the Paris Peace Conference 1919” (Johannsen 2002: 5).

in time” (Bachmat/Abdul-Latif 2003; Goldreich 1995; Salem 2009). Alterations of dry and wet years are constitutive to this climate (IPCC 2007b; figures 22.1, 22.2, table 22.1).

The exact depth of future rainfall reduction scenarios (table 22.2) remains uncertain and opens the door to a wide field of discourses with insufficiently substantiated expectations. However, despite all uncertainties², a predicted reduction in available water of 20–25 per cent seems appropriate³ (IPCC 2007a: 11, 136; IPCC 2007b: 854, 874, 875⁴ and IPCC 2008: 3, 11, 47, 48, 136, 181; figures 22.3, 22.4, 22.5; table 22.2).

Table 22.2: Rainfall reductions 2050-2099 according to different scenarios. **Source:** This table was compiled by the author based on Hemming, Betts and Ryall (2007: 4); Hoff (2008: 20); GLOWA (2008: 59); IPCC (2007a: 25); GLOWA (2008: 59, 111).

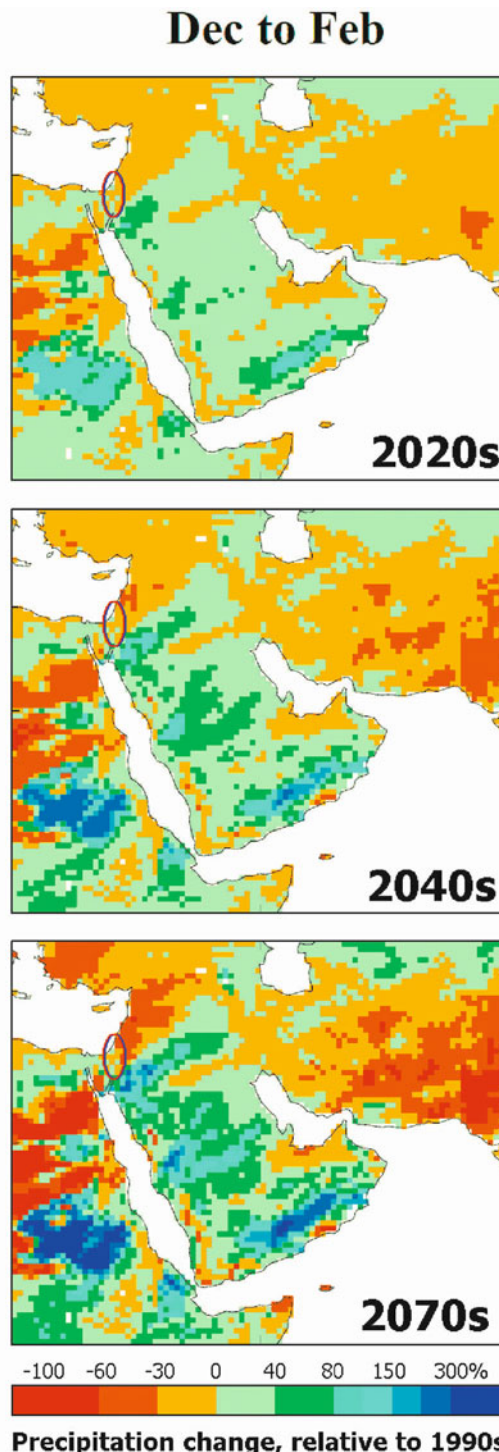
Year	Scenario	Reduction	Source
2040	ensemble	20%	Hemming/Betts/Ryall (2007: 4)
2050	B2	11%	Hoff (2008: 20)
	B2	15%	GLOWA (2008: 59)
2099	A1b	20%	IPCC (2007a: 25)
	B2	25%	GLOWA (2008: 59, 111)

22.2.2 The State of the Water Resources

As figure 22.8 shows, water levels in Lake Tiberias have suffered from over-pumping⁵ since the 1970s, when the *National Water Carrier* (NWC) pumping

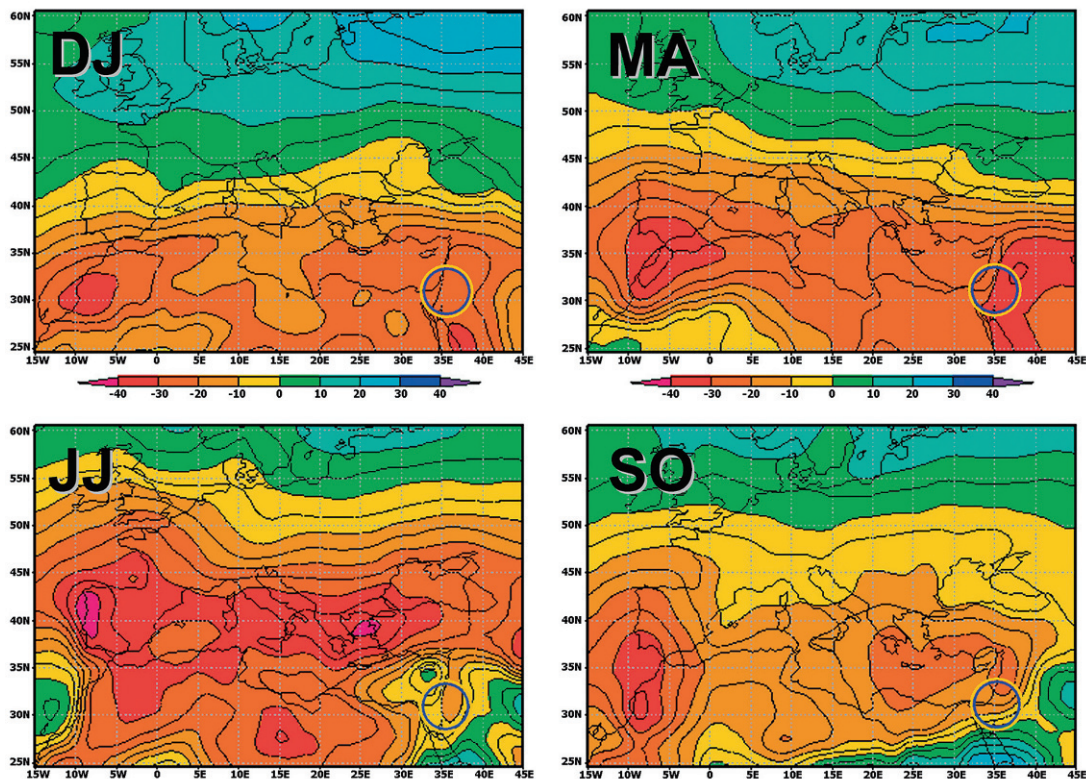
2 IPCC (2007b: 850, 852, 857, 863, 872).
 3 Reduction forecasts have become “consistent across model projections” (IPCC 2007b: 863).
 4 Uncertainty originates from a wide array of reasons, such as spatial problems and model grid size (IPCC 2007a: 3, 25, 136), atmospheric (IPCC 2007b: 849, 865, 874, 875, 921, 924) and oceanic circulation (IPCC 2007a: 60; 2007b: 865), and orographic forcing (IPCC 2007b: 861, 868, 918, 919), natural variability, intensity, and seasonality of weather phenomena (2007a: 15, 16, 18, 29, 30, 60, 62, 70, 85, 94, 95) and other factors such as land use change (IPCC 2007b: 871, 892, 897, 921), and finally currently unknown future adaptation and mitigation measures, which IPCC calls “the nature, extent, and relative success of those initiatives and measures already planned as interventions” (IPCC 2007a: 48).
 5 “Kinneret hits red line, endangering water quality”, in: *Haaretz*, 9 July 2008: 7; at: <<http://www.haaretz.com/hasen/pages/1000043.html>> (28 March 2011): 1 of 1.

Figure 22.3: Change in winter rains. **Source:** Hemming, Betts and Ryall (2007: 38). With kind permission of the Met Office, © British Crown Copyright (2007).



scheme became fully operational.⁶ Yet Israel’s response to the current ‘drought’ is to increase pumping

Figure 22.4: Ensemble situations of future precipitation change (% , 2071-2100 minus 1961-1990), MGME ensemble average, A1B scenario). **Source:** Giorgi, Lionello (2008: 98); quoted after: Hoff (2008: 19). Permission was granted by the author of the publication, from which the figure was taken.



by a massive 70 million cubic metres per year (mcm/yr) from 39 new wells built under an emergency “drought drilling” programme (Mekorot 2009).⁷

The river Jordan is literally pumped dry by Israel (figure 22.9), dropping from 1300 mcm/yr to currently 2 per cent of its natural flow (FoEME 2011: 2).

The sinking level of the Dead Sea (Salem 2009: 300) and ensuing dramatic rise in the Dead Sea’s brackish spring discharge has created a situation of extensive storage depletion of water within the *Eastern Aquifer Basin* (EAB) in the West Bank (HWE/MWH/PWA/USAID 2010: 24).

All other aquifers, Carmel, the Galilee, Tiberias, or the Negev are over-pumped by Israel. As a Knesset Committee of Inquiry remarked (Knesset 2002), Israel follows a “gambling management”⁸ (Zeitoun/

Messerschmid/Attili 2008: 157) whereby dry winters with lack of “available water” in Lake Tiberias are compensated through over-pumping the aquifer (figure 22.10), thus gambling on the next winter becoming rainy again.

Palestinians do not over-pump the Mountain Aquifer but are restricted to an incremental share of merely 10–20 per cent of this groundwater emerging in the West Bank (HSI 2008, World Bank 2009, AI 2009). The number of new Palestinian wells drilled in the main Western Aquifer since the onset of the occupation (June 1967) is easy to remember – it is zero.

22.2.3 Water Use Patterns

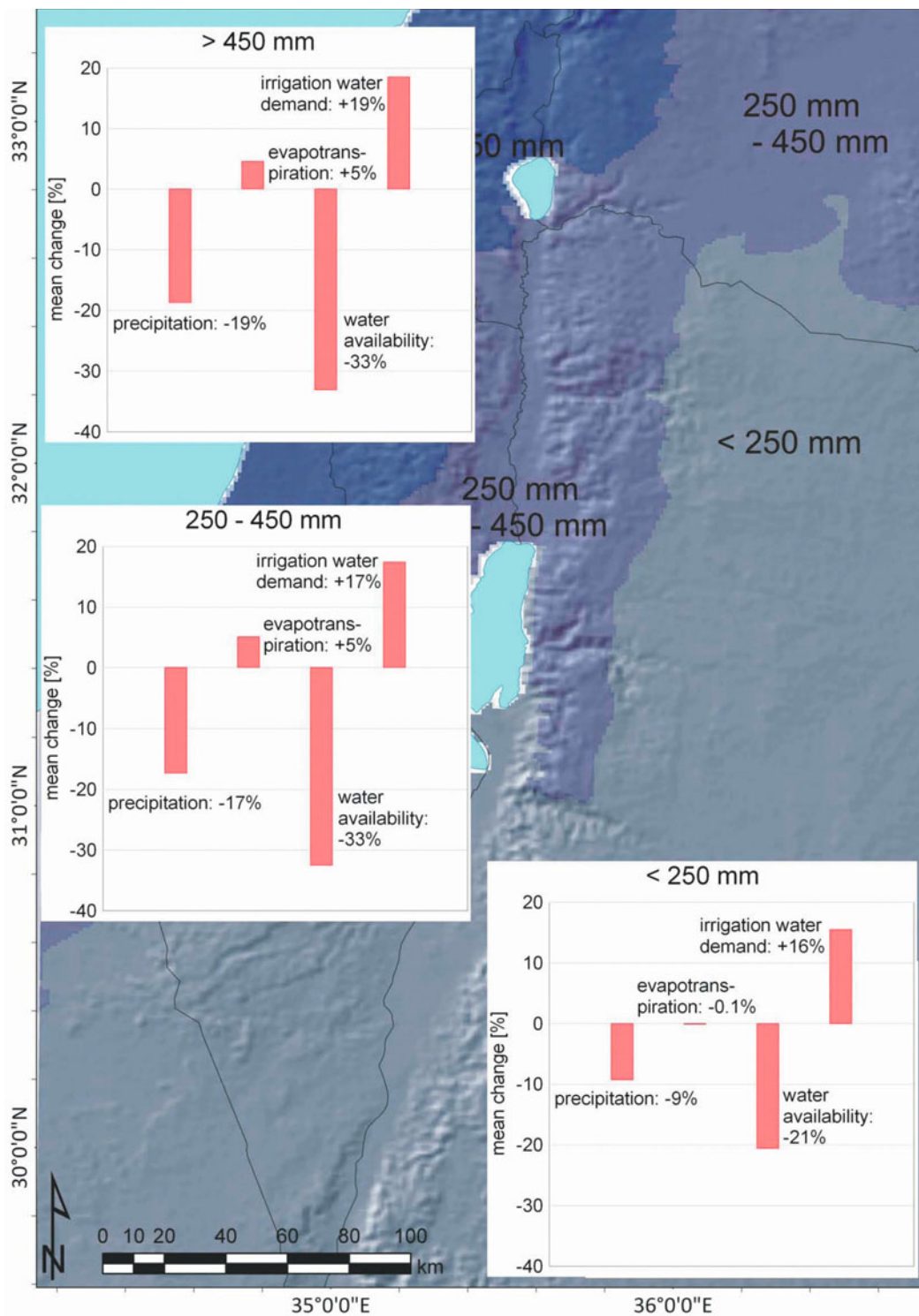
Israel has long developed as an industrialized, high-tech economy. Agriculture consumes 60 per cent of all water (INC 2010: 20) but adds only 2.6 per cent to the GDP. In the West Bank and Gaza, only 6 per cent of the agricultural area is irrigated, but Palestinians

6 The figure also shows the impact of reducing the Lake’s outlet in 1934, which resulted in a steady water level rise during the ensuing 30 years.

7 *Mekorot National Water Company Report*, Tel Aviv, 29 October 2009; at: <<http://www.mekorot.co.il/ENG/NEWSEVENTS/Pages/MekorotNationalWaterCompanyReport.aspx>> (28 March 2011): 1 of 1.

8 E.Z. Waldoks: “Making a sea change”, in: *Jerusalem Post* (10 July 2008): 1:7.

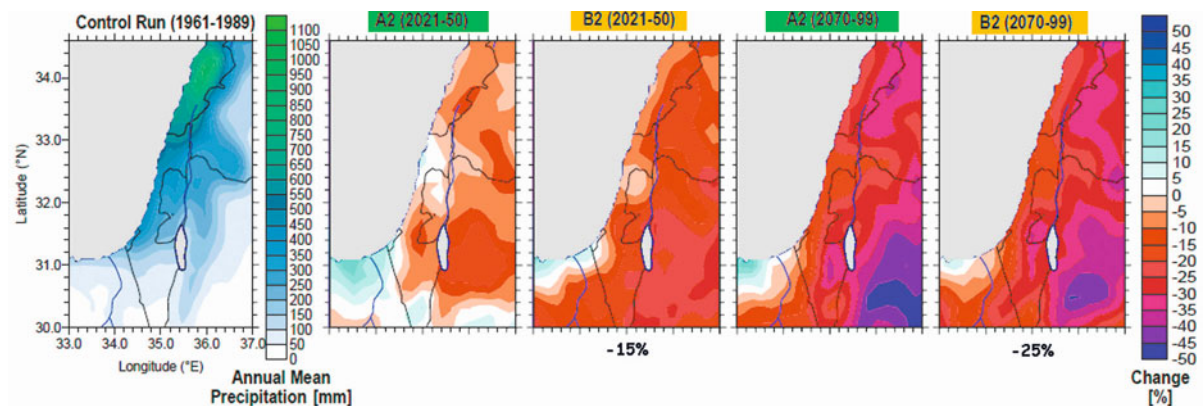
Figure 22.5: Simulations of changes in water availability and irrigation demands in the Jordan River region. **Source:** Törnros, Menzel and Strakova (2010). Permission for inclusion was granted by Mr. Menzel for an upgraded figure which is reproduced here.



depend on agriculture for 30 per cent of their GDP (FoEME 2007: 19). The Palestinian share in all three

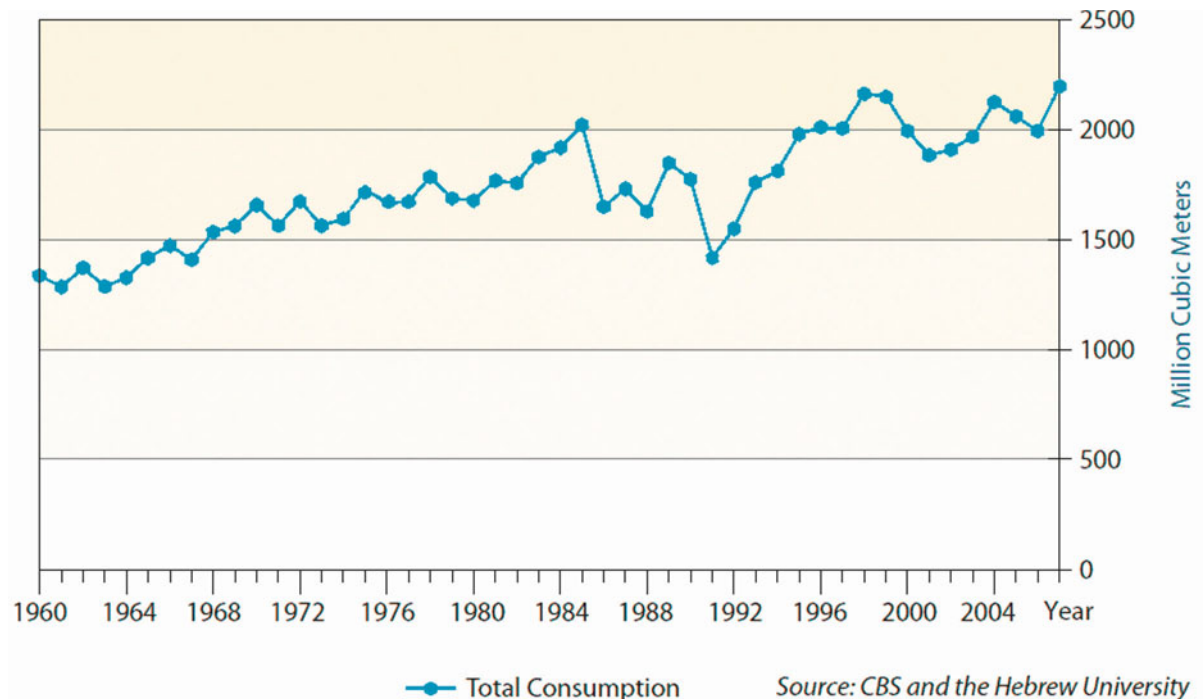
Mountain Aquifer basins⁹ is 10.4 per cent (PWA 2009; HSI 2008). According to table 22.4, Palestinian-con-

Figure 22.6: Rainfall scenarios 2050-2099. **Source:** Kunstmann, Suppan, Heckl et al. (2007: 145); Heckl (2011). Permission for reproduction was granted by Mr. Andreas Heckl, KIT/IMK-IFU.



Note: B2 Scenario (2021-50 and 2070-99): Rain -15 per cent/-25 per cent by 2050/2099 in the West Bank. Gaza is less affected.

Figure 22.7: Israeli supply-side management: ever-increasing total water consumption (1960-2007). **Source:** Modified after INC (2010: 39).



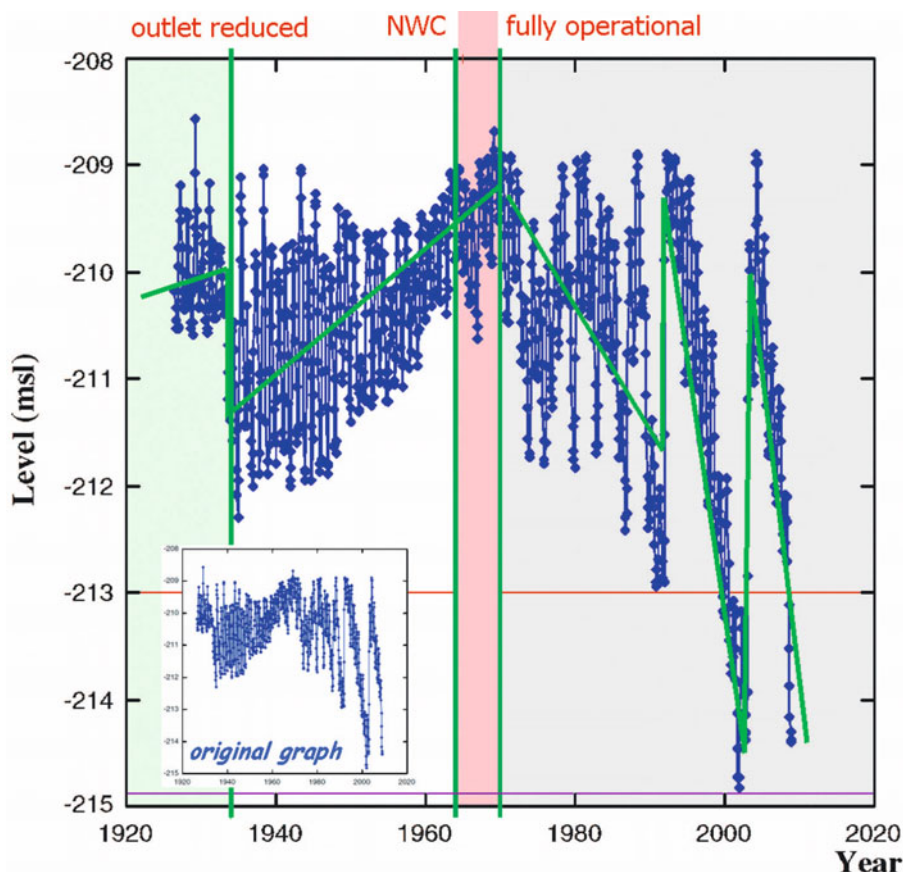
trolled well and spring abstractions in the West Bank now stand at 84.4 mcm/yr (2008). In the brackish Gaza aquifer, only 7.5 mcm of fresh water remain annually for consumption.¹⁰

Even more drastic is the rate of over-abstraction in the Coastal Aquifer - both in Gaza (177 mcm/yr¹¹) and inside Israel (466 mcm/yr¹²; table 22.3).

9 The shallow local aquifers are not part of Oslo-II.
 10 5 per cent of total abstractions in Gaza are fresh (PWA 2010)

11 Rainfall recharge and total inflows - including return flows and intrusions - lie at 35 mcm/yr and 146 mcm/yr respectively (PWA 2010: 8,10; HWE 2010).
 12 Average pumping since Oslo (HSI 2008); rainfall recharge and total input stand at 247 mcm and 426 mcm/yr respectively.

Figure 22.8: Water level fluctuations in Lake Tiberias, man-made or a “direct consequence of decreasing inflows for the last 30 years”? **Source:** Modified based on Sowers, Vengosh and Weinthal (2010: 604). The original diagram is documented in the small inserted box.



Note: The periodicity of water levels matches exactly that of rain and available water (figures 22.2, 22.12). The only difference is that water levels, unlike annual available inflows, have a memory for past sins and overdraft.

Table 22.3: Over-abstraction in the Coastal aquifer. **Source:** Compiled by the author based on PWA (2010: 8, 10); HWE (2010); HSI (2008).

Flow rates [mcm/yr]	Israel	Gaza
Rain recharge	247	35
Total recharge (incl. return flows)	426	146
Abstractions (average since Oslo)	466	177

Israel has 1800 mcm/yr of fresh water (~2300 mcm in total¹³) (HSI 2009a; PWA 2009). Thus, Israelis enjoy a ten times higher fresh water availability per capita than Palestinians (figure 22.11).

Accordingly, the Palestinians in the oPt – not naturally, but under conditions of Israeli occupation – already suffer from an extreme degree of human-induced ‘scarcity’.

13 Including all surface and groundwater.

22.2.4 Riparian Relations

At its heart, the Israeli Palestinian water conflict always was and remains a competition over control and access to limited water resources.¹⁴ Oslo merely “wrapped up” the unbroken Israeli domination “as cooperation” within the Joint Water Committee (JWC) (Selby 2003b). Israel has the last word in all affairs concerning Palestinian (shared) water resources. This is possible through Israel’s system of exclusive control and strict separation of standards

14 World Bank (2009); AI (2009); Libiszewski (1995); see also: Arie Issar (1993): “Water in the Middle East Conflict”, at: <<http://www.mideastweb.org/water2.htm>> (28 March 2011): 1 of 3; Issar (1998): “The water as a parable”, in: *Haaretz* (June 1998); at: <<http://www.mideastweb.org/water1.htm>> (28 March 2011): 1 of 2.

Figure 22.9: The entire Lower Jordan River at the Alumot Dam (Dagania) consisting of two pipes with raw sewage (photo) and salt bypass. **Source:** This figure is reproduced with permission by Michael Talhami.



for the two populations – in other words, a system of jointly operated hydro-apartheid.

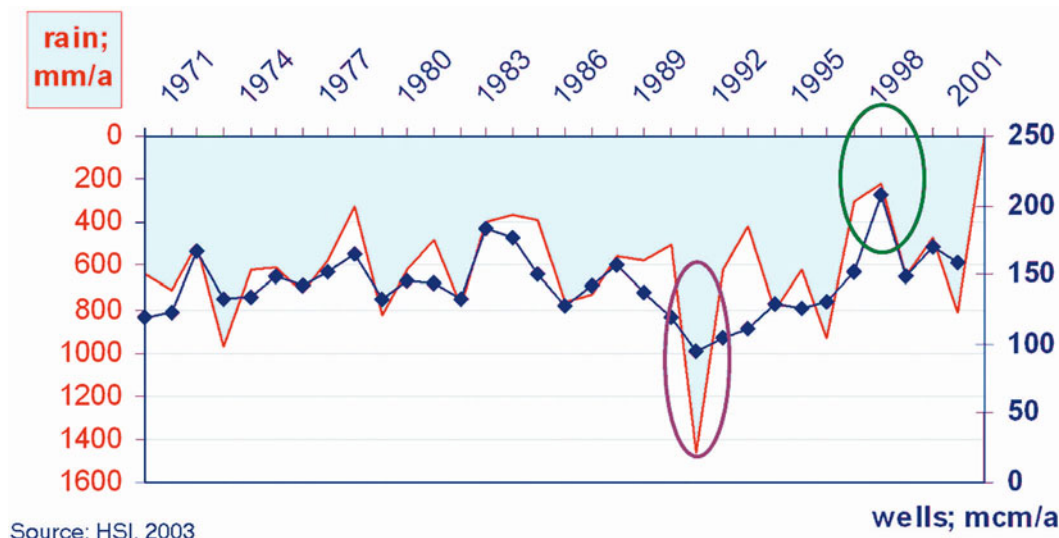
22.2.5 The Impacts of Climate Change

For Israel, the 2nd National Communication on Climate Change (INC) predicts “reducing agricultural water consumption by 200 mcm/yr, as expected according to several forecasts for 2020, will lead to reduced income of approximately \$100 million a year”

(INC 2010: 80). One hundred million dollars a year, however, is equivalent to 0.0097 per cent of Israel’s GDP.¹⁵ However, the question of CC impacts on the

¹⁵ The agricultural net domestic product annually (1986–2008) fluctuates between 5 and 20 per cent; see: *Statistical Abstract of Israel* (2010: table st19_13.xls); at: <http://www.cbs.gov.il/reader/shanton/templ_shnaton_e.html?num_tab=st19_13&CYear=2010> (28 April 2011): 1 of 1.

Figure 22.10: Rainfall and pumping in the northern part of the Western Aquifer Basin. Low abstractions in wet years and high abstractions in dry years. Rain and well abstractions in Cell 210 (North). **Source:** Messerschmid (2008a: 352) with data from: HSI (2003: 198).



Source: HSI, 2003

Note: Rain (in red) and pumping (blue line) match, albeit in a reciprocal fashion.

Table 22.4: Per capita fresh water availability– Continued Occupation Scenario. **Source:** Compiled by the author based on PWA (2009); HSI (2008).

	Palestinian population (millions)	Palestinian available fresh water (mcm/yr)	Palestinian per capita available water (l/c/d)	Israeli fresh available water (l/c/d)
West Bank	2.35	84.4	99	X
Gaza Strip	1.5	7.5 ^{a)}	14	X
Sum	3.85	91.9	66	663 ^{b)}

Note: This means that Palestinians have a fresh water share of 5 per cent or, per capita, of 9 per cent.

a) 95 per cent of Gaza’s drinking water wells are already unfit for human consumption, loaded with salt, nitrate, sewage, fertilizers, pesticides, etc. (PWA 2009).

b) The figure of Israeli freshwater availability refers to the “natural recharge” in the comparatively very dry year 2007, as reported by HSI (2008).

Palestinian side cannot be answered as such. It must be broken down into different scenarios, such as (A) continuation of the political status quo, or (B) a change that grants Palestinians the right to develop their own water.

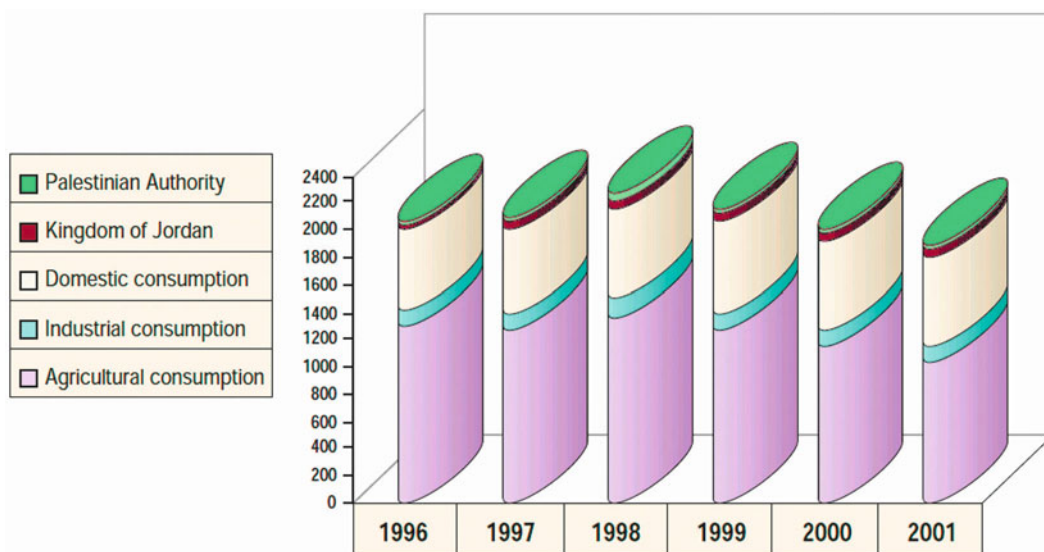
- *Scenario A – Preservation of the status quo.* Under scenario A, a continuous drop in water availability coincides with a prolongation of the political status quo, which means no access to water, repair, maintenance, or drilling of new wells. No adaptation (or mitigation) would be possible. The West Bank stands to lose 21 mcm of its currently

‘available water’. However, this reflects a mere 2.9 per cent of the water to which it is legally entitled.

- *Scenario B – Change in status quo.* The occupation ends. Final Status negotiations with Israel and international law grant Palestinians at least 700 mcm of their inalienable water rights¹⁶ (some 40 per cent of the overall current use) → Palestinian water balance rises to 79 mcm/yr. In the worse case (25 per cent losses due to CC; table 22.5), Pal-

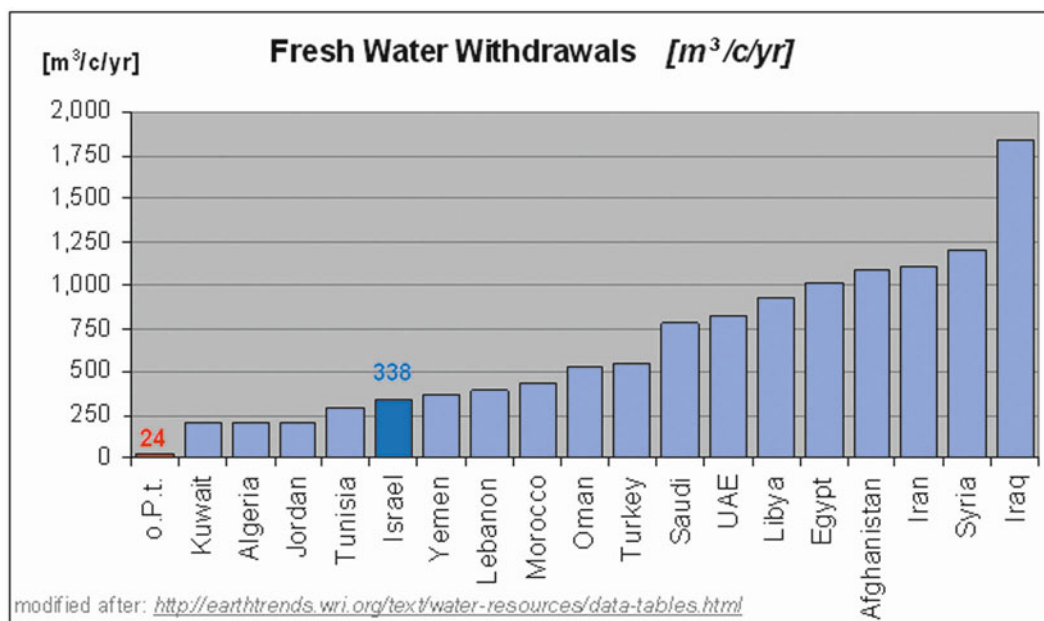
16 Already in 1943, Palestinians used some 397 mcm/yr from wells and springs, Jews 443 mcm/yr (Messerschmid 2008b).

Figure 22.11: Overall water consumption, including supply to the Kingdom of Jordan and the Palestinian Authority. Extreme asymmetry in water distribution for Israel and the oPt (mcm/yr). **Source:** IWC (2002b: 12).



Note: In addition, Palestinians in the West Bank have control over 84 mcm/yr of flows from wells and springs. Gaza pumps some 170 mcm/yr, far beyond its sustainable yield (PWA 2009).

Figure 22.12: Per capita freshwater withdrawals in the Middle East and North Africa. **Source:** Modified after: WRI (2009), at: <<http://earthtrends.wri.org>>; data for the oPt are quoted based on PWA (2009).



Note: Brackish water use in Gaza is not included.

estinians would gain a net 546 per cent in available fresh water.

rights and access to water resources, any climate scenario pales into complete insignificance.

The above scenarios (table 22.5; figure 22.13) show impressively: compared with the question of water

Table 22.5: Comparison of political and CC scenarios for the oPt. **Source:** Compiled by the author.

		Scenario A	Scenario B	
		without water rights	with water rights	
Current fresh available	WB	84.4	84.4	mcm/yr
	Gaza	7.5	7.5	mcm/yr
	oPt (WB+GS)	92	92	mcm/yr
	Israel ^{a)}	1771	1771	mcm/yr
	Total fresh (oPt+Isr)	1863	1863	mcm/yr
	Pal current share	4.9%	4.9%	%
Pal gain water rights		No! → 0	Yes! → 700	mcm/yr
	Pal available	92	792	mcm/yr
	Pal new share	4.9%	42.5%	%
Pal available after CC	reduced by 25%	69	594	mcm/yr
	reduced by 50%	46	396	mcm/yr
Pal water loss due to CC	Net Pal loss (25%)	-23 loss	502 gain	mcm/yr
	Net Pal loss (50%)	-46 loss	304 gain	mcm/yr
Loss/gain compared to current water	25% - reduction	-25% loss	546% gain	%
	50% - reduction	-50% loss	331% gain	%
Loss compared to rights	25% - reduction	2.9% loss	25% loss	%
	50% - reduction	5.8% loss	50% loss	%

Note: This table only accounts for fresh water – not brackish, saline, or marginal water.

Average annual natural recharge between 1970 and 2007 in Israel was 1771 mcm/yr (according to HSI 2008)

Figure 22.13: Political vs. CC impacts on Palestinian water availability. **Source:** This figure was prepared by the author based on data compiled in [table 22.5](#).

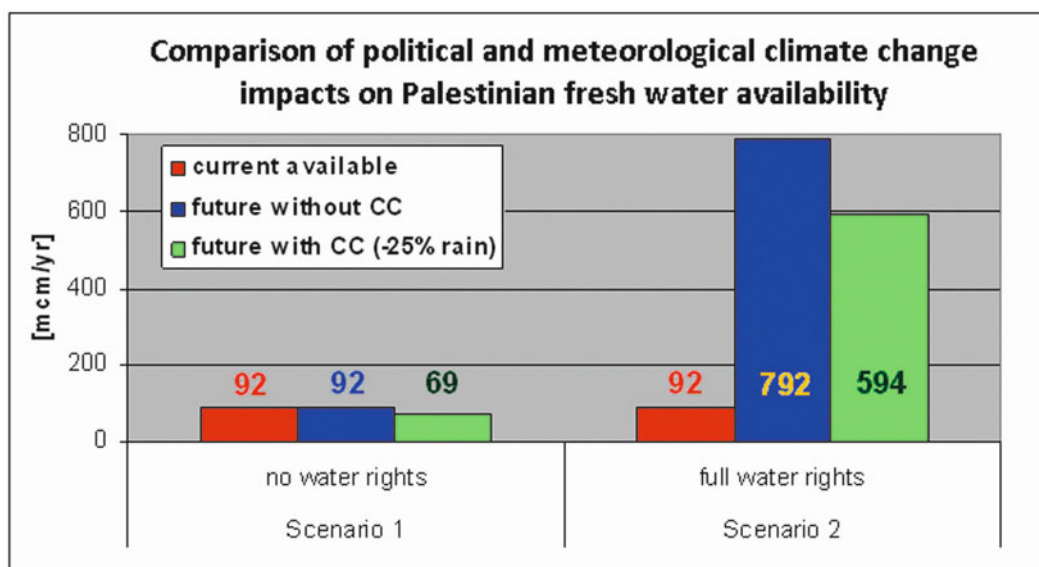
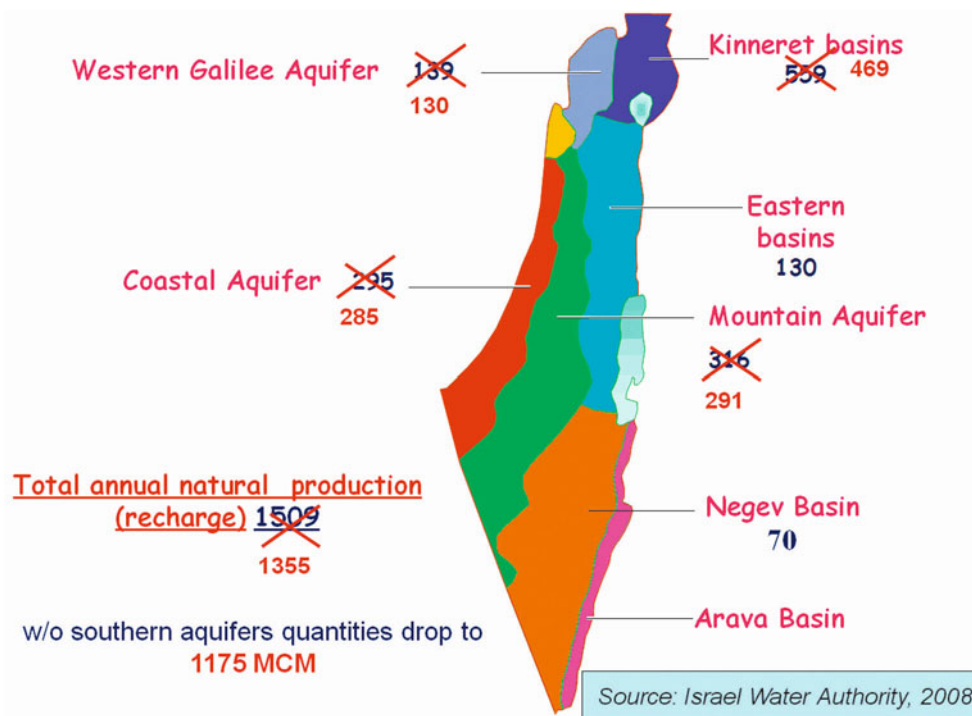


Figure 22.14: Past and present Israeli water supply (in mcm). Allegedly decreasing basin yields in Israel and the oPt. **Source:** IWA (2008: 1); at: <http://www.zaragoza.es/contenidos/medioambiente/cajaAzul/21 Conferencia_Magistral-2-Alon_TalACC.pdf>.



22.3 Discourse – Construction and Fabrication of CC

The aquifers would be in good condition, the Kinneret would not be threatened, and we would have discovered that Israel actually does not have a water problem.¹⁷

The country's water and electricity economies require urgent politicization.¹⁸

22.3.1 The Israeli Discourse

The Israeli discourse is marked by five essential myths and epistemic figures: scarcity and reduced availability (1), efficiency (2), making the desert bloom (3), security (4), and the denial of a Palestinian water crisis (5). In all of the 5 discourse venues, the status quo is the

17 N. Shtrasler, 2008: "Oh my Kinneret", in: *Haaretz*, 28 March 2008; at: <<http://www.haaretz.com/print-edition/opinion/oh-my-kinneret-1.242897>> (28 March 2011): 3.

18 Dan Rabinowitz, 2008: "Pipeline Sociology", in: *Haaretz*, 16 March 2008; at: <www.haaretz.com/print-edition/opinion/pipeline-sociology-1.241407> (1 November 2009): 1 of 1.

central 'sanctioned' asset to be defended at any price. Climate change *appears* as an external threat disrupting the status quo.

22.3.1.1 The Scarcity Myth – Reduced Availability

Water officials never forget to stress Israel's scarcity: *Israel's 2nd National Communication on CC* (INC) attests climate vulnerability as of vital importance, due to Israel's alleged "lack of adequate water resources". Israel is fighting "the country's scarcity ... since its creation some 62 years ago" (INC 2010: 25, 3).

A more recent adaptation of this myth is 'reduced availability', using CC as a new rationale, see [figure 22.14](#). Uri Shani, head of IWA: "a major reason for Israel's severe water crisis is that the climate and the region is becoming drier."¹⁹ The IWA allegations presented in [figure 22.14](#) are contradicted by the most authoritative source, the Hydrological Service of Israel ([table 22.6](#)).

19 This text is quoted from: "Water Authority hikes prices in effort to stave off emergency", in: *Haaretz* (12 July 2008), in: <<http://www.haaretz.com/hasen/spages/1000224.html>> (1 November 2009).

Table 22.6: Comparison of natural blue-water yields from wells and springs (including the Jordan River) in mcm/yr – IWA versus HSI. **Source:** Compiled by the author based on HSI (2009b: 13); IWA (2008: 1).

Basin*	Alleged yields, public discourse IWA (2008)		Actual measurements, for internal use (in Hebrew) HSI (2009b).	
	'past'	'present'	2008	average since Oslo
Lake Tiberias, NWC	559	469	528	779
Coastal	295	285	444 ³	437
'Eastern Mountain Basins'	130	130	414 ³	339
Western ('Mountain')	316	291	400 ³	404
Western Galilee	139	130	127	124
Mount Carmel	0	0	48	40
Negev & Arava	70	70	104	92
SUM	1,509	1,375¹	2,065	2,215²

Note: * The Hydrological Service of Israel (his) differentiates between groundwater (wells and springs) and surface water (NWC), other surface flows (Wadi storm run-off) are not included in this calculation; ¹ miscalculated in the graph; ² individual basin amounts rounded³. The shared Coastal and Mountain aquifer basins are pumped increasingly during the drought years.

Likewise, for Alon Tal from the Jacob Blaustein Desert Research Institute, Negev, “CC is not any longer a ‘gloomy projection’ but “a grim basic fact, a new hydrological reality”²⁰. These are examples where leading Israeli authorities prolong the ‘scarcity’ and ‘reduced availability’ myth and make CC the scapegoat for Israel’s own mismanagement.

Notably, none of the features of the ‘current crisis’ are new. Over 10 years ago, the “Knesset committee of inquiry into the water crisis” concluded:

The astounding failure is primarily manmade! ... Irresponsible management for the last 25 years, has caused the liquidation of Israel's water reserves ... There is no doubt about the continuous exploitation and over-pumping, this ... may be defined as a state of imbalance between supply and demand. ... The established system is unwilling to solve the problem by means of the price mechanism. ... So far no comprehensive and binding policy has been formulated (Knesset 2002: 11ff).

The committee could reach “no agreement amongst experts whether or not we are really in the midst of a process of drying out.”²¹ “The current crisis was not brought about only by climatic changes that caused a fall in the quantity of rain” (Knesset 2002: 11 ff.). Yet it continued to bank on supply management measures

such as large-scale desalination, wastewater reuse, and water imports.

22.3.1.2 Academic Scarcity Discourse

Even respected international journals such as the *Climatic Changes Journal* print Israeli storylines that confuse recurrent but passing droughts with CC:

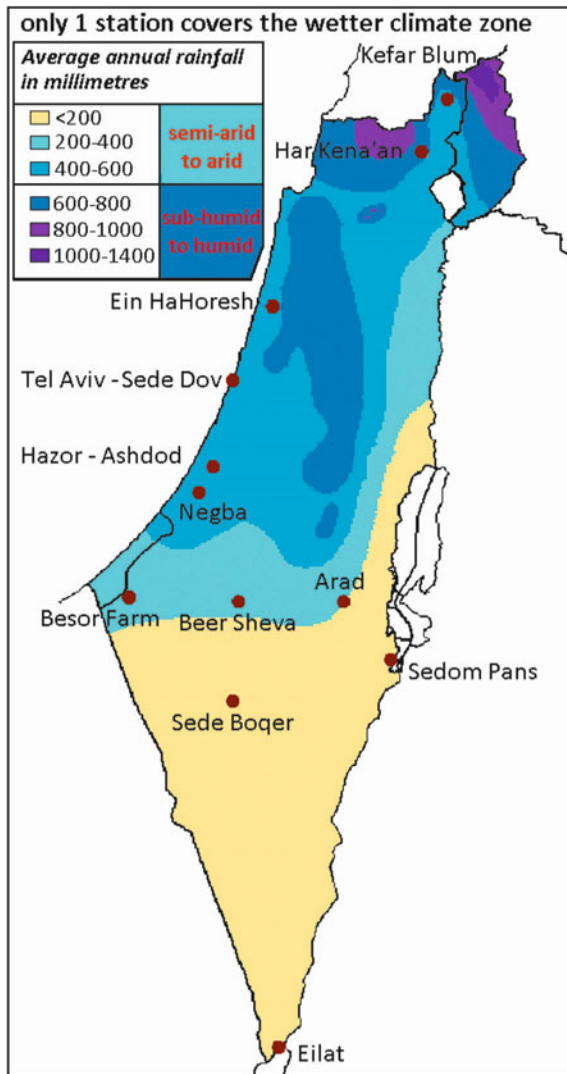
Significant warming is evident in all 12 evaluated meteorological stations, [...] selected in specific distribution patterns ... to highlight the regional variations. Considering the trends of all meteorological stations, it is clear that the climate has become more arid in most parts of Israel (Kafle/Bruins 2009: 66, 76).

All but one station covered Israel’s dry, sparsely inhabited half (figure 22.15). The ‘trend’ is derived by choosing a short random period. However, even minute changes in the period picked lead to opposing results – from apparently ‘increasing’ trends to ‘no’ trends or ‘decreasing’ trends (figure 22.16). In other words, the ‘observed’ trend depends on the years (and areas)

21 “Among the spokesmen who argue that indeed a process of warming is taking place is Arie Issar who presented the Committee with an article of his under the title ‘Climatic changes in the past, the present and the future, and their effect on the water resources of the Middle East’” (Knesset 2002: 39). At the same time, Issar is amongst the most fervent proponents of supply expansion – see also Issar (2006) and Issar (2000) in: <<http://www.mideastweb.org/water3.htm>> (28 March 2011): 20 of 22.

20 Alon Tal, 2009: “Building a hydrological future”, in: *Haaretz*, 26 May 2009; at: <<http://www.haaretz.co.il/hasen/spages/1087356.html>> (1 November 2009): 1 of 1.

Figure 22.15: The 12 “representative” rainfall stations (red dots) chosen by Kafle/Bruins (2009) and long-term average isohyets (background).
Source: Kafle/Bruins (2009: 76).

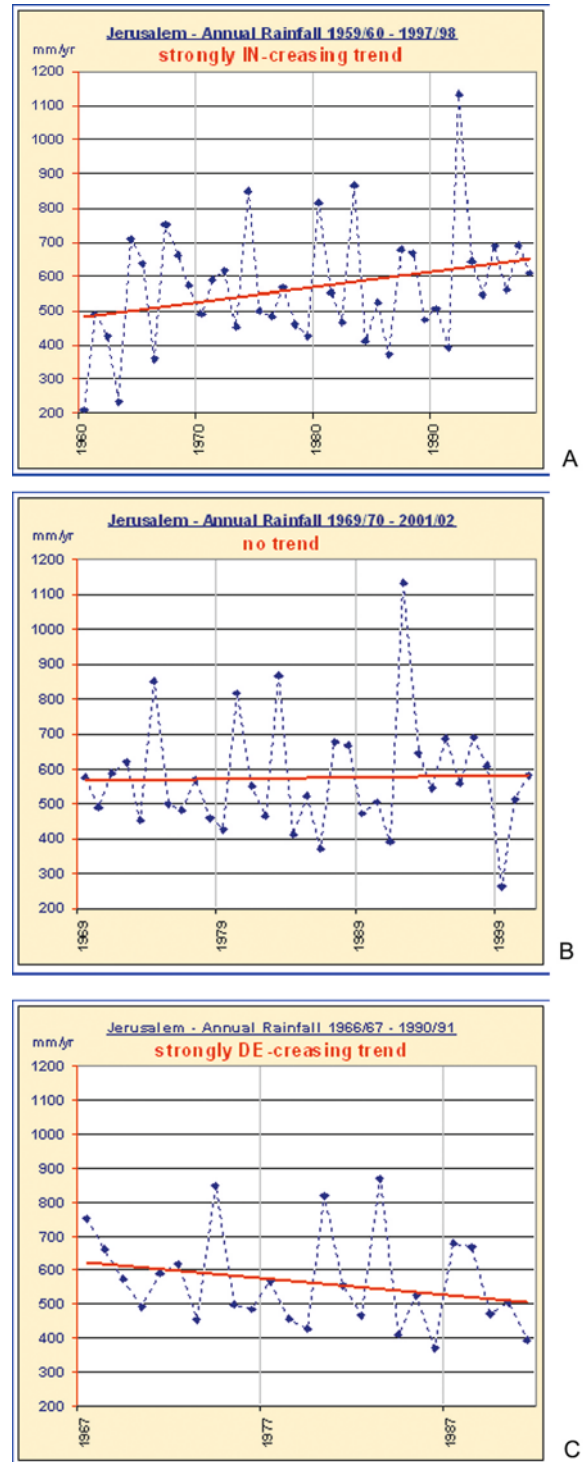


picked. The finding of a ‘more arid climate’ is a fabrication.

Professor Rosenfeld (Earth sciences, Hebrew University) not only emphasizes a “multiyear downward trend in rainfall in the Lake Kinneret basin area” and a drop of 100 mcm in “annual amount of water”, but concludes: “One of the [explanations] is climate change”.²²

22 “Haifa University study: Local rainfall stats defy global warming fears”, in: *Haaretz*, 11 January 2008; at: <www.haaretz.com/news/haifa-university-study-local-rainfall-stats-defy-global-warming-fears-1.236999> (7 April 2011): 1 of 1.

Figure 22.16: a, b, c: 3 different ‘trends’ for 3 slightly different periods at Jerusalem rainfall station. **Source:** The three graphs were generated by the author.



A. 1960-1998: Increasing ‘trend’; **B.** 1969- 2002: No ‘trend’; **C.** 1967-1991: Decreasing ‘trend’

Figure 22.17: Unmodified data on the available annual volume of precipitation in Lake Tiberias (1981-2008). **Source:** Excel graph prepared by the author based on data from HSI (2009a: 401).

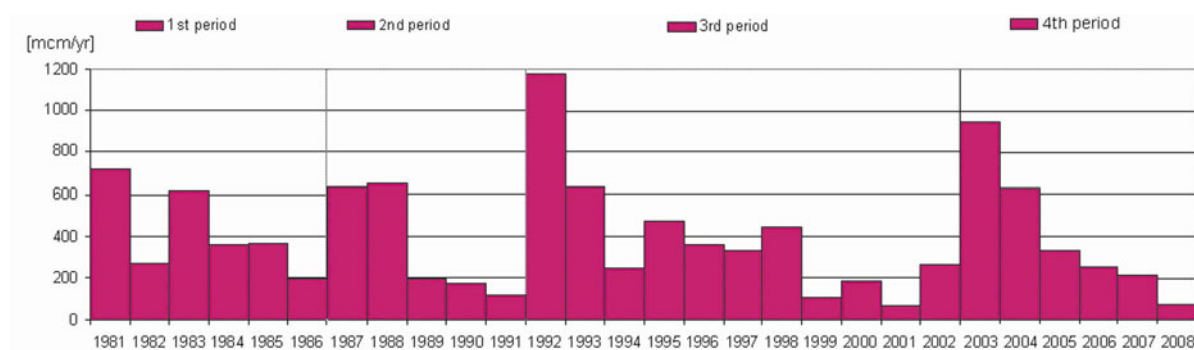
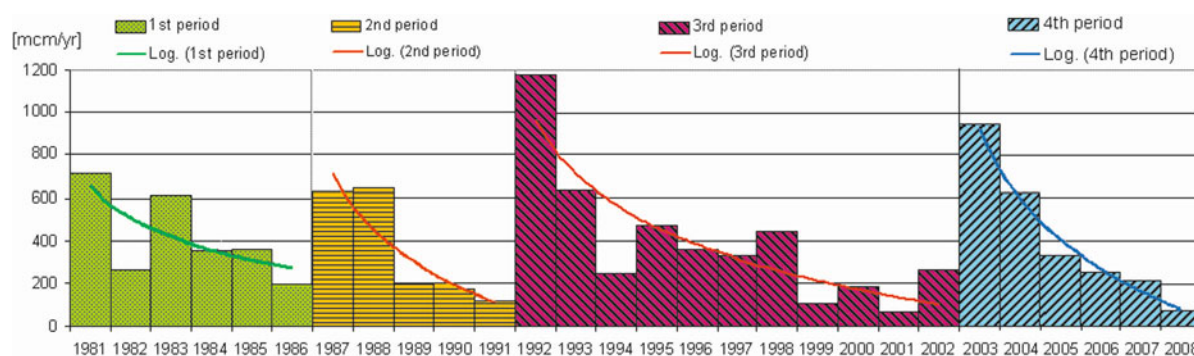


Figure 22.18: Transformed into alleged ‘trends’ of drought and CC based on the available annual volume of precipitation in Lake Tiberias (1981-2008). **Source:** Excel graph prepared by the author based on data from HSI (2009a: 401).



The dataset in [figure 22.17](#) can easily be ‘transformed’ into a series of consecutive trend periods ([figure 22.18](#); see for natural variability Bachmat/Abdul-Latif 2003).

Sowers, Vengosh, and Weinthal (2010: 604) also make CC a scapegoat: “Declining precipitation has had unprecedented effects in Israel – the ... impact of the consecutive drought conditions in the region on the lake levels is a direct consequence of decreasing inflows during the last 30 years ...consistent with ... the climatic model”²³ (Sowers/Vengosh/Weinthal 2010: 604), delivering a classical example of ‘naturalizing’ the impacts of human action.

22.3.1.3 Dissenting Discourse

Gideon Bromberg, head of the NGO Friends of the Earth, Middle East (FoEME) Israel, names the power and interest groups behind the apparently ‘technical’ discourses – “the narrow interests of the farming lobby, not to mention the even narrower interests of

private sector companies that stand to make windfall profits from desalination”.²⁴

Amnon Kartin (2011: 272) of the Political geography department of *Tel Aviv University* (TAU) differentiates between

scarcity because of inaccessibility of existing water sources and shortage due to demand exceeding supply from natural reserves. The responsible authorities in Israel have persistently avoided any serious effort to respond to the problem by curtailing national consumption to a level compatible with renewable resources. Why are Israeli leaders ... incapable of demolishing the existing ‘sacred shrine of water’ (Nietzsche)?

In the officially sanctioned discourse, ‘natural scarcity’ remains a long-standing Israeli mantra.²⁵ It is a myth in that it depicts water problems as purely natural without taking into account the deep impact of human action ([figures 22.22](#) and [22.24](#)), mismanage-

²³ [Figure 22.8](#) above actually proves the opposite.

²⁴ Gideon Bromberg, 2009: “Let common sense flow”, in: *Haaretz*, 11 November 2009: 7; at: <<http://www.haaretz.co.il/hasen/spages/1027753.html>>.

²⁵ Dating back to the beginning of the 20th century (Messerschmid 2008b: 5).

ment, and short-sightedness. ‘Scarcity’ naturalizes human deficiencies instead of *politicizing* hydrological problems. Thus, while the Israeli discourse is highly political in its agenda and content, it uses a technical vocabulary and storyline to come across as scientific, neutral, or matter-of-fact.

22.3.1.4 The Efficiency Myth

Another *myth* concerns Israel’s self-declared position as a *world leader* in conservation and efficient water use. Israel wastefully consumes 288 l/c/d²⁶, and plans to expand domestic supplies to over 325 l/c/d (IWC 2002: 50)²⁷.

Drip irrigation in Israel is legendary. But in the agricultural sector, Israel wastes most of its own water and that of the Palestinians. As Davidson (2008) has shown, it is a myth that Israeli drip irrigation was a mechanism to improve demand management – on the contrary, it was employed as a supply tool to maximize both available water use and agricultural yields. In Israel’s case, the ubiquitous drip irrigation and wasteful unsustainable supply management may constitute a contradiction, however not in logical terms, but rather as a reality.

The dissenting discourse that demystifies the mismanagement remains outside the circles of water professionals, with voices like those of Dan Rabinowitz, an anthropologist at Ben Gurion University:

Once, the Kinneret was full. Then water was pumped at a rate that outstripped [the] rate of replenishment. It was all predictable. It’s called unsustainable water management, ... unbalanced development and settlement policy. The stupefying waste immediately created a false sense of abundance, and farmers developed a severe addiction to the state-subsidized, clear liquid (Rabinowitz 2008: 1).

From the other end of the spectrum, free-market proponents like Nehemia Shtrasler²⁸ confirm:

“Had farmers paid the real price of water during all the years since the establishment of the state, there would have been no waste and no deficit in the water economy. The aquifers would be in good condition, the Kinneret would not be threatened, and we would have dis-

covered that Israel actually does not have a water problem.”

22.3.1.5 The Storyline of Making the Desert Bloom

‘Making the desert bloom’ remains one of Israel’s founding storylines.²⁹ “The Zionist movement has always seen transforming land into a means of production as the index for success” (Kartin 2011: 272). “Horizontal expansion of agricultural land remains a declared priority. The expansion of arable land into desert frontiers has been central to state building projects and nationalist ideologies” (Sowers/Vengosh/Weinthal 2010: 613). The land-water nexus and the expansion of the desert frontier tell the tale of appropriation and exclusive land control³⁰. Land grab requires and leads to water grab.

This theme remains an official priority. The Knesset committee of inquiry sticks to Israel’s water icons and endorses the continuation of privileged water access for agriculture, due to its “Zionist-strategic-political value” (Knesset 2002: 11ff). As Gershon Baskin (2008³¹), founder of the Israel/Palestine Center for Research and Information (IPCRI), remarks, this storyline belongs to “the old Zionist ideology of control and occupation³², ... the Zionist ethos of making the desert bloom (which everyone now knows is no magic – all you need is to waste huge quantities of water).”

22.3.1.6 The Epistemic Figure of Security

The epistemic figure of unlimited water availability as a prerequisite for security and survival of the *state* is also a long-standing leitmotif in Israel (Selby 2009),

26 The figure for Germany is 122 l/c/d (litres/citizen/day).

27 In the West Bank, Palestinians domestically consume 50–60 l/c/d (World Bank 2009). The agricultural share of consumption has dropped from 60 per cent to 41 per cent since Oslo (PWA 2009).

28 N. Shtrasler, 2008: “Oh my Kinneret”, in: *Haaretz*, 28 March 2008; at: <<http://www.haaretz.com/print-edition/opinion/oh-my-kinneret-1.242897>> (28 March 2011): 3.

29 A storyline, according to Hajer/Wagenaar (2003: 104), assembles previously unrelated elements of reality and a diversity of actors behind one common theme.

30 In competition with the Palestinian majority before 1948 and up until today against the remaining Bedouin of the Negev.

31 Gershon Baskin, 2008: “Encountering Peace: Who owns the water?”, in: *Jerusalem Post*, 8 December 2008): 5; at: <www.jpost.com/servlet/Satellite?cid=1228728113021&pagename=JPost%2FJPArticle%2FShowFull> (11 November 2009).

32 Upon entering Ben Gurion airport, the visitor is confronted with a long gallery of historical Jewish National Fund (JNF) posters, some of them from the 1950s, with the desert-bloom theme: The proud title reads ‘Kibbush ha-midbar, kibbush ha-teva!’ – ‘Conquest of the desert – conquest of nature!’ Incidentally, ‘kibbush’ is also the word for ‘occupation’...

see for example a Jerusalem Post article entitled: ‘Water crisis endangers entire state’³³ (Hoff 2008: 20). Israel has securitized³⁴ all water in the region for almost a century now (Zeitoun 2008, Johannsen 2002: 5). Improvement of Israel’s chronically bad political relations with its neighbours is regularly sacrificed on the altar of Israeli “water security” (Selby 2009: 9). “Every drop of water in Israel is Jewish water, Zionist water and if we compromise, we are compromising on our very existence” (Baskin 2008).³⁵

In its extreme form – “our very existence, the entire state” – this figure securitizes water control in a classical way (Wæver 1998) that dismisses compromise and water sharing as an unaffordable threat, whereby natural droughts rank in the same category as external rupture of an otherwise pleasant status quo.

22.3.1.7 Denial of a Palestinian Crisis

A remarkable pattern in the Israeli discourse is the minute role or at times flat denial of the Palestinian water crisis by water officials like Noam Kinarty, the chief water negotiator in Oslo, advisor to IWA, and counterpart to the Palestinians within the JWC³⁶:

Liars! They have enough water to drink ... There are water tankers in Amman and Damascus, too. That’s how they do things. In the interim agreement they were given at least 70 to 80 million cubic meters of water [a year] from the eastern aquifer. They did nothing. They want us to bring them water and to live at our expense. They want Lake Kinneret, the Coastal Plain, what don’t they want? ... We let them dig [wells] in the eastern aquifer; there is water there, so let them dig, God damn it. Why aren’t they digging? For no reason, because it’s easier to cry. Do they care about their nation? They want to be miserable.

33 “Water crisis endangers entire state”, in: *Jerusalem Post*, 29 July 2008: 20; quoted after Hoff (2008: 20).

34 Security in both meanings of the word: security in a more narrow technical sense (i.e. against sabotage – Knesset 2002: 146) and in a wider meaning of sufficient availability: “The Israeli states that the settlements are important for security and defense of the water sources”; see Issar 1998, at: <<http://www.mideast-web.org/water1.htm>> (28 March 2011): 1 of 2.

35 Gershon Baskin, 2008: “Encountering Peace: Who owns the water?”, in: *Jerusalem Post*, 8 December 2008): 5; at: <www.jpost.com/servlet/Satellite?cid=1228728113021&pagename=JPost%2FJPArticle%2FShowFull> (11 November 2009).

36 Haaretz reporter Yotam Feldman asked Noah Kinarty: “The Palestinians claim to suffer from an acute water shortage”. See: “A dry and thirsty land” in: *Haaretz*, 20 August 2009; at: <www.haaretz.com/hasen/pages/1107419.html> (1 November 2009).

Not every Israeli thinks like Kinarty:

Only the Palestinians experienced water shortages: Those who are Israeli citizens have for years received tiny and inequable water quotas for farming; those living in the territories have experienced genuine, life-threatening water shortages. ... The worrisome part is that all this happened even before climate change thrust the region into a new era. The country’s water and electricity economies, the transportation system and the master plans for planning and development require urgent politicization (Rabinowitz 2008: 1).

However, Rabinowitz’ call goes widely unheard: Israel’s 2nd National Communication on Climate Change (INC 2010) does not mention the Palestinian water crisis once. The *Israeli Water Authority* (IWA) fabricates a much smaller Palestinian population, in order to support its dubious claim that Palestinians have almost the same per capita supply as the Israelis (IWA 2009: 17–19).

22.3.1.8 Summary

The main stream of Israeli CC discourses operates as a problem-solving theory. It naturalizes and continues to depoliticize CC from a comfortable position of privileged use, control, and extreme but not openly acknowledged power asymmetry. It is ahistorical in that it aims to preserve the status quo with some CC mitigation and adaptation adjustments (MandA; see 22.4). None of these adjustments, practical or conceptual, breaks with the ‘sanctioned discourse’.

The two myths (scarcity, efficiency), together with the storylines (desert bloom) and epistemic figures (unlimited availability as security and survival prerequisite; no-drop-to-forego) and in the context of the real conflict (asymmetry in power, control, use) are complemented by the *new theme* of CC. However, they fail to converge into a new paradigm. The alleged new paradigm (Issar 2007; Issar/Zohar 2009, 2004: XXIII) merely reframes the old paradigm, informed and driven by the “state building ethos and nationalist ideology” (Sowers/Vengosh/Weinthal 2010: 613).

22.3.2 The Palestinian Discourse

The Palestinian discourse so far is less developed than the Israeli but slowly gaining momentum on all three levels, the professional water sector, academia, and the popular level, especially of the media and of public opinion.³⁷ A *Climate Change Adaptation Strategy*

37 This chapter does not include publications in Arabic, which remains a field for future investigation.

(EQA/UNDP 2010) combines the views of all stakeholders and allows a representative overview of this discourse.

22.3.2.1 Climate Change Projections

The current drought is consistently mentioned, but without referring to it as an already ‘grim new reality’ of climatic change. Some statements rather stress natural variability: “There is no clear evidence for climate change. In recent years, some places have increased, others decreased precipitation” (EQA/UNDP 2010: 23, 24; PHG).

22.3.2.2 The Political Context

Droughts and desertification is estimated to be high in the long run, though still deemed to be less of a policy priority than the Israeli occupation. In the wet areas of the West Bank, the main problem is political. In dry areas, the problems are climatic and political (EQA/UNDP 2010: 52, Livelihoods Focus Group).

The water crisis in Palestine is not a result of climate change; it is above all a result of Israeli control over Palestinian water resources (EQA/UNDP 2010: 24; PHG).

It is necessary to characterize correctly climate change and drought. We need a common understanding of the meaning of drought. There are different types of drought – meteorological, agricultural, hydrological and socio-economic. The Palestinians are suffering from ‘political drought’ – our water resource management is distorted by the Israeli occupation (EQA/UNDP 2010: 24; Ministry of Agriculture).

22.3.2.3 Vulnerability, Scarcity, and Security

So pervasive are the effects of the Israeli occupation on the climate vulnerability of Palestinian communities that the occupation – in and of itself – is considered here a ‘risk’, alongside environmental risks such as sea-level rise and altered rainfall patterns: (EQA/UNDP 2010: 18).

In the Palestinian discourse ‘vulnerability’ is an important and powerful metaphor. Unlike in the prevalent Israeli and donor discourses, the terms ‘scarcity’ and ‘vulnerability’ are strongly politicized. Conversely, ‘security’ as a concept from international relations theory (Wæver 1998) is absent.³⁸ The prominence of the technical discourse in the EQA and UNDP study but also in other communications (Attili 2009: 8) is surprisingly high (22.5).

38 Even in the widened form of ‘human security’, ‘environmental security’ etc. (Brauch 2004, 2008). Security is mentioned four times as militarized state security, albeit only referring to Israeli actions and interests.

22.3.2.4 Donor Relations

The “substantial dependence on donor assistance” is a recurring theme in the EQA³⁹ and UNDP⁴⁰ report. The Gaza stakeholder scoping meeting criticizes the narrow focus of the international community in recognizing “Palestinian CC adaptation as a humanitarian issue” (EQA/UNDP 2010: 32). The Ministry of Planning adds: “Too often in the oPt, the PA has implemented programmes that reflect donor priorities and that have not addressed wider issues or delivered necessary outcomes” (EQA/UNDP 2010: 23).⁴¹ The donor focus group notes “that donors are reluctant to challenge Israel over the occupation (constrained by diplomatic positions) even though the occupation reduces the effectiveness of their programmes” (EQA/UNDP 2010: 30).

It can be concluded here that contrary to the dominant Israeli discourse, the Palestinian discourse actively politicizes and repoliticizes the technical discussion of CC. To politicize means to foreground the constitutive relations of power (Ferguson⁴²), while ‘naturalization’, as Warner (2007: 6) observes, is a “tactic of dominant individuals against heretical discourse”. To Palestinians, climatic change is secondary but tied to the main threat – the political status quo. This is not all too surprising given the bitter fruits of the occupation (22.6). The supply crisis has deepened and widened throughout the past decade in all supply sectors, and particularly in agriculture.

22.3.3 The Donor Discourse

22.3.3.1 The Ecological Discourse on ‘Scarcity’

Almost all donor studies of CC in Israel and Palestine fall for the myth of ‘scarcity’.⁴³ As a recurrent and dominant epistemic figure, the ecological donor discourse at best sets ‘natural scarcity’ alongside political drivers.

39 EQA, the “Environmental Quality Agency” is a Ministry of the Palestinian Authority.

40 UNDP is the United Nations Development Programme

41 These internal debates and controversies will not be assessed here.

42 James Ferguson, in: Schouten (2009: 6); at: <<http://www.theory-talks.org/2009/11/theorytalk-34.html>> (28 March 2011): 6 of 12.

43 World Bank (2007); SFG (2011b); Brown/Crawford (2009); Mason/Mimi/Zeitoun 2009; UNESCO/WWAP (2009); BMZ (2010); SIDA (2010); Maas/Tänzler (2009).

Table 22.7: Downward revision in comparison with Oslo II (mcm per median year). **Source:** Table was reproduced and expanded by the author, based on original data from SFG (2011a: 5).

	1993 Availability (Oslo-II)			New Median Availability		
	Sum	Israel	Palestine	SUM	Israel	Palestine
Western Aquifer	362	340	22	337	317	20
North-Eastern Aquifer	145	103	42	130	92	38
Eastern Aquifer	172	40	54 (+78 new)	167	67	100
TOTAL	679	483	196	634	476	158

Note: According to SFG (2011a: 5), the revised quantities were based “on discussions with IWA”. Erroneous information (Oslo-II in 1993) was left uncorrected.

“In this water scarce environment ... availability of water is a key resource for development and also a reason for conflict” (GLOWA 2008: 17, 25). The *Swedish International Development Cooperation Agency* (SIDA) agrees in its *Concept Note* that “the scarcity of water has been identified as the key environmental issue and one of the major constraints to development” (SIDA 2010: 2) and that “The MENA region is naturally water scarce” (SIDA 2010: 3).

The Report *Growing Temperatures, Growing Tensions* (Brown/Crawford 2009) by the *International Institute for Sustainable Development* (IISD) opens its summary with the refreshing statement: “Climate change seems, at most, a secondary concern to be addressed once other problems have been resolved”, but envisages security threats such as “increased water scarcity” (Brown/Crawford 2009: 4). All too often however, ‘scarcity’ is entirely deprived of its political context, such as by the German Federal Government (BMZ 2010: 14; see below 22.6).

Most of the studies would not go so far as the Israeli discourse in describing CC as a ‘grim new reality’. However, some studies already speak of a new “reduced recharge in normal years” and call for a “downward revision of allocations” (SFG 2011a: 4).

22.3.3.2 Downward Revision of Palestinian Allocations

The Blue Peace report (SFG 2011a, 2011b) opens with a sensationalist prediction⁴⁴: “The [Middle East water] crisis will be so severe that current events in the region will seem minor in comparison. It will be a major humanitarian crisis” (Revolve 2011).

Blue Peace recommends a reassessment of the Oslo-II commitments on water, due to allegedly in-

creased scarcity and reduced ‘New Median Availability’. “The renewable freshwater resources in the Mountain Aquifer have been reduced by seven per cent (in a normal rainy year). The availability of water is substantially reduced in drought years. As a result, the calculations made at the time of Oslo Accords ... need to be revised downwards to provide a realistic formula for water sharing between Israel and the Palestinian Territories (or a future Palestinian State)” (SFG 2011a: 4).

Under the disguise of neutral ecological concern, the plan envisages revising Israeli allocations downwards by 1 per cent of its Oslo allocations, the Palestinian side by 19 per cent (table 22.7; SFG 2011a: 5).

According to the ‘new holistic’ confidence-building approach of Blue Peace, Palestinians should lose 24 per cent in the Eastern Aquifer, while Israel should not lose but gain an additional 68 per cent above the original Oslo-II allocations.

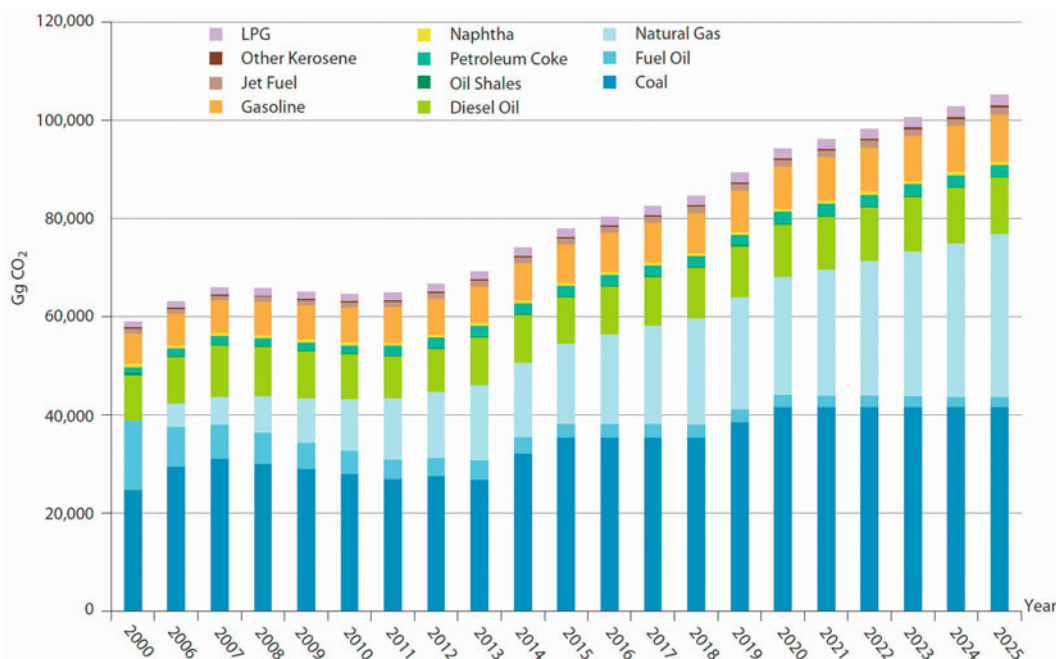
22.3.3.3 Shortcomings in the Political Discourse

There is no lack of reference to the existence of a water conflict in the donor discourse, not as a root cause, however, but at best as an additional factor or at worst as a result of natural scarcity.

When the discourse on CC and the water crisis is taken out of the political context and Palestinian scarcity is no longer considered as politically induced by the occupation, it appears as merely a technical challenge. The donor discourse stops short of addressing the fundamental problem and restricts itself to resource-neutral solutions that are less likely to run into Israeli obstructions: either increased technical intervention programmes or increased ‘cooperation’ (Brauch/Oswald Spring/Grin et al. 2009; SFG 2011b; BMZ 2010). At the point where real pressure would have to be applied to Israel to stick to its minimum commitments under Oslo, donors regularly back down and leave the field. In other words, suggested

⁴⁴ See the Mumbai-based think tank *Strategic Foresight Group* (SFG).

Figure 22.19: Evolution of CO₂ emissions by fuel in the energy sector. **Source:** INC (2010: 109) based on the Heifetz study (2009).



adaptation measures have to be compatible with the occupation. The apolitical, depoliticizing discourse turns out to be a very political approach, maintaining and even strengthening the status quo of asymmetric access and allocations of shared water.

22.4 Proposed Solutions and Mitigation

22.4.1 Israeli Options

22.4.1.1 Israeli Energy Balance and Mitigation Plans

Israel's 2nd National Communication on Climate Change (INC 2010: 88) projects a rise in energy demand of 3.2 per cent annually or of 1,650 per cent by the end of the century. This enormous hike gives rise to an (unmitigated) increase in CO₂ emissions in the energy sector of 62.8 per cent by 2025 alone (INC 2010: 108 based on the BaU scenario). Figure 22.19 shows that even coal emissions are prone to rise by 40 per cent. Total CO₂ emissions will rise by 55 per cent from 2010 to 2015 (figure 22.20), equivalent to a per capita rise of 25 per cent⁴⁵ (INC 2010: 115).

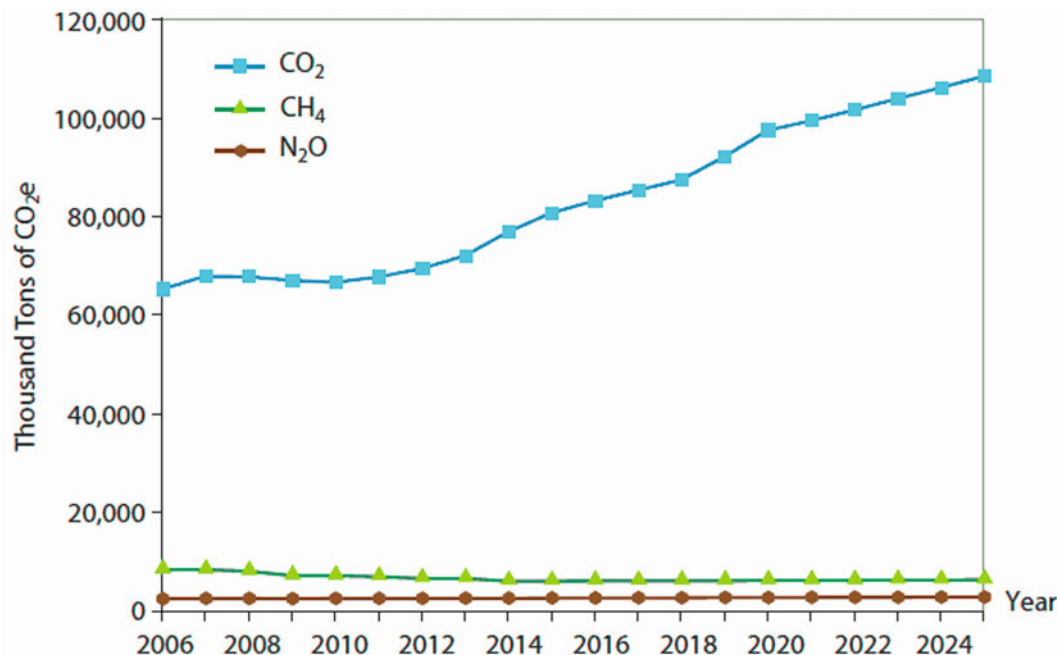
22.4.1.2 CO₂ Emissions (Business as Usual and Mitigated)

Renewable energy is negligible: "At the end of 2005, total electricity capacity stood at 10,010 MW, of which only 15 MW (0.15 per cent) originated from renewable energy (wind and solar)" (INC 2010: 117). Israel currently operates only one wind farm with 6 MW of power (INC 2010: 117). "In Israel, water use continues to climb by about 4 percent a year. A similar trend [exists] in the energy economy. ... And what does the government do? It invests hundreds of billions in building a new coal-fired power plant in Ashkelon" (Rabinowitz 2008: 1).

Current plans for photovoltaic solar farms are restricted to 0.3 per cent of total energy generation and in addition, two future thermal solar energy plants with 250 MW power are planned in the Negev (INC 2010: 117). The total abatement potential from wind and solar energy is equal to 1.7 per cent and 3.4 per cent of the overall share, respectively (INC 2010: 125).

Israel is clearly avoiding any serious attempt to use renewable energy. The lack of seriousness is expressed under the heading "Obstacles in the field of energy efficiency", where the Ministry lists "lack of open space in the Negev" as one of the reasons why renewable energy is not an option for Israel (INC 2010: 174). "We cannot fill the Negev with solar facil-

⁴⁵ From 10.2 to 12.7 tons/c/yr (BaU).

Figure 22.20: Evolution of greenhouse gas emissions by gas. **Source:** INC (2010: 115) based on the Heifetz study (2009).

ities or plant forests because the Negev [is] the last area in the country with significant open space.”⁴⁶ The Negev has no space – precisely because it is vast and empty: an open land reserve cannot be used because it would cease to be a land reserve.

The total future mitigation potential lies at 31.7 M tons of CO₂ savings, equivalent to 12.3 per cent – not decrease but increase in greenhouse gas emissions by 2025 (INC 2010: 145). “Environmental Protection Minister Gilad Erdan⁴⁷ in Copenhagen [suggested] that Israel’s emissions, instead of doubling by 2030, would grow by ‘only’ 37 percent.”⁴⁸

22.4.1.3 Link to Desalination

The fastest growing consumer in the energy sector is the desalination industry, which (burning fossil fuel) will increase from 150 mcm/yr in 2008 to 750 mcm/yr by 2020 (INC 2010: 91). Figure 22.22 shows the sources of future increases of total water supply by ~50 per cent.

46 “Toward Greenhouse Gas Reduction”, in: *Haaretz*, 23 November 2008, in: <www.haaretz.com/print-edition/opinion/toward-greenhouse-gas-reduction-1.257972> (28 March 2011): 1 of 1.

47 Erdan has been the Minister of Environmental Protection since March 2009.

48 U. Gordon, 2009: “System change, not climate change”, in: *Haaretz*, 10 December 2009; at: <<http://www.haaretz.com/hasen/spages/1134195.html>>.

22.4.1.4 Gaza Should Save

In Copenhagen, former “Environmental Protection Minister Gideon Ezra⁴⁹ proposed working to increase the Palestinians’ awareness of the need to reduce greenhouse gases. We really should have a word about this with the Palestinians in Gaza, whose electricity consumption threatens to drown the world in greenhouse gases.”⁵⁰

22.4.2 Palestinian Options

As water specific mitigation options, the International Panel on Climate Change (IPCC) (2008: 118) suggests measures such as afforestation,⁵¹ hydropower, and wastewater⁵² and solid waste management (table 22.8).

49 Ezra was Minister of Environmental Protection until March 2009.

50 “For a thriftier, more efficient society”, in: *Haaretz*, 11 November 2009; at: <<http://haaretz.com/print-edition/opinion/for-a-thriftier-more-efficient-society-1.4962>> (7 April 2011): 1 of 1.

51 Israeli permits for afforestation are routinely refused.

52 Wastewater “projects suffer from the lowest rate of approval and the longest delays in the Joint Water Council”. In the West Bank, Israel “prevented all but one wastewater treatment plant from going ahead”. In Gaza under siege, “less than 2% of the investment plan has been implemented” (World Bank 2009: 50, 53).

Table 22.8: Influence of sector-specific mitigation options. **Source:** Modified from IPCC (2008: 118, table 6.1).

Table 6.1: Influence of sector-specific mitigation options (or their consequences) on water quality, quantity and level. Positive effects on water are indicated with [+]; negative effects with [-]; and uncertain effects with [?]. Numbers in round brackets refer to the Notes, and also to the sub-section numbers in Section 6.2.

Water aspect	Energy	Buildings	Industry	Agriculture	Forests	Waste
Quality						
Chemical/biological	CCS ⁽¹⁾ [?] Bio-fuels ⁽²⁾ [+/-] Geothermal energy ⁽⁵⁾ [-] Unconventional oil ⁽¹³⁾ [-]		CCS ⁽¹⁾ [?] Wastewater treatment ⁽¹²⁾ [-] Biomass electricity ⁽³⁾ [-/?]	Land-use change and management ⁽⁷⁾ [+/-] Cropland management (water) ⁽⁸⁾ [+/-]	Afforestation (sinks) ⁽¹⁰⁾ [+]	Solid waste management; Wastewater treatment ⁽²⁾ [+/-]
Temperature	Biomass electricity ⁽³⁾ [+]			Cropland management (reduced tillage) ⁽⁹⁾ [+/-]		
Quantity						
Availability/demand	Hydropower ⁽⁴⁾ [+/-] Unconventional oil ⁽¹³⁾ [-] Geothermal energy ⁽⁵⁾ [-]	Energy use in buildings ⁽⁶⁾ [+/-]		Land-use change and management ⁽⁷⁾ [+/-] Cropland management (water) ⁽⁸⁾ [-]	Afforestation ⁽¹⁰⁾ [+/-] Avoided/ reduced deforestation ⁽¹¹⁾ [+]	Wastewater treatment ⁽¹²⁾ [+]
Flow/runoff/recharge	Bio-fuels ⁽²⁾ [+/-] Hydropower ⁽⁴⁾ [+/-]			Cropland management (reduced tillage) ⁽⁹⁾ [+]		
Water level						
Surface water	Hydropower ⁽⁴⁾ [+/-]			Land-use change and management ⁽⁷⁾ [+/-]		
Groundwater	Geothermal energy ⁽⁵⁾ [-]			Land-use change and management ⁽⁷⁾ [+/-]	Afforestation ⁽¹⁰⁾ [-]	

However, in the West Bank, for all mitigation actions, the last word remains with the occupation. Palestinians buy their energy from Israel.⁵³ The Israeli military *Civil Administration* (CA) in Area C even controls the depth of the shallowest Palestinian earth works: “Works have to be performed by hand, without tools, and digging is not allowed deeper than 40cm below ground level.”⁵⁴ In a case like Palestine, where no control over land, resources, borders, and biosphere

exists,⁵⁵ none of the above mitigation measures are feasible - except, maybe, reduced tillage.

22.5 Proposed Solutions – Adaptation

Adaptation measures should be tailored to the specific conditions of each country. Where affluence reigns in the water sector, demand management should be the priority, whereas countries with a severe supply crisis should rather focus on expanding supplies to meet climate change. For Palestinians, the occupation remains the all-encompassing limiting factor to adaptation, whereas Israel is hardly affected by

53 The West Bank’s own empty desert above the Dead Sea is a no-go area, sealed off as firing range for the Israeli army or as ‘nature reserves’.

54 See permit #341: “Upgrading of internal water network” in Jiftlik, Jordan Valley, issued 13 May 2009 (in Hebrew).

55 The settlements’ Regional Councils control 2,346 km² of land, while Palestinians have 1,008 km² of Area A under their control (B’Tselem 2002: 93, 116).

Figure 22.21: Israeli adaptation options in the water sector. Summary of vulnerable sectors and adaptation options.
Source: INC (2010: 96).

Vulnerable Sector	Possible Impacts	Adaptation Options
Water Resources	<ul style="list-style-type: none"> • Reduction in water availability in aquifers and surface water bodies • Deterioration of water quality • Increased probability of flood events 	<ul style="list-style-type: none"> • Expansion of desalination capacity • Efficient water use and effective water economy management • Improved modeling • Increased public awareness and change of consumption patterns • Enhanced water quality and quantity monitoring and modeling • Reassessment of water quality standards • Enhanced collaboration of authorities and relevant institutions • Improved wastewater and drainage infrastructure • Enhanced management of the land-use interface in flood-sensitive areas

the conflict. This is expressed in the discourse as well as in the practical solutions suggested.

22.5.1 Israeli Adaptation Options

22.5.1.1 Dramatic Cuts?

The projected impacts on agriculture (22.2, <1 ppm of GDP) can by no means be interpreted as “dramatic cuts in allocation to agriculture” (INC 2010: 78). The discourse therefore again has to resort to other ‘impacts’, such as those under the old Zionist mantra of agriculture as a ‘strategic-political value’ (Knesset 2002): “The social-environmental contribution of agriculture goes beyond its business contribution. Nearly 40 per cent of Israel’s agriculture has landscape value, which is highly rated” (INC 2010: 78).

22.5.1.2 Demand vs. Supply Management

The academic discourse assures us that “managing water demand ... and promoting conservation will be key ingredients in responding to climate-induced impacts on the water sector” (Sowers/Vengosh/Weinthal 2010: 610). The 2nd National Communication lists six supply-side measures, four demand-side, and four research and monitoring measures (figure 22.21).

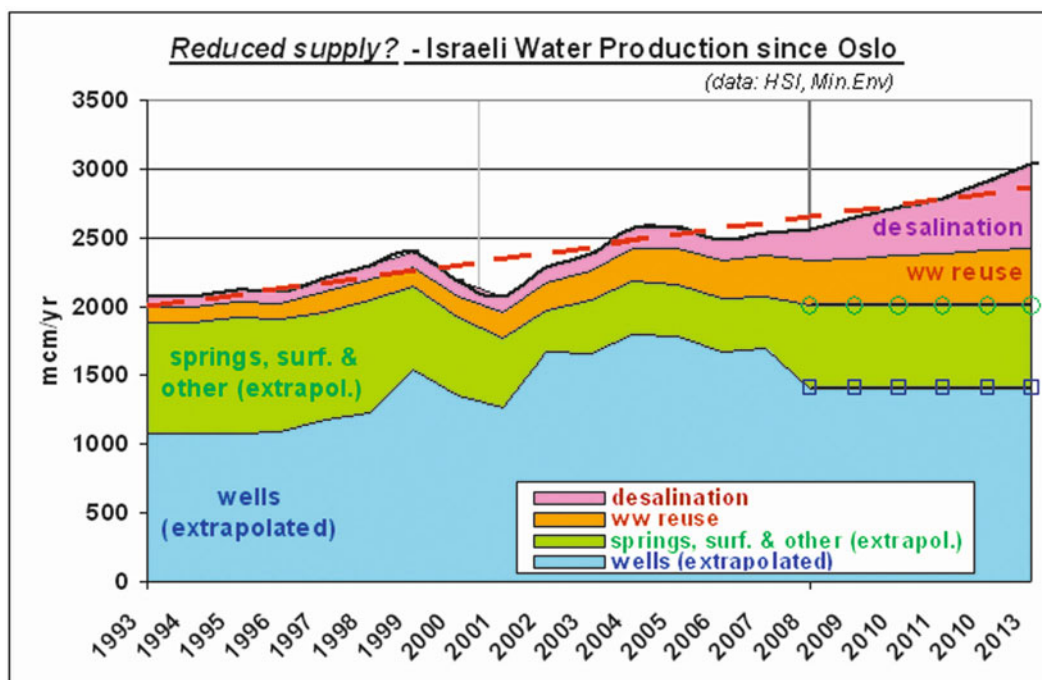
But is Israel really reducing its supply (figure 22.22)? “As a result of reduced water supply ... at present, Israel is considerably expanding its desalination capacity”, raising desalination to 750 mcm/yr by

2020 (INC 2010: 91). Unlike CC impacts on agriculture, the costs of the mega-plants mushrooming along Israel’s coast will burden the economy “with a capital investment of \$56 billion by 2015” (Sanders 2009: 97). Capital investments into (and private profits from) desalination are equivalent to 560 years of agricultural losses.

The truth is that Israel – against all discourse of ‘water efficiency, decreased scarcity and sustainable management’ – still follows the supply-side mantra of increased production and single-mindedly banks on large-scale seawater desalination to meet increasing, not falling, demands in “several sectors” (INC 2010: 73) and particularly in agricultural water, with a “20 per cent increase in water demand for irrigation” (INC 2010: 77).⁵⁶ Desalination dwarfs all other adaptation measures taken together to such a degree that it is appropriate to speak of practically one overall adaptation tool for Israel – desalination – which at the same time is one of the main drivers for Israel’s ‘inability’ to mitigate CC even in the slightest.

⁵⁶ No reference with regard to a specific year, possibly until the end of the century.

Figure 22.22: Reduced supply? Israeli water production since Oslo. **Source:** This figure was prepared by the author based on data published by HSI (2008); INC (2010).



Note: adding 400 mcm wastewater reuse and 600 mcm desalination annually.

22.5.2 Palestinian Adaptation Options

22.5.2.1 IPCC Options

The IPCC (2008) – unrelated to the Palestinian case – provides a list of general adaptation options worldwide (table 22.9), such as:

- unecological ‘options’: desalination, counter to mitigation;
- silent economic options: ‘virtual water’ (Allan 2003, 2003a);
- small-scale interventions: rainwater storage (water harvesting);
- demand-side options: reducing irrigation demand (table 22.7); and
- mixed demand-side/supply-side options: water recycling.⁵⁷

The option of “prospecting and extraction of groundwater” (figure 22.23), in fact, is the one and only

⁵⁷ Recycling, listed here as a mixed option, has features of both demand-side and supply-side options. Israel currently recycles 15 % of its total water. This percentage would be equivalent to 12.7 mcm in the entire (Palestinian) West Bank (given the current annual total under Palestinian control of 84.4 mcm per year; PWA-2009).

option in the West Bank that would have a real and lasting impact on the Palestinians’ chronic supply crisis.⁵⁸

22.5.2.2 Palestinian Proposals

The EQA and UNDP (2010: 42ff) report presents a long list of adaptation measures, from very small interventions to large and mega-scale options. They identify six major climate-induced risks to be responded to, such as changes in crop area and productivity (1, 2), floods (3), droughts and scarcity (4), increased irrigation demand (5), and water quality or seawater intrusion issues in Gaza (6).

An example of responses to the fourth category risks – drought and scarcity – is given in figure 22.23 (EQA/UNDP 2010: 44). The adaptation options represent a mix of all categories of adaptation measures: planning, efficiency, farming methods, and marginal water (wastewater) reuse. The only two options that run counter to Israeli interests – increased fresh water production and development of new sources – are

⁵⁸ No access to the sea; virtual water cannot replace minimum household consumption; cisterns have a minuscule quantitative potential; recycling would depend on sufficient supply input to be recycled....

Table 22.9: Some adaptation options for water supply and demand (the list is not exhaustive). **Source:** Modified from IPCC (2008: 49, table 6.1).

Table 3.4: Some adaptation options for water supply and demand (the list is not exhaustive). [WGII Table 3.5]

Supply-side	Demand-side
Prospecting and extraction of groundwater	Improvement of water-use efficiency by recycling water
Increasing storage capacity by building reservoirs and dams	Reduction in water demand for irrigation by changing the cropping calendar, crop mix, irrigation method, and area planted
Desalination of sea water	Reduction in water demand for irrigation by importing agricultural products, i.e., virtual water
Expansion of rain-water storage	Promotion of indigenous practices for sustainable water use
Removal of invasive non-native vegetation from riparian areas	Expanded use of water markets to reallocate water to highly valued uses
Water transfer	Expanded use of economic incentives including metering and pricing to encourage water conservation

Figure 22.23: Adaptation to food and water security risks. **Source:** EQA/UNDP (2010: 44).

Consequences for food and water and security	Agricultural and water-sector adaptation	Category ¹	Scale ²	Adaptive capacity ³	Technical feasibility ³	Potential cost ³
4. Increased risk of drought and water scarcity						
Main climatic causes of risk: Decreased annual and/or seasonal precipitation Decreased groundwater recharge rates Increase in the frequency of extreme conditions (droughts and heat waves)						
Conflicts among water users due to drought and water scarcity	Set clear water use priorities Increase water use efficiency	M M	N N	H H	H H	L H
Water supply reduced	Increased regional-level rainfall interception (e.g. afforestation)	M	N	H	H	H
	Increased freshwater production	N	R/U	H	H	M
	Awareness-raising on water conservation techniques	I	R/U	M	H	L
	Improved field drainage and soil absorption capacity	T	R/U	L	M	M
	Use of drought tolerant crops and ruminants	M	R	H	M	M
	Local use of treated wastewater for agriculture	T	R	M	H	H
	Development of new water sources including desalination	I	N	H	H	H

1 Category = T: Technical, M: Management, I: Infrastructure

2 Scale of implementation = R: Regional/local rural level, N: National policy sector, U: Urban areas

3 Adaptive capacity level, technical feasibility and potential cost = M: Moderate, H: High, L: Low

marked grey in figure 22.23. But part of the new resources for water supply should come from desalination, as in the Israeli approaches. In addition, under category six, the report demands “equitable groundwater utilization” of water shared with the Israelis (EQA/UNDP: 2010: 61). In all other adaptation measures, the political discourse is absent.

The prioritized options (figure 22.24) are very similar to Mason, Mimi, and Zeitoun (2009), but the Palestinian catalogue adds two crucial options, “(7) in-

crease sustainable freshwater production” and “(8) equitable TB water use” (EQA/UNDP 2010: XII, 46, 61, 69).

At the current stage, the proposal indicates that the Palestinian authorities see little chance of relying heavily on the hope for increased access to water as an adaptation measure.

Figure 22.24: Prioritized Palestinian adaptation options. **Source:** EQA/UNDP (2010: 69).**No-regrets adaptation (in no order of priority)**

1. Development of flood contingency plans
2. Local increases in rainfall interception capacity
3. Establishment of clear water use priorities
4. Introduction of more efficient irrigation techniques
5. Review of drinking water quality management systems to incorporate climate risks
7. Increased (sustainable) production of freshwater
8. Increased use of brackish water and treated wastewater use
9. Equitable and reasonable utilisation of transboundary water resources between the Israelis and Palestinians (implying a fairer allocation of groundwater and freshwater).

Low-regrets adaptation (in no order of priority)

1. Prioritisation of irrigation for highest value crops
2. Increased use of water harvesting
3. Protection of coastal sand dunes in the Gaza Strip
4. Diversification of rural livelihoods
5. Incorporation of climate adaptation in land use planning
6. Greater use of precision agriculture for improved soil and crop management
7. Selection of crop and ruminant selections for more tolerance to heat and drought

Table 22.10: Agriculture and irrigation in Israel and the oPt. **Source:** Modified by the author after Brown and Crawford (2009: 22, table 1: Agriculture in the Levant). Republished with permission of the International Institute for Sustainable Development (IISD); ar: <www.iisd.org>. Original table based on data from the World Bank (2009) and UNFPA (2009).

Country	Area [km ²]	Agricultural land (2008) [km ²]	Irrigated land (2008) [km ²]	Agricultural employment [millions]	Irrigated land per capita [m ²]
Israel	20,770	4,985	2,004 (40.8%)	0.140 (2%)	14,310
oPt	6,263	3,883	264 (6.8%)	0.536 (14%)	490
Pal share [%]	23%	44%	12%	79%	3%

22.5.2.3 Agriculture

Agriculture equally leaves hardly any room for adaptation (table 22.10). The involuntary adaptation to ‘reduced irrigation’ in the oPt is already almost complete.

From a purely technical point of view, almost all the worldwide recipes for A&M are inapplicable in the oPt or negligible in their impacts. Under the occupation, Palestinians cannot even dream of mitigation or adaptation. Throughout their problem analysis, EQA and UNDP emphasize the main obstacle to adaptation – lack of control over land, borders, and water, in short, the ongoing occupation. Remarkably, the practical options suggested for adaptations are more pragmatic and show the influence of the donor agenda to make ends meet under the occupation rather than challenging it and “embolden[ing] actual social transformation” (Selby 2009: 8, 9). Due to the extremely high financial dependency on donor funds, Palestinians are extremely vulnerable to such pressure.

Thus, all too often, Israel’s agenda ends up being pushed through by the donors and is reflected, even if partly, in the Palestinian agenda.

22.5.3 The Donors’ Adaptation Options

As mentioned above, general donor engagement in the water sector of the oPt restricts itself to technical interventions that do not interfere with the current (im-)balance of power. Apolitical silence prevails.

The examples presented here show a clear tendency to plan and strategize adaptation or mitigation measures to CC under the assumption of a continuation of the political status quo. The occupation is either ignored or, at best, mentioned as an additional challenge, but not as a primary cause of preventing any adaptation or mitigation measures to climate change. In the worst case, the Israeli agenda of exclusive control and asymmetric allocations is incorporated in the donor agenda. As a contextual setting, it

Figure 22.25: Priority climate adaptation measures. **Source:** Compiled by the author with data from Mason, Mimi and Zeitoun (2009: 87-88). Permission was granted by Mark Zeitoun.

No-regret adaptation measures	Low-regret adaptation measures
Development of flood contingency plans	Protection of coastal sand dunes
Setting clear water use priorities Irrigation during the night Reviewing drinking water quality management systems	Increase in irrigation for highest value crops Rural livelihood diversification Adaptive land use planning Heat- and drought resistant crop and ruminant selections
Local increases in rainfall interception capacity Increasing water re-use	Increased use of water harvesting Reducing overpumping on groundwater

is useful to recall three key observations by Selby (2009: 8, 9):

1. International agendas ... implicitly accepted, confirmed and even exacerbated, enduring political economic structures.
2. International expert discourse has consistently understated the extent of ongoing Israeli control, and overstated the changes caused by the ‘peace process’.
3. In the absence of material change, ‘new security thinking’ can come to serve primarily as a rhetorical cover for enduring inequities and interests. The real challenge is not to re-imagine security, but to support and hopefully embolden actual social transformation.

22.5.3.1 Examples of Approach and Discourse

The IISD report finds that “building adaptive capacity to climate change and wider peace building are inherently linked.” However, this does not mean international efforts to change the political setting of hydro-power relations, but that interventions should remain strictly on the technical level; IISD wants to address “core tensions through better water management (conservation and efficiency); agricultural development (irrigation with treated waste water); and disaster prevention (spreading drought-resistant crop varieties)” (Brown/Crawford 2009: 33). This approach is typical of the concept of “functional cooperation” (Brauch 2006, 2007).

22.5.3.2 Mason, Mimi, and Zeitoun (UNDP)

In August 2009, UNDP presented 21 no-regret and low-regret options,⁵⁹ almost exclusively in the realm

of agricultural methods (9 measures), demand-side and planning (6 measures), and other infrastructure interventions (3 measures). The three supply-side measures are restricted to marginal water (wastewater reuse and cisterns). Figure 22.25 presents the 13 priority measures.⁶⁰

The UNDP proposal (Mason/Mimi/Zeitoun 2009), unlike the EQA/UNDP report, does not include the increase of fresh water production and the equitable use of transboundary water shared with Israel. Instead, UNDP earnestly suggests that as a ‘low-regret option’ Palestinians should further “reduce over-pumping of groundwater” (figure 22.25; Mason/Mimi/Zeitoun 2009: 70; table 6.3).

22.5.3.3 Blue Peace

The Blue Peace banks heavily on unsustainable supply-side options, large-scale joint desalination, and Turkish water import plans for both Israel and Palestinians. Blue Peace (SFG 2011b) is concerned that Israel could suffer in the case of another drought or, worse, by sharing water with Palestinians:

If, however, Israel suffers another severe drought period or cedes freshwater resources to an independent Palestinian state, it may face a marginal or severe deficit. Israel’s strategy of ensuring water security for its 8.3 million people in 2020 is dependent on efficient demand management and creation of wastewater and desalinated water on a large scale.

Palestinians, however, should continue without fresh water access and be satisfied with low consumption levels of marginal water: “In the case of the Palestinian Territories, efficient demand management, capacity creation in marginal water and independence from Israel will alleviate the degree of deficit but at a low

⁵⁹ In addition, non-prioritized high-cost solutions comprise of agricultural approaches, infrastructure methods (dunes), and so-called ‘new water’ - treated wastewater and seawater desalination.

⁶⁰ Supply-side measures in blue, demand management and agricultural techniques and practices in green, other infrastructure interventions in grey.

level of per capita consumption below 100 cubic metres” (SFG 2011b: XIX).

The Blue Peace plan displays fully-fledged double standards. Most worryingly, these proposals are promoted and funded by the Swedish International Development Cooperation Agency, the Swiss Agency for Development and Cooperation, and the Swiss Political Affairs Division of the Federal Department of Foreign Affairs.

22.5.3.4 German Government

Germany is the largest donor in the Palestinian water sector and was the first to start well-drilling under Oslo. Soon enough the projects faced the bureaucratic obstructionism of Israel (World Bank 2009).⁶¹ Instead of increasing pressure on Israel, the German development cooperation abandoned the whole sector of water resource development (Messerschmid 2008a; AI 2009).⁶² A German parliamentary inquiry (BMZ 2010: 14) asked the government difficult questions about its water projects and strategy:

Q. 28 Why has Germany abandoned the priority of systematic development of autochthonous groundwater resources through the drilling of new deep wells?

Q. 30 Why did German projects shift away from water and towards wastewater despite the grossly inadequate drinking and irrigation water supply?

Q. 33 Why does Germany now exclusively bank on network construction and rehabilitation, despite the fact that many of these stand empty due to Israeli restrictions?

QQ. 31 and 32 Why does the German government not insist on well-drilling permits (Israeli minimum obligations under international law)? How does Germany explain its shared responsibility for this blatant violation of the Oslo Accords (refusal to participate in alleviating water crisis)?

German Development Cooperation Minister Dirk Niebel’s answers provide a rare insight into the official German line concerning its role in the water conflict.

61 The last German well, Ein Samia #6, was drilled in 1999 for Ramallah district (more details in Messerschmid 2008a).

62 Permits for the last well applied for under German projects in 2001, Hizmeh exploration well, were still delayed by and pending in the JWC and the Civil Administration in 2010 (World Bank 2009; AI 2009). The German Reconstruction Bank (KfW) had already abandoned this project in 2002/2003.

A 33: The Federal Government does not share the view that [networks lay empty] due to Israeli restrictions on the development of adequate water sources. The frequent drop in pressure is mainly due to technical losses (BMZ 2010: Q. 33).

→ The answer to Q. 33 can thus be summarized as: *There are no Israeli restrictions.*

A 30: As climate change will further exacerbate water scarcity in the *Middle East and North Africa* (MENA) region, it is essential to protect renewable resources. Germany’s priorities are relevant here (BMZ 2010: Q. 30).

A 28: As water availability in all three aquifers is limited for reasons of sustainability, Germany is now prioritizing development projects which aim to reduce water losses and conserve groundwater resources (BMZ 2010, Q. 28)

A 30: As water reserves are generally scarce, German-Palestinian development cooperation ... now focuses on reducing water losses in the water supply system and on improving the efficiency of water resource use, *rather than* on abstracting additional raw water from scarce, overexploited and in some cases contaminated groundwater resources. Purified wastewater [will] generate additional water supplies for agriculture (BMZ 2010, Q. 30).

→ The answer to QQ. 30 and 28 can thus be summarized as: *CC and scarcity mean: Protect resources against Palestinian use.*

A 31: In relations between Israel and the Palestinians, the use of water resources is one of the ‘final status’ issues which ... must be resolved within the framework of a negotiated peace agreement (BMZ 2010, Q. 31, 32).

→ The answer to QQ. 31 and 32 can thus be summarized as: *Germany has no responsibility for Oslo; Palestinians are left alone.*

In answer 33, the impacts of the occupation are flatly denied. Answers 30 and 28 exhibit the donor’s *ecological* discourse, which takes Palestinians hostage to ‘scarcity’, a scarcity artificially created by the occupation and Israel’s one-sided over-abstractions. Minister Niebel has discouraged Palestinian well-drilling projects, but Germany exerts no pressure on Israel to reduce pumping. Thus, Minister Niebel sets a clear priority for protecting the resources against rising ‘scarcity’ – and in effect against Palestinians. What remains for Palestinians to meet their demand is marginal water only.

Answer 31: Germany as a leader in the water sector and as a central European power is clearly obliged to

secure at least the minimum requirements of Oslo. But Mr Niebel and the German government do not want to hear about their responsibility. Palestinians need to wait for the ‘final status negotiations’, and Palestinians alone will miraculously acquire the bargaining power vis-à-vis Israel to reach their equitable and reasonable share of freshwater allocations. In effect, Germany is pursuing a policy of adaptation to the climate of occupation.

22.5.3.5 Summary

Scarcity as a blind fate brought upon Palestinians by a cruel nature enables donors to actively dismiss the essentially political struggle for an equitable and reasonable share in transboundary water resources. None of the above-mentioned detailed studies attempts to integrate a “positive political climate change” into the A&M agenda. The donor discourse on Palestinian adaptation to CC can be boiled down to three essential lines:

- Palestinians should strive for purely technical, small-scale, resource-neutral measures (demand management, planning, administration, and agriculture) that do not address the underlying political reasons for the Palestinian water crisis.
- Palestinians should look for ‘new water only’ (marginal water, treated wastewater, or seawater), and not question Israel’s exclusive fresh water control.
- Donors discourage Palestinians from struggling for their equitable and reasonable share (new wells). Palestinian demands for a higher share (even Oslo minimum requirements) are abandoned. Under CC, Palestinians should further downscale their share.

To call these approaches ‘adaptation to CC’ is truly absurd. In essence, it is simply adaptation to the unchanged political climate, the political status quo, imposed by Israel and a case of blatant hydro-discrimination. This is despite the fact that under a prolonged unchallenged occupation, all common A&M measures will run straight into a solid wall of Israeli restrictions and remain largely ineffective, if not even a placebo. It appears that to Palestinians, the coming climatic changes will be less of a threat than the consequences of such CC discourses.

22.6 Proposed Solutions – Cooperation

Climate change provides a strong rationale for better cooperation over resources (Brown/Crawford 2009: 36).

The outcome of cooperation between an elephant and a fly is not difficult to predict (Chomsky 1999: 166).

The international discourse on CC emphasizes the role of regional transboundary cooperation⁶³ in facing future challenges and regards it as an appropriate response to conflict, even as the opposite of conflict.⁶⁴ But is ‘*cooperation*’ a realistic venue that can live up to its promises? And what role does cooperation play in the existing water conflict between Israeli and Palestinians?

High hopes were invested in cooperation by many observers in the early years of Oslo (Libiszewski 1995: 56). However, over time, many have sobered up (Jägerskog 2003, 2009; Dombrowski 2003, 2009; Messerschmid 2008a; World Bank 2009). Not only has the expected ‘spillover’ from water into other fields not taken place (Jägerskog 2003, 2009; Maas/Tänzler 2009⁶⁵), the very mechanism of cooperation in the Israeli and Palestinian *Joint Water Committee* (JWC) has turned out to be as asymmetrical as the previous overt occupation (Selby 2006; Messerschmid 2008a). Real Palestinian control and abstractions of groundwater in the West Bank have not only failed to reach the rates agreed in Oslo (World Bank 2009), but have actually dropped over the past years (PWA 2009).

For each project, Palestinians have to *cooperate*. Cooperation thus is neither new nor does it lack intensity and relevance. If it has proven disastrous for Palestinians before and since Oslo, then this is because of its asymmetric scheme of power, control, and veto-power within and outside the JWC.

63 The international discourse as presented here includes renowned and influential international scholars, think tanks, government statements, and donor agencies.

64 Brauch (2006, 2009); FoEME (2007); GLOWA (2008); Brown/Crawford (2009); BMZ (2010); SFG (2011b, 2011c); UNDP-HDR (2006).

65 “Water remains one of the key unresolved issues in the Israeli-Palestinian conflict. While there have been efforts to use joint water management as a pathway for cooperation and peacebuilding, most successes were on the technical level, without much spill-over to the political level” (Maas/Tänzler 2009: 6).

22.6.1 The New Discourse on Climate Change Cooperation

The new emerging discourse on CC cooperation, for the most part, fails to acknowledge these experiences and lessons from Oslo. Any analysis of the role of cooperation and CC would have to start with a critique of the already existing entrenched patterns of ‘cooperation’ before and under Oslo (Kistin/Phillips 2007: 9). But the donor discourse systematically steers away from this task. In fact, cooperation has become a myth in itself, in that

- a) it is disconnected from the reality of the status quo and power asymmetries (apolitical and ahistorical), blending out the existing conflict and its drivers and replacing them by pragmatism (Revolve 2011;⁶⁶ Brauch 2006: 8, 32; 2007);
- b) the existence of “cooperation of any sort, no matter how slight” (UNDP-HDR 2006: 228) is seen as a goal and success in itself, not merely as a means that has to stand up to the test of tangible effects on the ground⁶⁷ (regularly misjudged by its intensity, rather than by its results);
- c) some discourses even consider CC cooperation as a universal remedy for the conflict that will in time spill over to other spheres of conflict,⁶⁸ will prevent ‘water wars’, and make actors “rise above self-interest”⁶⁹, thus misinterpreting the conflict as a matter of goodwill and trust (Brauch 2006, 2007; SFG 2011b).

66 This incidentally is exactly the Israeli position: “Israel believes, ... the sides must dwell less on theoretical, legal or ideological aspects relating to the sharing of existing water sources, and focus more on practical and effective planning and preparation for coordinated water resources management ... pragmatic solutions, not strict adherence to ‘dry’ legal principles. ... clear conclusion that it would be most beneficial to focus on pragmatic rather than legal solutions” (IWA 2009: 28, 29).

67 Discussed above and by Selby (2009); World Bank (2009); Messerschmid (2008a).

68 “The extent to which the water is shared in the region as synonym for the extent that the conflicts in the region can be solved” (GLOWA 2008: 17).

69 “By adopting a pragmatic approach to water sharing and management ... countries can build upon existing agreements and confidence measures ... Once countries accept the principle of cooperation, they rise above self-interest” asserts the Blue Peace Plan (Revolve 2011).

22.6.2 Shared Interests and Common Threats

To detect “shared interests” (Brown/Crawford 2008), a common enemy or threat must be found, mostly through the *ecological discourse*, based on ‘scarcity’ (BMZ 2010; SFG 2011b; Brown/Crawford 2008). The ecological discourse as a new conceptual lens focuses on concerns about ecosystems, resources, and aquifers, thus further securitizing the environment and pushing actors and living conditions into the background (BMZ 2010).

However, by circumventing the history, power, and politics of the real conflict, such cooperation ends up perpetuating the old pattern of domination, cementing the status quo, in particular with respect to the hard core: allocation and access to fresh water resources.⁷⁰ This is why most practical suggestions avoid any action that would question the given framework of power and the asymmetric status quo. Surprisingly, most such approaches for ‘functional cooperation’ end up actively promoting the by far most unecological solution, large-scale seawater desalination, to offer ‘more water for both’ (Brauch 2006; SFG 2011b).

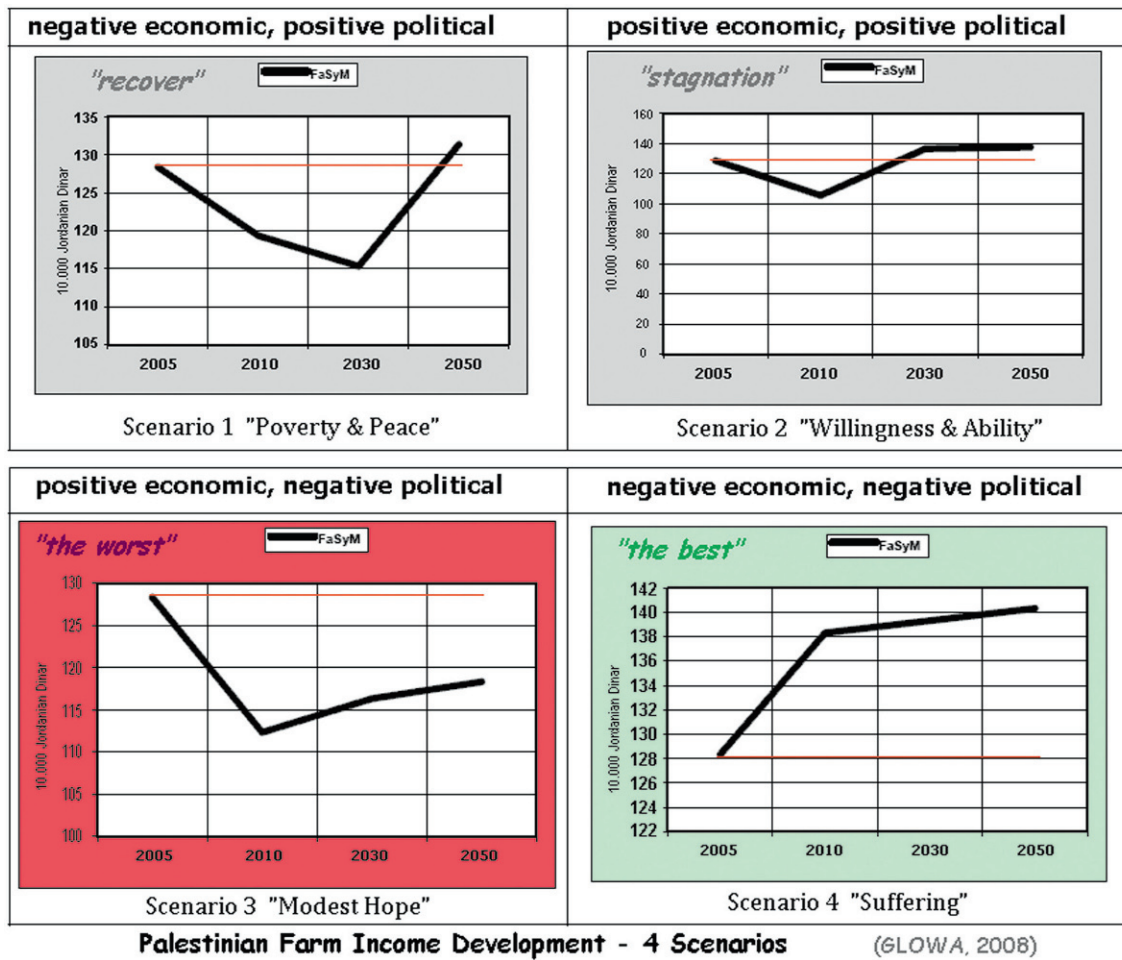
22.6.3 Shared Benefits and Positive Sum Games

On the conceptual level, cooperation must promise a positive sum game under which benefits can be shared by both sides (Phillips 2008: 142), i.e. ‘functional cooperation’ (Brauch 2006, 2007; Davidson 2008; Brooks/Trottier 2008). The cooperation discourse on CC promises through the “new policy instruments: in the process [of pragmatic ‘functional cooperation’], the River Jordan, the Mountain Aquifer, and the Dead Sea, which are currently depleting at a fast rate, would be rejuvenated. Lake Kinneret (Tiberias), which faces threats from climate change, would be made sustainable” (SFG 2011a: 2).

According to the common notion, peace and cooperation will improve the water-stressed sectors, particularly agriculture. But a GLOWA⁷¹ model of climate change impacts on farm incomes (figure 22.26)

70 Oslo water cooperation has proved to be an expression of self-interest on both sides, or in other words, the flip side of the conflict, not its opposite. If cooperation is thus understood as a manifestation, an expression of the conflict, it becomes clear that it cannot and does not automatically alter the interests and the mindset of the two sides.

Figure 22.26: Four scenarios of Palestinian farm income development: climate change impacts on farm incomes. Source: GLOWA (2008: 45ff.); this figure is reproduced with permission by Thameen Hijawi.



Note: Scenario 4 “Suffering” with negative economic and political vectors is the ‘best’ scenario for farm incomes.^{a)}

a) Mainly due to “the lack of alternative employment for resources in sectors other than agriculture”, ‘modest hope’ would witness a drastic drop in farm incomes, due to “a growing competition for water resources by competing sectors of the economy in a positive economic environment”. Remarkably, an initial strong drop in farm incomes would also occur if peace had been made (‘poverty & peace’), (GLOWA 2008: 48).

has shown that for Palestinians (unlike Israelis and Jordanians), ‘peace and cooperation’ is not the most promising scenario (GLOWA 2008: 17).

This is but one example showing that the common myth of cooperation and peace leading directly to benefits is too simplistic.

22.6.4 Convergence

“The [Blue Peace] report calls for a confidence-building initiative between the heads of water authorities of Israel and PA.” These meetings, intended to downgrade Palestinian allocations (by 19 per cent), will be conducted under donor supervision, “under observation of representatives of [the] Quartet or major donor countries”.⁷² Therefore, this ‘new’ approach will remain just more of the same, based on “interaction through the Joint Water Committee”. What is left for

71 GLOWA - ‘Globaler Wandel des Wasserkreislaufs’ (*Global Change in the Hydrologic Cycle*); GLOWA-JR is the GLOWA project on the Jordan River.

72 Brauch (2006: 32) also promotes donor pressure through “conditionalized support”.

the oPt is marginal water and wastewater (“small sized decentralised plants”; SFG 2011a: 5).

In the new discourse on cooperation, the donor agenda converges with the Israeli agenda – pragmatism and a focus not on legal matters but on marginal water, wastewater, and desalination as ‘new water’ resources, or even downgrading of Oslo allocations (SFG 2011b). The only thing that could alter life for Palestinians – new wells as access points to freshwater – is entirely absent from this discourse. On the contrary: more than ever, this approach discourages Palestinians and raises obstacles for access to their own, albeit shared, water (BMZ 2010; SFG 2011b).

And again, dissenting voices such as SIDA (2010: 16) are marginal: “One important aspect of transboundary water cooperation is to understand the power structures in the region. It may be fruitful to ‘level the playing field’ by targeting support to the relatively weaker part.” The new model of cooperation does not intend to level the playing field, lend support to the weaker side, or use pressure to further universal justice (BMZ 2010: Q. 31).

Therefore, reminding people of the conflict⁷³ can easily become synonymous with spoiling the great new adventure and offensive of goodwill. Palestinian aspirations are sidelined and sacrificed on the altar of this ‘new’ discourse.

22.6.5 Outlook

The ‘new model’ of CC cooperation will end up – just as the old model did – in “Joint Water Mismanagement” (Selby 2006). This is because it also fails technically to address inequality and asymmetry. Different recipes would be needed for the two sides:

- conservation, ending the waste of water and demand management on the Israeli side;
- catch-up development of available water resources, reallocation on the Palestinian side.

By promising both sides more water, the ‘scarcity’-driven, positive-sum, supply-side approach not only harms Palestinians but also the environment and climate itself. CC is a new mould for an old conflict. It alters neither the social nor the political realities on the ground in the context of this conflict. CC cooperation discourse acts as a cover-up and prolongs the inequitable, unfair Israeli domination under the disguise of cooperation. The donor discourse attempts

to make CC adaptation and cooperation compatible with the occupation. As Gershon Baskin (2008: 1) remarked:

“There is no Green Line on the aquifers. It is true that in this joint water pool that we share, there is a zero-sum game. Whatever one side gets is at the expense of the other. Cooperation means changing the ‘hard disk’ in our minds regarding the Palestinians. The occupation mind-set that guides the talks on water led by Kinarti and Nagar⁷⁴ can only lead to bad agreements or to conflicts. In simple terms, *it’s the occupation - stupid!*”

22.6.6 Research Needs

Still lacking is a CC impact and adaptation discourse that is rooted in reality, with the conflict as the principal driver – both as scientific research and as a practical approach for action plans and their implementation. Furthermore, special research on the emerging Palestinian discourse is called for. This includes an analysis of the popular and mass-media level discourse in Arabic. As a refinement, the analysis of contradictions within the Palestinian camp deserves attention, in order to determine the likely losers or winners from CC and their interactions, as well as the drivers and the interests at stake.

22.7 Conclusions

This chapter has presented the current CC discourse within the context of the Israeli-Palestinian conflict over transboundary, but largely unshared water resources. The prospected impacts on Israel were found to be marginal. Even for Palestinians, these impacts are secondary to the main threat, the continuation of the unsustainable status quo.

This chapter has argued that CC is a powerful discursive pattern, but not because it accurately portrays a new reality as a new paradigm. In the reality of the conflict, nothing has changed; the conflict remains, and old positions are being reframed. Yet CC is highly attractive because it is an empty canvas, a projection screen for almost everybody and any agenda – using more water or less water, sharing or securitizing water, demand- or supply-management, etc. The ‘new’ discourse of CC is cast into the pre-existing mould of the contextual setting and its hydrostrategic drivers (conflict, occupation, Oslo, etc.). CC is subsumed under, and understood and operated through, the

73 And that in essence, interests are not common and shared, but conflicting.

74 Both are Israeli representatives in the JWC.

existing myths, metaphors, epistemic figures, and vocabularies.

The weaker and still embryonic Palestinian discourse was found to be ambiguous; most Palestinians on the one hand stress the conflict and political impediments, while at the same time many fall, at least partially, for the pragmatic technical solutions promoted by Israel and the donors.

In the Israeli discourse, the old myths (scarcity), storylines (desert bloom), and epistemic figures (secured availability) are still standing. CC updates, confirms, and stabilizes the old discourse. Dissenting discourses that refer to the occupation and call for an urgent politicization of the water economies remain marginal. To Israel, climate change is a disruption of the status quo, although marginal rather than existential. The mainstream of Israeli CC discourses operates as a problem-solving theory. It naturalizes and continues to depoliticize CC from a comfortable position of privileged use, control, and extreme but not openly acknowledged power asymmetry. CC allows Israel to portray itself as a victim.

Regrettably, Israel is here followed by the donors. The donor discourse exemplifies the dangers of depoliticization. CC adaptation is not considered as a socio-economic and political task, but as a purely technical endeavour. Lessons are not learned, old recipes are warmed up again: ‘pragmatic cooperation’, which under Oslo led to the current life-threatening Palestinian water crisis, is misinterpreted as the new solution, a functional means of pacifying the situation and simultaneously meeting the challenges of CC. The action plans are tailored to and made compatible with the given status quo of the conflict.

Under the disguise of ecological concern for natural water resources, the donor discourse converges with the Israeli agenda of asymmetric control and allocation – conceptually, a confirmation of the scarcity mantra and a push for pragmatic ‘functional cooperation’; practically, a continuation of supply-side management for Israel and marginal or ‘new water’ solutions for Palestinians. Equitable water allocation is no priority. The power asymmetry underlying the conflict remains the best ‘hidden secret’ of this discourse. Thus the opportunity for a major shift towards a sustainable future for all water users is sacrificed on the altar of the *sanctioned discourse* of Israeli ‘water security’.

In essence, the approaches pursued under the donor discourse mitigate and adapt to the status quo, rather than to climate change. They stabilize and embolden the occupation. Palestinians, essentially, are

bereaved of any prospect of mastering or adapting to CC. They have to carry the double burden of the ongoing occupation and, in addition, the threats posed by the new CC interventions, which pose a threat and an obstacle to Palestinian historic aspirations for hydro-justice.

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Part VI Climate Change and Security in Africa

Chapter 23 Locating Climate Insecurity: Where Are the Most Vulnerable Places in Africa?

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23 Locating Climate Insecurity: Where Are the Most Vulnerable Places in Africa?

Joshua W. Busby, Todd G. Smith, Kaiba L. White, and Shawn M. Strange

23.1 Introduction¹

Africa is widely recognized as one of the continents most vulnerable to climate change. The continent's vulnerability is partly driven by unfortunate geography, where the physical effects of climate change are likely to be among the most severe on the planet. It is also largely due to the low adaptive capacity of many African states, a product of problems in their economies, healthcare and education systems, infrastructure, and governance.²

These challenges are not uniformly distributed within Africa. In order to identify areas of vulnerability and prioritize limited resources, it is not sufficient to say 'Ethiopia is vulnerable' without explaining which parts of Ethiopia are particularly vulnerable and for what reasons. Recognizing where physical exposure to climate change conjoins with other dimensions of vulnerability is an important area for research with significant policy relevance. With information on which parts of the continent are most vulnerable to climate change, Africans themselves can prioritize their scarce resources accordingly and the international policy community can better target adaptation assistance that is likely to become increasingly important.

This project is located in the larger, emergent debate about climate change and security.³ The 'securitization' of climate change in the policy world and among academics has largely focused on the causal connections between climate change and violent conflict.⁴ Methodologically, most scholars take the expected effects of climate change – such as drought, rainfall variation, disasters, and migration – and look for analogues to see if those effects have historically been correlated with the onset of violent conflict.⁵ To date, the findings of this literature have been mixed and somewhat disappointing, in part because of the lack of adequate data (Buhaug/Gleditsch/Theisen 2008; Busby 2009, 2010). Moreover, such approaches have a number of limitations, not least of which is a truncated view of what constitutes a security problem.

With the concept of human security, some academics and practitioners sought to enlarge the concept of security to encompass almost any harm to human welfare.⁶ Such conceptual stretching may

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2 Low (2005); Collier, Conway and Venables (2008); Gullege (2008); Boko, Niang and Nyong (2007); Basher and Briceño (2005).

3 Gleditsch, Nordås and Salehyan (2007); Gleditsch (2009); Buhaug, Gleditsch and Theisen (2008); Salehyan (2008); Hendrix and Glaser (2007); Raleigh, Jordan and Salehyan (2008); Nordås and Gleditsch (2007); Brauch (2002, 2009); Bauer (2011); Scheffran (2009, 2011).

4 Fingar (2008); CNA Corporation (2007); Campbell, Gullege, McNeill et al. (2007); WBGU (2007); Herman and Treverton (2009); Solana (2008); Podesta and Ogden (2008).

5 Hendrix and Glaser (2007); Buhaug (2010); Burke, Miguel, Satyana et al. (2009); Levy, Anderson, Brickman et al. (2008); Theisen, Holtermann and Buhaug (2009).

6 See the three volumes of the *Global Environmental and Human Security Handbook for the Anthropocene* with 270 peer-reviewed chapters by 300 authors from 100 countries that offer a topical and comprehensive overview of the global debate on the reconceptualization of security since 1990 (Brauch/Oswald Spring/Mesjasz et al. 2008; Brauch/Oswald Spring/Grin et al. 2009; Brauch/Oswald Spring/Mesjasz et al. 2011).

make the idea of security meaningless (Paris 2001, 2004).⁷ Climate change does, however, constitute a security concern beyond its potential contribution to violent conflict. Climate change is expected to increase the number and severity of extreme weather events (IPCC 2007). Given that militaries are frequently deployed to provide humanitarian relief in the aftermath of extreme weather events, such crises constitute important security concerns for external actors, if only because the diversion of military resources represents an opportunity cost and could keep military resources from being deployed for other purposes (Busby 2007, 2008).

Moreover, in poor, fragile states, like many of those in Africa, climate shocks and swift-onset meteorological shocks potentially constitute more severe threats to domestic security by compromising a state's monopoly of force within its borders (Brancati 2007; Nel/Righarts 2008). In the absence of effective delivery of relief supplies, the destruction of infrastructure and interruption of services can contribute to such desperation that the populace will steal or riot to secure necessities. In such circumstances, these risks to state control are compounded if others take advantage of the absence of a security presence to loot for personal gain. Moreover, disasters may provide focal points around which citizens with grievances against the regime may rally (Flores/Smith 2010).

The emphasis of the authors in this chapter is on the potential security consequences of climate change, including but not limited to conflict. By this we mean to encompass situations where large numbers of people are put at risk of mass death from climate hazards such that the capacities of civilian agencies are over-run, potentially requiring the mobilization of domestic and/or international military assets to protect them. The security focus makes this work broader than the *United Nations International Strategy for Disaster Reduction* (UNISDR), which focuses more narrowly on mortality and economic losses from disasters (UNISDR 2009). The authors of this study are especially interested in the impact of climate-related hazards where physical exposure, compounded by other sources of vulnerability, will likely

put large numbers of people at risk of mass death and suffering such that local emergency rescue personnel cannot cope. In those instances, emergency relief will often require the mobilization of domestic and foreign militaries. In some cases, such crises will make internal conflict more likely and contribute to other potential security outcomes of interest, including internal and international migration.

What makes a place potentially vulnerable to these security consequences of climate change? Answering this question requires an understanding of the concept of vulnerability. As the literature on vulnerability and disasters has demonstrated, vulnerability to extreme weather events is only partially a function of environmental and geographic features (Basher/Briceño 2005: 276). In addition to living in areas prone to flooding, drought, or other extreme weather events, communities are often made more vulnerable because they are marginalized from services, infrastructure, and levers of power that might otherwise help them in times of need. They lack adequate public infrastructure (such as roads, piped water, sanitation, and electricity) or access to healthcare, education, and other basic services. These risks may be compounded by a lack of political representation, poor governance, or a history of violence in the country.

In this chapter *geographic information systems* (GIS) are used to locate the confluence of these types of vulnerability in Africa. The authors mapped layers of data on sub-national vulnerability to climate-related hazards that may increase in frequency and severity due to climate change. These maps show relative vulnerability to climate change in different places by incorporating a variety of indicators. Vulnerability mapping provides a way of understanding where and how climate change might constitute a threat to African security. GIS are not widely deployed in international relations scholarship but are extensively used in other fields. GIS allow users to visualize data spatially. The software also permits users to calculate spatial properties of locations or geographic shapes (such as states, provinces, or sub-national administrative units). For the purposes of this chapter, mapping the diverse sources of historic problems in Africa at the sub-national level provides a way of understanding which places might be most vulnerable to climate change in the future.

This approach ranks locations within Africa in terms of their relative vulnerability to climate change using a holistic model of vulnerability. The vulnerability rankings are relative to other African countries rather than to the entire globe. Thus, countries and

7 National security threats in the authors' view constitute situations that pose such grave risks to a country or its way of life that a state would be willing to wage war to forestall such consequences. Localized security consequences are those that put large numbers of people at risk of mass death, potentially requiring the mobilization of military assets to protect them.

localities exhibiting low relative vulnerability within Africa may still be highly vulnerable to climate change compared with the world as a whole.

Using this approach, the authors find that the areas with the greatest vulnerability are parts of Madagascar, coastal west Africa, coastal Nigeria, western Ethiopia, and parts of the Democratic Republic of Congo (DRC). Some areas that face high physical exposure to climate change, such as north African countries along the Mediterranean, appear less vulnerable given higher levels of community and household resilience and more capable, if not good, governance. By contrast, other countries, with less physical exposure to climate change, like southern Sudan, Niger, and Somalia, appear much more vulnerable when governance and household and community indicators are brought in. Interestingly, western Ethiopia appears consistently vulnerable across all dimensions of interest.

This chapter opens with a discussion of vulnerability and includes a review of several exemplars of vulnerability indices (23.2). The next section presents an overview of the approach of the authors to vulnerability and a detailed review of the methodology (23.3). The concluding section presents the chapter's aggregate findings and several maps of areas of particular concern (23.4).

23.2 The Attributes of Vulnerability

Conceptual fragmentation characterizes the literature on vulnerability. Different disciplines and professions understand the concept differently.⁸ The Fourth Assessment Report by the *Intergovernmental Panel on Climate Change* (IPCC) defined vulnerability as “the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity” (end box 2 in IPCC 2007: 21).

Vulnerability is also often identified in government and scholarly assessments as being susceptible to losses. Wisner, for example, suggests that across the

diverse meanings of vulnerability is the notion of “potential for disruption or harm” (Wisner 2004: 184). Cardona suggests that “vulnerability in social groups could thus be understood as the reduced capacity to ‘adapt to’, or adjust to, a determined set of environmental circumstances” (Cardona 2004: 37, 2011). In the UNISDR *Global Assessment Report*, vulnerability is defined as “a propensity or susceptibility to suffer loss and is associated with a range of physical, social, political, economic, cultural and institutional characteristics” (UNISDR 2009: 6). The converse of vulnerability is *resilience*, or the degree to which countries, communities, families, or individuals are able to insulate themselves from losses or, at the very least, have the capacity to respond quickly to emergencies and recover from them, minimizing long-term damage and loss of life.

One of the more popular conceptions of vulnerability in the literature is encapsulated by the simple equation: risk = vulnerability x hazard (Burg 2008; Alexander 2009). In this view, vulnerability is seen as a component of risk. Risk is seen as a function of both exposure to physical *hazards* and *vulnerability*. Brooks, Adger, and Kelly (2005) seek to operationalize this with respect to the risk of disaster mortality, where the probability that a country will be exposed to a climate-related or meteorological event and its vulnerability to this event reflect the likely consequence or importance of that event. In this equation, environmental and physical factors contribute to risk, whereas vulnerability is narrowly defined in socio-economic and political terms. A focus on vulnerability as a purely social understanding could potentially be misleading. As Cardona notes, “If there is no hazard, it is not feasible to be vulnerable when seen from the perspective of the potential damage or loss due to the occurrence of an event” (Cardona 2004: 38). A vulnerability index based on non-physical variables would tend to underweight the physical determinants of vulnerability.

Another tendency might be to focus on vulnerability purely in terms of physical exposure. Raleigh, Jordan, and Salehyan (2008) suggest that – despite the inclusion of measures of a society's adaptive capacity in its definition of vulnerability – the IPCC definition focuses mainly on physical risks rather than the social and economic sources of vulnerability: “The IPCC's definition of vulnerability is pointedly related to the physical risks communities experience from environmental hazards” (Raleigh/Jordan/Salehyan 2008: 4). However, as Raleigh, Jordan, and Salehyan note, scholars have long concluded that “human agency” is

8 For a variety of definitions, see McEntire (2005); see also Raleigh, Jordan, and Salehyan (2008); Füssel and Klein (2006); Cardona (2004); Alexander (2009); McLeman and Smit (2006); Weichselgartner (2001); Wisner (2004); and the systematic overview by Brauch (2005, 2011).

an important determinant of whether or not countries experience adverse consequences from physical events and are able to recover from them swiftly.

To a certain extent, the issue is a semantic one; some authors define risk and vulnerability interchangeably, while others distinguish between them. The important issue is not the name of the concept but what is being measured. The purpose of this study is to create an index of the diverse sources that expose people to harm, including physical, demographic, social, and political sources.

This study captures a static snapshot of chronic vulnerability, rather than emergent, dynamic vulnerability (Burg 2008). Other organizations, such as the World Food Programme and the United Nations, have parallel efforts to document and map emergent vulnerability to drought and famines (World Food Programme 2009).

This section evaluates four exemplars of risk and vulnerability rankings, including work by Clionadh Raleigh, Lisa Jordan, and Idean Salehyan (2008); research by Marc Levy, Bridget Anderson, Melanie Brickman et al. (2008); papers by Nick Brooks, Neil Adger, and Mick Kelly (2005); and work by Antoinette Brenkert and Elizabeth Malone (2005).

23.2.1 Raleigh, Jordan, and Salehyan

In their effort to capture vulnerability to disasters, Raleigh, Jordan, and Salehyan (2008) incorporate just three dimensions: (1) *Gross Domestic Product* (GDP) per capita, (2) population growth by 2050, and (3) historical disaster frequency. Their intuitions are straightforward; in their view, demographic growth and limited income constitute risk factors equal to disaster frequency in contributing to a country's overall vulnerability. They provide rankings of country vulnerability to particular disasters, wind storms, droughts, and floods (table 23.1).

Table 23.1: Countries Most Vulnerable to Disasters (1968–2007). **Source:** Raleigh, Jordan, and Salehyan (2008).

Droughts	Floods	Wind storms
Burkina Faso, Mozambique, Rwanda, Somalia, Tanzania	Afghanistan, Bangladesh, Malawi, Mozambique, Nepal, Nigeria, Somalia, Sudan, Tanzania	Bangladesh, Madagascar, Mozambique

A spare metric of vulnerability has some advantages. It provides a comparatively simple way to capture relative vulnerability. Limited information is required to make the calculations. Moreover, with equal weight attached to each indicator, the decision rule for aggregation requires no lengthy rationale.

However, such a lean conception does not capture the full range of contributors to state vulnerability. While any model of vulnerability necessarily simplifies reality, an overly restrictive conception is potentially less policy-relevant. An index based on a few broad indicators may give little insight as to the mechanisms that give rise to underlying vulnerability. For example, income may be correlated with a variety of indicators within domains like education and health, each of which could be subject to policy interventions.

They use the EM-DAT International Disaster database compiled by the Université Catholique de Louvain in Belgium. By using the EM-DAT data on disasters, there is the potential to conflate physical exposure with other dimensions of vulnerability. The EM-DAT database only counts an event as a disaster if the consequences meet one of the following conditions: ten or more people killed; a hundred or more people reported affected; a declaration of a state of emergency; or a call for international assistance.⁹ Whether or not a climate-related hazard produces these effects will ultimately be contingent upon a host of other factors, including community resilience and government effectiveness. For this reason, later indicators of physical exposure to climate-related hazards are used that are measured independently of their ultimate impact on people. In order not to equate 'disasters' with physical exposure to climate hazards, this chapter tries to use the latter terminology when physical exposure is discussed on its own.¹⁰

As the disaster risk literature argues, 'natural' disasters are something of a misnomer (Basher/Briceño 2005: 276). Whether or not an extreme meteorological event becomes a disaster (i.e. generates lasting adverse consequences on human welfare) is typically a product of governance failures and other sources of individual and community vulnerability such as inequality, poor health, or poor nutrition.

9 The EM-DAT dataset is in part a reflection of reporting, so that the patterns may not fully reflect all the disasters or may be biased towards countries that have more media attention. Moreover, the data on fatalities, people affected, and homelessness may be inaccurate.

10 See at: <<http://www.emdat.be/database>>; see also Guha-Sapir and Vos (2011).

Table 23.2: Countries Most Vulnerable to Climate and Political Risks. **Source:** Levy, Anderson, Brickman et al. (2008).^{a)}

Coastal Population Exposure		Aggregate Temperature Changes	Water Scarcity
Population Exposed	Percentage of Population		
China, Philippines, India, Indonesia	Philippines, Egypt, Indonesia	South Africa, Nepal, Morocco, Bangladesh, Tunisia, Paraguay, Yemen, Sudan, Côte d'Ivoire	Mozambique, Côte d'Ivoire, Nigeria, Iraq, Guatemala, Zimbabwe, Ethiopia, Somalia, China, Syria, Algeria

a) The data for climate risk is based on 2030 projections. The data for political risk is based on historical data of three indicators of instability (dangerous neighbourhood 1992-2005, crisis history 1990-2005, and low capacity from the World Bank Government Effectiveness indicators [dates not specified]). The first column on coastal population exposure and population exposed is based on countries with Two or More Instability Risk Factors (Dangerous Neighbourhood, Crisis History, Low Capacity), sorted by Population based on the number of people projected to be living within 1 metre of the *low-elevation coastal zone* (LECZ), 2030. The second column on coastal population percent of population is based on the same as the above two or more instability factors but the highest percentage of projected population in 2030 within 1m of the LECZ. The middle column on aggregate temperature change is based on countries with two or more risk factors (low capacity, high crisis history, dangerous neighbourhood), climate vulnerability 2030, A1 Scenario. The final column on water scarcity is based on countries with two or more instability factors, sorted by change in percentage of population in water scarcity (2000-2030).

Raleigh, Jordan, and Salehyan's (2008) vulnerability scheme could benefit from the inclusion of governance indicators. While governance indicators may be correlated with income, some poor countries have more capacity and willingness to insulate their populations from the worst consequences of adverse climate-related changes.

23.2.2 Marc Levy, Bridget Anderson, Melanie Brickman et al.

Emphasizing the potential security consequences of climate change, Levy, Anderson, Brickman et al. include several governance and political measures of vulnerability. Their paper examines where physical risks of future climate change conjoin with contemporary indicators of weak governance and political instability. Their model includes three indicators of future climate effects: (1) projected populations living in low-elevation coastal zones potentially subject to sea-level rise, (2) projected temperature change and levels of adaptive capacity, and (3) simulations of future water scarcity (Levy/Anderson/Brickman et al. 2008). They combine these indicators of future climate vulnerability with three indicators of political instability: (1) a country's crisis history, (2) whether a country is located in a dangerous neighbourhood, and (3) countries with low capacity. A country with high levels of two or more of these variables was identified as a high risk for political instability (table 23.2).¹¹

Levy, Anderson, Brickman et al.'s (2008) paper has a number of virtues. First, they incorporate models of future climate vulnerability. Historic patterns of

exposure to climate hazards may not reflect future climate vulnerability, as future climate change may not take place in the regions where previous extreme weather events took place. Second, they also include several indicators of political risk and instability, which makes their work more relevant to the emergent climate security literature. Their research also includes attributes of governance thought important in disaster response. They provide a diversity of different permutations of rankings and different proximities to low-elevation coastal zones, including some focused on individual indicators of political risk, some on multiple indicators of instability, and some on scenarios of future climate change.

In this approach, country rankings are provided in bar charts rather than maps. Countries are identified as moderate and high risk, so some of the information about the least vulnerable countries is ultimately lost in the presentation. While the political risk indicators are aggregated in some permutations - whereby countries with high scores on two or more dimensions are defined as high political risks - the climate hazards are not aggregated, so there is no single risk or vulnerability map that combines all dimen-

11 The measures of instability and dangerous neighbourhood are derived from the Political Instability Task Force. Levy, Anderson, Brickman et al. calculated the number of major instability events between 1992 and 2005. Countries with 30 or more events were considered 'extremely high' in terms of instability. Countries whose neighbours had 30 or more events were considered 'very dangerous'.

sions. Like Raleigh, Jordan, and Salehyan's method, which distinguishes vulnerable countries on the basis of particular disaster risks, Levy, Anderson, Brickman et al.'s approach also allows one to focus on the specific physical source of future climate vulnerability.

Yet, despite its virtues, the approach taken by Levy, Anderson, Brickman et al. ultimately generates a disaggregated framework and has some limitations. There is no single risk or vulnerability rating scheme, leaving readers to draw their own conclusions about which countries consistently show up among the most vulnerable lists. Their approach also leaves out other dimensions of vulnerability, particularly at the household level, which can mediate or exacerbate the physical and political sources of vulnerability included in their model.

While the inclusion of future climate risks is an important refinement, the accuracy of climate models is uncertain. Therefore, an approach that compares historical exposure to extreme climate-related events with future climate projections would offer more information for triangulating retrospective evidence of actual vulnerability with prospective scenarios and simulations of future events.

23.2.3 Brooks, Adger, and Kelly

Recognizing that particular places are subject to very specific sources of vulnerability, Brooks, Adger, and Kelly (2005) seek to synthesize the diverse sources of country vulnerability to generate a portrait of global vulnerability, using generic indicators that are common processes potentially affecting all countries. Brooks, Adger, and Kelly focus on populations' vulnerability to mortality from natural disasters. After examining 46 indicators identified in the literature as potentially relevant to vulnerability, they select eleven indicators of vulnerability to pursue for strategic assessment and construction of a global ranking of national-level vulnerability (table 23.3).¹²

The eleven indicators are proxies for variables from three broad areas: *education*, *health*, and *governance*. The *education* basket includes three indicators: literacy rate for 15- to 24-year olds, literacy rate of those over 15 years of age, and the overall literacy ratio (female to male). The *health* basket includes four measures: the population with access to sanitation, maternal mortality, calorific intake, and life expect-

12 Brooks, Adger, and Kelly (2005); for a more extended discussion of their methodology, see Adger, Brooks, Bentham et al. (2004).

Table 23.3: Countries Most Vulnerable to Climate Change and Disaster Mortality. **Source:** Brooks, Adger, and Kelly (2005).^{a)}

Afghanistan	Ethiopia	Niger
Angola	Equatorial	Pakistan
Burundi	Guinea	Rwanda
Central African	Gambia	Sierra Leone
Republic	Guinea Bissau	Somalia
Democratic Repu-	Haiti	Sudan
blic of Congo	Mauritania	Togo
Eritrea	Mozambique	

a) On the basis of thirteen weighting schemes, these are the countries most vulnerable to climate disaster mortality; they appeared in the upper quintile of all thirteen weighting schemes.

ancy at birth. *Governance* also encompasses four measures: two derived from World Bank governance indicators (government effectiveness and voice and accountability) and two from Freedom House indicators (political rights and civil liberties).

Brooks, Adger, and Kelly (2005) selected these eleven indicators after subjecting all 46 indicators to Monte Carlo simulations to identify which were statistically correlated with an increase in mortality from climate-related disasters.¹³ They then derived rankings for the variables selected based on assessments by a focus group of twelve experts. From the expert assessments and a separate assessment based on equal weights for all eleven indicators, the rankings of the indicators were as follows: (1) government effectiveness, (2) voice and accountability, (3) life expectancy and sanitation (tied), (5) literacy for 15-24-year olds, (6) political rights, (7) literacy of those over 15 years of age, (8) civil liberties, (9) literacy ratio, (10) average calorie intake, and (11) maternal mortality.

13 In this regard, the research by Brooks, Adger, and Kelly is similar to that by Timmons Roberts and Bradley Parks (2007). Whereas Brooks and his colleagues appear to serially test the significance of individual variables, Roberts and Parks seek to explain disaster mortality through multivariate regression. The variables Roberts and Parks tested included GDP per capita, the Gini coefficient, two attributes of geographical vulnerability (population near coasts and population near cities), environmental vulnerability, civil society pressure, and two measures of institutional quality (press freedom and property rights). In finding higher disaster mortality vulnerability among countries in the developing world, they ultimately attribute many of the problems to their colonial heritage and the ways in which developing countries have become inserted in the global economy as exporters of primary commodities.

The ranking scheme offered by Brooks, Adger, and Kelly (2005) offers an interesting methodology for determining which indicators to include in an overall vulnerability assessment. The effort to systematize indicator selection and ranking is an important contribution. As Brooks, Adger, and Kelly argue, vulnerability assessments may often reflect idiosyncratic judgments by authors about what elements to include and how to weigh them. Their overall findings, that many African countries are likely to be among the most vulnerable to climate change, are valid.¹⁴ However, the selected indicators include some that are so highly correlated with each other that inclusion of all of them does not add explanatory value, at least for African countries. For example, youth and adult literacy rates are correlated with each other at .95 within African countries. Similarly, the Freedom House indicators are highly correlated with the World Bank indicators at .90 or greater.

The construction of the index could also lead to biases and conclusions that could potentially confuse policymakers about which countries should be of highest priority. In separating the physical hazards from the more social and political determinants of vulnerability, Brooks, Adger, and Kelly underplay the significance of geographical and physical components of vulnerability. As a consequence, countries known to be highly geographically vulnerable to climate change appear not to be worthy of concern. For example, across the thirteen separate ranking schemes, Bangladesh appeared in the upper vulnerability quintile of only one of them, principally because the underlying physical basis of the country's vulnerability drops out of their analysis.

23.2.4 Brenkert and Malone

Brenkert and Malone (2005), part of a larger *Pacific Northwest National Laboratory* (PNNL) research team, have been developing indices of climate vulnerability since 2001 with the use of their *Vulnerability-Resilience Indicator Model* (VRIM). They provide mostly national rankings but have also made a preliminary effort to rank Indian states at the sub-national level (table 23.4).¹⁵

14 Table 23.3 includes the list of top countries vulnerable to climate disasters, as determined by Brooks, Adger, and Kelly (2005).

15 Moss, Brenkert, and Malone (2001); Brenkert and Malone (2005); Yohe, Malone, Brenkert et al. (2006, 2006a).

Table 23.4: Top Tertile of 102 Vulnerable Countries.
Source: Brenkert and Malone (2005).

Sierra Leone	Nigeria	Pakistan
Bangladesh	Uganda	South Africa
Somalia	Madagascar	Ghana
Mozambique	Sudan	Nicaragua
Ethiopia	Nepal	India
Rwanda	Haiti	Congo
Benin	Guatemala	Morocco
Yemen	Syria	Honduras
Angola	Kuwait	El Salvador
Kenya	Swaziland	Cameroon
Senegal	Zimbabwe	Dominican Republic

The VRIM includes seventeen indicators. Brenkert and Malone suggest vulnerability is a function of three factors: *exposure*, *sensitivity*, and *adaptive capacity*, though only sensitivity and adaptive capacity are represented in the indicators.¹⁶ They then group indicators into sectors and each indicator is weighted equally. In the *sensitivity* basket, they include the following sectors: food security, water resources, settlement and infrastructure, human health, and ecosystem.¹⁷ In the *adaptive capacity* basket, they include environmental capacity, economic capacity, and human civic resources.¹⁸ Country *sensitivity* indicators enter as negative values so greater sensitivity reflects a net negative vulnerability, while *adaptive capacity* enters in as a positive sum. Vulnerability-resilience scores reflect the sum of negative sensitivity and positive

16 *Exposure* reflects the nature and extent of climate change likely to affect a place. *Sensitivity* reflects how systems could be negatively affected by climate change, how much land could be inundated by sea level rise, how crop yields might change, and how human health might be affected. *Adaptive capacity* reflects how much capability the society has to adapt to changes to minimize losses. Brenkert and Malone (2005: 63–64).

17 Sensitivity indicators include: *food security* represented by (1) cereals production/crop land area and (2) protein consumption/area; *water resources* represented by (3) renewable supply and inflow and (4) water use; *settlement/infrastructure* represented by (5) population at flood risk and (6) population with no access to clean water/sanitation; *human health* represented by (7) completed fertility and (8) life expectancy; and *ecosystem* represented by (9) per cent of land managed and (10) fertilizer/cropland area.

18 Adaptive capacity indicators include: *environmental capacity* represented by (11) population density, (12) sulphur dioxide/state area, and (13) per cent of land unmanaged; *economic capacity* represented by (14) GDP per capita and (15) income equity; and *human and civic resources* represented by (16) dependency ratio and (17) literacy.

adaptive capacity. The authors then scale these scores against global or US averages.

While the Brenkert and Malone model has a number of parallels with the one developed for this study, there are some notable differences. First, as the authors themselves note, governance indicators are not included – a notable exclusion given the importance of these indicators for India and the authors' own comments about the role of India's democracy. One of the inspirations for contemporary vulnerability studies is the work of economist Amartya Sen. Having observed the responsiveness of contemporary India after independence to drought and food shortages, Sen suggested that famines do not happen in democracies (Sen 1981). Government effectiveness in the expert rankings in Brooks, Adger, and Kelly (2005) was identified as the most important indicator. Thus, the omission of governance indicators is a significant oversight that makes application of the VRIM problematic.

Second, in the Brenkert and Malone studies of India, exposure appears to largely drop out as a physical risk; indicators of exposure near coasts are not accounted for except through the population indicator. The omission of governance data and the diminution of physical risk potentially make the VRIM less easy to use by practitioners. For example, in a 2009 study, the Center for Naval Analyses used the VRIM but added exposure and governance data from other sources. The result is somewhat ad hoc and unwieldy since these other measures were not systematically included in the overall VRIM index (King/Espach 2009).

In several other papers, the PNNL research team intersects their index with projections of future climate change derived from climate models. However, the method used for coding these future projections is somewhat unclear. For example, in the Brenkert and Malone maps of country vulnerability, countries with low adaptive capacity and those facing higher temperature changes were assigned darker, more reddish colours in their ten colour maps (Yohe/Malone/Brenkert et al. 2006: 3). A clearer, replicable way to represent such data would be to integrate those estimates of future temperature change in an overall vulnerability or risk rating.¹⁹

Moreover, the data are only available for 102 countries. Only 25 of Africa's 53 countries are covered,

with the DRC, Tanzania, and the Central African Republic among the notable omissions.²⁰ This leaves questions about potential biases in their country selection and, ultimately, the utility of the model, with omitted countries being among the potentially most vulnerable (as the findings of this chapter suggest).²¹

23.3 Methodology

In this study four main processes, or baskets, encompass different aspects of vulnerability: (1) *physical exposure to climate-related hazards*, (2) *population density* (3) *household and community resilience*, and (4) *governance and political violence*.²²

Following conventions among many studies that employ indexes such as the Human Development Index (HDI), the VRIM, and the Commitment to Development Index (CDI), among others, all four baskets have equal weight in the final vulnerability analysis.²³ While there are a number of objections to equal-weight-based indices, the principal value is the ease with which a summary statistic can help summarize complex, multi-dimensional data.²⁴ Three of the four baskets include several indicators to reflect that dimension (the exception is population density). These indicators have equal weight within each basket, unless there are missing data for an indicator. This section outlines the intuitions behind each basket, followed by a detailed discussion of each component of the baskets.

19 Moreover, some of the variables they include, such as sulphur dioxide emissions, appear either irrelevant to climate change or are poor proxies for the underlying processes that they are meant to reflect.

20 Yohe, Malone, Brenkert et al. (2006). The authors use the Environmental Sustainability Index, which is highly correlated with the VRIM to impute values for six African countries: Mauritania, Mali, Niger, Chad, Zambia, and Namibia.

21 Table 23.4 includes the top tertile of the 102 most vulnerable countries, as defined by Brenkert and Malone (2005).

22 Cardona (2004: 49) expresses a similar framework identifying the origins of vulnerability in physical fragility or exposure, socio-economic fragility, and lack of resilience.

23 For a discussion of the virtues of equal weights in composite indices, see Stapleton and Garrod (2006, 2007). For a discussion of problems with equal weight-based indices, see Chowdhury and Squire (2005).

24 For a discussion of the pros and cons of composite indicators, see OECD (2005).

23.3.1 Physical Exposure to Climate-related Hazards

Geographical location makes some countries more susceptible to climate change impacts. Within countries, some areas, such as the coasts, are more vulnerable to certain kinds of climate-related hazards. This study uses historical data concerning the frequency and magnitude of climate-related hazards, including cyclones, fires, floods, and droughts. The authors also include a measure of low-elevation coastal zones that may be susceptible to future sea level rise and higher storm surges.

23.3.1.1 Population Density

When extreme weather events occur in densely populated areas, the impact is likely to be more severe than it would be in areas with fewer people. More people will be in need of emergency rations of food and water and medical care, and demands on existing facilities and resources may be quickly overwhelmed, especially if climate change impacts force rural populations to migrate to urban areas. Moreover, policymakers generally care about places where people live. All else being equal, more densely-populated areas that are highly exposed to climate-related hazards will command more attention from decision-makers.

23.3.1.2 Household and Community Resilience

While physical exposure and population are integral parts of vulnerability, whether people experience severe negative consequences of climate hazards depends on other factors. The first line of defence for many people will be what resources they have at the household and community level to protect themselves from physical hazards and respond in the event of climate-related emergencies like floods, droughts, or storms. Communities where many people are sick and have inadequate access to health care and basic amenities are likely to be less resilient than those that are healthier and have greater access to services. Where people are poorly educated, they may have fewer entrepreneurial skills to avoid those hazards or minimize their effects.

23.3.1.3 Governance and Political Violence

That said, in many instances, weather emergencies frequently exceed the capacities of local communities' emergency services, requiring national level mobilization to save people from rising waters or from being trapped under rubble, and to provide food, water,

and shelter for people left homeless or otherwise affected by extreme weather events. Whether or not individuals experience the worst effects of climate-related events will partially depend on the quality of governance in the country in which they live. Government support can enable communities to prepare for and adapt to the expected impacts of climate change and can help them respond when extreme weather events do occur. Governments that are either so lacking in capacity or so venal that they cannot or will not look after their citizens can transform a natural phenomenon into a disaster that puts a large number of people at risk of mass death from starvation, disease, or exposure to the elements. In such societies, disorder and instability may also follow exposure to climate hazards. Where countries have a violent history, this too can complicate the task of providing relief supplies.

Each of these four dimensions of vulnerability was mapped. The authors first mapped physical exposure to climate-related hazards (figure 23.1) followed by a map of population density (figure 23.2), then community/household resilience (figure 23.3), and finally, governance and political violence (figure 23.4). At each stage, a map was created adding each new dimension to the previous one (such as climate exposure + population density). Then the difference between the simpler map and the more complex one was mapped, which permits identification of the places that show up as more or less vulnerable with the addition of each basket. This also demonstrates the value-added of the more complex map that incorporates social and political indicators compared to simpler frameworks based purely on physical exposure and population.

The following section provides a more detailed description of the indicators and methodology used for each basket.

23.3.2 Exposure to Climate-related Hazards

In this study, historic, geo-coded climate hazard data on cyclone surges and winds, floods, droughts, and wildfires is from the Global Risk Data Platform on PreventionWeb, which includes data provided by the World Bank and several UN agencies.²⁵

The cyclone surge frequency data is from 1975–2007 and represents events per 1000 years for cate-

25 For more detailed metadata, please see the Data-Download section of the Global Risk Data Platform. UNEP, UNDP, UNISDR, and World Bank (2009).

gory 1 cyclones. The cyclone wind frequency data is also from 1975–2007 and represents events per 1000 years, but contains data for category 1, 2, 3, 4, and 5 cyclones. Each category of cyclone frequency was classified by quintiles, and reclassified with scores of 0–5, with 0 representing no exposure, 1 the least exposure, and 5 the most exposure. These scores are represented as a final cyclone frequency raster using the following equation: Cyclone wind frequency = category 1 frequency + (category 2 frequency × 2) + (category 3 frequency × 3) + (category 4 frequency × 4) + (category 5 frequency × 5). This formula assigns greater weight to stronger, more dangerous cyclones.

The flood dataset was derived from a combination of flood observations from 1999 to 2007, the UNEP/GRID-Europe flood dataset, and a GIS model, and is scaled to represent the expected number of events per 100 years. The drought data are represented by GRID rasters converted from individual shapefiles of drought events in each year between 1980 and 2001.²⁶ The model sums these individual rasters to create a drought frequency raster for the years 1980–2001. The wildfire density data represents the expected number of events per year per pixel, or grid cell, from 1997–2008.

The rasters for each type of extreme weather event are classified by quintiles and assigned a score of 0–5, with 0 representing no exposure, 1 the least exposure, and 5 the most exposure. All GRIDs from Prevention-Web have a 1-kilometre resolution.

In order to represent future risk from rising sea levels, this study used a *digital elevation model* (DEM) to extract the 1–10 metre coastal zone for all of Africa. The authors selected all cells with values 1–10 and then excluded areas clearly not contiguous with the coast to increase accuracy. It is possible, however, that a few low-lying areas included in the final low-elevation coastal zone dataset would be protected from rising sea levels and storm surges by higher-elevation land along the coast. Areas in the 1–2 metre coastal elevation zone were assigned a value of 5,

areas in the 3–4 metre zone a value of 4, areas in the 5–6 metre zone a value of 3, areas in the 7–8 metre zone a value of 2, and areas in the 9–10 metre zone a value of 1. The DEM resolution is 30 arc seconds (1 kilometre; USGS 2009).

The authors then summed the six final rasters for exposure to each type of climate-related hazard, with 0–5 scores, to create a composite score of physical exposure to climate-related hazards. The quintile ranking system described above enabled the combination of different types of events without regard to how their frequency was measured. Each type of exposure received equal weight, so the final equation for exposure was as follows: Exposure to climate-related hazards = cyclone surge frequency + cyclone wind exposure + flood frequency + drought frequency + wildfire frequency + low-elevation coastal zone. The highest possible value was 25 and the lowest was 0. They classified this composite raster by quintiles as well and reclassified once more on the 0–5 scale.

Figure 23.1 shows relative exposure to historic climate hazards and low-elevation coastal zones within Africa with high physical exposure concentrated along the Mediterranean, western Ethiopia extending across southern Sudan to the Central African Republic, and south into parts of Kenya and Uganda. Much of southern Africa has pockets of high physical exposure including the eastern seaboard as well as parts of Zimbabwe, Malawi, and Madagascar. Pockets of high physical exposure also dot west Africa, including parts of Nigeria (figure 23.1).²⁷

23.3.2.1 Population Density

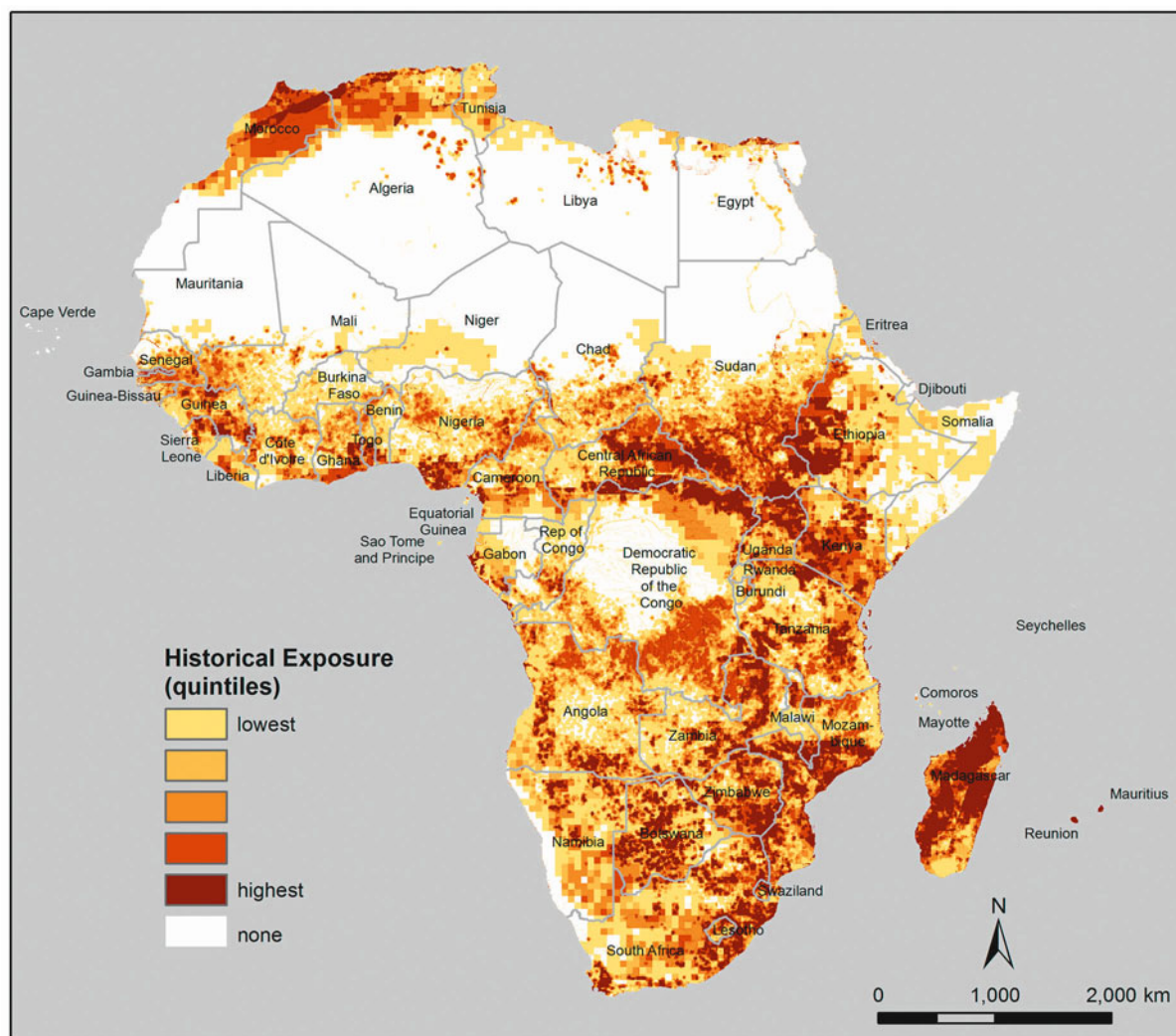
Using a population density dataset from LandScan, initial findings of vulnerability were overlaid with population data to find where localities of vulnerability coincide with large population concentrations.²⁸ The authors used a population density GRID for the year 2008 with 1 km resolution to account for differences in the number of people likely to be affected by a climate-related hazard in a given area. The population density GRID was reclassified into quintiles, with the first quintile containing the most rural areas – exclud-

26 The *Environmental Systems Research Institute* (ESRI 2008) describes a raster file as follows: “In its simplest form, a raster consists of a matrix of cells (or pixels) organized into rows and columns (or a grid) where each cell contains a value representing information”. ESRI describes how: “A shapefile stores geometry and attribute information for the spatial features in a data set. The geometry for a feature is stored as a shape comprising a set of vector coordinates. Shapefiles can support point, line, and area features.” See also ESRI (1998).

27 The appendix has detailed maps of each indicator. See figures 23.12–23.17.

28 This product was made utilizing the LandScan (2008)TM High Resolution Global Population Data Set copyrighted by UT-Battelle, LLC, operator of Oak Ridge National Laboratory under Contract No. DE-AC05-00OR22725 with the United States Department of Energy.

Figure 23.1: Climate-related Hazard Exposure in Africa. **Sources:** UNEP/GRID-Europe; DEM from USGS. This map was designed by Kaiba White (2011).



ing areas with zero population density - and the fifth quintile containing the most urban areas. Areas with zero population density were excluded based on the idea that a climate-related event is only a hazard if it affects human populations. The population density raster was then reclassified using values from 0 to 5. Values of 1 represent the least densely-populated areas and values of 5 the most densely-populated ones.

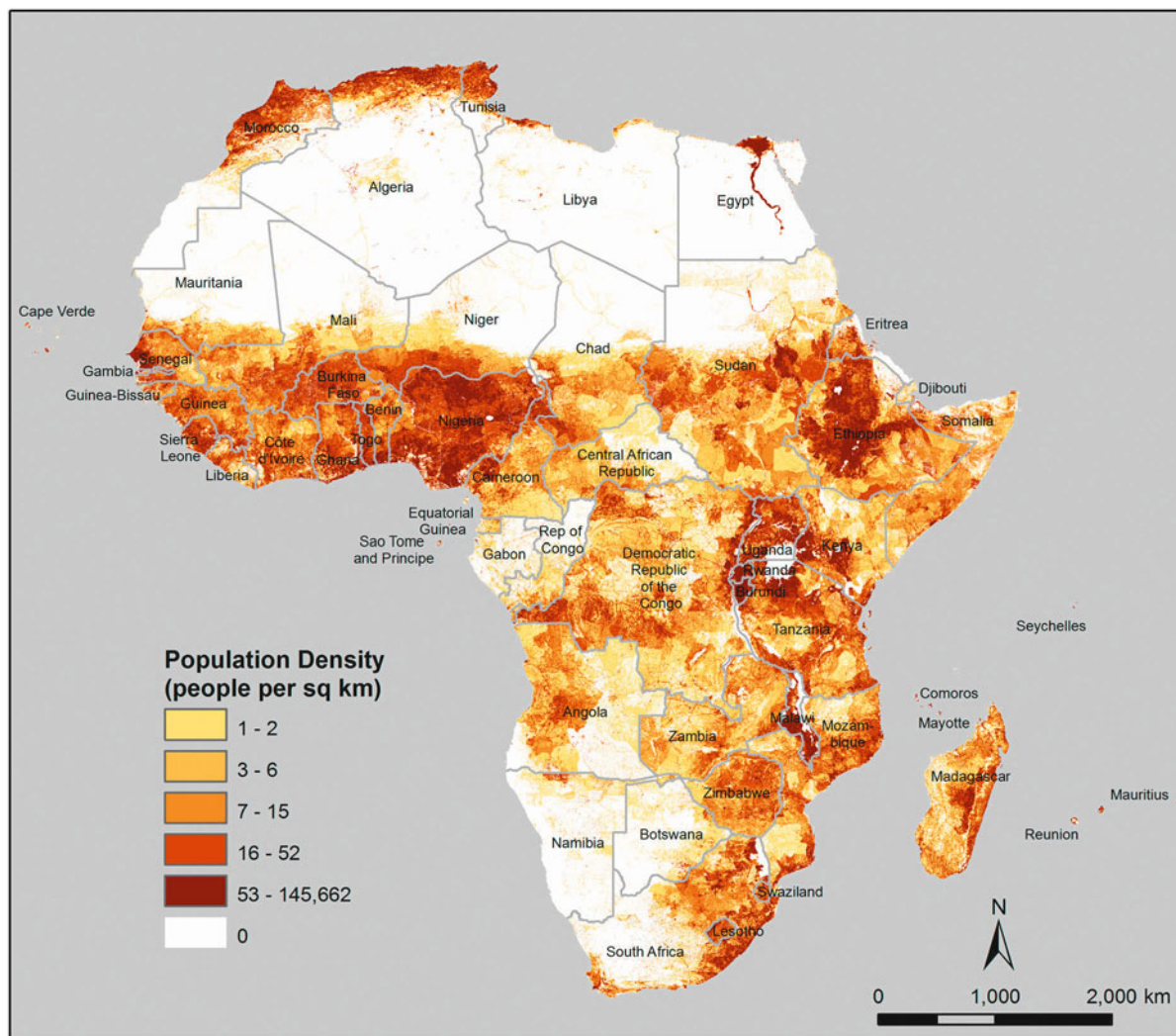
Figure 23.2 shows the distribution of population density within Africa, which refers to dense populations along the Mediterranean coastline, Egypt along the Nile, throughout western Ethiopia, and pockets in Sudan around Khartoum. Much of west Africa is densely populated including, but not limited to, Nigeria. The Great Lakes region in Central Africa around Uganda, Rwanda, and the eastern part of the

DRC also has high population concentrations. Southern Africa is less densely populated by comparison with slivers of high population in Malawi, along the eastern seaboard, and in pockets around major cities like Johannesburg (figure 23.2).

23.3.2.2 Household and Community Resilience

This basket measures the ability of households and communities to fulfil their own immediate needs during and after exposure to climate hazards. Low levels of such capacity reflect low levels of household or community level resilience. Four different but related characteristics represent this capacity: (1) health of the population, (2) education of the population, (3) availability of daily necessities, and (4) access to healthcare services.

Figure 23.2: Population Density in Africa (2008). **Source:** LandScan. This map was designed by by Kaiba White (2011).



After an extensive review of the existing literature, the authors initially selected fifteen national-level indicators to represent these four characteristics. As previously discussed, Brooks, Adger, and Kelly (2005) tested the statistical significance of many of these indicators in terms of their contribution to disaster mortality. These indicators are from the World Bank's *World Development Indicators* (WDI), the *World Health Organization* (WHO), and the *Food and Agriculture Organization* (FAO):

1. Gross National Income (GNI) per capita, *Purchasing Power Parity* (PPP, current international \$).
2. Literacy rate, youth total (per cent of people ages 15-24).
3. Literacy rate, adult total (per cent of people ages 15 and above).
4. School enrolment, primary (per cent gross).
5. School enrolment, secondary (per cent gross).
6. Maternal mortality ratio (per 100,000 live births).
7. Under-5 mortality rate (both sexes).
8. Life expectancy at birth (years, both sexes).
9. Dietary energy consumption (kcal/person/day).
10. Dietary protein consumption (g/person/day).
11. Population with sustainable access to improved drinking water sources (percentage of total).
12. Population with sustainable access to improved sanitation (percentage of total).
13. Per capita total expenditure on health (PPP international \$).
14. Nursing and midwifery personnel density (per 10,000 population).
15. Hospital beds (per 10,000 population).

The authors used the latest available data for each of these indicators from 1998 to 2008. The latest data

point for each series was presumed to be the best proxy of the current situation in the given country and was, therefore, used in this analysis (given the patchiness of this data, it was problematic to carry out multi-year averages). After analysis, they eliminated some of these indicators to develop a more parsimonious framework. The authors sought to avoid giving any one variable too much weight by measuring it with two highly correlated proxies. When two indicators bore a strong correlation, they selected the one with more data available for African countries. For example, they used adult literacy rates rather than youth literacy rates because the two indicators have a correlation of .9593 and there were two countries – Cameroon and Lesotho – with data available for adult literacy, but not youth literacy. Similarly, under-5 mortality is highly correlated with life expectancy at birth (.9193), and hospital beds per 10,000 is highly correlated with nursing and midwifery density (.7574). In both cases, the latter indicator was used.

Perhaps more controversially, the authors excluded *Gross National Income* (GNI) per capita.²⁹ They originally included GNI as a proxy for household income. However, GNI per capita may not be the best measure of household income due to high levels of inequality for countries reliant on extractive natural resources. GNI is also reasonably correlated with other indicators – .6237 with adult literacy and .8101 with nursing and midwifery density – and the authors instead chose these indicators to capture household income. This approach helped to exclude anomalous observations. For example, Equatorial Guinea has the highest GNI per capita in Africa at \$21,700 (current international PPP) yet ranks 29th for maternal mortality, 43rd for life expectancy, and 35th for nursing and midwifery density (World Bank 2009b).

This left eight national-level indicators – two in each category. The authors sought to use sub-national data for the indicators where it was available. Using survey data from USAID Demographic and Health Surveys, UNDP National Human Development Reports, UNICEF statistics, and, in some cases, national survey data from the *Center for International Earth Science Information Network* (CIESIN) at Columbia University, they generated datasets at the level of sub-national administrative regions for the following variables:

1. Infant mortality rate (adjusted to the national 2000 UNICEF rate), and
2. Percentage of children underweight (more than two standard deviations below the mean weight-for-age score of the NCHS/CDC/WHO international reference population).

Data from the World Health Organization revealed that, at a national level, infant mortality rate was highly correlated (.8115) with maternal mortality rate (WHO 2009). The authors therefore concluded that replacing maternal mortality with the CIESIN infant mortality data would obtain higher-resolution insights into the health status of populations. The available national-level data closest to the CIESIN underweight children data is represented by the data for malnourished children from the WHO, and these data are not as highly correlated to the FAO (2009) dietary energy consumption (.5133). These data on underweight children nonetheless provide a better indicator of the availability of adequate nutrition in local communities because young children exhibit the effects of inadequate nutrition first and most noticeably. The authors therefore replaced the previously included FAO energy-consumption data with the CIESIN (2005) underweight children data. Table 23.5 describes the final eight indicators included in the study and the weights applied to each within this framework.

Two indicators in the study thus use data for 542 sub-national regions in Africa. The remaining indicators use national-level data applied to all administrative regions within the country. Each percentage rank score was then multiplied by the appropriate weight (0.125 if data were available for each indicator in a given variable). If one indicator for a given variable was not available, the full 0.25 weight was assigned to the other indicator. In no case was data unavailable for both indicators for a given area. Finally, these weighted percent rank scores generated a composite score for each sub-national area. All areas were then ranked.

Finally, the authors classified composite scores by quintiles and assigned each a score of 1–5, with 1 representing the least vulnerable areas and 5 representing the most vulnerable areas. These data were joined to country-level administrative polygons (figure 23.3). The shapefile was then converted to a GRID raster based on the quintile scores. Countries with the most resilience are the island nations of Seychelles and Mauritius followed closely by the north African countries of Tunisia and Libya. Countries with the least household and community resilience (i.e. the highest vulnerability) are the perennially worst performers in

²⁹ Brooks, Adger, and Kelly (2005) ultimately made a similar choice.

Table 23.5: Indicators of Household & Community Resilience. **Source:** Compiled by the authors.

Variable (weight)	Indicator (weight)	Source	Years of Data Availability
Education (.25)	Literacy rate, adult total (% of people ages 15 and above) (.125)	WDI	2000-2007; no data for The Gambia, Guinea-Bissau or Somalia
	School enrolment, primary (% gross) (.125)	WDI	2004-2008; 1998 for Angola; 1999 for Somalia; 2001 for Guinea-Bissau
Health (.25)	Infant mortality rate adjusted to national 2000 UNICEF rate (.125)	CIESIN	2000
	Life expectancy at birth (years), both sexes (.125)	WHO	2006
Daily necessities (.25)	Percentage of children underweight (more than two standard deviations below the mean weight-for-age score of the NCHS/CDC/WHO international reference population) (.125)	CIESIN	1990-2002
	Population with sustainable access to improved drinking water sources (%) total (.125)	WHO	2006; 2000 for Cape Verde and Seychelles
Access to health-care (.25)	Per capita total expenditure on health (PPP int. \$) (.125)	WHO	2006; 2001 for Somalia
	Nursing and midwifery personnel density (per 10 000 population) (.125)	WHO	2002-2006; no data for Somalia

Africa: Niger, Somalia, Chad, and the DRC (figure 23.3).³⁰

When household and community resilience are added to physical exposure and population density to create a composite map of the first three baskets (not shown), some areas where large populations were physically vulnerable to climate change are less vulnerable because households possess more capacity to protect themselves. By contrast, other areas that were less physically exposed to climate change now appear more vulnerable. For example, the Mediterranean coastline appears less vulnerable, given the higher healthcare standards and better education of its populace, whereas parts of Niger, Chad, eastern Ethiopia, southern DRC, northern Mozambique, and Somalia appear more vulnerable given low household and community resilience.

23.3.2.3 Governance and Political Violence

This basket measures the potential effectiveness of any governmental response during and after exposure to climate hazards and whether or not an extreme weather event becomes a disaster. Five variables comprise this basket: (1) government accountability, (2)

government effectiveness, (3) global integration, (4) political stability, and (5) presence of political violence. The authors used national-level indicators for the first four variables to develop a national composite score for each variable. They combined these scores with sub-national data on political violence to create a final quintile score for individual grid cells.³¹

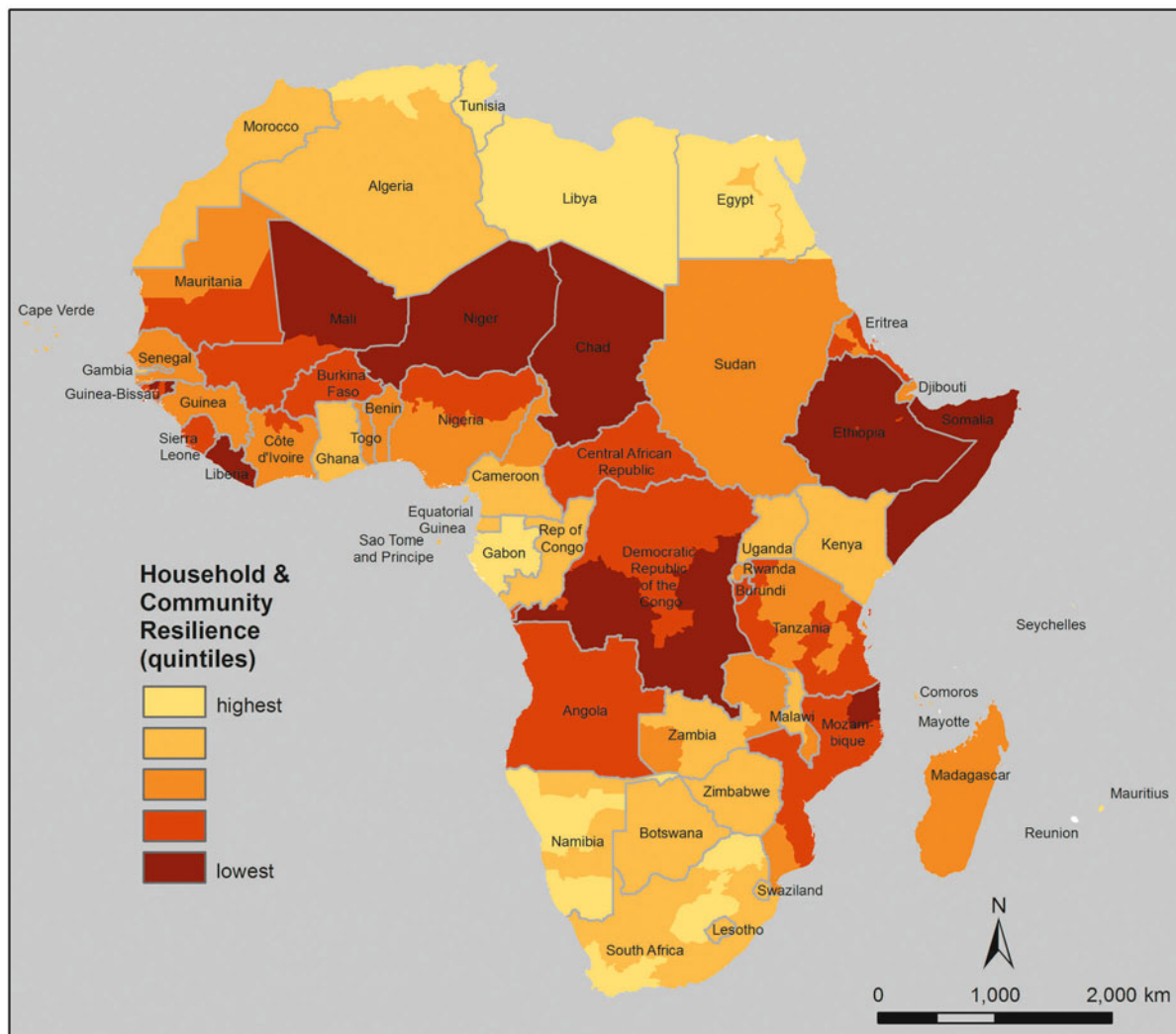
As with household and community vulnerability, the study by Brooks, Adger, and Kelly (2005) informed the choice of governance indicators in this study. While Brooks, Adger, and Kelly (2005) included two World Bank Governance Indicators (*voice and accountability* and *government effectiveness*) and two Freedom House indicators (*civil liberties* and *political rights*), this study includes only some of the World Bank's (2009a) measures, for reasons discussed below.

The authors ultimately excluded the Freedom House measures because they are both highly correlated with the World Bank's *voice and accountability* indicator (.9295 for *political rights* and .9511 for *civil liberties*). The methodology developed by Kaufman, Kraay, and Mastruzzi (2010) for the World Bank measures six interrelated governance dimensions in three categories. These are developed using a statistical tool

30 The appendix provides detailed maps of each component of the household and community resilience basket. See figures 23.18–23.24.

31 The appendix provides detailed maps of each component of the governance and political violence basket. See figures 23.25–23.31.

Figure 23.3: Household and Community Resilience in Africa. **Sources:** World Health Organization; World Development Indicators; Food and Agriculture Organization of the United Nations Food Security Statistics; Center for International Earth Science Information Network (CIESIN) (1991-2003). The map was designed by Kaiba White (2011).



known as an unobserved components model with data from over 35 data sources including “surveys of firms and households, as well as the subjective assessments of a variety of commercial business information providers, non-governmental organizations, and a number of multilateral organizations and other public-sector bodies” (Kaufmann/Kraay/Mastruzzi 2010). The Freedom House metrics are generated from the views of only 33 analysts and 16 academic advisors (Freedom House 2008). The authors thus use the two World Bank Governance Indicators, supplemented with indicators from two other data sources.

First, *voice and accountability* measures how responsive a government is to the needs of its citizens.

It is measured on a scale of -2.5 to +2.5 with zero representing the median country score. We use the 2008 scores. In general, African countries perform worse than the rest of the world. Only ten of the 53 countries considered have a positive score with the highest three scores being Cape Verde at 0.95, Mauritius at 0.88, and South Africa at 0.68. The worst performers in Africa are Eritrea with a score of -2.20, Libya at -1.90, and Equatorial Guinea at -1.89.

Second, *government effectiveness* captures the ability of a government to implement policy in general and, in particular, to undertake post-disaster relief operations. It is measured on the same scale as *voice and accountability* and, again, African countries gen-

Table 23.6: Indicators of Governance and Political Violence. **Source:** The authors.

Variable	Indicator (weight)	Source	Year(s)
Government responsiveness	Voice & accountability (.2)	World Governance Indicators	2008
Government response capacity	Government effectiveness (.2)	World Governance Indicators	2008
Openness to external assistance	Globalization index (.2)	KOF Index of Globalization	2009
Government stability	Polity variance (.1)	Polity IV Project	2000-2009
	No. of stable years (.1)	Polity IV Project	1855-2009
Presence of violence	Politically-motivated atrocities (.2)	Kansas Event Data System (KEDS)/ Political Instability Task Force Worldwide Atrocities Dataset	1995-2008

erally perform poorly in relation to the rest of the world. Only six countries in Africa have positive scores, topped by South Africa at 0.75, and followed by Botswana at 0.67 and Mauritius at 0.60. The worst three performers are Somalia at -2.51, the DRC at -1.89, and Comoros at -1.88.

Third, the *KOF Index of Globalization* serves as a proxy for a country's level of global integration. It uses data on three dimensions of globalization – economic, social, and political – to create an overall globalization score between zero and 100 that measures a country's level of integration in the global system. A country with a higher degree of global integration will be better positioned to obtain disaster assistance from the international community. Autarkic or less well-integrated countries such as Zimbabwe or Myanmar may be less able or willing to receive outside assistance in the event of extreme weather events. Such assistance could take the form of aid from bilateral or multilateral donors or international humanitarian organizations, or it could be in the form of remittances from overseas family or diasporas of the affected population (KOF 2009).

Fourth, two metrics for *political stability* are included, as less stable governments – whether democratic or autocratic – are more easily upset by the shock of a disaster or the unrest of a stressed population. The authors developed these two metrics using data from the Polity IV Project. First, the Polity IV Project reports a polity score for most countries in the world on a scale of -10, the most autocratic, to +10, the most democratic. Without preference for democracy or autocracy, this study used the difference between a country's highest and lowest polity scores in the past ten years as a measure of how much a country's government has changed. A zero indicates that the government has experienced no change, while a higher score indicates that the government has changed considerably. Comoros moved eleven points,

while Kenya and Mauritania each moved ten points. Nineteen African countries have experienced no significant change. For the second metric of *political stability*, this study used a count of the total number of years since a country has undergone a major change in a single year, as reported by the Polity IV Project. In this case, a higher year count indicates a more stable government. Libya (until events of early 2011), Morocco, and Botswana have experienced the longest periods of stability with 57, 43, and 42 years respectively. Côte d'Ivoire, Mauritania, and Somalia have each experienced zero years of stability. When generating the percentage ranks, the authors gave each of these two metrics equal weight within the *political stability* variable (table 23.6; Polity IV Project 2009).

The study used the raw data for each of these four variables to generate a percentage rank for each country in relation to all 53 African countries. As with the household and community resilience measure, a composite score was generated by multiplying the percentage rank for each of these four variables by one-fourth and then summing them for a total governance resilience score. With values between zero and one, a higher score indicates a higher level of resilience. In the event of missing data, that indicator was simply not included and the remaining variables were weighted equally. Table 23.7 reports these final scores and ranks for governance resilience. The island nations of Mauritius and Seychelles had the highest composite scores followed closely by South Africa and Namibia. Somalia, the DRC, and Sudan had the lowest scores.

After determining countries' rankings on governance resilience, these data were joined to country-level administrative polygons and the shapefile was converted to a GRID raster, based on the quintile scores. Scores of 1 represent the places with the least governmental problems and scores of 5 the most problems.

Table 23.7: Governance Composite Scores and Rankings.

Sources: World Bank Governance Indicators; KOF Index of Globalization; Polity IV Project.

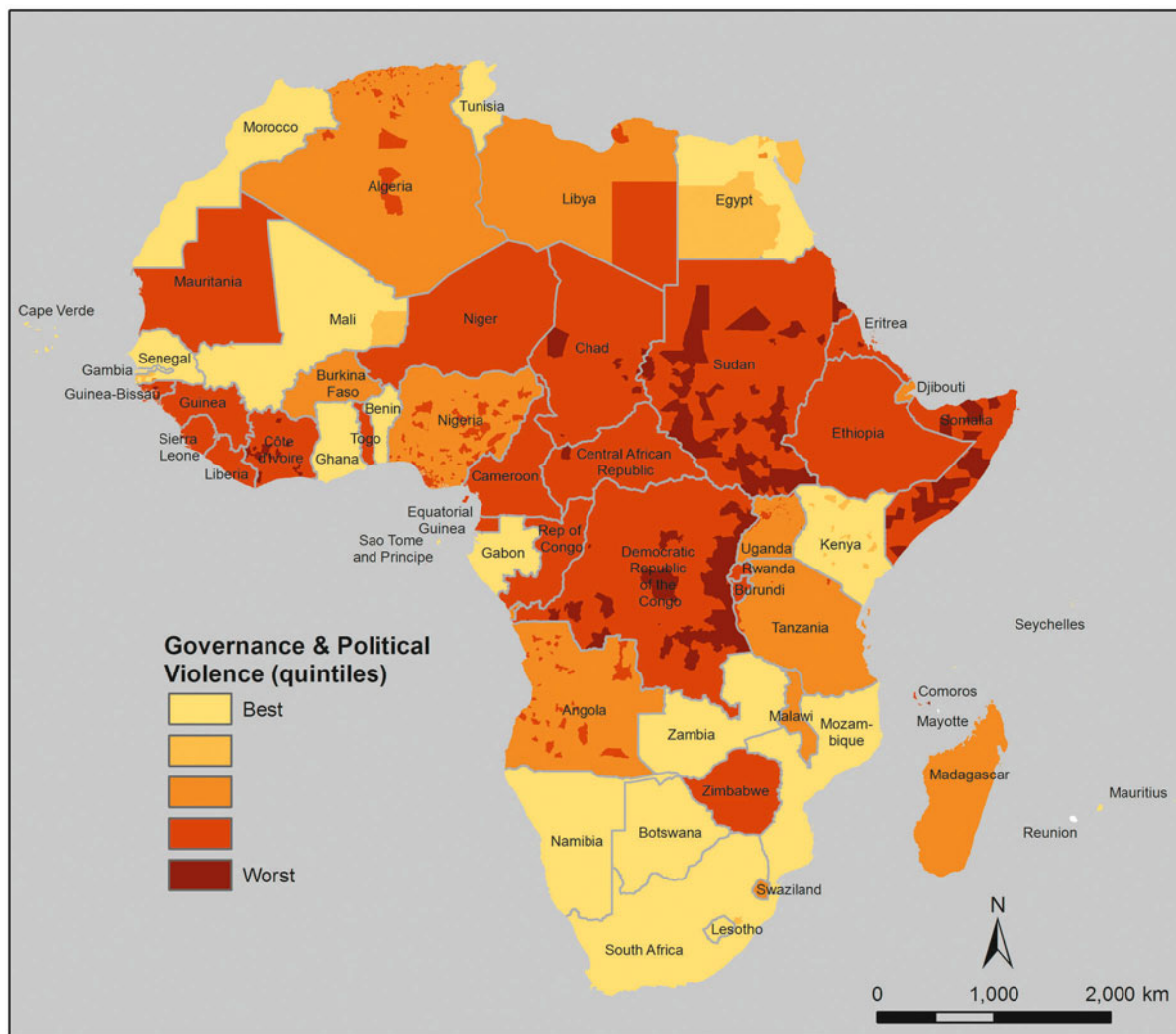
Rank	Country	Composite Score	Quintile	Notes
1	Mauritius	0.847	1	
2	Seychelles	0.844	1	2
3	South Africa	0.819	1	
4	Namibia	0.800	1	
5	Cape Verde	0.781	1	2
6	Botswana	0.764	1	
7	Morocco	0.691	1	
8	Ghana	0.686	1	
9	Sao Tome and Principe	0.673	1	1,2
10	Mozambique	0.648	1	
11	Tunisia	0.631	1	
12	Senegal	0.585	2	
13	Zambia	0.558	2	
14	Benin	0.556	2	
15	Lesotho	0.553	2	
16	Gabon	0.545	2	
17	Mali	0.530	2	
18	Egypt	0.496	2	
19	Kenya	0.487	2	
20	Gambia	0.481	2	
21	Malawi	0.478	2	
22	Tanzania	0.477	3	
23	Libya	0.474	3	1
24	Djibouti	0.465	3	1
25	Swaziland	0.458	3	
26	Algeria	0.455	3	
27	Madagascar	0.449	3	
28	Angola	0.446	3	
29	Nigeria	0.441	3	
30	Burkina Faso	0.416	3	
31	Uganda	0.416	3	
32	Cameroon	0.395	3	
33	Equatorial Guinea	0.377	4	1
34	Guinea	0.377	4	1
35	Rwanda	0.362	4	
36	Ethiopia	0.355	4	
37	Mauritania	0.352	4	

38	Liberia	0.337	4	1
39	Niger	0.328	4	
40	Sierra Leone	0.325	4	
41	Togo	0.323	4	
42	Congo	0.274	4	
43	Eritrea	0.271	5	1
44	Cote d'Ivoire	0.257	5	
45	Guinea-Bissau	0.232	5	
46	Burundi	0.223	5	
47	Zimbabwe	0.223	5	
48	Comoros	0.215	5	1
49	Chad	0.211	5	
50	Central African Republic	0.167	5	
51	Sudan	0.112	5	
52	Congo, Democratic Republic	0.041	5	
53	Somalia	0.019	5	1,2

Notes: 1 - missing Index of Globalization data; 2 - missing Polity IV data

Lastly, a measure of *political violence* is included, as this is thought to severely limit a government's ability to deliver emergency relief. If the government itself is responsible for the violence, it will certainly be less inclined to provide humanitarian relief after climate-related emergencies. Unlike the other indicators in the governance basket that the authors combined into a national-level score, *political violence* is assessed at a sub-national level using GIS. The authors spatially joined geo-referenced data on political atrocities from the *Kansas Event Data System* (KEDS 2009) to the highest (smallest) available administrative level and calculated the total number of events within each administrative area. They then classified administrative areas by quintiles based on the sum of events within the area (excluding all administrative areas with no events). A new field was added and populated with appropriate quintile rank scores, with a score of 1 representing the lowest vulnerability and 5 the highest. The shapefile was then converted to a GRID raster, based on the quintile rank scores, which was then summed with the governance vulnerability raster. The governance vulnerability score was assigned a weight of 0.8 because it includes four variables and the violent events data was given the remaining weight of 0.2. The final scores were then classified by quintiles

Figure 23.4: Governance and Political Violence in Africa. **Sources:** World Bank Governance Indicators; Polity IV Project: Political Regime Characteristics and Transitions; KOF Index of Globalization; Political Instability Task Force Worldwide Atrocities Dataset. The map was designed by Kaiba White (2011).



to create an overall map of governance vulnerability and political violence (figure 23.4).

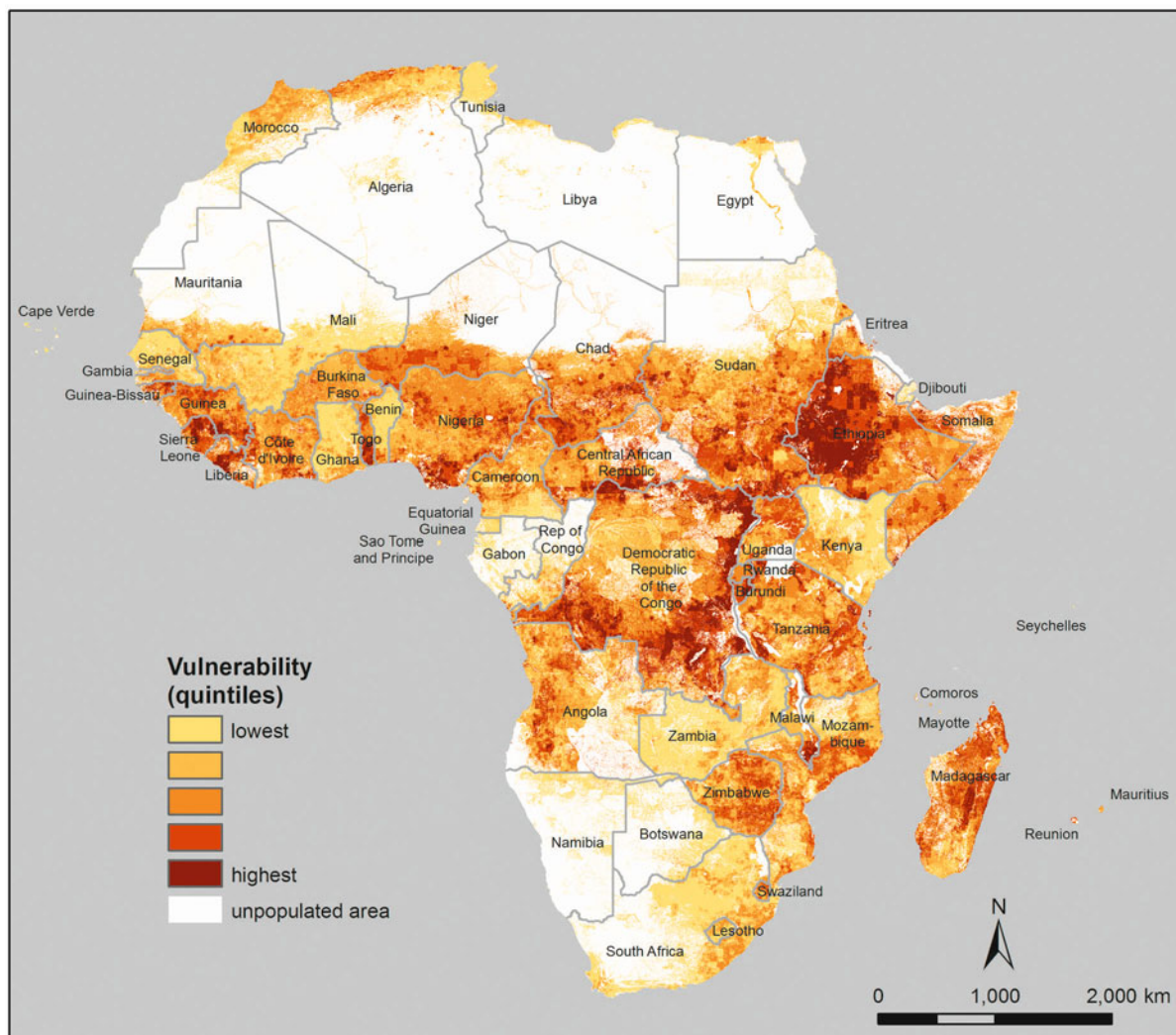
This final map reveals pockets of high vulnerability, driven by localized atrocities, throughout Sudan, Somalia, and the DRC. Parts of west Africa, including Côte d'Ivoire and parts of Nigeria, also possess areas of higher vulnerability. Adding in governance and political violence enhances the vulnerability of some places like those above, while decreasing the vulnerability of other places, including relatively well-governed countries in west Africa such as Ghana, Mali, and Senegal. A number of other countries in southern Africa also decline in vulnerability, including Malawi, Mozambique, Zambia, and South Africa (not shown).

23.4 Findings

After combining these four components of total vulnerability, the aggregate level findings show a number of interesting patterns (figure 23.5). Areas of most acute composite vulnerability are Madagascar, coastal west Africa, coastal Nigeria, Ethiopia, and parts of the DRC.

The authors can demonstrate the value-added of this more complex portrait of vulnerability compared to a simpler scheme based solely on physical exposure and population. By subtracting a map of the first two baskets from the final composite map, we can show which places on the continent become more (or less) vulnerable when we add indicators from the final two

Figure 23.5: Composite Vulnerability in Africa. **Sources:** World Bank Governance Indicators; Polity IV Project: Political Regime Characteristics and Transitions; KOF Index of Globalization; Political Instability Task Force Worldwide Atrocities Dataset; World Health Organization; World Development Indicators; Food and Agriculture Organization of the United Nations Food Security Statistics; UNEP/GRID-Europe; DEM from USGS; LandScan; CIESIN. The map was designed by Kaiba White (2011).



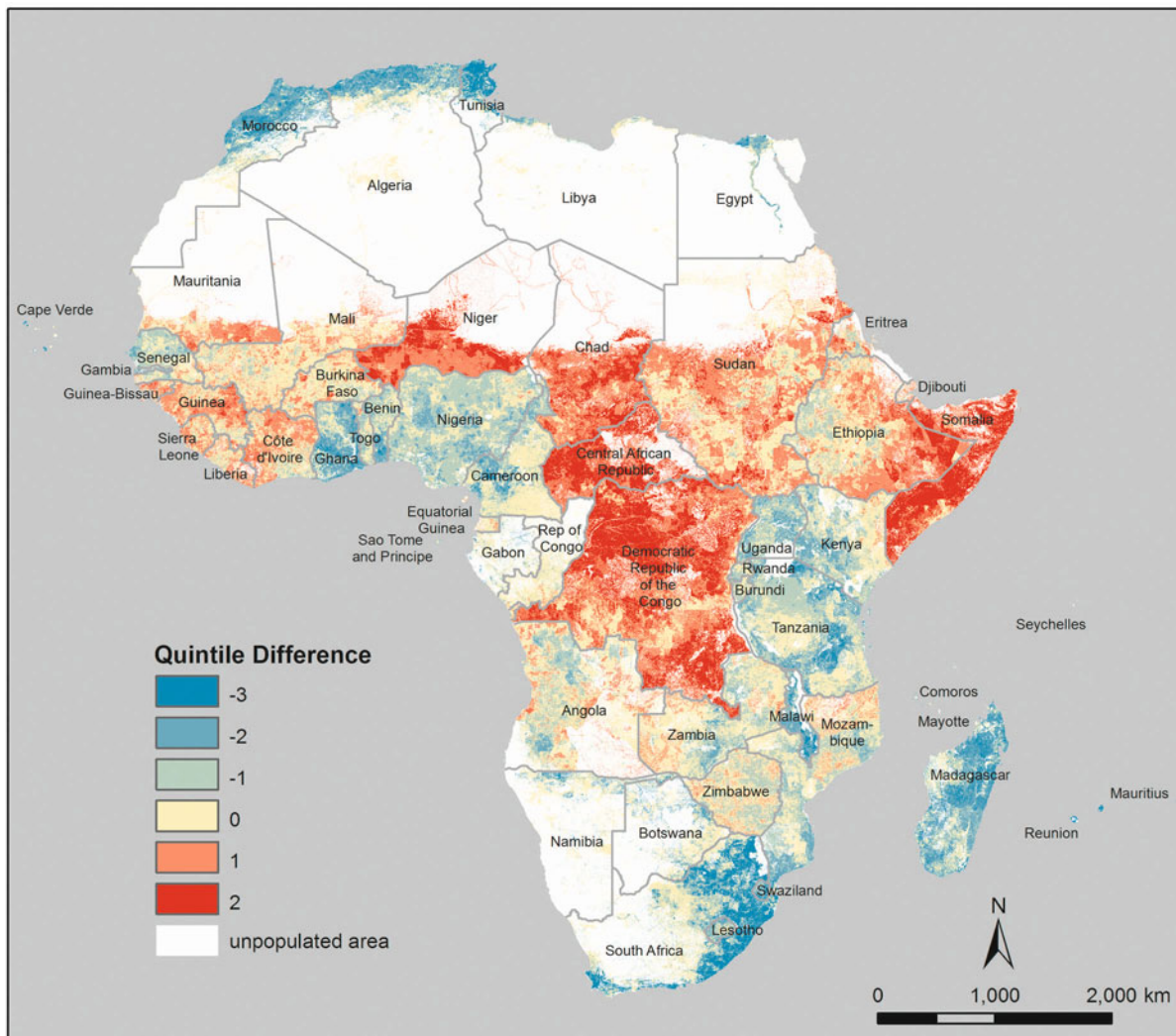
baskets, household and community resilience and governance and political violence. As [figure 23.6](#) demonstrates, the Mediterranean coastline appears far less vulnerable to climate security concerns when we incorporate measures of resilience and governance, whereas parts of Niger, the Sudan, and Somalia appear far more vulnerable, given their low levels of resilience and poor governance ([figure 23.6](#)).

More important than mere identification, however, this approach allows for in-depth examination of the drivers of this vulnerability, which can in turn inform appropriate policies and interventions. From [figure 23.5](#), we selected five areas of high overall vul-

nerability for more fine-grained analysis, including Madagascar, coastal west Africa, Nigeria, western Ethiopia, and the DRC. Madagascar’s vulnerability is primarily driven by exposure to cyclones, wildfires, and rising sea levels in densely-populated low-elevation coastal areas (see [figure 23.7](#)).

Similarly, coastal regions of many west African states are particularly vulnerable due in part to low-elevation coastal zone exposure and wildfires. However, high population density, household and community level vulnerability, governance vulnerability, and politically-motivated violence also contribute to overall vulnerability in this region ([figure 23.8](#)). In these ar-

Figure 23.6: Difference between Composite Vulnerability and Human Exposure to Climate-related Hazards. Composite Vulnerability - (Population Density + Climate-related Hazard Exposure). **Sources:** UNEP/GRID-Europe; DEM from USGS; LandScan; World Health Organization; World Development Indicators; Food and Agriculture Organization of the United Nations Food Security Statistics; Center for International Earth Science Information Network (CIESIN) (1991-2003); World Bank Governance Indicators; Polity IV Project: Political Regime Characteristics and Transitions; KOF Index of Globalization; Political Instability Task Force Worldwide Atrocities Dataset. The map was designed by Kaiba White (2011).

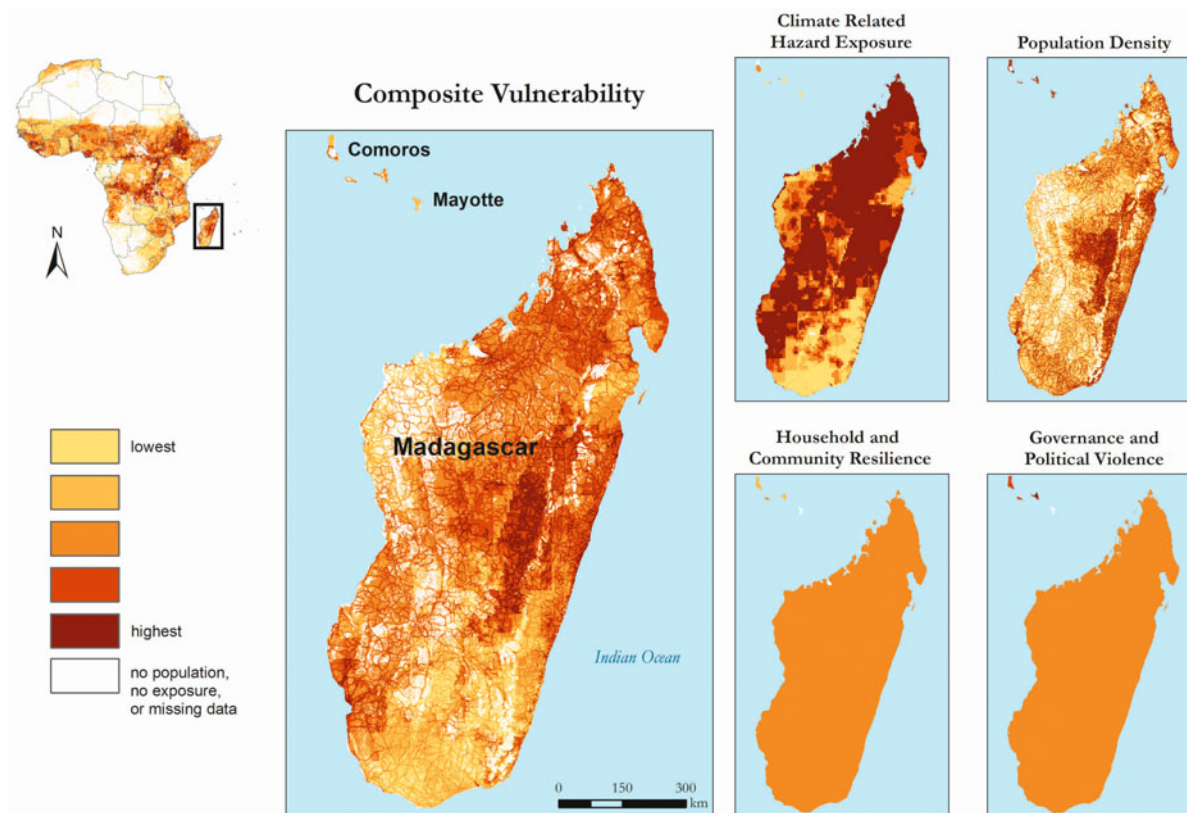


cas, effective adaptation efforts may include severe weather early-warning systems, sea walls, and improved building codes, though these alone are unlikely to be effective without addressing broader governance challenges.

The Niger delta region of Nigeria - Port Harcourt and surrounding area - is a prime example of the confluence between high population density and high physical exposure to climate-related hazards, primarily flooding and coastal inundation (figure 23.9). On household and community vulnerability as well as governance, Nigeria ranked near the middle. In neither

case was this moderate national vulnerability able to compensate for the high vulnerability of Nigeria's dense population that lives along the coast. With its oil refineries, periodic violence by armed militia groups, and history of secessionist movements, Nigeria's coast, particularly Rivers State, is of special concern. In these areas of interrelated vulnerabilities, effective interventions are much more difficult to design, but will necessarily need to address not just the physical exposure to climate-related hazards, but also risks of governance vulnerability and violence.

Figure 23.7: Madagascar. **Sources:** World Bank Governance Indicators; Polity IV Project: Political Regime Characteristics and Transitions; KOF Index of Globalization; Political Instability Task Force Worldwide Atrocities Dataset; World Health Organization; World Development Indicators; Food and Agriculture Organization of the United Nations Food Security Statistics; UNEP/GRID-Europe; DEM from USGS; LandScan; CIESIN. The map was designed by Shawn Strange and Kaiba White (2011).



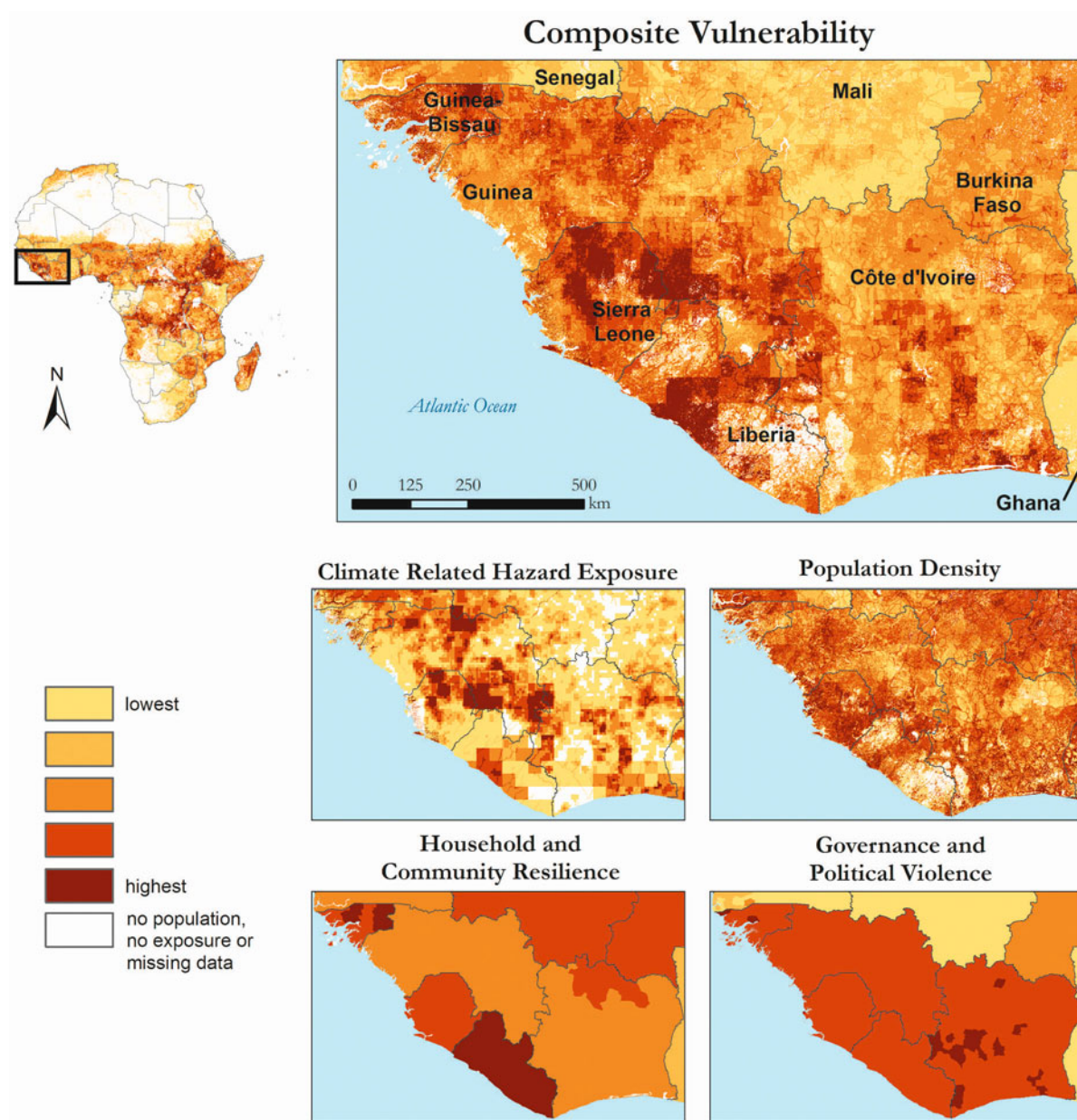
In other areas, the vulnerability to future climate change is the consequence of past events (figure 23.10). First, with a population of approximately 81 million, Ethiopia is the third most populous nation in Africa, behind Nigeria and Egypt. As shown in the detail map, much of this population is concentrated in the drought-prone western half of the country, where a lack of irrigation infrastructure means the population is largely reliant on rain-fed agriculture. These factors have contributed to severe famines in the past several decades that have, in turn, led to the country's poor nutritional and health status today. Finally, although Ethiopia has seen relatively little political violence compared with its neighbours, the government scores poorly on the World Bank's *voice and accountability* index and has limited capacity for responding to extreme weather events or adapting to changing conditions. Here programmes for developing irrigation infrastructure and promoting drought-resistant crops could be pivotal, but there is little

hope for such programmes without improved governance.

Second, the eastern half of the DRC shows up as vulnerable for different historical reasons (figure 23.11). With the exception of the droughts in the far north of the country and wildfires in the far north and far south, the DRC is less exposed to natural climate-related hazards than other parts of Africa. However, poor governance throughout the DRC gives it the second lowest score on this study's Governance Vulnerability index. Ongoing political violence, particularly in the east, is related to the war that officially ended in 2003 but continues to plague much of the region. This has hampered development and the population's ability to adapt to changing environmental conditions. Furthermore, continuing violence undermines efforts by the government and international actors to respond to natural or humanitarian crises.

Although effective interventions will need to address many drivers of vulnerability, governance improvement is paramount. More accountable, respon-

Figure 23.8: Coastal West Africa. **Sources:** World Bank Governance Indicators; Polity IV Project: Political Regime Characteristics and Transitions; KOF Index of Globalization; Political Instability Task Force Worldwide Atrocities Dataset; World Health Organization; World Development Indicators; Food and Agriculture Organization of the United Nations Food Security Statistics; UNEP/GRID-Europe; DEM from USGS; LandScan; CIESIN. The map was designed by Shawn Strange and Kaiba White (2011).

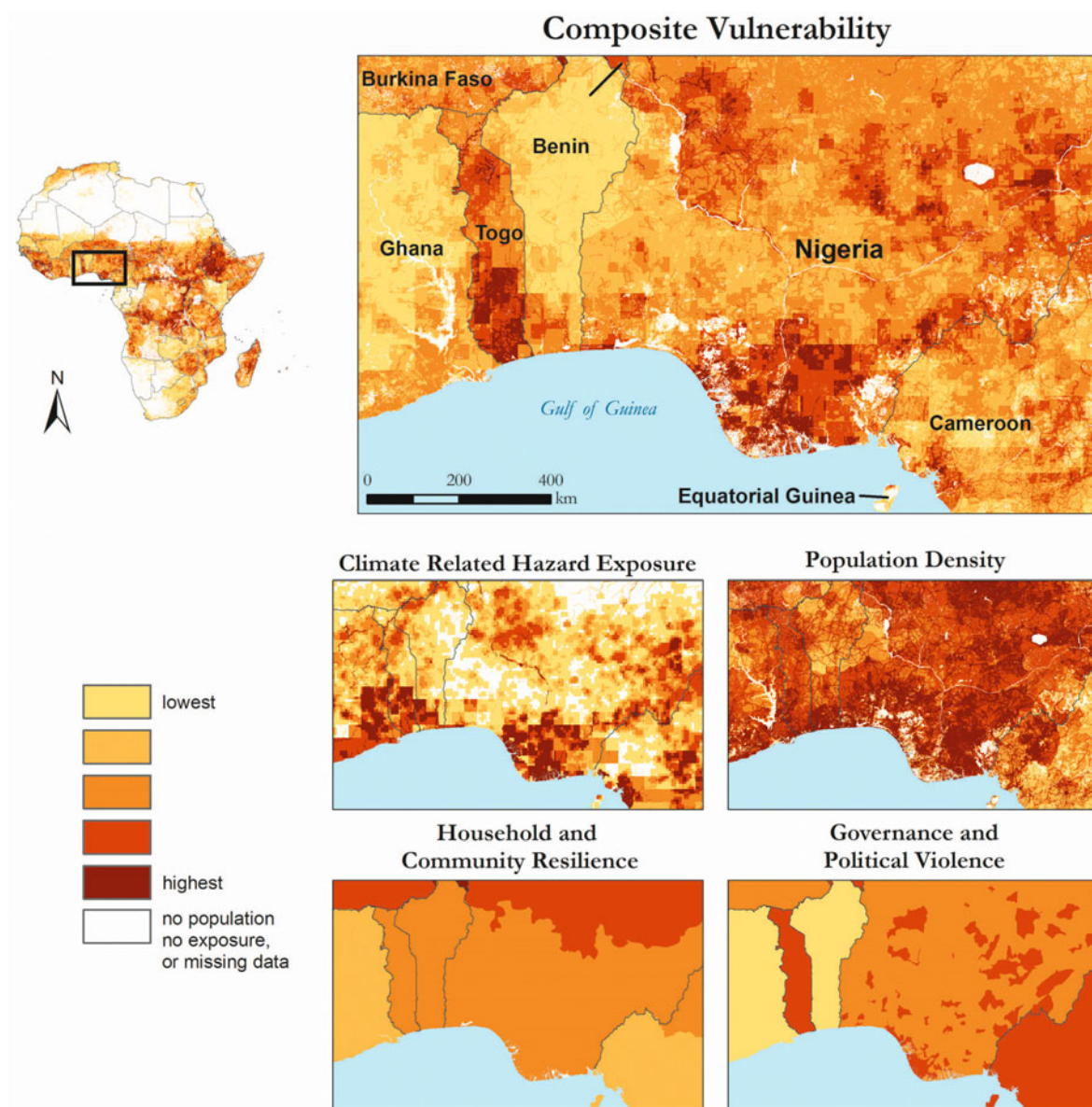


sive, and capable governments are integral to reducing household and community vulnerability, adapting to changing environmental conditions, and responding to inevitable extreme weather events.

One danger of this comparative approach is that it has the potential for focusing attention on larger regions of vulnerability at the expense of smaller areas. Although not explicitly discussed, other pockets of

high vulnerability exist in Tanzania, Zimbabwe, Rwanda, Swaziland, and Mozambique, where low scores on human development coincide with poor governance indicators and considerable disaster risk from droughts and fires. These areas must not be overlooked.

Figure 23.9: Nigeria. **Sources:** World Bank Governance Indicators; Polity IV Project: Political Regime Characteristics and Transitions; KOF Index of Globalization; Political Instability Task Force Worldwide Atrocities Dataset; World Health Organization; World Development Indicators; Food and Agriculture Organization of the United Nations Food Security Statistics; UNEP/GRID-Europe; DEM from USGS; LandScan; CIESIN. The map was designed by Shawn Strange and Kaiba White (2011).

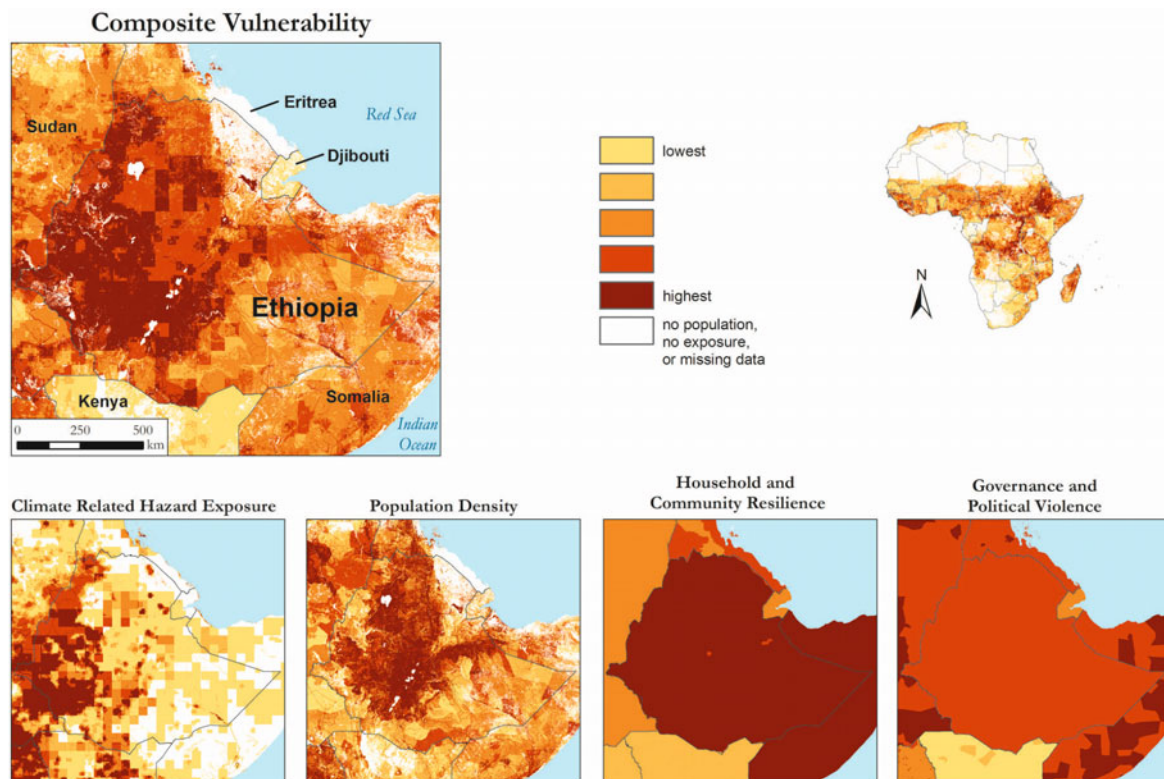


23.5 Conclusions and Extensions for Further Research

This chapter is intended to be a proof of concept for a methodology of producing sub-national climate change vulnerability maps. The aim is to be holistic if not exhaustive in the inclusion of indicators. For a number of indicators, particularly those for house-

hold vulnerability and governance, we had to use national level data in the absence of local geo-referenced data. As a consequence, the location of sub-national vulnerability is not as precise as ultimately would be desirable. While some indicators – such as climate-related physical exposure, low elevation, population, and atrocities – are geo-referenced at the sub-national level, better data is required for many others. Subse-

Figure 23.10: Ethiopia. **Sources:** World Bank Governance Indicators; Polity IV Project: Political Regime Characteristics and Transitions; KOF Index of Globalization; Political Instability Task Force Worldwide Atrocities Dataset; World Health Organization; World Development Indicators; Food and Agriculture Organization of the United Nations Food Security Statistics; UNEP/GRID-Europe; DEM from USGS; LandScan; CIESIN. The map was designed by Shawn Strange and Kaiba White (2011).



quent iterations will attempt to acquire more localized data as it becomes available.

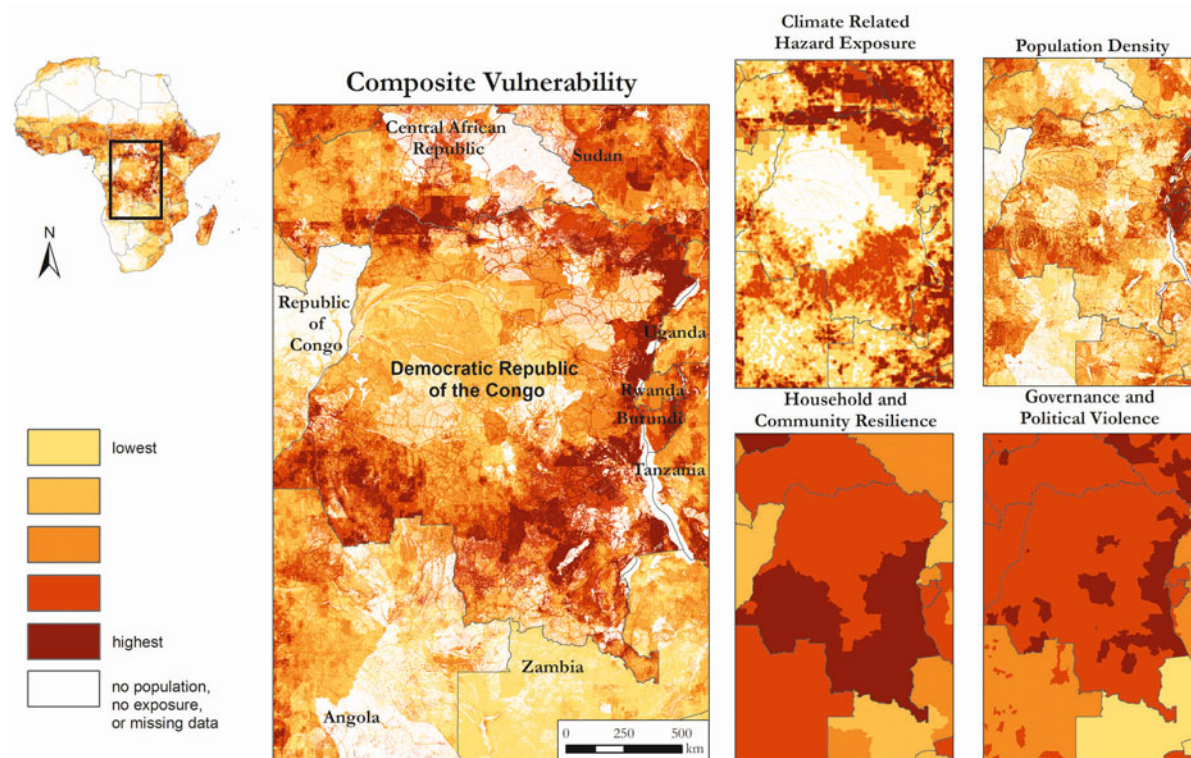
A number of areas for future research ultimately will depend on data availability. One possible extension is the inclusion of data on infrastructure. In the event of a weather emergency, communities at risk will often need emergency services in the form of search and rescue, relief supplies, and reconstruction materials. Communities that are isolated from transport and information networks may be more at risk, as it may be difficult to warn them of impending extreme weather events and provide them with adequate services when climate-related events occur. While access to communications infrastructure may be more applicable for swift-onset disasters like floods and storms, access to transport infrastructure could be potentially salient for slow-onset disasters, such as droughts.

Another potential extension is the inclusion of additional data on agriculture and primary commodities. While drought indicators capture one dimension of risks for agriculture, some countries, given their high dependence on agriculture and the export of pri-

mary commodities, are likely to be especially affected as the effects of climate change impact the food supply and foreign exchange revenue. Some countries, like South Africa, with more diversified economies may be less vulnerable to such climatic shocks. Ideally, sub-national data would allow us to capture both continental and within-country variation.

Most of the physical vulnerability data in this chapter is based on past exposure to extreme weather events. The next iteration of our research will incorporate models of future climate change risk, to the extent that authoritative models of future climate trends in Africa can be found. Indeed, models of future African climate change, at least for some areas like the Sahel, appear to have wildly divergent predictions with respect to rainfall and other indicators (Boko/Niang/Nyong et al. 2007; Gullede 2008). More recent research, however, suggests that these discordant findings may be a product of problems in downscaling global climate models. Patricola and Cook (2009) have constructed a regional climate model for north Africa above the equator (and excluding typical north

Figure 23.11: Democratic Republic of Congo. **Sources:** World Bank Governance Indicators; Polity IV Project: Political Regime Characteristics and Transitions; KOF Index of Globalization; Political Instability Task Force Worldwide Atrocities Dataset; World Health Organization; World Development Indicators; Food and Agriculture Organization of the United Nations Food Security Statistics; UNEP/GRID-Europe; DEM from USGS; LandScan; CIESIN. The map was designed by Shawn Strange and Kaiba White (2011).



African countries on the Mediterranean coast). They argue that their findings do a better job than previous climate prediction models in explaining past climate patterns and important attributes such as the west African monsoon. For future research, the authors are collaborating with climate modellers including Kerry Cook to extend the regional model to be continent-wide and to focus on timescales relevant for policymakers - mid-21st century rather than late 21st century as is the norm among climate modellers.

Additionally, the consequences of climate-related extreme events may be more severe in regions with a history of political violence, as both conflict and weather can spill over borders. Dealing with climate change effects in violent regions may be problematic, in terms of eliciting cross-border cooperation and the damage wrought to governance and development in areas plagued by perennial conflict. While the KEDS data on political atrocities provided us with sub-national data on one particular dimension of violence, larger-scale violent events such as civil wars are also likely to impede both disaster preparedness and provi-

sion of relief in the event of weather-related emergencies. The *Armed Conflict Location and Events Dataset* (ACLED), as well as Halvard Buhaug's geo-referenced work on African civil wars, are prospective data sources for these extensions, though are not yet publicly available.³² The authors also plan to incorporate geo-coded strike and riot event data from Idean Salehyan and Cullen Hendrix's new dataset, the *Social Conflict in Africa Database* (SCAD), when it becomes available (Hendrix/Salehyan 2010).

An additional extension would be to overlay geo-coded data on ethnicity. Given that ethnicity has appeared to play a strong role in African politics - as a source of conflict and division - ethnicity could play a powerful role in determining future vulnerability to the effects of climate change as well. In some cases, ethnic groups may be actively targeted by the govern-

32 In November 2010, ACLED was completing coding for all of Africa. Buhaug plans to release a revised version of geo-coded civil war data in 2011. Cf. Raleigh, Linke, and Hegre (2009); Buhaug and Rod (2006).

ment such that, in the event of an extreme weather event, ethnic groups at odds with the government may be deprived of essential relief services. In other cases, powerless and politically irrelevant groups may be ignored by the central government, should they find themselves subject to extreme weather events or other effects associated with climate change. A *Geocoded version of the Ethnic Power Relations* (GeoEPR) dataset was published in 2010.³³ This data could help identify where vulnerable areas overlap with ethnic groups that have experienced historic discrimination, that are powerless, or that are politically irrelevant (Cederman/Min/Wimmer 2009).

A further extension would be to statistically test the strength of the indicators as predictors of outcomes such as disaster mortality, as Roberts and Parks have done using multivariate regression and Brooks et al. did using Monte Carlo simulations. These can be performed for multiple hazards or for individual hazards. For example, the 2009 UNISDR global assessment on disasters assesses the statistical significance of different factors for individual kinds of disasters. Consistent with the Brooks et al. study, UNISDR includes a number of different variables, including per capita net savings, ratio of economic losses to the capital stock, economic competitiveness, concentration of exports, the Human Development Index, and per capita GDP (UNISDR 2009: 57).

Maps of vulnerability are only points of departure rather than end-states of analysis. Having provisionally identified the places of greatest sub-national vulnerability within Africa, the authors ultimately need to understand more about the historical and political dynamics of those places and how such dynamics intersect with exposure to historic climate-related hazards and climate change. In addition to our mapping work, the authors are conducting case studies and fieldwork to complement these maps.

The more holistic approach to vulnerability analysis outlined in this study can provide guidance to policymakers within Africa and internationally as they work to identify the places in Africa most vulnerable to climate change. We hope that by identifying sub-national geographic areas of interest our work can help policymakers tailor adaptation strategies and distribute scarce resources to the places in Africa where the need is greatest.

33 See at: <<http://dvn.iq.harvard.edu/dvn/dv/epr/faces/study/StudyPage.xhtml?studyId=45340>>.

Appendix (figures 23.12–23.31)

Figure 23.12: Cyclone Wind Exposure in Eastern Africa (1975-2007). **Source:** UNEP/GRID-Europe. Note: Cyclones wind frequency weighed by cyclone intensity (Saffir-Simpson scale): category 1 x 1; category 2 x 2; category 3 x 3; category 4 x 4. There were no category 5 cyclone tracks that made landfall in Africa. This map was designed by Kaiba White (2011).

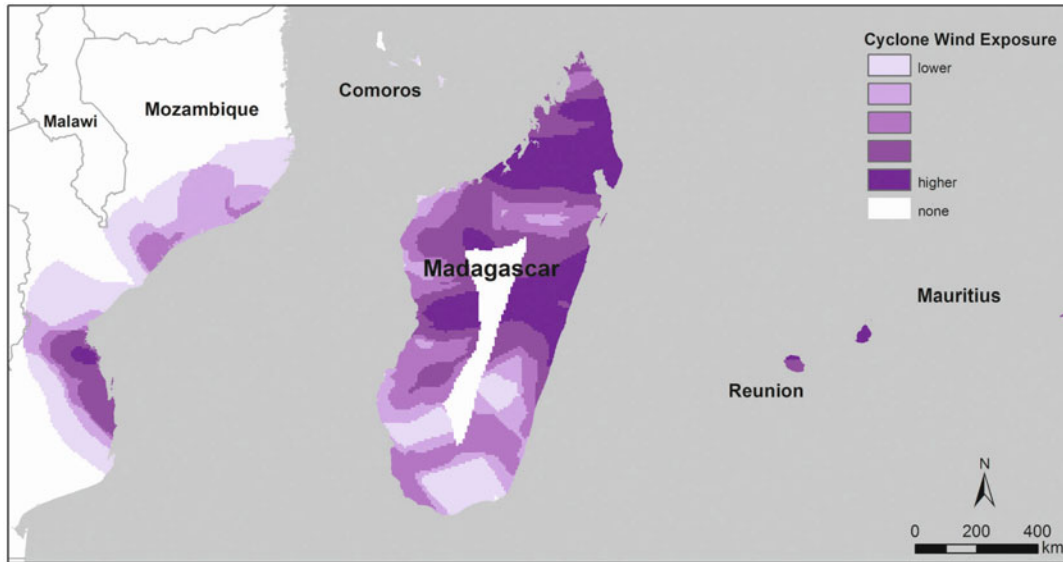


Figure 23.13: Cyclone Surge Frequency in Eastern Africa (1975-2007). **Source:** UNEP/GRID-Europe. Note: Surge frequency for category 1 cyclones only (Saffir-Simpson scale). This map was designed by Kaiba White (2011).

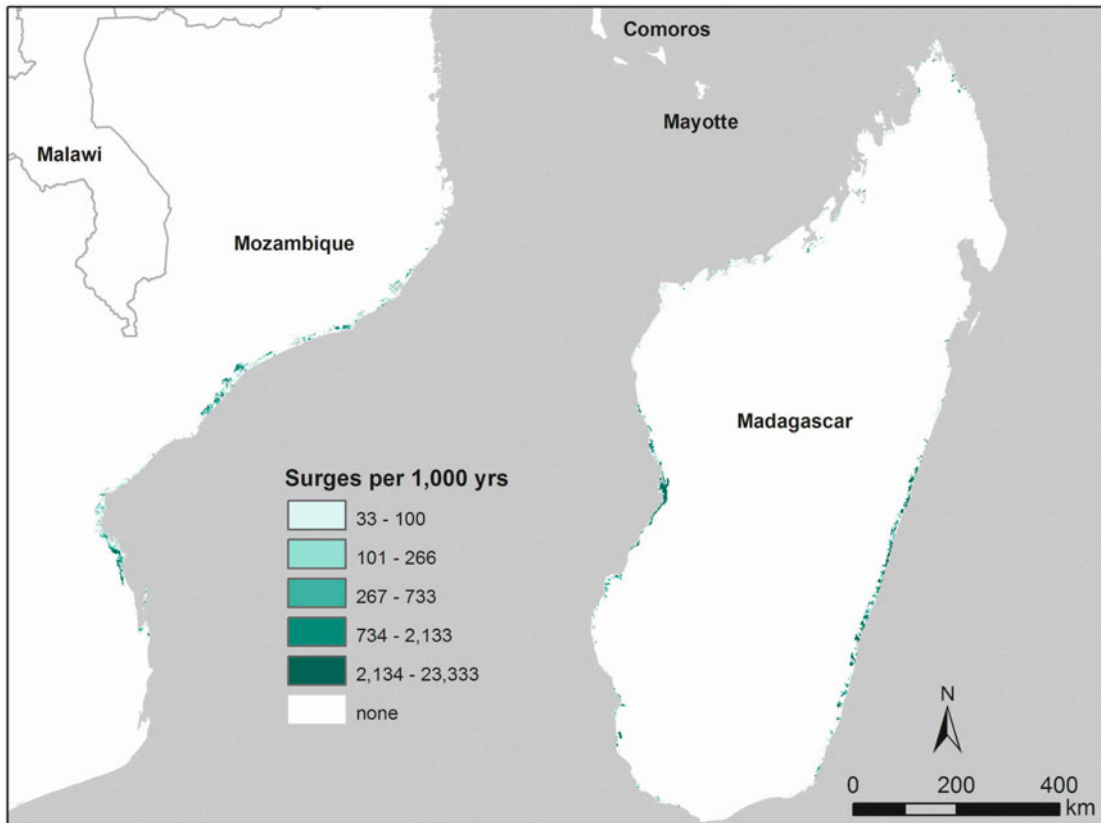


Figure 23.14: Flood Frequency in Eastern Africa. **Source:** UNEP/GRID-Europe. This map was designed by Kaiba White (2011).

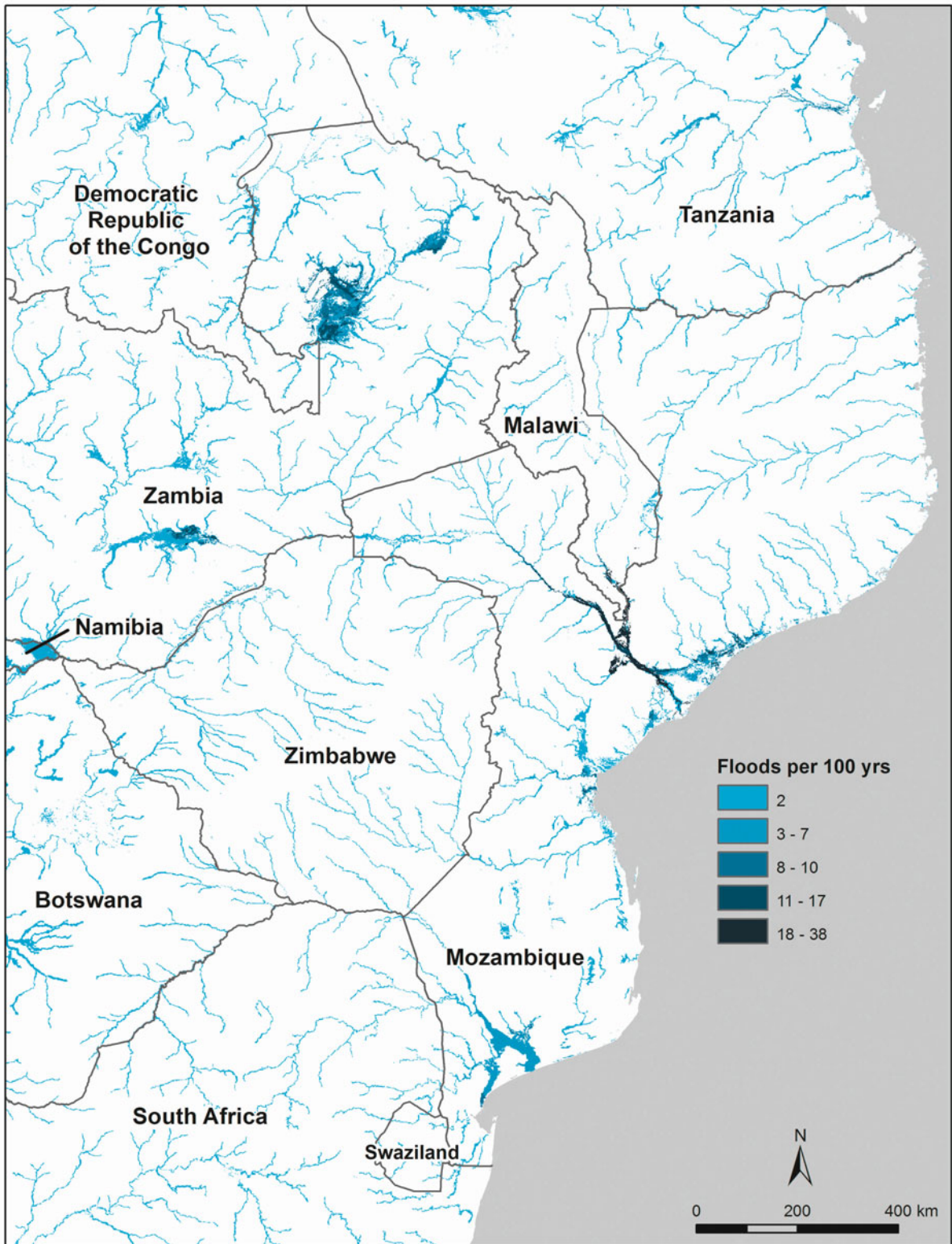


Figure 23.15: Drought Frequency in Africa (1980-2001). **Source:** UNEP/GRID-Europe. This map was designed by Kaiba White (2011).

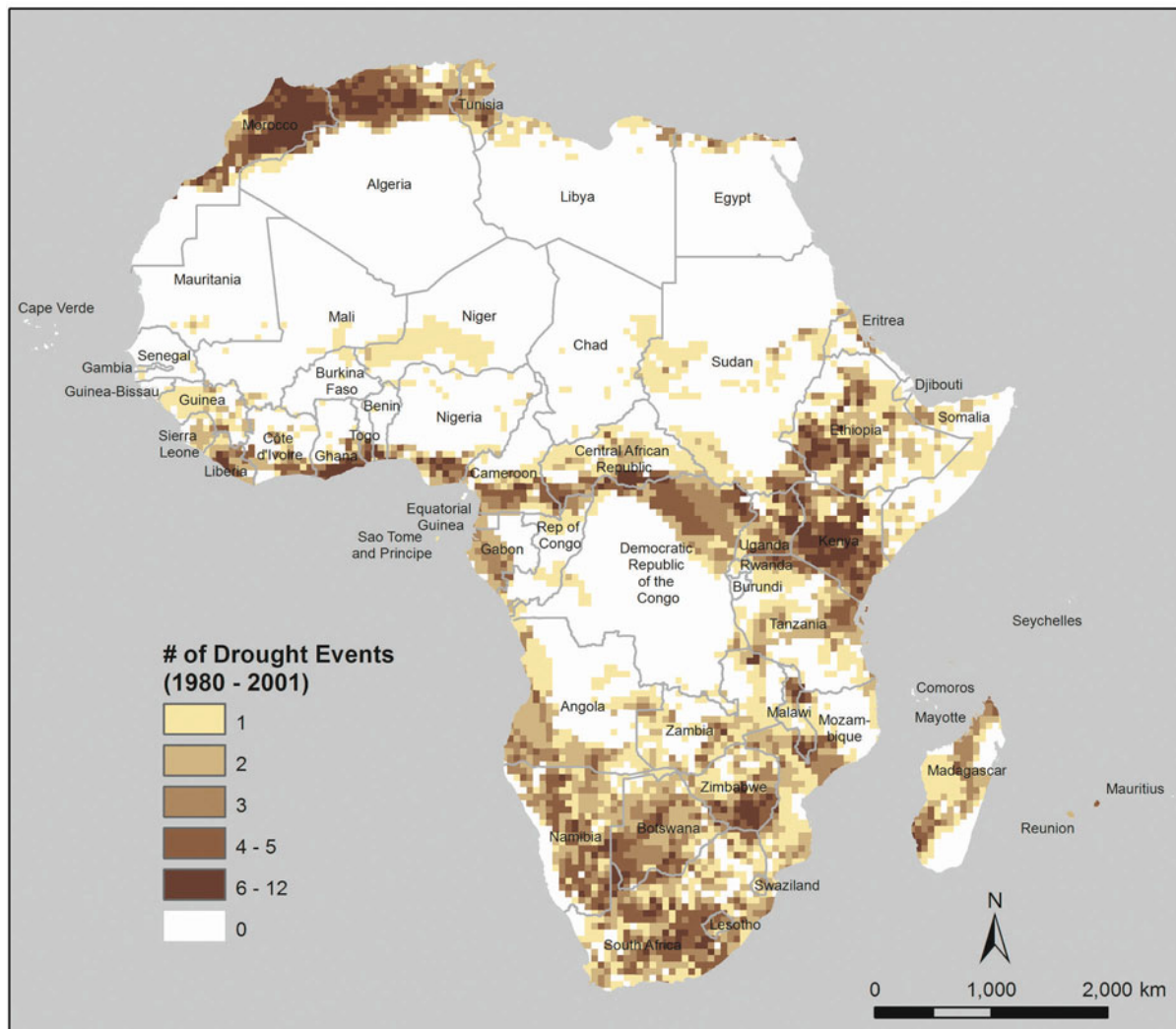


Figure 23.16: Wildfire Frequency in Africa (1997-2008). **Source:** UNEP/GRID-Europe. This map was designed by Kaiba White (2011).

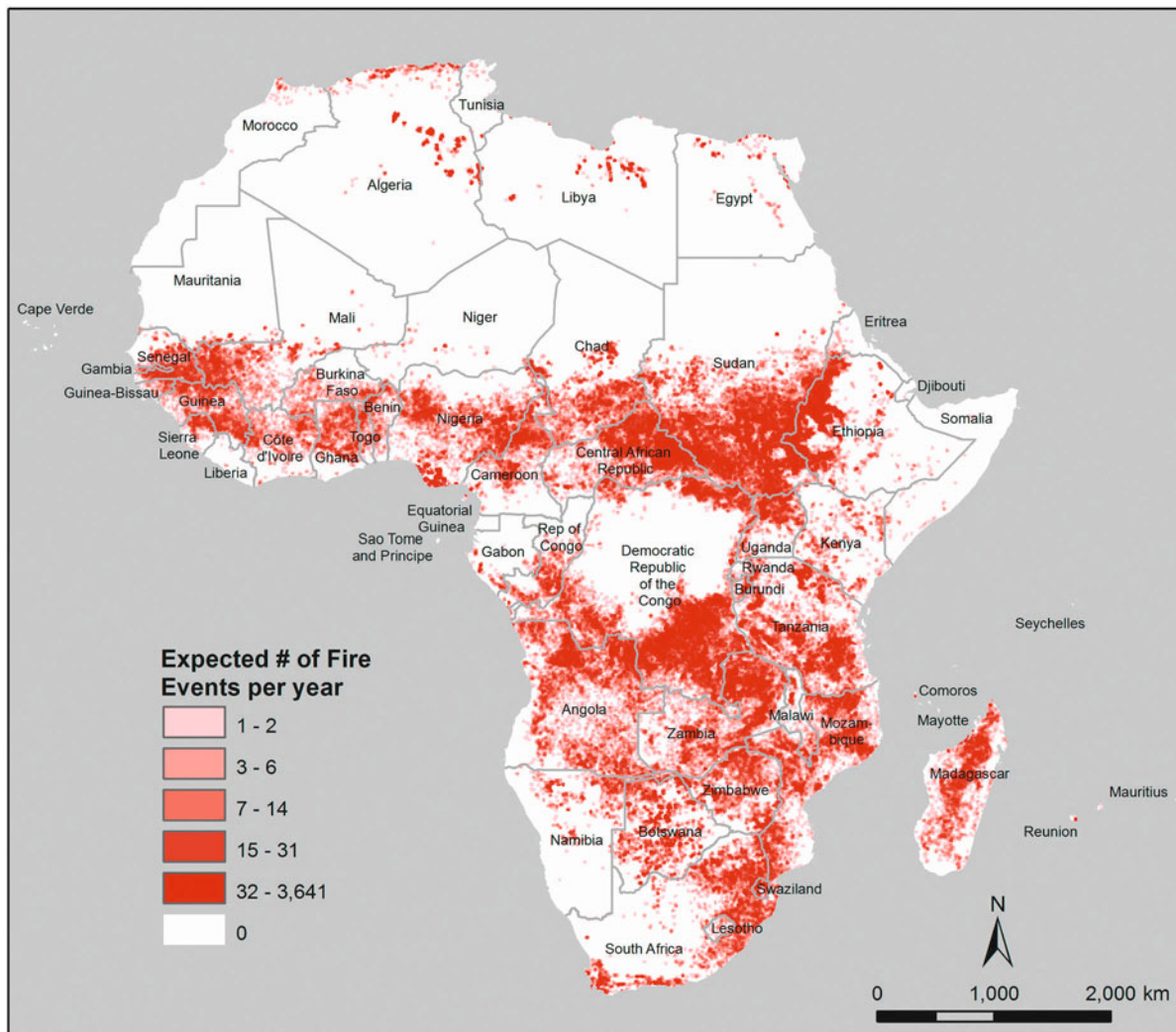


Figure 23.17: Potential Coastal Inundation in Western Africa. **Source:** USGS DEM. This map was designed by Kaiba White (2011).

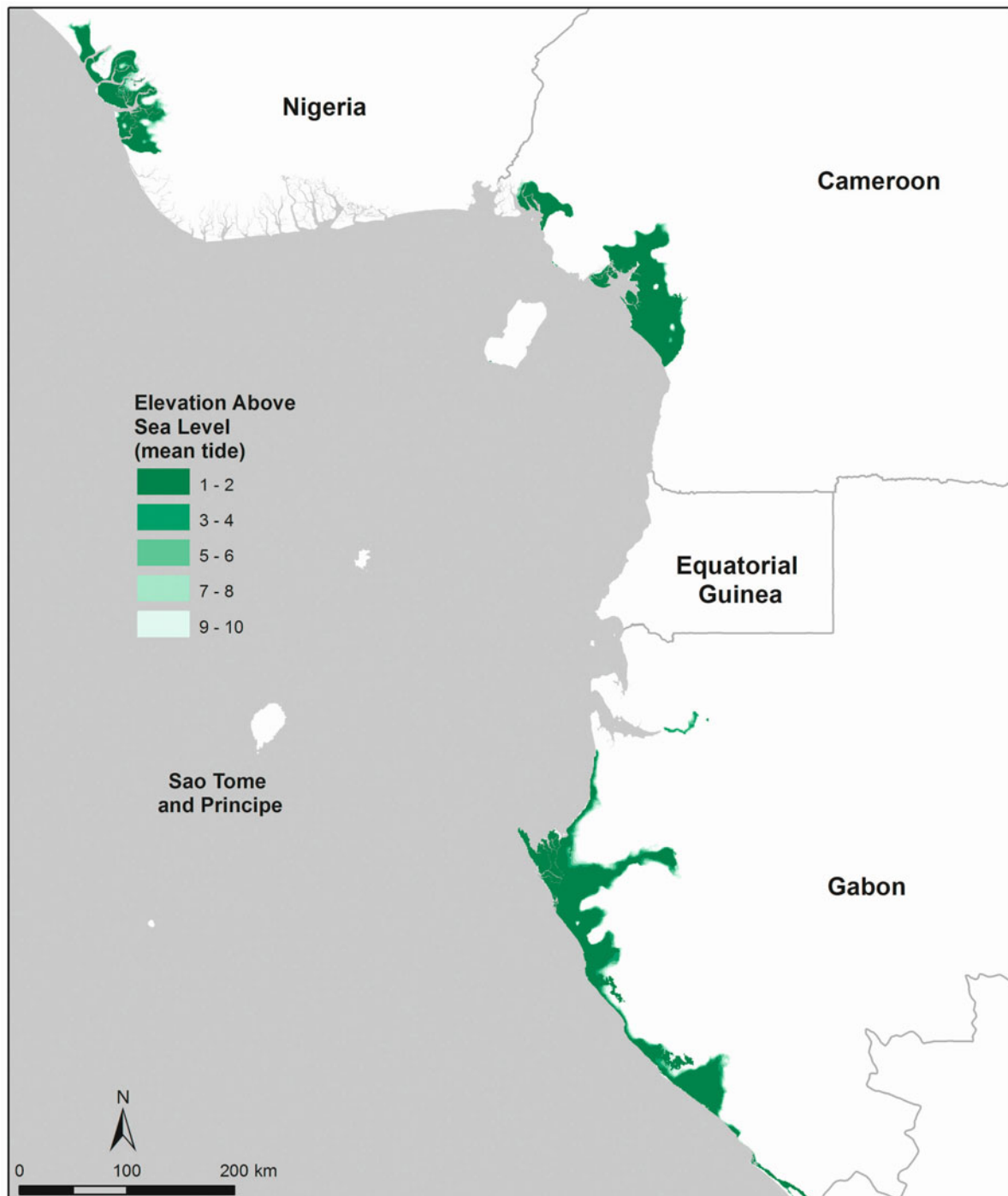


Figure 23.18: Adult Literacy Rates in Africa. **Source:** World Development Indicators (2000-2007, most recent available for each country). This map was designed by Kaiba White (2011).

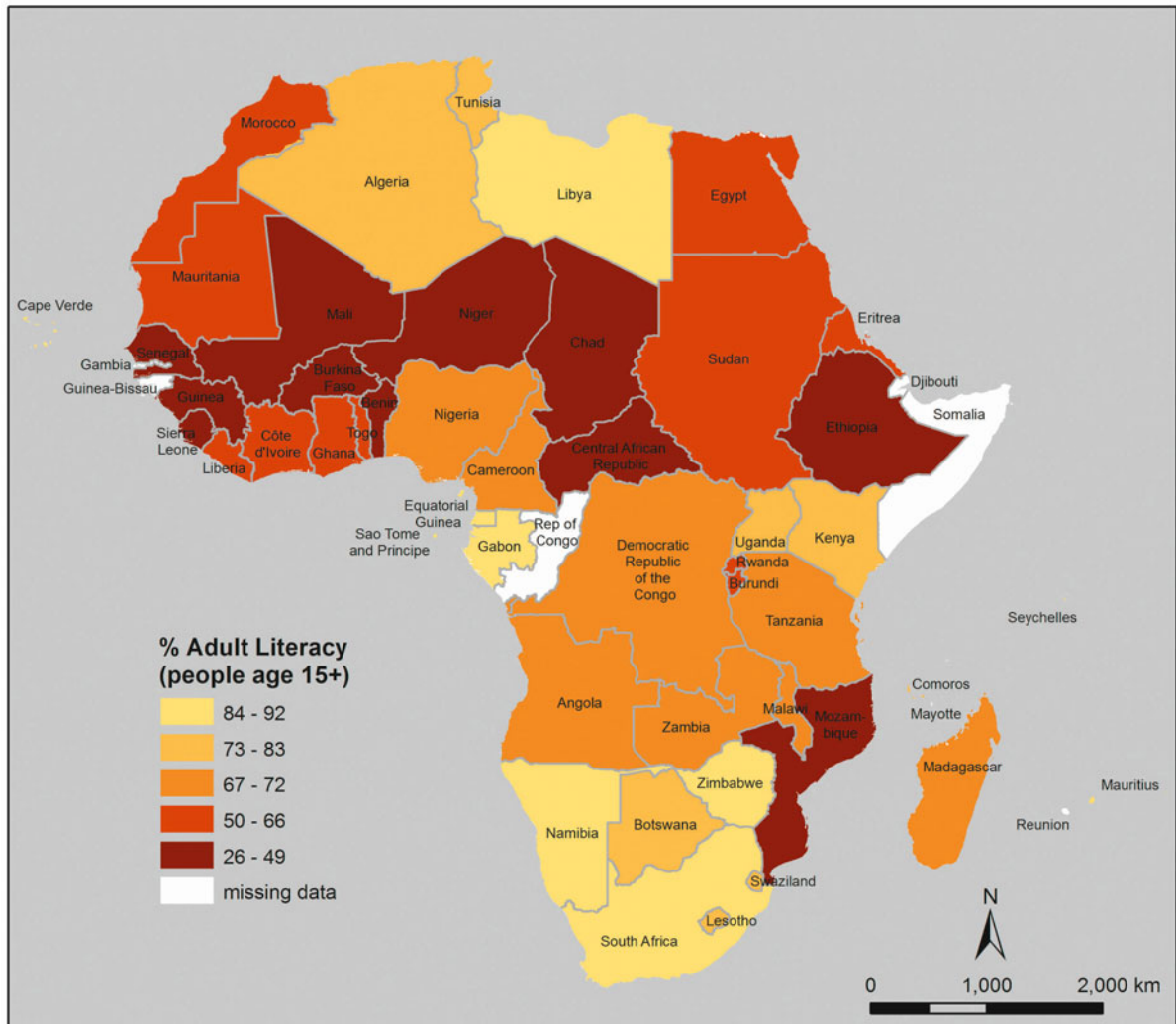


Figure 23.19: Primary School Enrolment Rates in Africa. **Source:** World Development Indicators (2004-2008; 1998 for Angola; 1999 for Somalia; 2001 for Guinea-Bissau). Note: Gross primary school enrolment rate = the no. of children in primary school / the no. of primary school age children. This can result in rates over 100%. This map was designed by Kaiba White (2011).

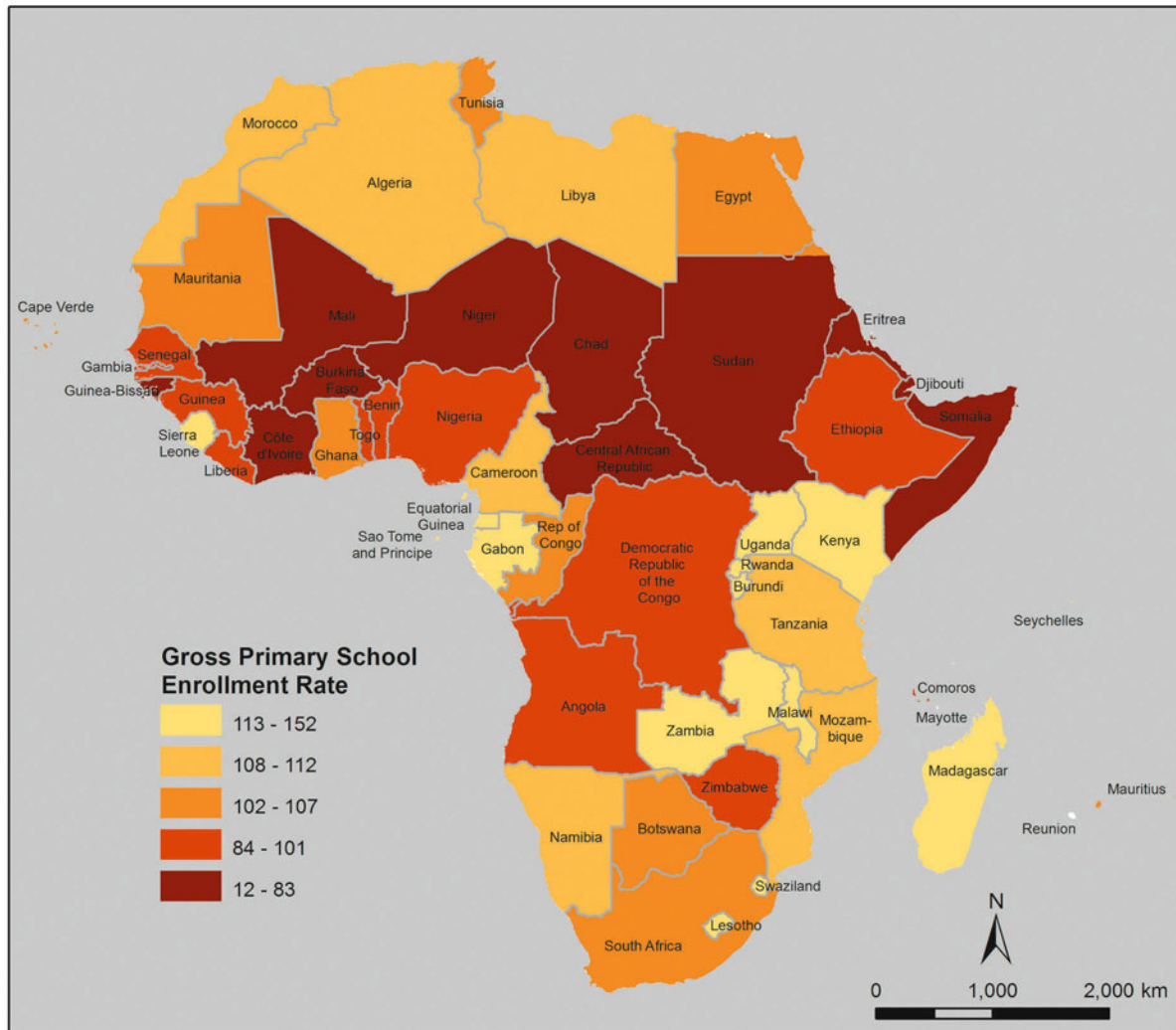


Figure 23.20: Infant Mortality Rates in Africa. **Source:** Center for International Earth Science Information Network (CIESIN) (1991-2003), *adjusted to national 2000 UNICEF rate. This map was designed by Kaiba White (2011).

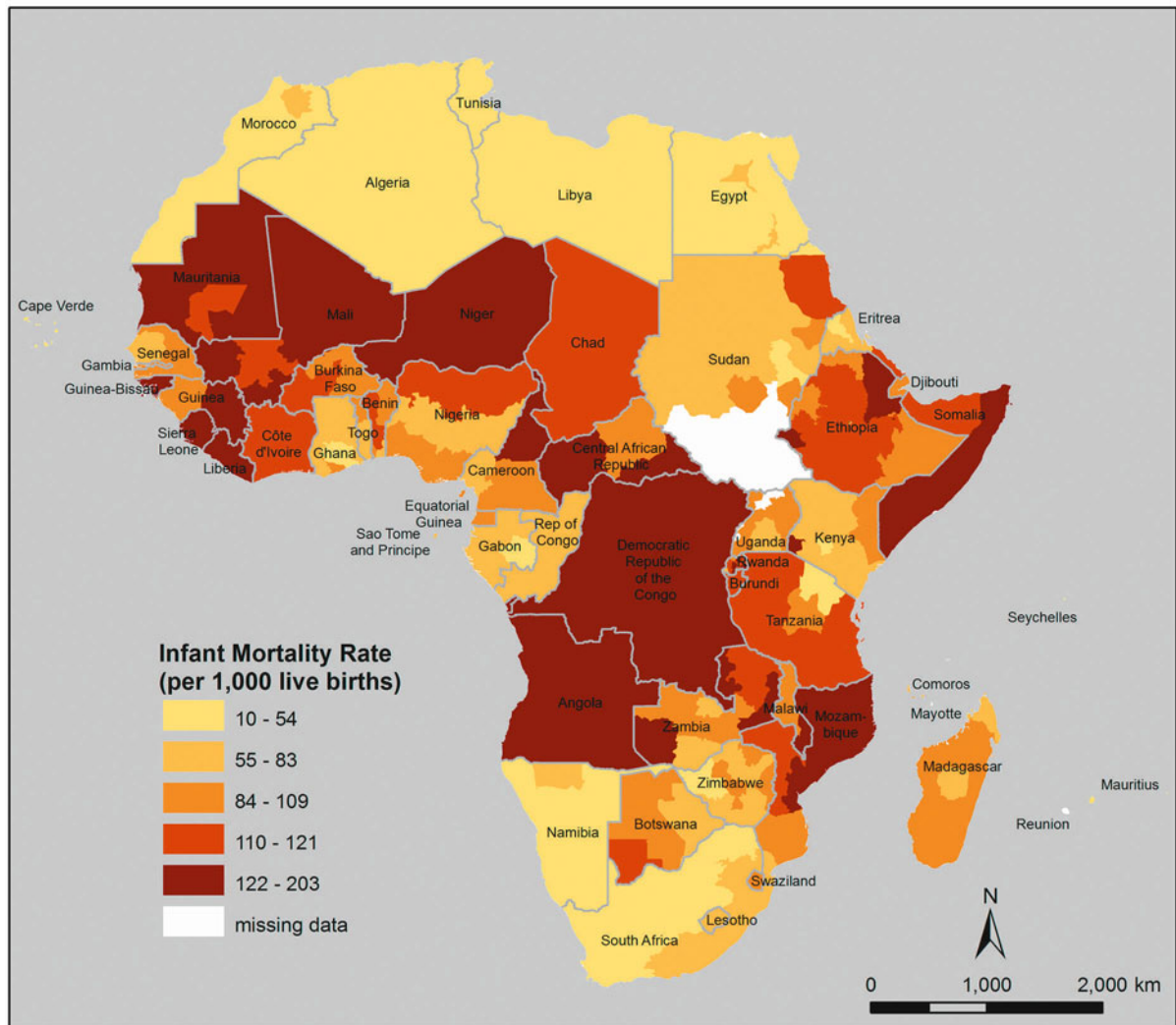


Figure 23.21: Life Expectancy at Birth in Africa (2006). **Source:** World Health Organization. This map was designed by Kaiba White (2011).

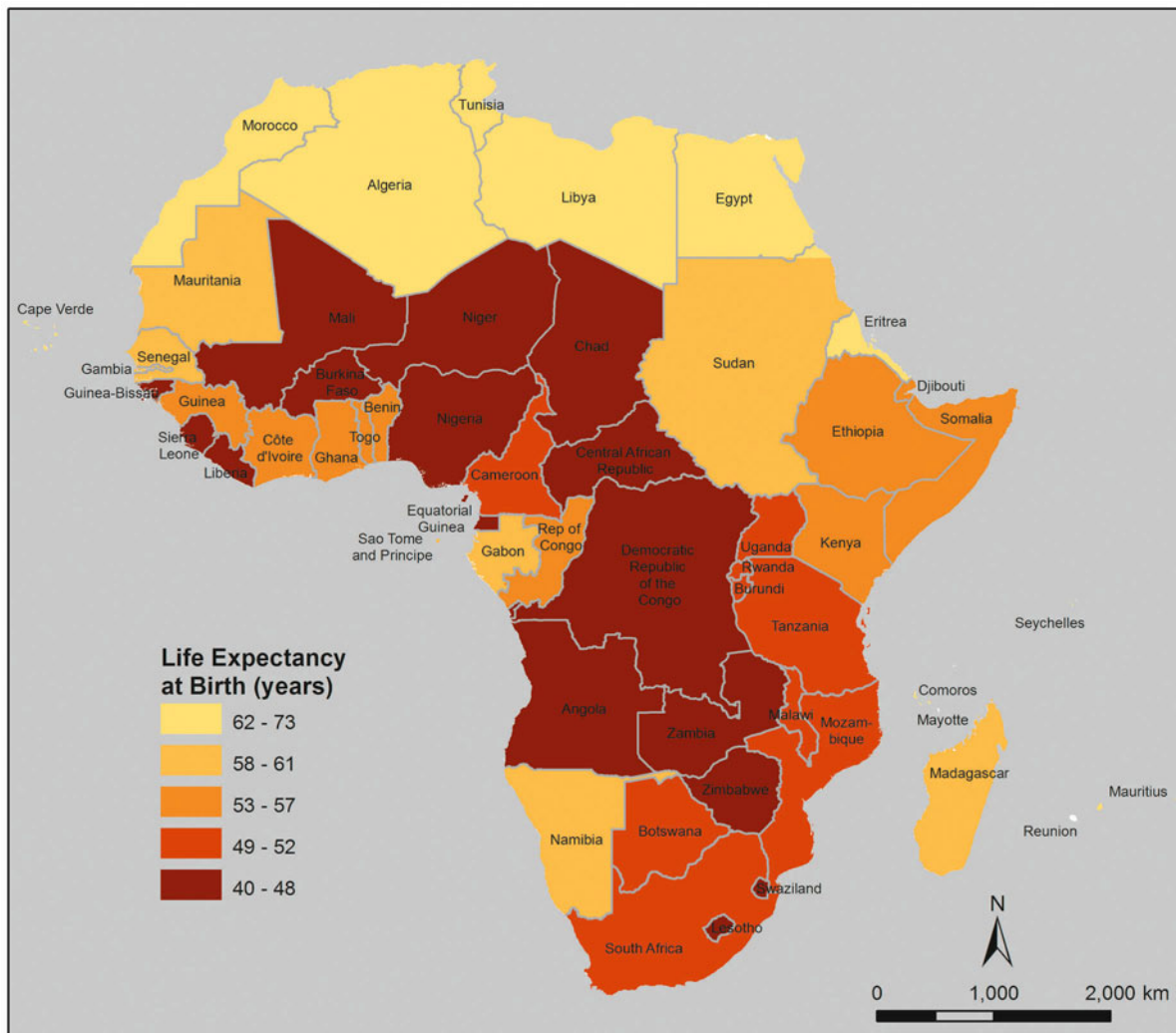


Figure 23.22: Childhood Malnutrition Rates in Africa. **Source:** Center for International Earth Science Information Network (CIESIN) (1990-2002). This map was designed by Kaiba White (2011).

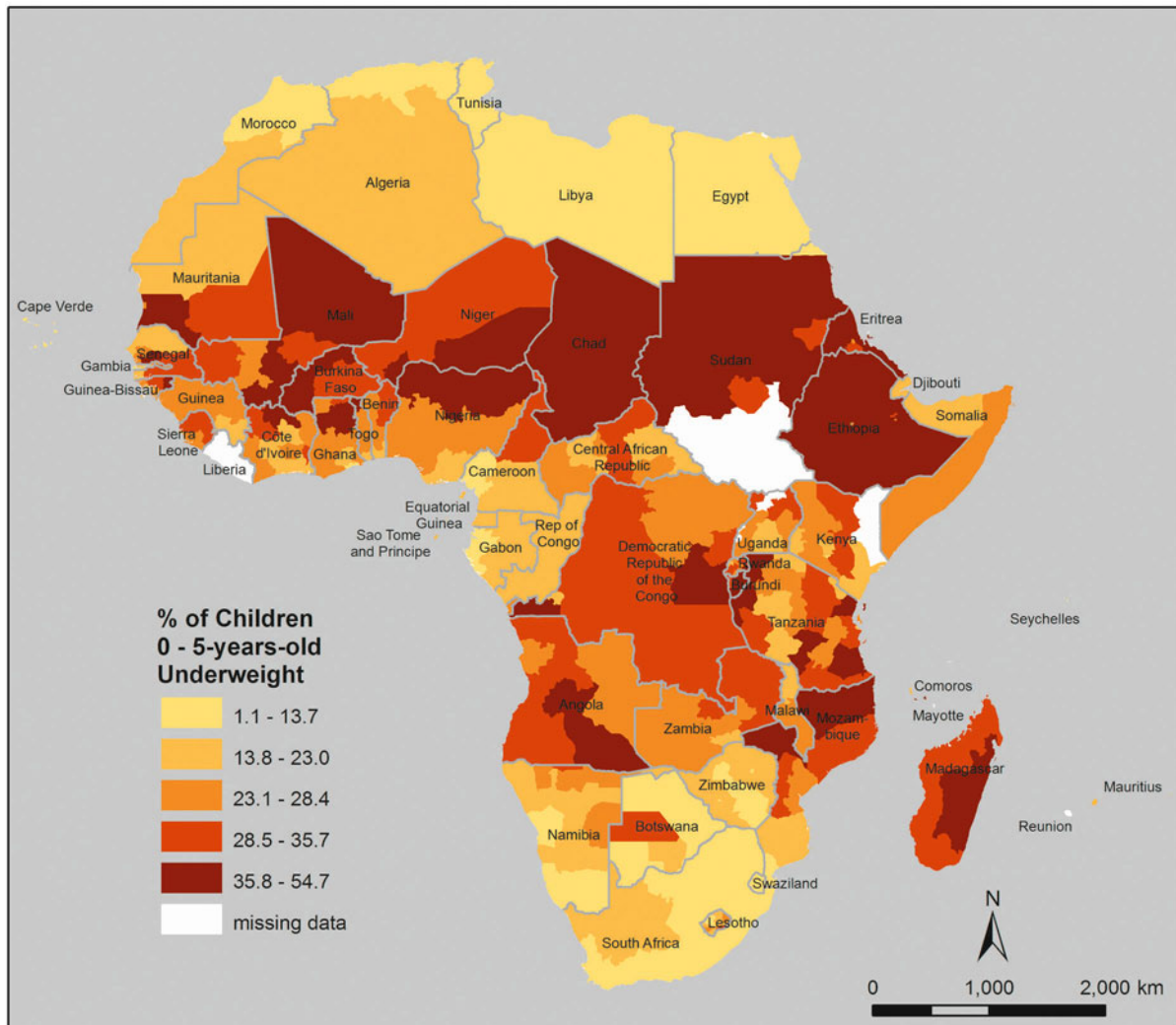


Figure 23.23: Drinking Water Accessibility in Africa. **Source:** World Health Organization (2006; 2000 for Cape Verde and Seychelles). This map was designed by Kaiba White (2011).

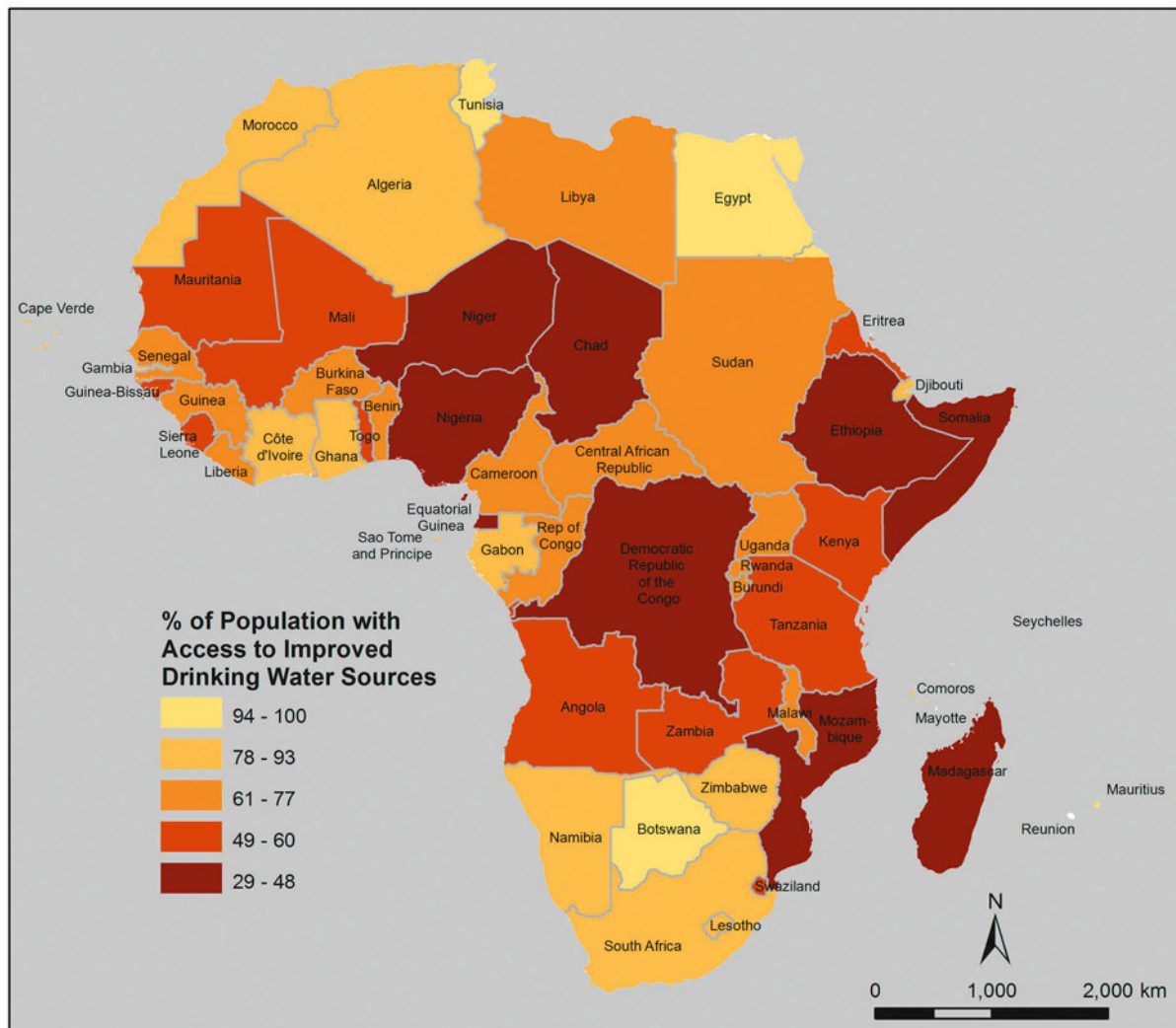


Figure 23.24: Healthcare Expenditures in Africa. **Source:** World Health Organization (2006, 2001 for Somalia). This map was designed by Kaiba White (2011).

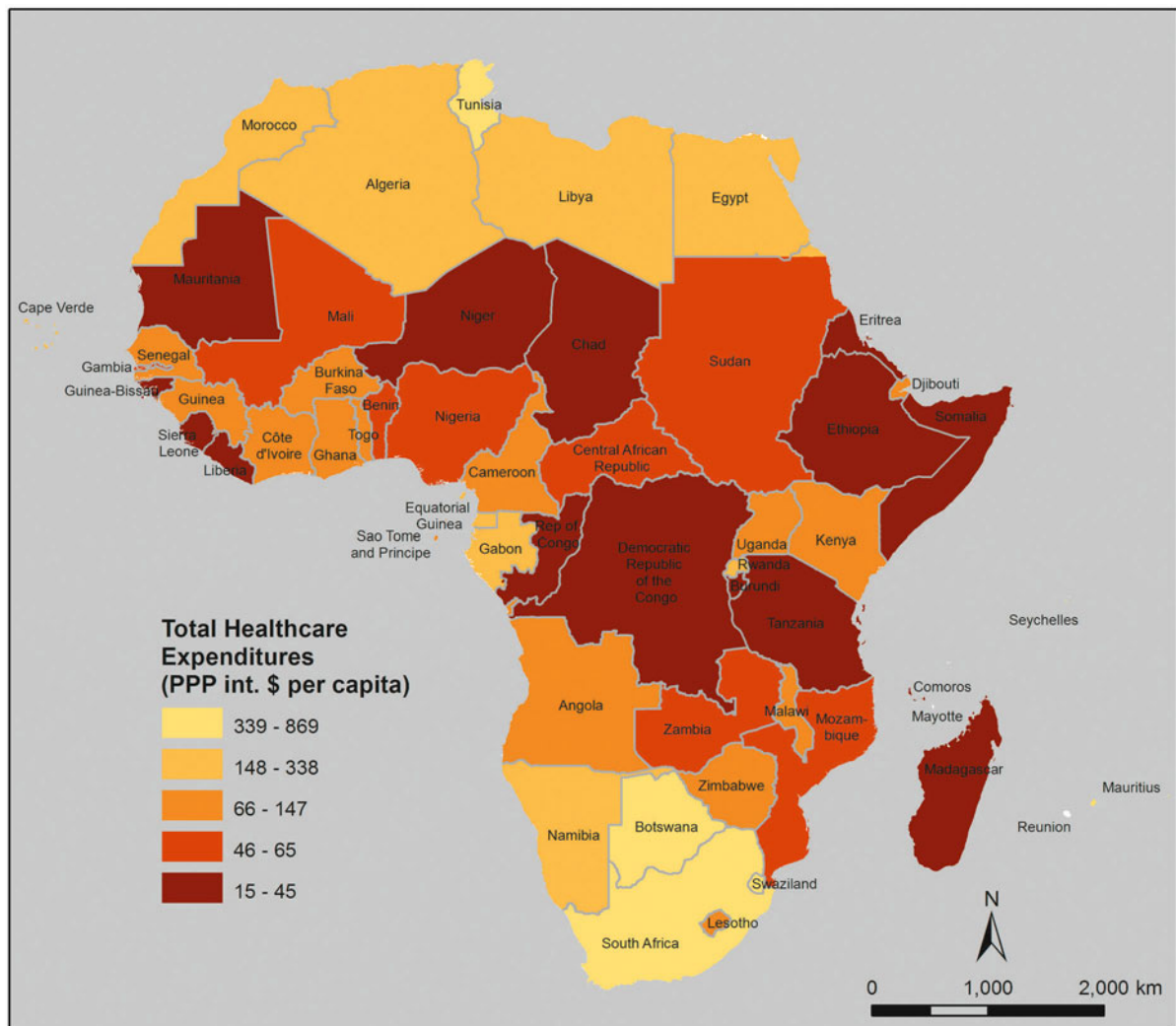


Figure 23.25: Nurses and Midwives in Africa. **Source:** World Health Organization (2002-2006). This map was designed by Kaiba White (2011).

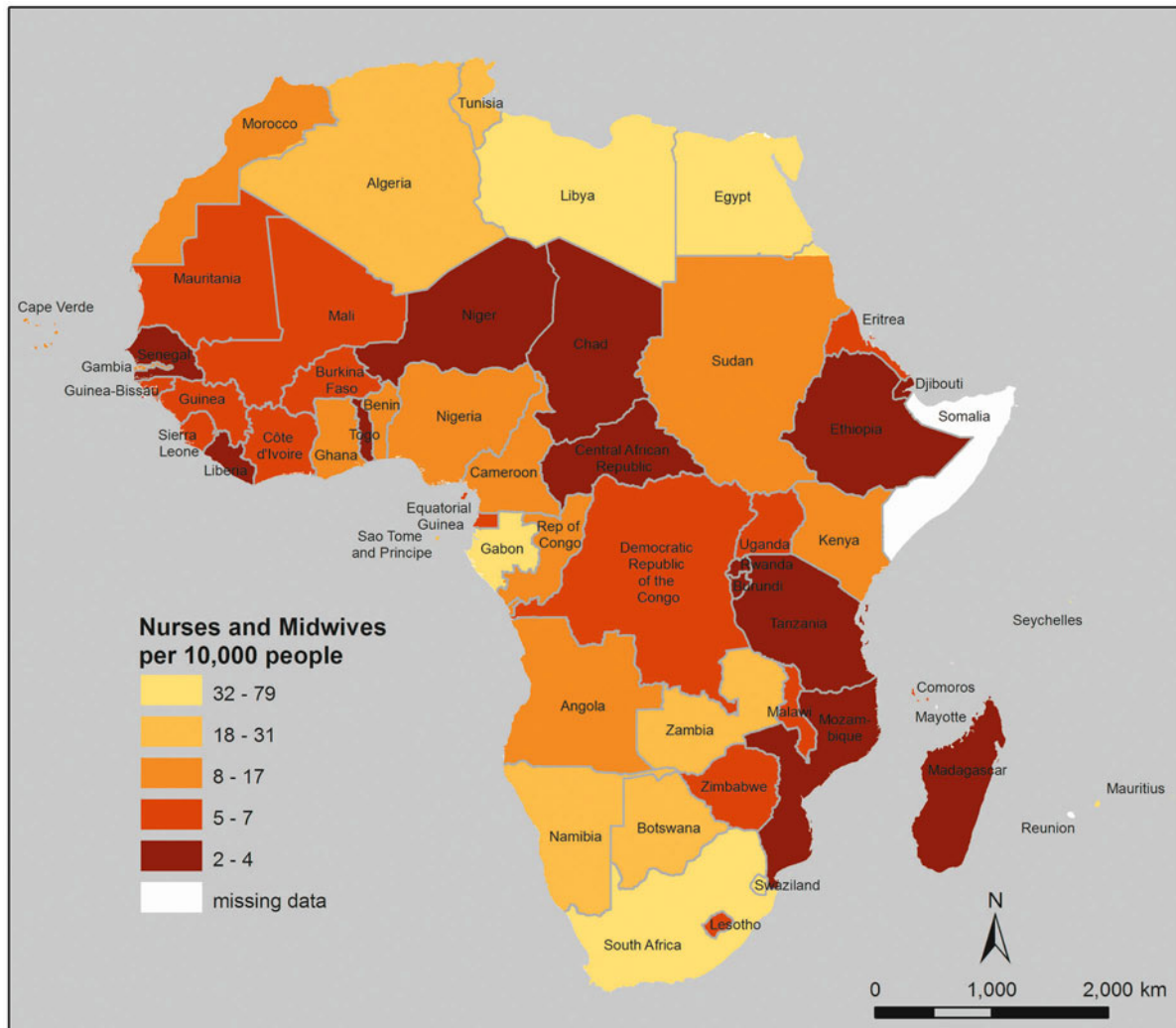


Figure 23.26: Government Effectiveness in Africa (2008). **Source:** World Bank Governance Indicators. This map was designed by Kaiba White (2011).

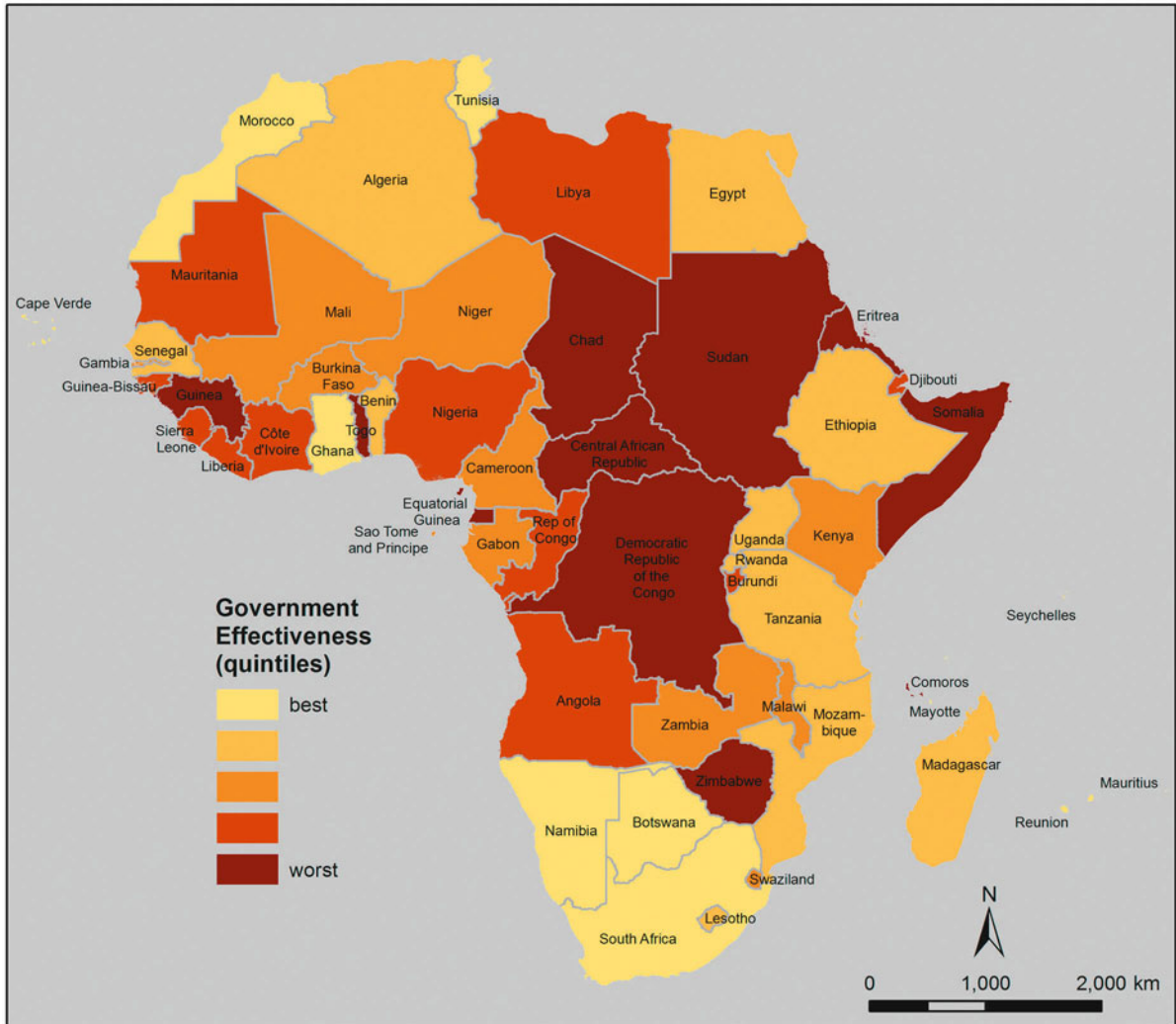


Figure 23.27: Voice and Accountability in Africa (2008). **Source:** World Bank Governance Indicators. This map was designed by Kaiba White (2011).

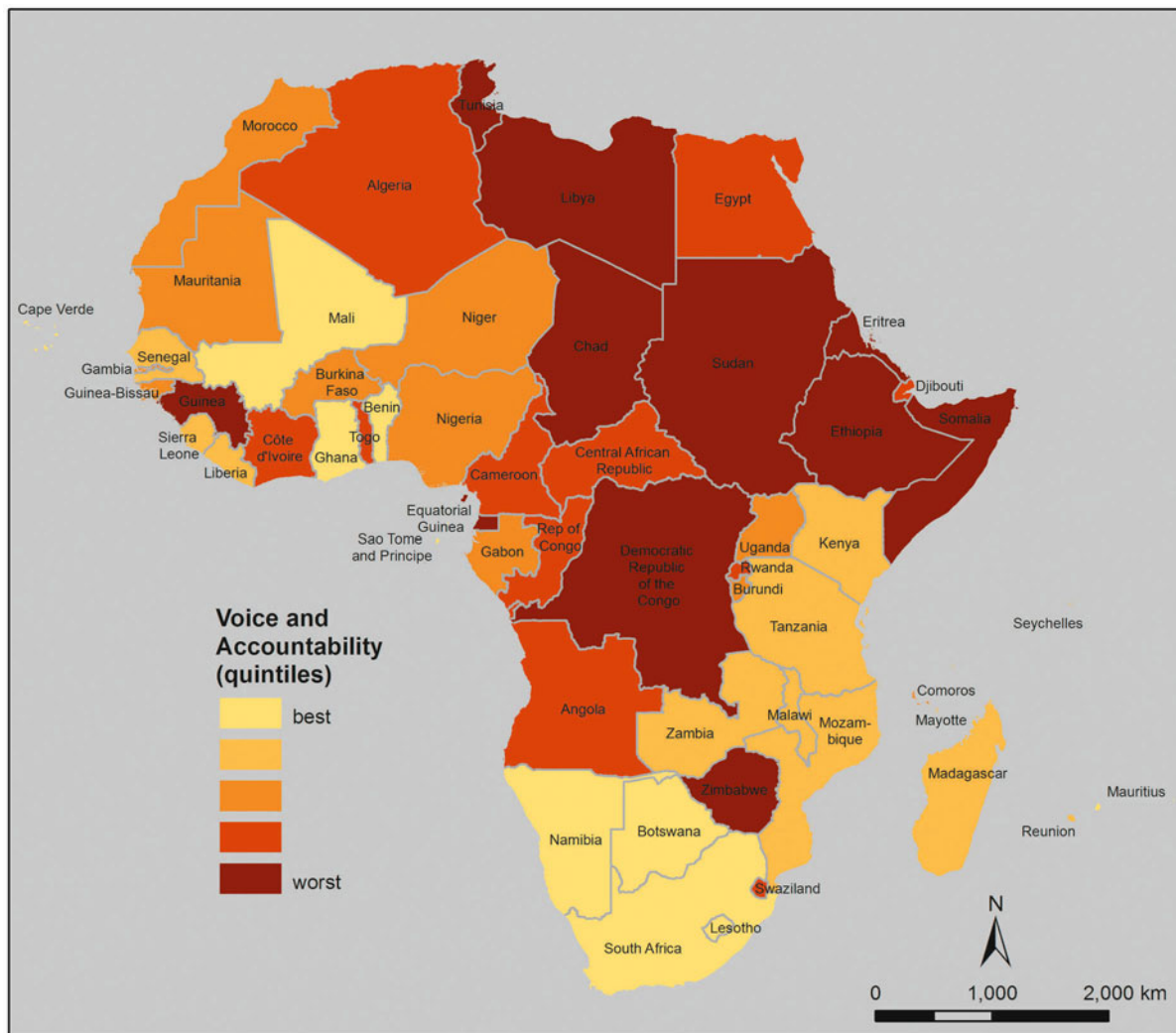


Figure 23.28: Government Stability in Africa (1999-2008). **Source:** Polity IV Project: Political Regime Characteristics and Transitions, 1800-2008. This map was designed by Kaiba White (2011).

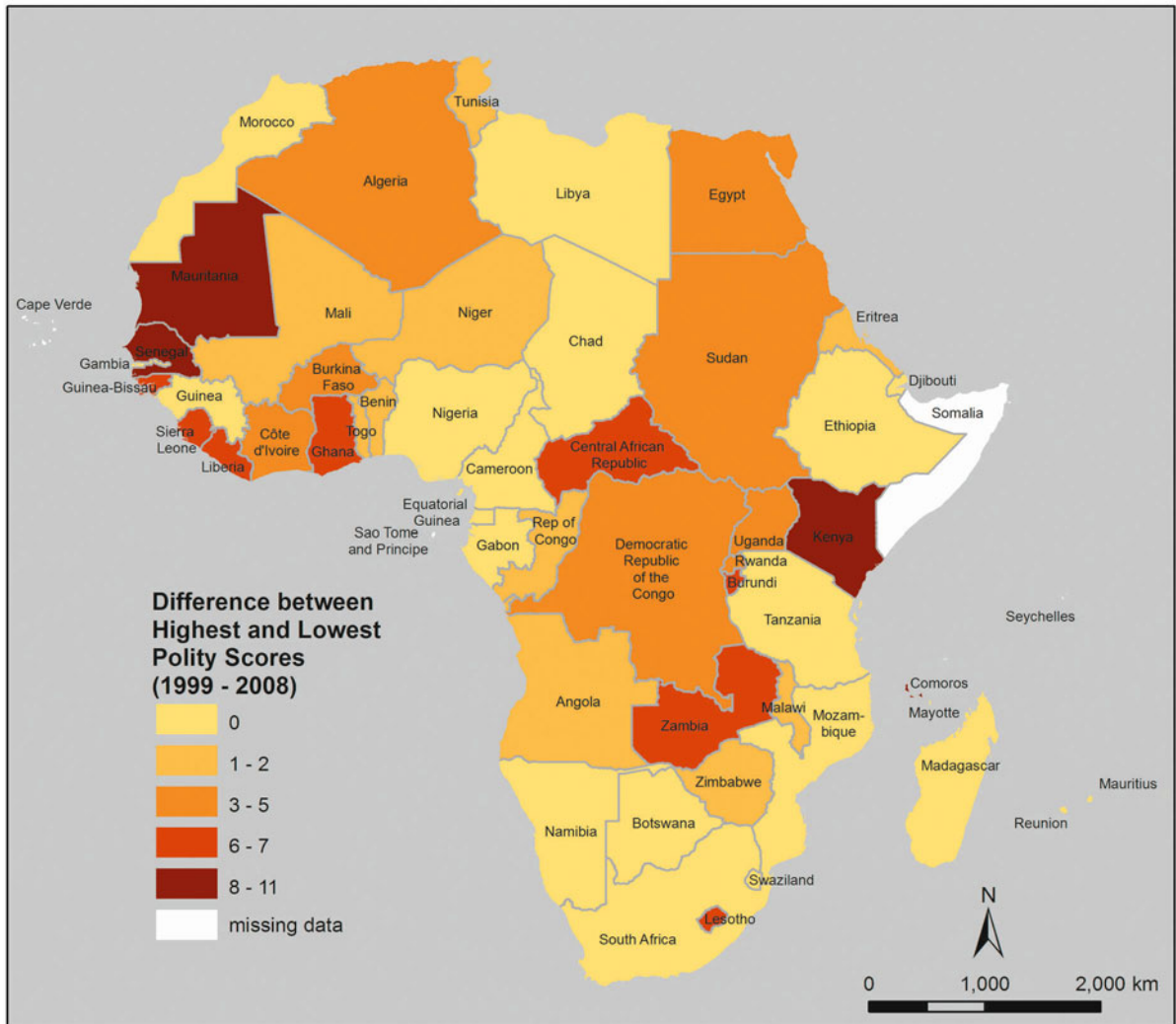


Figure 23.29: Years of Government Stability in African Countries. **Source:** Polity IV Project: Political Regime Characteristics and Transitions, 1950-2008. This map was designed by Kaiba White (2011).

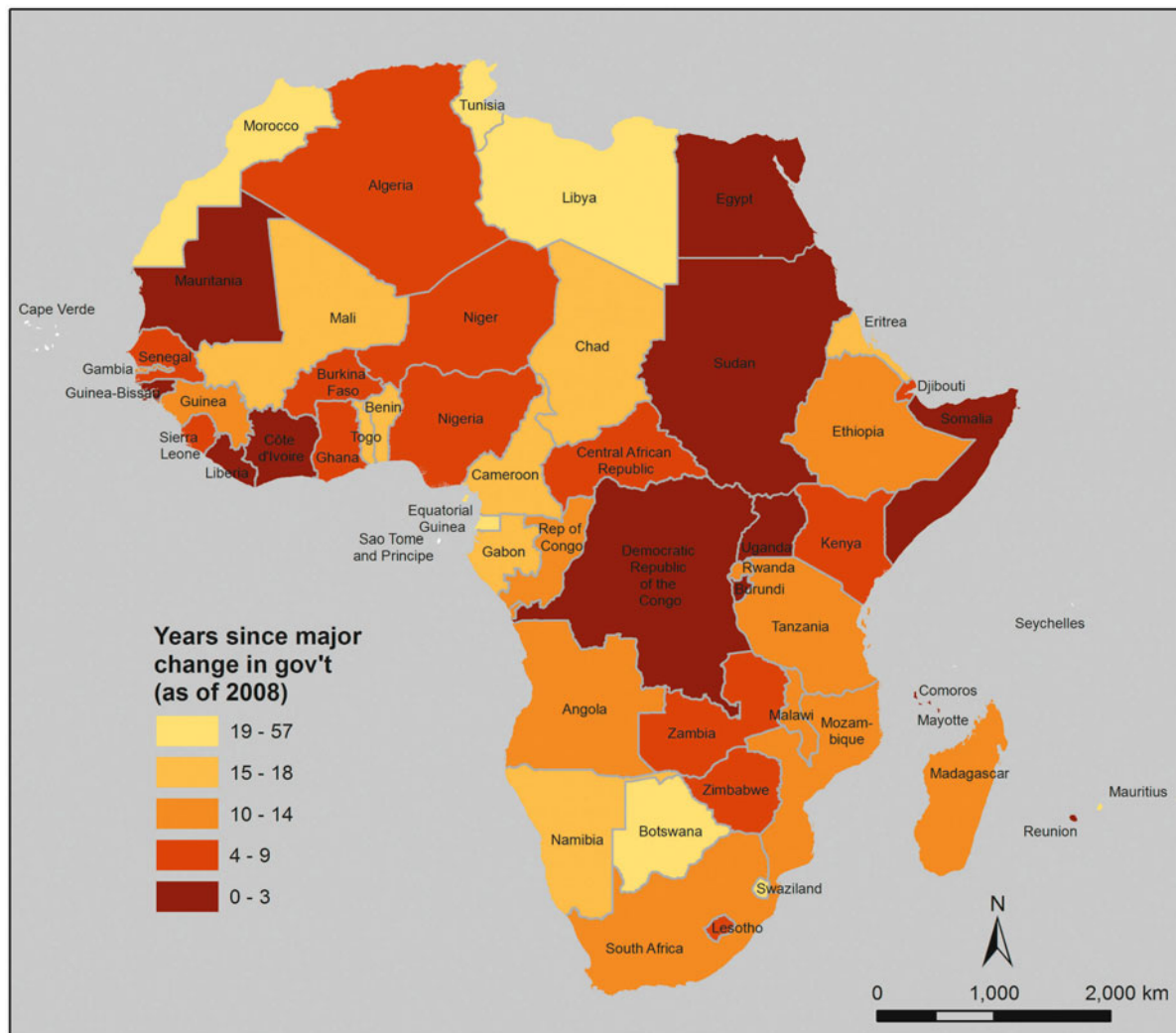


Figure 23.30: Globalization in Africa (2009). **Source:** KOF Index of Globalization. This map was designed by Kaiba White (2011).

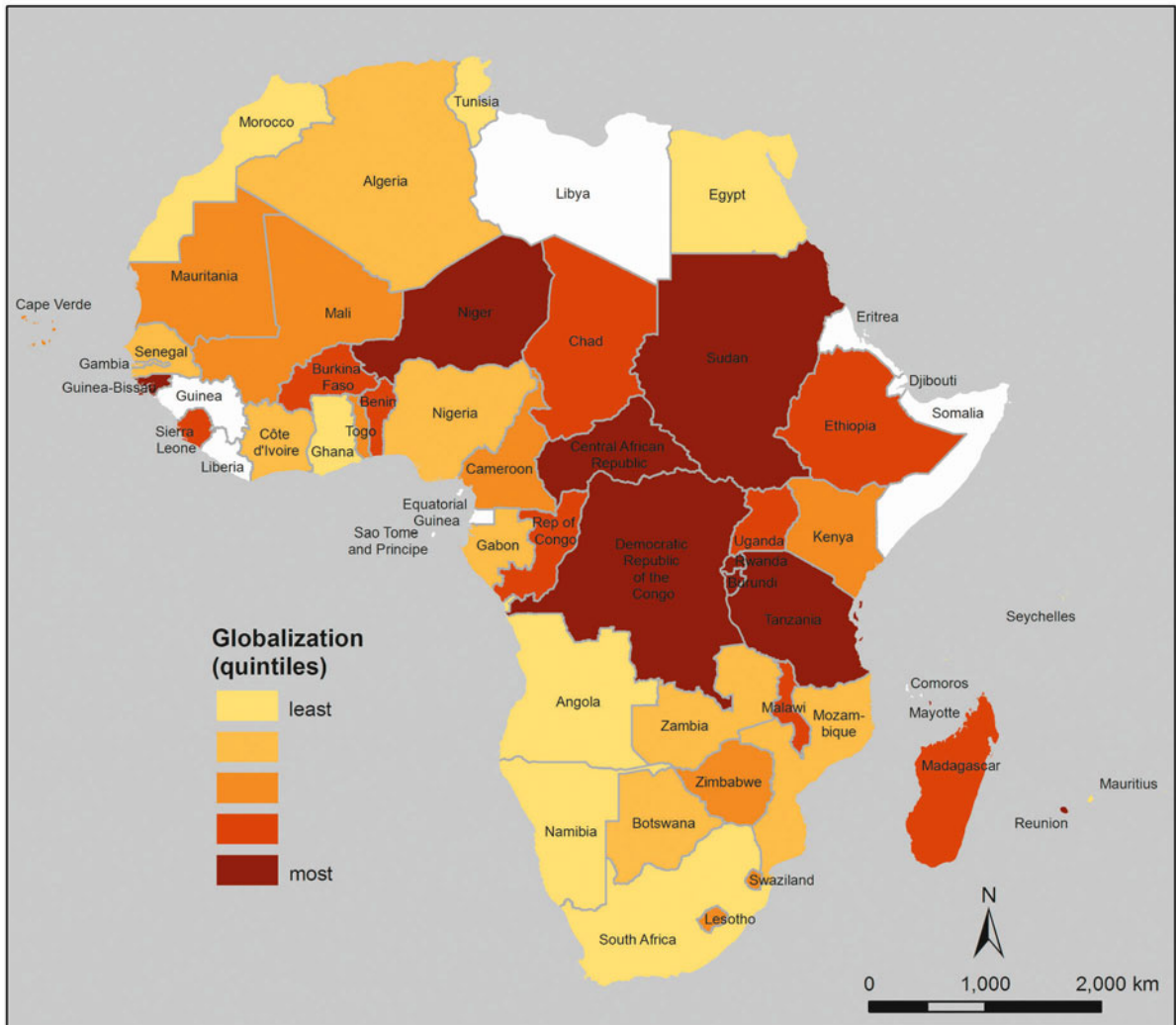
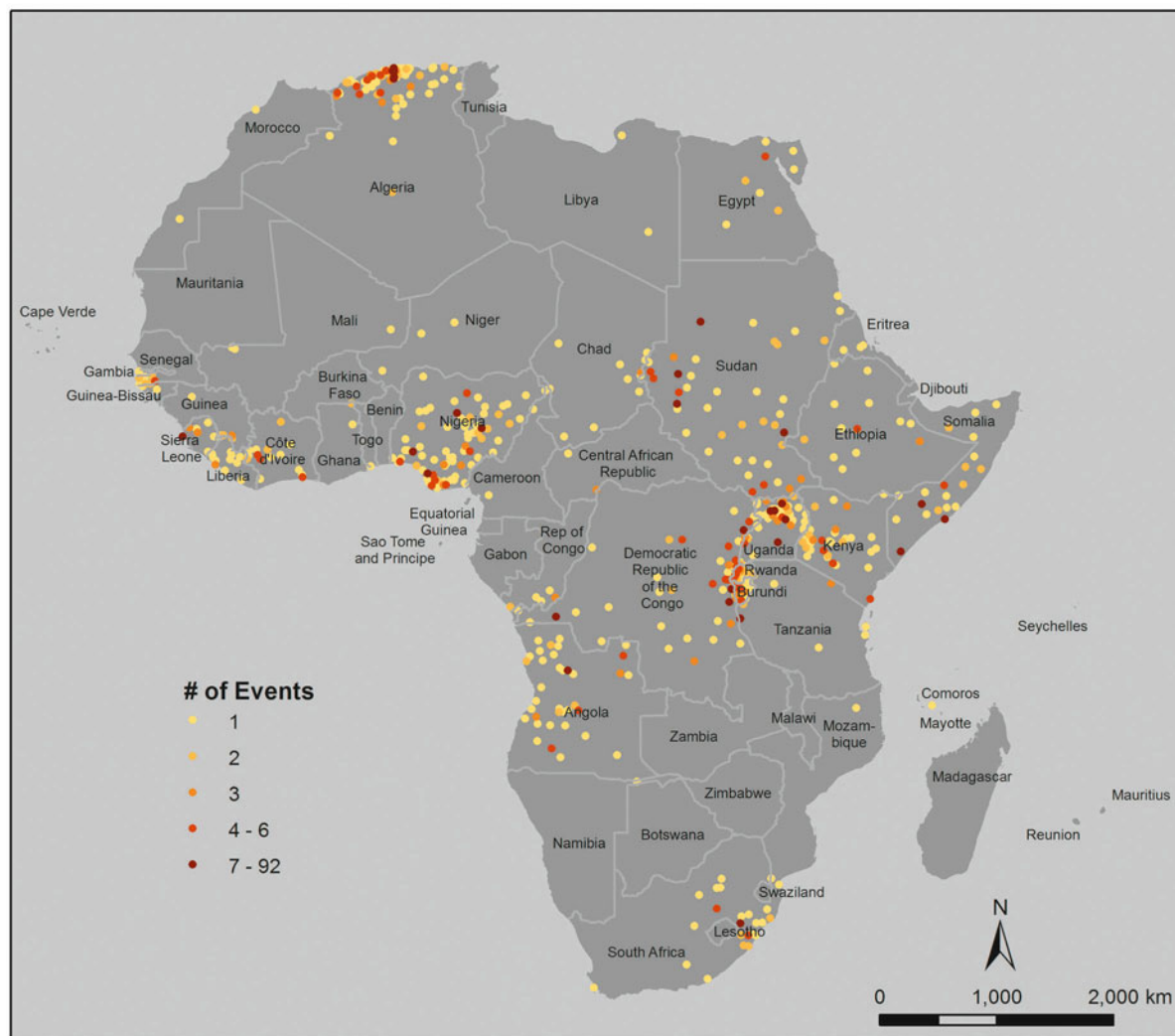


Figure 23.31: Politically Motivated Violent Events in Africa (1995-2008). **Source:** Political Instability Task Force Worldwide Atrocities Dataset. Note: All events resulted in the death of at least 5 non-combatants and were part of a larger political movement. This map was designed by Kaiba White (2011).



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24 Climate Change, Resource Competition, and Conflict amongst Pastoral Communities in Kenya

Beth Njeri Njiru

24.1 Introduction

This chapter tries to understand climate change, resource competition, and conflict amongst pastoral communities, and argues that violent conflict involving pastoralists is associated with resource competition which is, among other factors such as interstate and intercommunal tensions and political instabilities, aggravated by climate change. Conflicts among the pastoral communities have become very common and increasingly relentless in the northern region of Kenya. Specifically, the chapter documents the evidence of climate change in the pastoral areas in Kenya, determines the effects of climate change on pastoralist livelihoods in Kenya, and discusses the effects of climate change on resource-based conflicts among the pastoral communities of Kenya. Primary data was obtained from a total of 45 primary pastoralists, agro-pastoralists, and key informants. Four focus group discussions with ten participants each were conducted in Matuu. The interviews were conducted in order to find out how climate has changed and how this has affected pastoralism. Secondary data was utilized in literature analysis. These resources were obtained from Kenyatta University Library, University of Nairobi, and from the Internet. Primary data was qualitatively analysed. The main findings are that resource competition among the pastoralists is indeed exacerbating resource competition and consequential conflict.

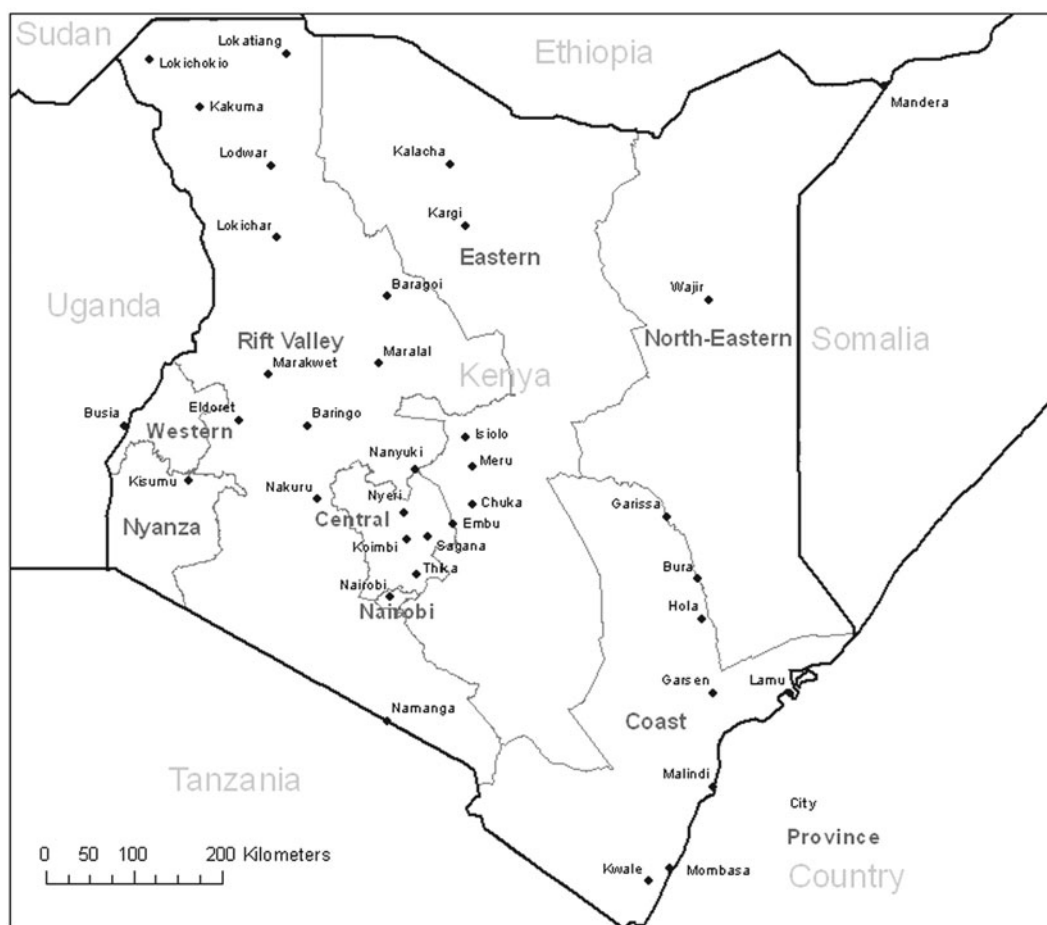
24.1.1 Background

Rising global temperatures are having adverse socio-economic effects in many parts of the world and especially in developing countries. The northern region of Kenya has been hit worst by continuous climate change. Prolonged droughts now characterize the region. This has led to widespread migration of the pastoral communities in search of pasture and water for

their animals and for human use. Traditionally, pastoral communities moved from one place to another in search of water and pasture. However, climate change and environmental degradation have exacerbated the situation, leading to resource competition. A basic consequence of climate change among the pastoral communities is widespread migration. These movements put pressure on the few available resources that have to be shared by two or more communities. As a result of these movements, there have been frequent violent conflicts, in many cases resulting in death, cattle rustling, social stress, disruptions of social settings, and most importantly economic setback in reaction to resource scarcity. Given this background, this chapter addresses the question of whether climate change has played a role in widespread migration and conflict among the pastoral communities in Kenya.

In Africa, about 40 per cent of land is dedicated to pastoralism (Griffin 2009). Drylands occupy 70 per cent of the Horn of Africa – ranging from 95 per cent in Somalia to more than 80 per cent in Kenya, 60 per cent of Uganda, and approximately half of Tanzania (Kandji 2006). These drylands are productive and, if irrigated, can support agriculture and hence contribute to national food security and economic growth. They already support livestock rearing, tourism, and wild resource harvesting. They play a critical role in ensuring national food sufficiency (Nori/Davies 2006). Pastoralism is practised in all the *arid and semi-arid lands* (ASALs) of Africa. High inter-annual rainfall variability, degraded ecosystems, and limited potential for arable farming are characteristics of ASALs. Under these conditions, pastoralism has evolved as the most feasible system of livelihood. Total annual rainfall correlates with annual net primary productivity, especially grass (Esilaba 2009; Oxfam 2008; Mwangi/Desanker 2007). In Kenya the ASALs constitute about 80 per cent of the country's total area. They support 25 per cent of the total human population and 50 per cent of the entire livestock

Figure 24.1: Map of Kenya showing the places mentioned in the text. **Source:** The map was designed by Janpeter Schilling who granted the permission to reproduce it here.



population in Kenya (Mwaniki/Mbuchi/Leleruk et al. 2007). Livestock accounts for 95 per cent of family income (Nori/Davis 2006).

There are several pastoral communities in Kenya. These include Masaai, Turkana, Samburu, Orma, Gabbra, Rendile, Borana, and Somali, among others (Kareithi 2003). The pastoral communities of Kenya depend on livestock (cattle, sheep, goats, donkeys, and camels) for their livelihood. They rely on access to water and pasture for the survival of their livestock. In the recent past, in January 1997, December 2000, December 2005, from late February to March 2010 and from November to March 2011 Kenya has experienced a prolonged drought. Kenya experienced torrential rains between January 2010 and early February 2010 and in May 2010. Meteorologists forecast that Kenya will be hit by the El Niño phenomenon, responsible for some of the most extreme weather conditions (Elisaba 2009). This study seeks to highlight the evidence of climate change in northern Kenya and

to document some of the key effects of climatic variability and change on the pastoral communities in Kenya.

24.1.2 Problem Statement

Pastoralists in Kenya are largely nomadic and depend almost exclusively on livestock for their livelihood. They rely primarily on rain-fed pasture and water for the survival of their livestock and for their domestic use. Pastoralists are travelling herdsmen who follow a seasonal migration pattern to find suitable land for their cattle to graze. This movement from one place to another in search of water and pasture is their story. Climate change has caused persistent drought in the arid and semi-arid lands, increasing the migration of the pastoral communities. The arrival of environmental migrants can burden the economic and resource base of the receiving area, promoting conflict between natives and emigrants over resources. Pres-

tures are expected to rise as the number of migrants and residents increases, particularly when resources are scarce in the receiving area and property rights are underdeveloped. The struggle for access to resources may also generate lateral pressure, expansion of economic and political activities beyond the region's or state's borders in order to acquire resources, increasing the risk of conflict (Reuveny 2007). These movements have now turned into displacement since the majority of the pastoralists are forced to leave their traditional area with little hope of going back to their point of origin. Due to increasing temperatures caused by climate change, it has become hard to predict and follow climatic seasons, unlike in the past when there was a clear sequence of weather patterns in the region. Asked what changes they have noted regarding climate change one of the respondents said

Since I was a child, the rains were plenty but around i.e from 1984 backwards the rains were a bit better, even though there used to be drought it was not a prolonged one. But from 1984, I started to see major climate changes, prolonged drought that has led to permanent migration to other regions (46 year old male respondent, pastoralist).

Since El Niño in 1997 the people have been confused because the rain is not predictable. There has been increasing dryness over the years and there are big children who have not seen maize plantation. Since then there has been no rainfall to enable maize to germinate and grow. I have also stayed for long without seeing maize plantation due to dryness. There has been drought and the grass became scarce and we had to drive our livestock like the Maasai people to far places (*looking for pasture*). Some of the livestock never made it back, some perished there. Then we had to buy grass which was not enough even for a single cow (female respondent agro-pastoralist).

Interviews conducted in Namanga (figure 24.1) indicate that nowadays pastoral movement has become increasingly difficult as rainfall patterns have changed. A respondent interviewed in Matuu on March 2011 stated that

These days there is a lot of heat. When I was young there used to be plenty of rainfall. But now people are confused. The rain does not fall as it used to. We used to know the time when it will rain, but these days it can rain even during harvesting time and it is confusing people. Once you plant, the rain goes and the seeds dry up. So the rain is confusing people.

Displacement has resulted in competition over the available resources, which must be shared amongst two or more communities with each community claiming ownership and user rights. In turn, pasture

and water resources become scarce and under increasing pressure, leading to resource competition and consequently to inter-ethnic conflict, intra-ethnic conflict, and international conflict, depending on where the pastoralists migrate to.

Climate change predictions point to a warmer world within the next 50 years. Levels of *greenhouse gases* (GHG) in the atmosphere are increasing, warming the earth's surface and the lower atmosphere (IPCC 2007a). According to the IPCC (2007a), between 75 and 250 million people in Africa are projected to be exposed to increased water stress due to climate change by 2020. In some countries, yields from rain-fed agriculture could be reduced by up to 50 per cent. Agricultural production and pastoralism, including access to food, is projected to be severely compromised in many African countries. This would further adversely affect food security and exacerbate malnutrition. By 2080, an increase of 5 to 8 per cent of arid and semi-arid land in Africa is projected under a range of climate scenarios. Kenya is a drought-prone country, primarily because of its peculiar eco-climatic conditions. Although dissected by the equator in its southern half, Kenya contains only a few pockets of high and regular rainfall (>2000 mm) per annum. Annual rainfall varies from 200 to 500 mm, and periodical droughts are part of the climate system (Kandji 2006). According to the IPCC (2007b), average global temperature has risen by about 0.1° C per decade since the 1950s, while winter snow cover has declined by 10 per cent, northern ice thickness has fallen by 40 per cent, the frequencies and intensities of droughts, storms, and warm periods has risen, glaciers have retreated, and sea level has risen by 20 cm. Scholars attribute these changes to increased carbon emissions from the burning of fossil fuel. Assuming business as usual, these problems are expected to intensify. Temperatures in Kenya have risen by 1° C over the past 50 years, and warming is expected to accelerate, with temperatures rising nearly 3° C by 2050. The prolonged and severe drought in Kenya in 2008 and 2009 is widely perceived to be symptomatic of the changing climate (Campbell/Dalrymple/Craig et al. 2009). As a result of the persistent drought in 2008 and 2009 many of these resources are never replenished and become extinct.

Climate has changed because when I was a young girl we used to fetch water using small jerrycans. At that time, there was plenty of rain. But nowadays, it is like we experience rainfall after every 5 years (a female respondent from Matuu, figure 24.1).

What I can say about climate changes as far as I can remember, climate changes started in 1952 when we experienced a lot of rainfall, there was plenty of food and water anywhere but around 1953 the weather changed and there was some drought. In 1962 there was some more rainfall. But from there rain used to reappear after 10 years or seven or eight years. It was obvious that the climate was changing. This continued until we had heavy rains referred to as El Niño, this was around 1997 to 1998. Then there was some drought once more and this continued slowly up to around 2009 to 2010. In the earlier times after heavy rainfall there used to be some springs not only near the rivers but also in the countryside. However, now even after heavy rainfall you cannot see those springs at all. So it seems that all the water which comes is of no help. Recently we experienced a very severe drought around 2008 to 2009 and we lost most of our livestock in this area (an elderly respondent from Matuu, Machakos district).

In many cases pastoralists have ended up in unfamiliar territory in search of pasture and water for their livestock, for example in bordering countries. Cattle rustling sets in as a way of restocking, worsening the resource-induced conflict. Research by Kumssa, Jones, and Williams (2009) has shown that cattle rustling in Kenya has evolved from a traditional practice to an avaricious life-threatening activity in several pastoral communities (Mkutu 2006, 2008). Pastoralist communities are largely nomadic and live primarily in arid or semi-arid areas and depend on livestock (cattle, sheep, goats, and camels) for their livelihoods. Over the years pastoralist conflicts have become more frequent and unpredictable, exhibiting a marked escalation in violence and geographical distribution (Witsenburg/Adano 2009). At the heart of the climate change-conflict relationship is the issue of natural resource scarcity and competition. This is not a simple one-way connection: climate change is one of several factors causing natural resource scarcity; while natural resource scarcity is one of a range of factors causing conflict. Climate change is often referred to as a 'threat multiplier' – a factor that will compound other drivers of conflict (Campbell/Dalrymple/Craig et al. 2009). One of the root causes of conflicts in the pastoral areas is principally competition for shrinking pasture and water resources. Such conflicts revolve around livestock and involve the use of arms (Witsenburg/Adano 2009).

24.1.3 Study Objectives

The main objective of this chapter is to discuss the effects of climate change on resource competition and

conflict amongst pastoral communities of Kenya. The chapter seeks to:

- document the evidence of climate change in the pastoral areas in Kenya,
- determine the effects of climate change on pastoralist livelihoods in Kenya, and
- discuss the effects of climate change on resource-based conflicts among the pastoral communities of Kenya.

24.1.4 Conceptual Framework

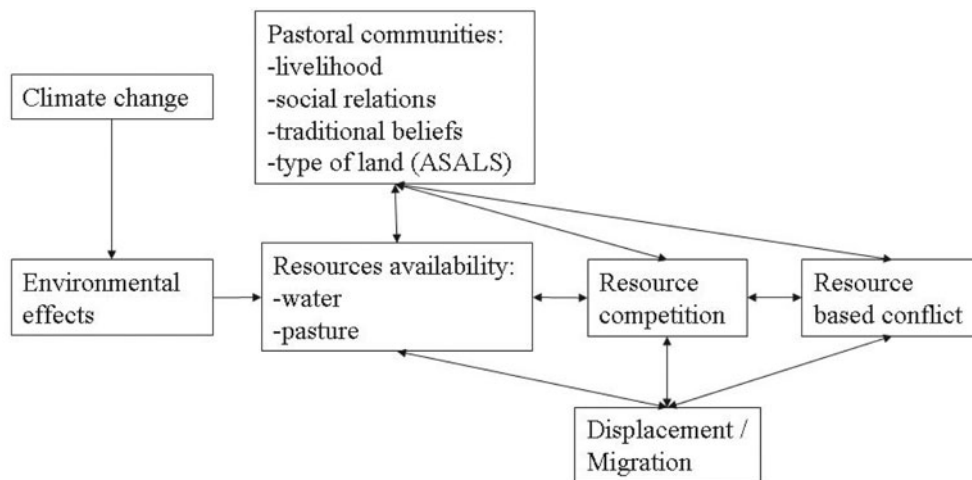
Figure 24.2 presents a theoretical framework for analysing the relationship between climate change, resource competition, and conflict. Linkages can be observed between climate change and productive activities (livestock, water, pasture). The environmental effects such as drought are taken to be a result of climate change. Environmental effects may lead to displacement, whereby pastoralists will be moving in search of pasture and water. In addition, environmental effects will also lead to competition for resources since the available resources are scarce and under increasing pressure because many communities are accessing the same resources which get depleted (Reuveny 2007). In turn this will lead to resource-based conflict. Unequal resource access can combine with displacement leading to conflict.

Displacement can occur because of three causes; pastoralists can move due to a) environmental effects and b) as a result of resource competition and conflict, since some pastoralists would want to move to a place with adequate pasture and water resources that is occupied by another pastoralist community. Traditional beliefs and social relations can also lead to resource competition since every community wants to claim ownership of the available resources leading to conflict. Traditional beliefs can also lead to conflict directly due to cattle rustling whereby each community would want to own large numbers of animals, which to them is a sign of wealth. From this perspective, climate change is seen as the driving force towards resource competition and consequently resource-based conflict.

24.2 Methodology

The data was collected from primary and secondary sources. Primary data were collected from the pastoralists and key informants from the Namanga location of Kajiado County in an arid area occupied by pasto-

Figure 24.2: Conceptual framework relating to climate change, resource competition, and conflict among the pastoral communities. **Source:** Adopted from Obioha (2005).



ralists and in the Matuu location of the Machakos district which is a semi-arid area where both pastoralism and farming are practised. Qualitative data were collected from both regions using focus group discussions and in-depth interviews with the pastoralists and key informants.

24.2.1 Interviews

Primary data were obtained from a total of 45 primary pastoralists, agro-pastoralists and key informants. Four focus group discussions with ten participants each were conducted in Matuu. The interviews were carried out in order to find out how climate has changed and how this has affected pastoralism and farming. Two key informants and three pastoralists were interviewed in Namanga, Kajiado County.

24.2.2 Review of Published and Unpublished Studies

Secondary data was utilized in literature analysis. These resources were obtained from Kenyatta University Library, University of Nairobi, and others from the Internet.

24.3 Results

24.3.1 Evidence of Climate Change in the Pastoral Areas of Kenya and East Africa

Communities in the developing world are already suffering as a result of the changing climate, pushing

poor people even deeper into poverty (Griffin 2009). The recurrence of droughts in East Africa is a natural calamity that is delivering a serious blow to the region. Scientists blame the massive clearance of forests as well as the emission of GHG into the atmosphere as a cause of the droughts (Wamatsi 2009). The crisis situation that is prevailing in northern Kenya suggests that these communities are now faced with a new set of challenges beyond what they can cope with. Primarily, droughts are becoming more frequent, giving victims no time to recover (Kandji 2006).

The earth is warming and the greenhouse gases emitted from industries, transportation, power plants, agricultural activities, and other human-made sources are the primary cause of climate change (IPCC 2007b). Carbon dioxide and other GHG have always been present in the atmosphere, making life possible on the earth by trapping the heat. Yet since the industrial revolution, emissions of these GHG from human activity have accumulated steadily, trapping more heat and exacerbating the natural greenhouse effect. As a result, global average temperatures have risen both on land and in the oceans, with observable impacts already occurring. Kenya is already witnessing the disappearance of the glaciers on Mount Kenya (MEMR 2009). It is further stated that the disappearance of the glaciers will affect agricultural activities and availability of water for both animal and human use (MEMR 2009). The arid and semi-arid lands of northern and eastern Kenya are predominantly inhabited by pastoralists who suffer from more or less persistent inter-ethnic violence (Theisen 2004). Kenya is extremely vulnerable to climate change as its economy relies heavily on sectors vulnerable to climate (MEMR

Figure 24.3: Upper part of the Tana River. **Source:** Photograph taken by the author.



2009). Climate change is happening (European Commission 2010; MEMR 2009) and it is caused in a large measure by human activity. It has many serious and damaging effects and many of the vulnerable countries and communities on the African continent will have their lives, already very difficult, made impossible (MEMR 2009), for example the pastoral communities of Kenya. Climate change represents one of the greatest environmental, social, and economic threats facing the planet (European Commission 2010). Scientists warn that Africa will be hit hard by global warming, with the IPCC projecting a temperature rise of up to 2° to 4° C by the 2080s (Wallis 2008). The rivers are drying up and vegetation is disappearing at an alarming rate. The drought is severe in Kenyan pastoral community areas. [Figure 24.3](#) shows the low water level of the upper Tana River which is used for irrigation and to generate electricity by the Seven Forks dam.

24.3.2 Effects of Climate Change on Pastoralists' Livelihood

The term pastoralist refers to people whose way of life largely depends on mobile livestock herding. Pastoralists live in *arid and semi-arid lands* (ASALs) where their livelihoods and culture are based on extensive livestock production. Pastoral communities generate most of their income from livestock rearing and therefore rely on the natural resources (water and pasture) available to them. Hence, climate change poses a significant challenge even for the most experienced and knowledgeable herdsmen. Livestock, the most important part of production, is volatile, and pastoralists live in perpetual threat of destitution from not only natural hazards, but also livestock raids (Kareithi 2003; Mkutu 2008). A small decrease in rainfall can be fatal for animals if sparse watering holes go dry.

There have been challenges in Namanga due to climate change. There has been water scarcity for over 20 years. Grass is disappearing. Before, we used to feed our animals at nearby places but these days we travel to as far

as Nyeri (central Kenya) in search of pasture and water (an elderly Masaai pastoralist from Namanga).

The plight of the nomadic herdsman is particularly apparent in East Africa. In Ethiopia major droughts are crippling herdsman who used to be able to adapt to changing conditions. They are not able to keep up with the pace of contemporary climate change (Stonehill 2008). There has been an increase in the rate of dryness and heat that has led to displacement of the pastoral communities in search of fodder and water for their animals and for their own use (Republic of Kenya 2003). Overall, the projected impacts of unmitigated climate change in Kenya are likely to have significant impacts on human livelihoods, health, water resources, agricultural production, and food security (MEMR 2009). Most herders are armed against predators and would sooner clash with other groups to get access to water than stand by and watch their animals die (Stonehill 2008).

For pastoralists, their cattle play an ambiguous role. On the one hand, they make up their livelihood and mean wealth to them. On the other, their cattle is a constant target for raiders and hence a source of insecurity. Despite this ambiguity, pastoralists have not stopped their traditional practice of cattle rearing (Macharia 2009). In the recent past, climate change has had very negative and severe impacts on the pastoral communities (Mwangi/Desanker 2006). Pastoralists are being displaced. They lose their traditional livelihoods as climate change contributes to the destruction of their rangelands. It is important to realize that the damage caused by climate change is not a distant concern in Kenya – it is here now and will be the future (Wamatsi 2009).

24.3.2.1 Pasture and Water

Traditionally pastoralists have been able to cope with their mobile way of life, depending on the seasons. As a result of climate change, new weather patterns and prolonged drought have emerged (Kareithi 2003), and pastoralists are now struggling with frequent water shortages that are threatening their livelihoods. The lack of rain has had serious implications for both people and animals. The Masaai people have to share the land with all kinds of wildlife. And when water is short in supply, incidents of conflict arise. According to one of the participants in Namanga, there have been incidences of conflict between humans and wildlife, especially with elephants that come to residential areas in search of water. These elephants destroy whatever they come across and threaten the lives of the pastoralists. As traditional cattle herders, the Maa-

sai have found themselves leaving their homes for months at a time in search of pastures and water for their animals. In most cases this means vulnerable women, children, and the elderly are left behind to fend for themselves in the villages (Wamatsi 2009).

With the loss of fodder and water sources due to climate change, pastoralists are being forced to move to towns. Good examples are the Masaai of Kajiado who migrate to Nairobi. According to one pastoralist who was interviewed in Namanga, many pastoralists, especially young men, are abandoning pastoralism. They look for formal employment. Many now work as watchmen in the city of Nairobi and in other towns. Nevertheless, these are indicators that the situation in their homelands is worsening due to multifaceted challenges such as climate change, political marginalization, and intercommunal dispute (Tiampati 2007). Some pastoralists have been forced to abandon livestock rearing altogether and have migrated to towns in search of other jobs which create problems in the receiving area. In Matuu, one of the respondents stated that “the other thing is that we as young men, we decorate calabashes and we sell them to tourists. If you may go to the market you will find men decorating them [calabashes] to sustain their lives”. Other pastoralists have now started growing crops which are often failing due to a lack of rainfall.

Water is the new oil, particularly in Kenya (Stonehill 2008). Women especially face the challenge of fetching the scarce water for household and animal use. In some cases, they are forced to walk for over ten kilometres in search of water. When drought worsens and springs dry up, some women and girls are forced to return home empty-handed (Wamatsi 2009).

24.3.2.2 Livestock

In Kenya, over 75 per cent of the cattle herd is made up of indigenous breeds, which traditionally kept pastoralists in the dry lands (Magda/Anderson/Hesse 2007). Drought has also taken its toll of the livestock. In Samburu district many cows have died and the ones that survived could no longer resist the drought. According to a respondent in Matuu, milk from cows has become scarce as many cows have died during the drought of 2009 and 2010. Instead they used milk from goats, which are more drought-resistant. According to Brendan Cox (cited by Bakano 2006), 70 per cent of cattle had already died in Wajir district since the drought began.

The devastating drought sweeping across Kenya is causing widespread hunger, thirst, and, in the case of

cattle, death. Aware that the drought was likely to cause pastoralists to lose significant parts of their herds, the government of Kenya announced a plan amounting to 500 m Kenyan shillings (6 million US\$) to buy weak animals from farmers for 8,000 Kenyan shillings (95 US\$) each. The plan provided for the animals to be transported by truck to the Kenya Meat Commission Depot in Athi River, a town near Nairobi, where they would be held, fed, and slaughtered, with the meat sold to cover the costs. But many of the trucks transporting the cows for hundreds of miles from the north-eastern province had insufficient water and food on board, causing large numbers of animals to die on the way. Of those that arrived alive, many soon died due to a lack of pasture in the holding area (Rice 2009).

24.3.2.3 Drought

Natural disasters such as prolonged droughts are one cause of the breakdown in the balance maintained in resource use among the pastoral communities. In this case, the number of animals are reduced either through sale in exchange for food, or because they die due to the effects of the drought (Kareithi 2003). Drought is the most injurious impact of climate change that decimates lives and hinders socio-economic development in most of the rangelands of Kenya. Several studies indicate that climate change will increase the frequency and intensity of droughts (Mwangi/Desanker 2006). The prolonged dryness with high temperatures that lead to complete drying up of pasture and to water scarcity, This drought has forced pastoral people to leave their homes in search of water and food for their animals.

At the heart of the climate change-conflict relationship is the issue of natural resource scarcity and competition. This is not a simple one-way connection: climate change is one of several factors causing natural resource scarcity; while natural resource scarcity is one of a range of factors causing conflict. Climate change is often referred to as a 'threat multiplier' – a factor that will compound other drivers of conflict (Campbell/Dalrymple/ Craig 2009). Drought triggers catastrophic events that diminish the adaptive capacity of inhabitants of these ASALs. Climate change is projected to intensify the occurrence, severity and duration of droughts (Mwangi/Densaker 2007).

Thousands of environmental migrants flee from drought, which results in pasture and water shortages for livestock (IRIN 2009). Clashes over water and pasture have increased in drought-affected pastoralist areas in northern Kenya (Opala 2006). Around 150,000

people already rely on food aid in parts of north-eastern Kenya (Mung'ou 2009). In the north of Kenya, where drought has remained severe, conflict over access to grazing land and water has erupted among pastoralists from different tribes. Pastoral communities have become the victims of the worst drought in the history of pastoralism in Kenya (Campbell/Dalrymple/Craig 2009).

24.3.2.4 Migration

Environmental migration between communities and between states in the affected areas such as Kenya and Ethiopia could strain already fragile relations between states. Seeking access to water and pastures, the pastoralists follow their cattle beyond the borders of Kenya. They cross and re-cross international borders to and from Somalia, Ethiopia, Sudan, and Uganda, resulting in international conflict over water and pasture (Gareth 2008; Meier 2011). Resource competition in a fragile economy has had significant consequences for the economic security of families and internally displaced people (Kumssa/Jones/Williams 2009; Mwaniki/Mbuchi/Leleruk et al. 2007). Social consequences of environmentally-induced migration, soil degradation, droughts, floods, and other natural disasters, as well as more slow-moving processes such as decreased land productivity due to population pressure, can set in action social processes that again can lead to armed conflict (Homer-Dixon 1999).

Three underlying movements can be observed in pastoral communities of Kenya, namely: movement from one pastoral community to another, movement from a pastoral community to a farming community, and movement from a pastoral community to a neighbouring country. The prospective effect of this migration is inter-ethnic conflict, intra-ethnic conflict, and international conflict (cross-border conflicts). As a result of this movement, there have been frequent violent conflicts which in many cases result in displacement, death, cattle rustling, social stress, disruptions of social settings, and, most importantly, economic setback in reaction to resource scarcity (Mwaniki/Mbuchi/Leleruk et al. 2007).

24.3.2.5 Displacement

In 2003 cattle rustling and banditry activities in Kerio valley and in areas bordering the West Pokot and Baringo districts displaced 32,000 people, accounting for 23 per cent of the total population of the Marakwet district. These statistics reveal that the Marakwet district has been hit hardest by conflicts in the region. A

total of 164,457 people have been displaced by conflicts in the northern districts of Kenya (Pkalya/Adan/Masinde 2003). Among the displaced, 70 per cent or 105,500 of the displaced are women and children aged below 14 years. The Turkana district had the highest number of displaced persons. The figure for 2006 stands at 41,097 people. Most of the displaced are from Kakuma and Lokichogio. Wajir comes second with a total of 32,914 against the districts' population of 270,700 people according to the 1999 census. In the West Pokot district, 30,361 people have been displaced. Most of the displaced come from areas bordering Turkana, Marakwet, and Uganda (Karamojang districts). The Alale division that borders the Turkana district and Uganda has 11,871 displaced people. The Samburu district comes second after Marakwet in terms of the percentage of the population displaced. Cattle rustling in the district has displaced 17 per cent of its population or 23,707 people. However, most of the displaced are Turkana from Baragoi and Nyiro divisions. It is hard to quantify the number of the displaced Samburu since most of them seek refuge in the pastoralists' temporary homes (Manyattas) of their relatives, unlike the Turkana who move to urban centres (Pkalya/Adan/Masinde 2003).

Conflict leads to losses of human life, property, displacement of large segments of the communities, disruption of socio-economic activities and livelihoods, and increased hatred between communities. Environmental degradation and threats to water catchments areas have increased economic hardship as a result of the loss of livelihoods. The relative prices of commodities in pastoralist areas are affected. "We used to take a sheep or a cow to the market to see it so that you can buy food. When we have drought and you take your cow to market, it will end up dying there" states a respondent from Matuu. In many cases pastoralists have been forced to switch to a breed of animals that consumes less. "We have changed because earlier we used to rear any breed and used to do well. But these days as the climate has changed you have to look for a cow that consumes little" states a female respondent. This comes with a cost. There are high levels of starvation and malnutrition among the displaced groups. Most depend on food. Severe inter-ethnic armed conflicts further aggravate the food security situation in northern Kenya (Practical Action 2006).

24.3.3 Effects of Climate Change on Resource-based Conflicts and on the Pastoral Communities

24.3.3.1 Resource-based Conflict

At the most basic level, human beings depend on the natural environment for their survival (Johnston 2008). It is the sole provider of the most basic of human needs: food, water, and shelter. Climate change resulting in changes to the environment will affect our ability to meet these needs. Conflict as a result of climate change is likely to emerge if the carrying capacity of the land is overstretched (Griffin 2009). Violent conflicts have had very negative and severe impacts on the communities that are involved in these (Practical Action 2006). A study carried out in Samburu found that the major causes of conflict are competition for scarce resources, cattle rustling, and poverty, among others (Pkalya/Adan/Masinde 2003).

Competition over water and pasture resources does not always lead to conflict. However, the scarcity of these resources can contribute to conflict. Conflict will only occur if the host area is unable to deal with the migrants. The most empirical consequence of climate change among the pastoral communities is migration. Failure of the host area to cope with the migrants can lead to conflict, for example within a community such as the Maasai, between different communities such as the Samburu and the Boran, and between states such as Kenya and Ethiopia. Migration puts pressure on the few available resources that have to be shared by two or more communities. The migrants have altered resource use, land distribution, and security in the host areas, leading to serious civil unrest (Practical Action 2006).

Climate impacts are generating wholly new tensions, or intensifying existing societal fault lines and operating as a 'threat multiplier' in already fragile regions. Increased climate variability in the form of drought and flooding can produce economic shocks among the pastoral communities (Gareth 2008). The northern region of Kenya is mostly semi-arid and receives sporadic rainfall, making the region prone to flooding during the rainy season (Campbell/Dalrymple/Craig et al. 2009). In November 2006, for example, flooding occurred in this region making 3,000 people homeless, and in January 2010 there was flooding in the region around Lake Turkana, leaving more than 30,000 homeless (Practical Action 2006).

Many herders lost their livelihoods after much of their livestock drowned in the flood. Floods worsened the fragile situation of the pastoralists. Just as

flooding, drought also leads to the death of livestock. Livestock is the means of livelihood for the pastoralists, so loss of their livestock leads to social unrest through banditry as they try to acquire livestock through theft from other pastoralists. Once they lose their livestock they are likely to migrate to safer areas where they start rearing animals all over again. This may lead to competition for resources (water and pasture), social unrest, and violent conflict in the host area.

Climate impacts also interact with social processes such as the coming of age of young men. As young men proceed through the age set system and become junior elders, they seek land rights (Campbell/Dalrymple/Craig et al. 2009). This is because every male member graduating to adulthood needs to have his extended (polygamous) family and an increasing number of livestock (cattle, goats, sheep, donkeys, and camels) to support his family and also as a sign of wealth. This partly leads to unsustainably large populations of livestock which in turn overstretch the available pasture and water resources. Internal environmental migration is the result.

Northern Kenya in particular not only experiences internal environmental migrants but also external environmental migrants from Ethiopia, Sudan, Uganda, and Somalia (Opala 2006). Some of these migrants are close or distant relatives of some of the pastoralists' families in the northern part of Kenya. They may be viewed as unwanted visitors who come to compete for the scarce pasture and water resources, leading to violent conflicts between and among clans of the same pastoralist communities. As water resources become diminished, some herders abandon their dry boreholes and encroach into their neighbour's territory (Opala 2006).

Insecurity which in many cases is politically instigated in the neighbouring countries has resulted in external migration into pastoral areas. Most of these refugees migrate without any source of income and once they get to Kenya they become pastoralists, hence increasing the demand for water and pasture. This has also caused increased competition for the scarce pasture and water resources (Opala 2006).

Given the fact that animal rearing is the main source of income, competition over and access to natural resources such as water and pasture have contributed to violence among the pastoral communities. These scarce resources are increasingly under pressure (Kumssa/Jones/Williams 2009). The crisis situation that prevails in northern Kenya suggests that these communities are now faced with a new set of challenges beyond what they can cope with (Kandji 2006).

In Kenya resource-based conflicts date back to pre-colonial periods. Conflicts over resources have been going on over a long period with little if any attention given to them (Campbell/Dalrymple/Craig et al. 2009). According to Elisaba (2009) these conflicts cannot go unnoticed because they are accompanied by large-scale killings and cattle rustling among the pastoral communities. Northern Kenya in general and the pastoralist lifestyle in particular is often associated with violent conflict. Disputes over pasture and water access between pastoralists and farmers have led to increasingly violent clashes, while cattle-raiding between pastoralist groups has devastated communities which have become trapped in cycles of violence and counter-violence (Campbell/Dalrymple/Craig et al. 2009). This has been escalated by prolonged droughts that are becoming more frequent, giving victims no time to recover (Kanji 2006).

This has often interrupted their normal production and has led to cattle raids and diseases of livestock (Elisaba 2009). Kenya has experienced both internal conflict, cross-border conflict, and the effects of conflicts occurring in neighbouring states (Gufu 2009). The violence forms part of an active conflict subsystem and cycle that traces its roots to not only the marginalization of these communities but also the consequences of climate change (Mortimore 2008). The prevalent form of violent conflict among pastoralist groups is cattle-raiding linked to resources (since it is generally a means of restocking herds after periods of drought), but it is also closely tied to the pastoralists' identity and cultural practices (Campbell/Dalrymple/Craig et al. 2009).

Competition for natural resources brought about by climate change is considered to be directly related to conflicts (IRIN 2009) over access to water and pasture. Pastoral communities compete for resources, and this often results in violent conflict. There are several consequences of violent conflicts which negatively impact on the pastoralists (Button 2006). Dozens of people have been involved in clashes over water in Mandera since September 2008. There have also been conflicts between communities such as Orma and Wardei (in the Tana River area) in which about five people died (IRIN 2009). In January 2009, for example, at least 15 people died in fighting between Somali and Samburu pastoralists in the Oldonyiro and Isiolo central division, according to the Isiolo district peace and reconciliation committee. In total, 40 people have died in the three districts (IRIN 2009). On 12 July 2005, Borana and Gabra pastoralists clashed in Marsabit, leaving 56 people, including 22 primary

schoolchildren, dead at a place called Turbi. Area members of parliament and administrators died in a plane crash as they went to help restore order (Opala 2006; Pkalya/Adan/Masinde 2003).

Conflicts lead to low household production and poor resource mobilization (Elisaba 2009). There is increased competition for grazing spaces with reported incidents of herdsmen roaming into restricted national parkland. Between Sudan, Kenya, and Uganda, there is the additional problem of pastoralist conflict between tribal groups, exacerbated by economic and political marginalization and increased access to small arms (Griffins 2009). Revenge attacks and cattle rustling are additional factors.

The conflicts have increased with the adversity of drought. Dozens of people have died in clashes over water in Mandera since September 2008 (Mung'ou 2008). The recorded 15 deaths in January have increased every month to 19 deaths in February, 13 in March, 30 in June, 41 in July, and 51 in August (IRIN 2009). The UN has claimed that the quest for water and pasture aggravated by the proliferation of small arms is escalating conflicts in West Pokot and Turkana (Menya 2009).

Climate change also plays a crucial role in inter-ethnic conflicts among the pastoralist communities in northern Kenya (IRIN 2009). On 15 September 2009, at least 30 people were massacred in a confrontation between the Pokot and Samburu in the northern district of Maralal. Several other people including children were seriously wounded and hospitalized (ICN 2009). Inter-ethnic conflict is the most common type of conflict between different pastoral communities (Campbell/Dalrymple/Craig et al. 2009). For pastoralists in north-eastern Kenya, the search for water and for land and livestock grows more violent by the day. Worried pastoralists carry guns in order to defend their access to water and pasture and their livelihood. As the drought continues, water becomes a defining issue, the cause of increased violence, significant population displacement, high drop-out rates in schools, and severe food shortages (IRIN 2009).

24.3.3.2 Effects on Social Settings of the Pastoral Communities

In principle, formal education holds out the promise of equal opportunity and social equality. However, this is far from achieved among the pastoral communities in Kenya. As a result of migration and conflict, social settings such as schools have been abandoned (Pkalya/Adan/Masinde 2003). Many children have

been forced out of school to accompany their parents as they move from one place to another in search of water and pasture for their livestock. In many cases, the receiving areas have no social amenities and this worsens the situation.

According to Baragoi as quoted by (IRIN 2009), the clashes have forced children out of school. "Many children, more than 1,000 from Samburu, have moved with their parents and they will not be going back to school soon" (IRIN 2009). Schools and other social amenities have been abandoned as pastoralists are displaced by drought and conflict. Overcrowding in small places leads to the spread of diseases such as typhoid, diarrhoea, malaria, and AIDS, among others (Pkalya/Adan/Masinde 2003).

The major impacts of conflict are loss of livestock, poverty, migration, displacement, death of animals and humans, hunger, and illiteracy, among others. The adverse impact of conflict over socio-economic infrastructure is enormous as civil servants, teachers, and medical officers, as well as development partners and *non-governmental organizations* (NGOs), opt to leave for better opportunities elsewhere. Schools and health centres are closed down and development projects are prematurely suspended (Kumssa/Jones/Williams 2009).

Conflict over grazing pasture and water also adversely affects the migratory roots and patterns of pastoralists. This has led to unsustainable utilization of resources as livestock tend to be concentrated in secure areas, resulting in environmental degradation (Kumssa/Jones/Williams 2009). Residents of Elmoro in Samburu have formed communal cattle holding points where men spend the night with their cattle to protect them from cattle rustling.

Women and children spend the night in tents a few kilometres away from the men to save them from the turmoil of cattle rustling as the men undertake vigils to protect their animals from potential bandits (Macharia 2009). This exposes women and children to many other dangers such as rape and death since they are left with no one to take care of them. Men in the Samburu community hardly sleep because they are forced to stay awake to protect their animals. At the same time, they are forced to walk long distances to look for water and pasture to feed their animals (Kimani 2009). This can also be seen to interfere with the conjugal rights and family bonding of the pastoral communities in Kenya.

A large number of households are displaced from their original settlements due to conflicts arising from cattle rustling and inter-clan disputes (Kumssa/Jones/

Williams 2009). As inter-ethnic conflicts rage between the various communities, men and young adults are killed, thereby leading to a rise in the number of households headed by women (Mwaniki/Mbuchi/Leleruk et al. 2007). After displacement, many become exposed to violence and other human rights violations. Among the IDPs, women and children are particularly vulnerable, suffering high rates of rape, physical assault, and exposure to child labour and trauma (Kumssa/Jones/Williams 2009). In addition, this can also lead to the spread of HIV/AIDS among the pastoral communities who have to spend most of the time away from home in search of pasture.

24.4 Response to These Effects

24.4.1 Community Efforts

In an effort to adapt to climate, pastoralists have devised several coping strategies.

- Formation of village communal holding points for livestock. For example, in Elmoro, a village of Samburu, the villagers have formed a communal holding point for the village. This is where all the animals are driven at night for security purposes.
- Migration to other areas even to towns where security, pasture, and water is available.
- Construction of water storage tanks. Some pastoral communities have constructed cement water tanks for their households. They collect rainwater from their iron-sheet-roofed houses and store it in the tanks. The women's initiative cooperates to construct water tanks from one homestead to another.
- Tree planting. Some communities have started tree planting projects to encourage adapting to a more settled communal way of life as arable farmers.

24.4.2 NGOs and International Community Efforts

NGOs in the pastoral communities provide food relief to the pastoralists, such as a Catholic missionary working in Maralal who feeds the famine-stricken people in the arid area.

24.4.3 Response by the Government of Kenya

In 2008 the government of Kenya, represented by the Ministry for the Development of Northern Kenya and Arid Lands, expressed its commitment to the arid ar-

reas. This area is largely occupied by pastoral communities and the creation of the ministry was meant to develop the area. The Ministry of Minerals and Natural Resources has set a target of increasing forest cover from the current 2 per cent to 10 per cent. This will have a positive impact on the local and regional climates (MEMR 2009).

The government is buying livestock from herding communities which is then sold to the Kenya Meat Commission. Even so, this was far too little and too late, though the government was right to buy up rangeland cattle as an emergency measure. Money spent buying emaciated cattle before they die puts cash in herders' pocket, lowers their dependency, cuts the costs of famine relief, and raises the chances of getting the strongest animals through the drought.

In 2011 the government has been evicting people from the forest areas in response to climate change. This is seen as an urgent measure to save Kenyan forests which have been cleared in the recent past from contributing to water scarcity.

24.5 Conclusion

This chapter has highlighted a grim picture of dispute over precious resources caused by climate change and consequential conflict. It is evident that increasing global temperatures are having adverse socio-economic effects on pastoral communities in Kenya. According to a respondent in Matuu

in 2009 and 2010 there was drought and the grass became scarce and we had to drive our livestock like Maasai people to far places (*looking for pasture*). Some of the livestock never made it back and perished there. Then we had to buy grass, which was not enough even for a single cow. We had problems and people suffered a lot.

Another one stated that "we experienced drought which affected the people and cows. We had to search for food for our livestock and for ourselves. This was a problem!" Hence, there is an urgent need to find a long-lasting solution to avoid other problems cropping up related to resource use among the pastoral communities. The real question is not how this is likely to happen, but what we should do to prevent it from happening, and how we can mitigate the effects of climate change. It is very clear that climate change is a real problem. However, it has viable solutions. Some climate change impacts are inevitable. It is of importance that coping strategies are developed for the pastoral communities. The risks of climate change

should be taken seriously from all perspectives. Ways should be explored on how resources can be used sustainably and how groups and communities can be brought together rather than divide them. The consequences of climate change require deeper international co-operation in areas such as promoting coping strategies through research and technology.

24.6 Recommendations

Climate change policies and programmes in Kenya must be sensitive to conflict dynamics, particularly when adaptation measures are being designed and implemented. A failure to do so could aggravate tensions and increase the prospect of violent conflict (Campbell/Dalrymple/Craig et al. 2009).

1. Pastoral communities should be strengthened regarding alternative sources of income to avoid over-reliance on animals.
2. Water sources should be developed, for example by building dams to collect rain water. Boreholes to access ground water can be used for irrigation as well as animal and domestic use during dry periods.
3. The economy should be diversified to reduce the reliance on livestock through the introduction of drought-resistant crops and other income-generating activities.
4. Provision of an emergency water supply should be made by the government and NGOs during prolonged droughts.
5. Mechanisms to prevent cattle rustling and resource-based conflicts should be developed to enhance security in pastoralist areas.
6. There is an urgent need to put the livelihoods of pastoralists at the centre of emergency preparedness, proper planning, and response mechanisms, for example by provision of better market access for their livestock during the dry seasons.
7. Pastoral communities should be involved in policy advocacy, inter-community dialogues, and participation in public discourse.
8. More technological research should be conducted to assist pastoralists to cope with climate change.

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25 Climate Change and Violent Conflicts in Nigeria: Human Needs and Relative Deprivation Theories

Oscar Edoror Ubhenin

25.1 Introduction¹

Two key questions are central to this chapter. First, what are the major causal chains between climate change and violent conflicts in Nigeria? Second, what theories are helpful for the analysis of the links between climate change and violent conflicts in Nigeria? A preliminary review would quickly reveal that there is an extensive body of literature that addresses these questions but there is no clear or unequivocal answer to them. Many analysts argue that Nigeria is losing the capacity to perform basic security and development functions, and the capability of exercising effective control over its territory, and thus is steadily moving towards and manifesting the symptoms of a 'failed state'. This categorization is largely influenced by the spate of violent conflicts, ranging from armed inter- and intra-ethnic skirmishes to ethno-religious conflicts, in which the country is deeply involved.

The emergence of ethnic-based militias in different parts of the country has also exacerbated the resort to arms, leading to the rise in gang wars. For the *World Council of Churches* (WCC), Samuel Kobia reported that "inter-communal violence has claimed the lives of more than 12,000 Nigerians during the past decade" (Ogundele 2009: 3). This brings to mind the productive members of Nigerian society who daily are frightened of their future and so seek every opportunity to emigrate to anywhere outside the country regardless of the challenges that lie ahead of them. Indeed, stress in the country has also been exacerbated by joblessness, inflation, social insecurity, unprecedented food insecurity, apparent paralysis of administration, and lack of new vision to resolve the fundamental problems of the country (Williams 2008: 40). In spite of the overwhelming evidence of the nature and causes of violent conflicts in Nigeria, the emerg-

ing empirical literature suggests a 'climate conflict' dimension. As was pointed out by the *German Advisory Council on Global Change* (WBGU) in its report *World in Transition: Climate Change as a Security Risk*, "climate change will overstretch many societies' adaptive capacities within the coming decades", and "this could result in destabilization and violence, jeopardizing national and international security to a new degree" (WBGU 2007: 1). It is therefore a matter of necessity to investigate how, if at all, climate change affects the rising violent conflicts in the country.

Two theories, namely 'human needs' and 'relative deprivation', easily present themselves as the framework for explaining the causal link between climate change and violent conflict. This choice stems partly from an argument presented by the WBGU. As a threat to humankind, climate change will trigger numerous conflicts between and within countries over resource distribution, especially water and land. Secondly, according to the WBGU's (2007) report, "rising global temperatures will jeopardize the basis of many people's livelihoods, especially in the developing regions, increase vulnerability to poverty and social deprivation and thus put human security at risk". The major thrust of the human needs theory as developed by Burton (1990) is that a root cause of conflict is failure to satisfy universal human needs. Based on the ideas of Emile Durkheim and developed by Gurr (1970), the relative deprivation theory explains the gap between people's expectations and reality, between what their life 'is' and what their life 'ought to be'. Based on an assessment of the published literature and other media sources, this chapter makes particular reference to the Niger Delta conflict and the *Boko Haram* uprising. Finally, it identifies the prospects for addressing climate security challenges for Nigeria.

1 Keywords: Climate change, violent conflict, human needs, relative deprivation.

25.2 The Concept of Climate Change

Watt-Cloutier (2004: 10-12) points out that some few years ago, climate change was an abstract concept and even a myth to some. However, this is no longer so since the creation of the *Intergovernmental Panel on Climate Change* (IPCC) under the auspices of the United Nations (UN) in 1988, which can be regarded as the representative voice of science on climate change. Today, climate change has become both a global and developmental challenge. It has become a topic for development and growth economists, as well as policy-makers worldwide. The IPCC is noted for bringing “together thousands of scientists from around the world, and the sequence of reports it has issued have established, on strong scientific grounds, that climate change is happening, that it is significant, and that it is clearly linked to human activity” (Dervis 2008). Climate change has many dimensions: from the physical sciences to economics, from domestic politics to foreign policy, from environmental to social issues, and while there is overwhelming scientific evidence that our climate is changing, “the link between greenhouse emissions and human activity is also well established” (Dervis 2008).

Of particular interest in the IPCC assessments (1990, 1995, 1996, 1996a, 1997/1998, 2001, 2001a, 2001b, 2003, 2007, 2007a, 2007b) is the growing consensus that significant action on climate change needs to commence. First, there are the possible catastrophic effects of climate change. Second, there is the immediate effect of this catastrophe on many of the poorest people in the world. Yet there is uncertainty as to the exact scale and timing of these effects, and those that are concerned with development and poverty reduction, as enshrined in the millennium development goals, cannot ignore the urgent need to mitigate the effects of climate change and to help those affected to adapt to climate change. More importantly, climate stability is a classic example of a global public good. In spite of the opposition that trailed the IPCC for political reasons, the *United Nations Development Report* (UNDP) human development report affirms that “climate change is now a scientifically established fact”. The UNDP report added that “we now know enough to recognize that there are large risks, potentially catastrophic ones, including the melting of ice-sheets on Greenland and the West Antarctic (which would place many countries under water) and changes in the course of the Gulf Stream that would bring about drastic climatic changes” (UNDP 2007: v).

The catastrophic effects of climate change have been described by Harris (2003), Ban Ki-Moon (2007), and Shorrocks (2008). According to Harris (2003: 149-162), “As the atmosphere and oceans warm, climate change will bring uncertainty and hardship almost everywhere. Just as nuclear Armageddon would have resulted from human failures, global warming is the product of the activities and decisions of humankind”. Climate change, he notes, “causes increased frequency of severe weather events like floods and droughts, the spread of pathogens to new areas, adverse changes in agricultural yields, increased human mortality from heat and cold, coastal erosion and damage from the rise in sea level, melting glaciers, and a host of other troubles”. Harris predicted that these problems will harm the poorest countries and peoples the most due to their vulnerable locations and limited resources, which make it difficult or impossible for them to adapt.

The UN Secretary-General Ban Ki-moon (2007: 23) has also drawn attention to the need to come together and forge a collective response to this global challenge. In his view, because climate change threatens the entire human family, “we are already beginning to see these catastrophes unfold. As sea levels rise and tropical storms gather in intensity, millions of people face displacement. Dryland inhabitants, some of the most vulnerable on our planet, have to cope with more frequent and more sustained droughts.” The statement by Ban Ki-moon is an indication that climate change is not a mere ‘natural’ event but also highly political and, indeed, has entered the political realm. Little wonder that Shorrocks (2008) points out how “nowadays the focus is on the possibility of future catastrophic scenarios, and the actions today that can help insure against these events”.

What can be gleaned from the foregoing is that the desire to subdue and dominate the environment propels man to constantly engage in activities that result in the release of hazardous greenhouse gases into the air, and this brings about unhealthy climate change. As noted by Ezaza², “it has therefore, become imperative for positive and concerted actions to be taken by all to save our planet which is the only habitable place in the entire solar system”.

2 Ezaza, Austin, 2009: “Much ado about climate change”, in: *The Guardian*, 13 November; at: <<http://www.nigeriamasterweb.com/chapterfmes.html>> (13 November 2009).

25.3 Is it Violent Conflict or Climate Conflict?

The conflict and peace researcher Schmid is noted for his work on class conflict, which arises “because the social structure is such that one class loses what the other wins”, rather than being “a conflict because the classes have incompatible goals, fight each other, and hate each other” (Schmid 1968: 226; Reimann 2004: 44). While “the decision to take up arms is a complex process involving many actors in a wide range of conditions and circumstances” (Smith 2004: 115), Burton’s (1987) definition of conflict appears very apt. According to Burton, conflict is “an essential creative element in human relations”, the “means to change” and “the means by which our social values of welfare, security, justice and opportunities for personal development can be achieved”. Burton notes that the complex process arising from the use of arms can lead to violence. This is what Reychler (2001: 15) refers to as a situation in which the qualitative and quantitative life expectancy of individuals or communities is intentionally reduced.

Conflict signals challenges that need to be addressed, and if serious conflicts are not resolved effectively, they can become destructive and cause a great deal of suffering. Conflict issues do not disappear when the fighting ends, but rather the means of their management (violence) shifts to peaceful methods such as negotiation and politics (Bloomfield 2006). Violent conflicts have combined with gross or systematic violations of human rights in which there is an element of discrimination to force populations to leave their normal residence. In characterizing contemporary violent conflicts, Dudouet (2006) argues that the earlier boundaries of army-to-army wars have broadened to encompass civilian communities and whole societies within the vortex of violence. That is, most wars are now fought in the intra-state arena. In addition, contemporary violent conflicts generally include a mixture of ideological, political, or resource issues with elements of communal and ethnic identity. For this reason, they are often referred to as ‘ethno-political’ conflicts. These conflicts are characterized by high levels of protractedness, often lasting for several generations, with frequent fluctuations in nature and intensity. Violent conflict “has by its nature a degree of confused, emotional and apparently non-rational thinking and behaviour in its workings” (Bloomfield 2006). It is important to note that recent analytical advances qualitatively separate violence from conflict,

rather than classifying one as a mere degree of the other (Guichaoua 2009).

From the point of view of climate change, the work of Wirkus and Schure (2007: 20–27) is very instructive. Their argument that “the availability and role of natural resources can be observed from two distinctive, but strongly interconnected viewpoints” is particularly helpful within the context of this discourse for two reasons. First, environmental change induces growing pressure on the availability of natural resources and increases the vulnerability of livelihoods as well as human insecurity. Second, natural resources, including their exploitation, processing, and export, can be perceived as economic assets which have the potential to spark or prolong a conflict. Accordingly, this contribution outlines the two perspectives on ‘natural resources’ in the context of conflict: respectively ‘environmental change and natural degradation in connection with stress and vulnerability’ and ‘natural resources as an economic asset’.

The WBGU’s (2007) report has identified what it calls “climate-induced conflict constellations” (defined as typical causal linkages at the interface of environment and society, whose dynamic can lead to social destabilization and, in the end, to violence). The first constellation is “climate-induced degradation of freshwater resources”. According to the report, the situation of the 1.1 billion people currently living without access to safe drinking water could worsen “as climate change alters the variability of precipitation and the quantity of available water” (WBGU 2007: 2). Second, “climate-induced decline in food production” means that the more than 850 million people who are currently undernourished worldwide could experience a worsening situation as a result of climate change. This is because “food insecurity in the lower latitudes, i.e. in many developing countries, will increase with a temperature rise of just 2 °C (relative to the baseline)”, and “with global warming of 2–4 °C, a drop in agricultural productivity is anticipated worldwide” (WBGU 2007: 2). “Climate-induced increase in storm and flood disasters” as the third constellation “will greatly increase the risk of natural disasters occurring in many cities and industrial regions in coastal zones.”

The report added that regions especially at risk from storm and flood disasters generally have weak economic and political capacities, which make adaptation and crisis management much more difficult (WBGU 2007: 3). The fourth and last constellation is “environmentally-induced migration”, and the WBGU report assumes “that the number of environmental

migrants will substantially rise in future due to impacts of climate change.” The report attributes this huge risk in developing countries to the increase in drought, soil degradation, and growing water scarcity in combination with high population growth, unstable institutions, poverty, or a high level of dependency on agriculture (WBGU 2007: 3).

In the light of the foregoing, it is safe to align with Smith’s (2004) argument that “degradation of renewable resources (especially soil erosion, deforestation and water scarcity) can also contribute significantly to the likelihood of violent conflict”. Smith typifies these factors as catalysts – factors that affect the intensity and duration of conflict, although they are in general not as central to the problem as political and economic determinants.

25.4 Theoretical Framework

25.4.1 Human Needs Theory

The ‘human needs theory’ was developed by John Burton (1990: 36–39), when he argued for the root causes of relative deprivation and conflict. The basic idea of human needs theory is that a root cause of conflict is a lack of satisfying human needs that are universal. Burton and other human needs theorists, such as Paul Sites and Edward Azar, have identified identity, security, development, and meaning of life as human needs. However, as observed by Chizea and Iyare (2006: 71–100), the meanings of these identified needs are different in their application to each cultural context. Burton’s identification of three significant elements, namely: interests, values, and needs, helps to identify those particular needs which form deeply rooted causes of conflicts. Burton (1990) sees interests as “the occupational, social, political, and economic aspirations of the individual and of identity or group or individuals within a social system”. While interests tend to be material and tangible, they can be common within a group but not within a society as a whole. For Burton too, values are characteristics of particular social communities, and these are manifest in ideas, habits, customs, and beliefs. He believed that values can be altered “after a generation or two of social and economic integration and shared education”. It should be noted that the preservation of values often leads to defensive and aggressive behaviour, which may lead to war. Values themselves cannot be identified as the main causes of conflict. Yet human needs are universal inherent motivations which often

lead to behaviour that is outside the legal norms of a society, depending on the characteristics and scope of a state’s legal system.

From the human security angle³, where there is a low level of state capacity to address the needs of the population, there cannot be stability. In addition, the lack of what UNDP (1994) classifies as “safety from such chronic threats as hunger, disease, repression and protection from such sudden and hurtful disruptions in the patterns of daily lives, whether in homes, jobs or communities” reduces opportunities for economic growth. In fact cross-country empirical studies find a correlation between low economic growth and risk of conflict (Collier/Hoeffler 2004: 563–595). For example, it is possible that poor young people lose little or nothing in joining a rebel group. However, a study by the *African Development Bank* (ADB) found that in countries such as the Democratic Republic of Congo, Liberia, and Sierra Leone, low income arose from general governance failure that induced growth collapse and violent conflict. Thus, “violent conflict may be due to the underlying conditions that keep incomes low and weaken the state’s capacity to deliver services and security” (ADB 2008). The ADB also reported that poor growth may arise from deteriorating governance and state capacity, which may, in itself, constitute a risk factor. And poor economic growth could lead to distributional fights or deepen grievances, and thus raise the conflict risk.

3 The three volumes of the *Global Environmental and Human Security Handbook for the Anthropocene* with 270 peer-reviewed chapters by 300 authors from 100 countries offers a topical and comprehensive overview of the global debate on the reconceptualization of security since 1990 (Brauch/Oswald Spring/Mesjasz et al. 2008; Brauch/Oswald Spring/Grin et al. 2009; Brauch/Oswald Spring/Mesjasz et al. 2011). In the volume edited by Brauch, Oswald Spring, Grin et al. (2009) 23 chapters offer an overview of the scientific and policy-driven human security debates and an additional 16 chapters give a survey of the recent global debates on environmental security concepts and discourses. The chapters by Ejigu (2009), Moyo (2009), Poku and Sandkjaer (2009), and Kameri_Mbote and Kindiki (2009) deal specifically with the environmental, human, and water security debate and issues in sub-Saharan Africa. Regional security issues in the Horn of Africa are examined by Rupiya and Nhema (2008), in southern Africa by Ngoma and Le Roux (2008), and in west Africa by Ogwu (2008), who also contributed forewords to the previous two volumes (Ogwu 2009, 2011), and by Aning and Atta-Asamoah (2001) and Akude (2011), and issues of security in African philosophy are addressed by Mabe (2008).

25.4.2 Relative Deprivation Theory

Based on the ideas of Emile Durkheim, the French sociologist, the 'relative deprivation theory' emphasizes the importance of people's expectations and reality. Durkheim argued that social change, or conflict, is the result of a breakdown in social cohesion, which is built upon a shared consciousness and a common history and experience. This was re-echoed by Jonem (1990) in his analysis of four main theories of conflict, which contributes to a deeper and comprehensive understanding of the development of conflict through stages. Chizea and Iyare (2006) tied the breakdown in social cohesion to rapid social changes such as changes in regime and public policies. The reason advanced by them is that social consciousness changes more slowly than society does as people become unable to relate themselves to their society when there is a rapid change in the needs of the whole society.

Gurr (1970) is noted for his significant contributions to the relative deprivation theory. He developed this theory in order to try and understand the development of political violent conflict. In Gurr's view, frustration sets in when people start experiencing a gap between what their life 'is' and what their life 'should be'. A violent breakdown of society tends to occur when this frustration and the gap called 'relative deprivation' are experienced by many people. Gurr (1970) offered an explanation that is based on the contrast between groups' expected and actual access to prosperity and power, an approach that is closely related to 'group entitlement theory' (Horowitz 1985; Smith 2004: 116).

Closely linked to the relative deprivation theory is what Folarin (2007) calls "the economic of abjection". As noted by Folarin (2007: 37-61), environmental degradation creates social dislocations, namely economic anomie and social deprivation, thereby constructing an economy of abjection; the state of being cast down, the state of frequently-marginalized groups. Folarin (2007) added that the relevance of abjection to spatial economy is "the habitation of the former in the compelling outcome of the latter". In an economy of abjection, the inevitable result of the struggle is the further increase in disempowerment and cleavages that erode the possibility of a united front to engender status change, prevail on policy, or compel favourable outcomes. Relative deprivation thus connotes socio-economic denials that ultimately culminate in abjection. Folarin (2007: 41) alluded to the work of Lea and Young (1984) who claimed that "deprivation occurs when a group feels deprived in

comparison to other similar groups, or when its expectations are not met." Hence protracted violent conflict may be the outcome of alienation, and the alienated finds himself or herself more isolated and alienated from society. Thus a state of perpetual anxiety arises from an inferiority complex, a process that is completed by subordination and humiliation by the powerful class. The long-term consequence of deprivation and alienation is conflict; a battle of wits between two unequal classes, with the weaker class losing out in the tussle (Townsend 1970; Dougherty/Pfaltzgraff 1971; Varma 2005; Folarin 2007).

25.4.3 Theoretical Relevance

The two theories contribute to an understanding of the 'greed versus grievance' debate as it relates to violent conflicts in Nigeria. The work of Hubert (2000) gives insights into this debate by pointing out that if the principal motive behind conflict is greed not grievance, either profit or political power may be a growing motivation for violence. On the other hand, violence could be a response to a range of grievances that place leadership at the centre of stoking the embers of conflict. Yet the absence of needs satisfaction leads to a feeling of relative deprivation, which builds up to grievance. In relation to the 'case' of Nigeria, Freeman's (2006: 60-63) thesis is that "the major internal danger to Nigeria, under conditions orchestrated by the financial/oil predators - which have had their fangs sunk into the country since its independence in 1960 - is the combined effect of ethnic tensions and extreme alienation and deprivation on millions of poverty-stricken youth".

The foregoing is corroborated by Amnesty International (2009: 3) in its report on the Niger Delta that "the contrast between the wealth generated by oil for the few and the deepening poverty of many has fuelled discontent and anger". The report also points to the way and manner the organized armed groups in the region feed on 'local frustrations'. The *Boko Haram* uprising, though largely fuelled by religious extremism, can also be situated within the theories of human needs and relative deprivation. Members of *Boko Haram* are of the opinion that corruption has infected Nigerian leaders, including Moslems, and this explains the high degree of poverty in the land. Oladele (2009:15) argues that the leaders of the northern states have contributed to the backwardness of the region, in terms of infrastructure and manpower development, social inequality, and oppression of youth. Hence the need to properly contextualize the

interface between extreme poverty and religious extremism, which Alamu (2009: 3) says cannot be over-emphasized.

One benefit of the relative deprivation theory as opposed to the human needs theory is that it helps to situate the restiveness among Nigerian youths and their “preferring the eloquence of violence”, to use the words of Babarinsa (2003: 17). As Imobighe (2003: 14) suggests, “the Nigerian youths are increasingly realizing that the country’s ruling elite have no plan for them in the scheme of things in their country”, and “in their desperation, they now constitute the angry brigade all over the country ready to cash in on ethnic and inter-communal conflicts, which they see as opportunities for taking their pound of flesh from a society that has compromised their future”. Stemming from this evidence is the issue of marginalization by the political elite, which manifests itself in unemployment, poverty, hunger, and deprivation. When viewed from the perspective of constellations as proffered by the WBGU (2007), it can be argued that climate change increases the problems that the human needs and relative deprivation theories identify as vital.

25.5 Investigating the ‘Case’ of Nigeria

It will hardly be disputed that Nigeria has a history of violent conflict. Evidence in the literature clearly suggests that the country contends with the challenges of extended internal conflicts, tenuous post-conflict situations, weak security, fractional social relations, high levels of poverty and inequality, and low levels of state capacity (Thomas 2006, Putzel 2007). These challenges are pointers to governance failure, with serious implications for social cohesion in the continent. It is not surprising, therefore, that the country, like many others in the continent, currently attracts global attention as one of the potential sites of violence, warfare, and terrorism, summarily dubbed ‘fragile states’. If for millions of the population the future is more a threat than an opportunity (alluding to Engberg-Pedersen 2008), what potential role does climate change play in Nigerian conflict situations? Two cases, namely a) the Niger Delta conflict and b) the *Boko Haram* uprising have been selected to address the question.

The choice of cases is influenced by the following factors. The Niger Delta conflict is occurring in the southern part of the country, while the *Boko Haram* uprising is in the north, bordering on the Sahel zone. This presents ample opportunity to investigate the in-

fluence of climate in resource-abundant and resource-scarce regions. Second, the Niger Delta conflict is rooted in a resource struggle and has been occurring for more than two decades. On the other hand, the *Boko Haram* uprising began in 2009, although it is deeply rooted in the religious extremism of the past. Attempts are made below to historicize both conflicts.

25.5.1 The Niger Delta Conflict

People living in the Niger Delta have to drink, cook with, and wash in polluted water; they eat fish contaminated with oil and other toxins – if they are lucky enough to still be able to find fish; the land they use for farming is being destroyed; after oil spills the air they breathe reeks of oil, gas, and other pollutants; they complain of breathing problems, skin lesions, and other health problems, but their concerns are not taken seriously and they have almost no information about the impact of oil pollution (Amnesty International 2009: 2).

The causes, nature and effects of the conflict that has enveloped the Niger Delta for more than two decades has been described in various ways. For example, the Resident Coordinator of the United Nations (UN) in Nigeria, Alberic Kacou, calls the Delta “a place of frustrated expectations and deep-rooted mistrust” (Isine 2008: 46). Ikelegbe (2005) described the Niger Delta as a region that is “generally restive, with pockets of insurrection and armed rebellion”. The region is noted for its biodiversity because of its high number of different plant and animal species, including many exotic and unique flowers and birds (Ibeanu 2000: 20), but it is now perhaps the most polluted region in the world (Onyekakeyah 2010: 73).

Current literature (Khor 2010: 2–4) suggests the magnitude of the ecological disasters in the region. In 2006, environmental groups reported that up to 1.5 m tons of oil – 50 times the pollution unleashed in the Exxon Valdez tanker disaster in Alaska – has been spilled in the Niger Delta over the past half-century. In 2009, Amnesty International accused the oil corporations of a human rights outrage because of the equivalent of at least 9 million barrels of oil spilled in the delta. In a sense, the failure of its rich biodiversity is largely due to the characteristic weak institutions of governance and uncoordinated policy responses to the crisis arising from the environment. This helps to explain how decades of ceaseless crude oil exploration and exploitation have left the region practically dead from oil pollution, whereas no Nigerian govern-

Table 25.1: Incidence of poverty in the Niger Delta, 1980-2004. **Source:** National Bureau of Statistics (2004), cited by UNDP (2006: 35).

	1980	1985	1992	1996	2004
Nigeria	28.1	46.3	42.7	65.6	54.4
Edo/Delta	19.8	52.4	33.9	56.1	45.35 (Delta) 33.09 (Edo)
Cross River	10.2	41.9	45.5	66.9	41.61
Imo/Abia	14.4	33.1	49.9	56.2	27.39 (Imo) 22.27 (Abia)
Ondo	24.9	47.3	46.6	71.6	42.15
Rivers/Bayelsa	7.2	44.4	43.4	44.3	29.09 (Rivers) 19.98 (Bayelsa)

ment has acted against the severe environmental damage in the area for well over five decades.

Did the Niger Delta just drop from the sky, one may ask. The nations of the Delta such as the Kalabari, Urhobo, and Edo had long existed before the colonial contrivance of 1 January 1914. However, the history of oil in the region is often traced to 1956, when the Anglo-Dutch oil giant Shell discovered oil, the high grade 'Bonny Light' crude in Oloibiri, which is located in present-day Bayelsa state. This culminated in Nigeria's first export of crude cargo in 1958. Since then, the Nigerian oil industry has grown to the potential of producing three million barrels of crude oil a day, in spite of the *Organization of Petroleum Exporting Countries* (OPEC) limit on the production of crude oil. Although the massive oil deposits in the Niger Delta region have generated billions of dollars in revenues for the country, the vast majority of people living in the oil producing areas live in poverty (Amnesty International 2009). Generally, the incidence of poverty in Nigeria (table 25.1) has increased since 1980 (National Bureau of Statistics 2004; UNDP 2006).

As noted in the UNDP Niger Delta Human Development Report, the critical issue goes beyond the incidence of poverty; it is also "the intense feeling among the people of the region that they ought to do far better", considering "the level of resources in their midst, and the brazen display and celebration of ill-gotten wealth in Nigeria, most of which derives from crude oil wealth" (UNDP 2006: 36).

Over the years, the people of the Niger Delta have been complaining about unfair treatment by the Nigerian state. Since the hanging of the environmental rights activist Ken Saro-Wiwa in 1995, agitation in the Delta has taken on a dangerous dimension as the youth of the region have used violence (Ayankola 2009). Agitation by youths, fuelled by the apparent

failure of governments at both the state and federal levels to meet the development concerns in the region, has precipitated a level of restiveness in the area, which is sometimes expressed in hostage-taking, vandalism, kidnapping, and outright murder of victims. This restiveness has led to a huge loss of revenue to the federation. In 2006 alone, the federal government reportedly lost about 500 billion due to the restiveness in the region (Okeke 2007: 80). The problem became worse in 2008, with an estimated \$6.3 billion in oil stolen, and another \$28 billion in oil deliberately not produced (Duggan 2009: 14), in conjunction with a decline in the production of crude oil to the tune of 500,000 barrels per day. This translates to a revenue loss in the region of \$40 million per day. Another impact of the crisis can be seen in major escalations in cost of between 30 and 40 per cent across key upstream projects, as contractors now factor into their contract bids the 'Niger Delta Premium', which covers community expectations, kidnappings, and a higher insurance premium (Lawal 2007: 2).

The most recent attempt by the Nigerian government to resolve the region's resource conflict is the granting of an amnesty to non-state combatants who are involved in the 'struggle'. The amnesty was proclaimed by Nigeria's president on 24 June 2009, and "provides unconditional pardon for all persons who have directly or indirectly participated in militant struggles or the commission of offences in the cause of militant activities in the Niger Delta" (Anofi 2009: 1). However, this has not yielded any substantial result and one may be tempted to conclude that the amnesty deal is a 'symbolic façade' behind which the state actors consolidate a personal network of economic exploitation. Perhaps a better insight into the common factors underlying the Niger Delta conflict would point to climate-induced factors.

25.5.2 The *Boko Haram* Uprising

The uprising began on 26 July 2009 when a fundamentalist group called *Boko Haram* staged a raid on a police station in an effort to establish a Taliban-style regime based on strict observance of sharia law. *Boko Haram* had urged its followers in several northern states to attack police stations, prisons, and churches, and burn down schools, in an attempt to enforce an extreme sharia and rid the country of western education. Four days of violence in Nigeria left hundreds dead, destroyed towns and villages across the north, brought the cold-blooded police shooting of an Islamist rabble-rouser, and left the outside world horrified (*The Nation* 2009: 9). This uprising further increases the number of persons who have lost their lives to sectarian clashes since the Nigerian government, in an attempt to appease the growing current of Islamic extremism after years of military dictatorship, allowed 12 of the northern states to proclaim the sharia.

The main leader of the group, which started as Sahaba in 1995, Abubakar Lawan, was reported to have left for the University of Medina to study. When he left the older clerics conceded the leadership to Ustaz Mohammed Yusuf, a young and versatile man. Yusuf, however, abandoned the older clerics and came up with *Boko Haram* after changing the doctrine of the sect immediately he took over. Yusuf was born in Maiduguri, where he grew up and lived until 2004 when he moved to Kanamma in neighbouring Yobe state. He formed his group in Maiduguri in 2001. Two years later he moved to Yobe state and set up a camp called 'Afghanistan'. According to Yusuf, the assumption that the earth is spherical is contrary to Islam and thus should be repudiated. He holds that Darwinism and the scientific assertion that rain comes from evaporated water should be rejected. Members of the group are largely drawn from disaffected youths, mostly university students and jobless graduates, and they "believe rain is a creation of God rather than an evaporation caused by the sun" (Nigerian Compass 2009: 3).

The meaning of *Boko Haram*, that 'western education is a sin', fits into the doctrine of the group as propagated by Yusuf, calling for full implementation of sharia law in the country. The group believes that western education is corrupt and is in conflict with Islam (Fasure 2009: 2). The major objectives of the group were to resist capitalist ideology, abolish western-style education, overthrow the Nigerian state, and ultimately impose an extreme interpretation of Islamic law. To realize this, the group had a subtle plot to take over government by adopting a spontaneous

attack on many major cities through the Iraq war pattern of suicide bombing. The members of the religious sect used unlawful methods to recruit followers, including abduction, kidnapping, or other tactics that violated the rights of other people. They were also alleged to use hypnotism to induce some women and their children to abandon their families to join them (Alli 2009).

Table 25.2: Some facts on *Boko Haram*. **Source:** *The Nation* (2009b, 5 August: 1).

Sect: Boko Haram ("Western education is sin")
Leader: Mohammed Yusuf
Belief: Women and children should be kept indoors
Membership: About 540,000
Origin: Started as Sahaba in 1995 by Abubakar Lawan
Operational Area: Borno, Bauchi, Kano, Katsina, Kaduna, Gombe, and Yobe states
Funding: Each member contributes 1 daily
Suspected backer: Kano businessman

Many members of *Boko Haram* were reported to have been trained in Algeria in the last three years before they struck (Alli 2009: 1). The first batch of recruits went for training in Algeria in 2006. A nephew of a former governor in the north-east was deeply involved in the coordination of the sect. A former local government chairman in Niger state was also mentioned as one of the sponsors of the group (Alli 2009: 8). Six bomb experts were trained in Borno, but most of the arms and ammunition were allegedly imported from Afghanistan. They have an al-Qaida network through some of their members such as Abul Barah and Mohammed Al-Amin, who were in Afghanistan because of a strong connection with a few al-Qaida leaders (Alli 2009: 8).

Yusuf was allocated 80 kilometres of land for farming in Borno state, which he used to train his sect members in various camps and to manufacture deadly weapons, and all attempts to prevail on the state government by security agents to revoke the allocation were reportedly rebuffed by the Governor. At the time, the sect was said to have two main agenda items: either to go on hegira (self-exile or migration) to Afghanistan or Saudi Arabia, or to declare jihad. However, the Saudi Arabian government was not favourably disposed to accommodating the sect and the immigration authorities would not allow them entry, hence their choice of the jihad option (Alli/Odunuga 2009: 1,2).

Of all the factors responsible for the *Boko Haram* uprising, two are relevant for this chapter. The first is the issue of poverty and relative deprivation. As presented by Fasure (2009: 2), “usually around the transitional period between planting and harvest when there is very little to eat, coupled with the harsh weather condition, a religion messiah emerges to promise the poor, down trodden masses an eldorado”. The *Boko Haram* uprising occurred at this time and from the same notorious cause. Secondly, Nigeria has porous borders which allow foreign nationals from neighbouring countries to enter the country freely. For example, the Republic of Niger is one of the poorest countries in the world, ranking close to the bottom of the *Human Development Index* (HDI). The UNDP (2007: 85) reports that “vulnerability to climate shocks in Niger is linked to several factors, including widespread poverty, high levels of malnutrition, precarious food security in ‘normal’ years, limited health coverage and agricultural production systems that have to cope with uncertain rainfall”. During 2004 and 2005, climate shock led to a crisis in agriculture, and this ultimately led to severe human costs, including migration to neighbouring countries and less critically affected zones, such as Nigeria.

To buttress the impact of porous borders, Nigeria’s intelligence reports revealed the emergence of an Islamic sect, *Duru-salam*, in Niger state, whose members are nationals of the Republic of Niger and Chad. The sect, with over 2,000 faithful, had been camping since 1994 in a village near Mokwa, about 300 kilometres from Minna, the state capital. The group allegedly shared similar beliefs with the *Boko Haram* sect (Orintunsin 2009: 6). One similarity that can be pointed out in the two cases is the position of the *Arewa Consultative Forum* (ACF). The ACF sees the Niger Delta militants and the *Boko Haram* sect as comprising people who feel aggrieved by the prevailing conditions in the country. The ACF noted that “this attitude is aggravated by the widening gap between our affluent and ostentatious leaders and the broad masses of the poverty stricken and deprived people” (Akowe 2009: 2).

25.6 Climate Security Challenges

In investigating climate security challenges, lessons can be drawn from the WBGU’s anticipation of six threats to international security and stability, arising from the failure of climate change mitigation. The threats include a possible increase in the number of

weak and fragile states, risks for global economic development, and the risks of growing international distributional conflicts between the main drivers of climate change and those most affected. Others are the risk to human rights and the industrialized countries’ legitimacy as global governance actors, the triggering and intensification of migration, and the overstretching of classic security policy (WBGU 2007: 5–6).

An application of the six threats to the ‘case’ of Nigeria would quickly reveal that the country’s classification as a ‘state in fragility’ is closely linked with environmental migration of citizens from neighbouring countries in the Sahel zone. Second, the livelihood and well-being of Nigerians is threatened by the erosion of human security, contributing to human rights violations, because of climate change. Third, while the country contends with the issue of environmental migration, it is important to note that many Nigerian youths have resorted to voting with their feet by crossing the Sahara in search of illusory green pastures abroad. This points to one element in the contradictions underpinning the country’s development crisis, which Arowosegbe (2009: 575) calls “the marginalization of the youth”. Fourth, it can be argued that the country’s security policy is in dire need of reform as a result of climate conflict. A pointer to this is resurgence of the Niger Delta conflict and the *Boko Haram* uprising.

The climate security challenge also corroborates the *World Institute for Development Research of the United Nations University* (UNU-WIDER 2005) report. “Poor countries are far more likely to become embroiled in armed conflicts than rich ones.” The report adds that while poverty *per se* appears not to be the decisive factor, most poor countries live in peace most of the time. Countries afflicted by war also suffer from inequality among domestic groups, and it is this, rather than poverty, that seems to be the critical factor. For it seems “the inequality may be based on ethnicity, religion, national identity or economic class, but it tends to be reflected in unequal access to political power that too often forecloses paths to peaceful change” (UNU-WIDER 2005: 32).

Developing countries are highly dependent on rain-fed agriculture, and when rains stop there are smaller harvests than in previous years, and there will be more malnutrition, which will increase the risk of conflicts. For example, local leaders might be angry that the government did not provide food aid and they see their families starve, leading to a violent reaction. Another issue is that when income falls, young men may look for another source of income outside

agriculture and may join a nascent rebellion. In other words, as observed by Justino (2009), there is a lower 'opportunity cost' of conflict. Ulrik (2009: 15-34) notes that climate change, which is already a matter of urgency in many parts of the world, is a global cross-cutting problem just like the food security crisis and the financial crisis. Dervis and Steiner (2007) remind us that "in reality, the world is a heterogeneous place: people have unequal incomes and wealth and climate change will affect regions differently". They add that "climate change is already starting to affect some of the poorest and most vulnerable communities around the world", and "in the long run climate change is a massive threat to human development and in some places it is already undermining the international community's efforts to reduce extreme poverty".

Does scarcity or abundance of resources drive conflict? The response would rather be in the affirmative inasmuch as competition for scarce resources sometimes leads to violence. Competition for scarce resources plays a major role in conflict dynamics because it engenders inequality. Bates's (2008) argument is to the effect that regional inequality is a major source of conflict in countries such as Nigeria. Embedded in Bates's argument is that much of what is taken as ethnic conflict originates from the mere fact that ethnic groups are geographically distributed, and so the struggle takes the form of ethnic conflict. Tied to this argument is that of Clements (2004: 442-461) that "the predicted conflicts over access to safe and clean drinking water will clearly be fuelled by scarcity factors. The conflicts over wealth generating minerals are more likely to be spawned by concerns to protect and enhance existing wealth." He made reference to the argument by Fairhead (2000: 147-178) that "environmental riches rather than poverty are the major precipitants of environmental conflict as groups struggle to gain control over wealth generating resources".

The UNDP (2003) identified the issue that the link between conflict and poor development can work both ways, in its averment that "economic and social hardships, especially when accompanied by sharp inequalities across groups and areas, can foment violence". The UNDP added that, at the same time, conflicts are often major causes of weak economic development, leading to (among other things) health crises and the destruction of infrastructure. Risley and Sisk (2005) note that "poverty, social injustice, discrimination and exclusion, combined with environmental degradation, high rates of death from curable diseases, poverty and economic decline, environmental stress, and rapid urbanization, are under-

stood to be the underlying drivers of violent social conflict". Smith (2004) argues that "poor economic conditions are the most important long-term causes of intra-state armed conflicts today". Smith added that "degradation of renewable resources (especially soil erosion, deforestation and water scarcity) can also contribute significantly to the likelihood of violent conflict, but are in general not as central to the problem as political and economic determinants". Finally, Austin (2004: 129-150) argues that "the conditions under which a group will instigate violent rebellion are: collective incentive, capacity for joint action and external opposition". Of relevance to us here are the collective incentives, which Austin (2004) equated with the perception of disadvantage or grievance felt by the group. This he broke down into: (a) the history of lost political autonomy, and (b) active political, economic, and cultural discrimination in the 1990s.

Generally, climate change comes with its own challenges, chief amongst which are those on the development side. As noted by Shorrocks (2008) "climate change is undoubtedly one of the greatest potential threats to improvements in welfare in the developing world". That is, the plight of poor nations - and poor groups within countries - who have contributed least to the stock of greenhouse gases, and yet face the prospect of a disproportionate effect on their livelihoods and health. Climate change has joined other factors such as the failure of public security decision-making structures and the general failure of governance to cause conflicts in Nigeria. In specific terms, Ibeanu and Momoh (2008) have identified the general failure of governance as expressed in poor economic conditions (economic crisis, land hunger, etc.), negative communalism (notably ethnic and religious conflicts), and political authoritarianism (as in repression under both military and civilian governments).

25.7 Conclusion

An attempt has been made in this chapter to investigate the impact of climate change on the rising violent conflicts in Nigeria. The theories of human needs and relative deprivation were found useful for investigating the emerging 'climate conflict' in the country. In particular, the relative deprivation theory proved more helpful in situating the restiveness among Nigerian youths because of their preference for the eloquence of violence. The chapter reveals that relative deprivation runs through the whole gamut of conflicts in the country, whether it is a resource war in

the south or a religious war in the north. Yet climate change catalyses the range of conflicts in the county. Human rights and the environment are not protected in the Niger Delta. Therefore, “companies can no longer be allowed to self-regulate” (Amnesty International 2009: 8).

The recent viewpoint of politics places premium emphasis on the human well-being and equal opportunity for all (Abdulsalami, Onyedika and Nwakanda 2011: 1). By extension, the huge social, economic, and political inequalities arising from climate change must be addressed. Therefore, the government should work towards stemming the tide of occurrences, such as unemployment, poverty, and hunger, which often lead to anger and frustration. It needs be mentioned that the proposal resulting from the Copenhagen declaration of December 2009, which Biney⁴ calls ‘derisory’ assistance to developing countries, cannot cushion the effect of climate change. This calls for a radical departure from the current regime of wealth accumulation by some persons and indeed nations.

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26 Enhancing Security and Resilience of Low-Income Communities to Climate Change in Growing Cities: An Assessment of Flood Management and Planning Regimes in Kampala City, Uganda

Paul Isolo Mukwaya, Hannington Sengendo and Shuaib Lwasa

26.1 Introduction¹

The rapid expansion of settlements in cities and worsening economic inequality have shifted the balance of disaster risk from rural to urban areas. People have to survive in a money economy and have to contend every day with many socio-economic and environmental hazards. Studies of flood hazard risks in Kampala are inconclusive. Lack of reliable information makes it difficult to evaluate the different impacts of integrated flood management and planning regimes on the livelihoods of low-income households. An ongoing study in the city of Kampala is spatially determining the magnitude and intensity of exposure to flood hazards and their impact on the livelihoods of communities occupying low-income areas. It also assesses the influence of flood management and planning regimes in enhancing the resilience and security of these low-income settlements. Here the actions of various stakeholders and their levels of participation in flood hazard reduction and governance systems are emphasized and the networks that exist amongst these actors explored further. Six low-income settlements (Kisenyi, Kivulu, Bwaise, Katwe, Kinawataka, and Katanga) were selected for further detailed study. People living in low-income areas are exposed to multiple vulnerability stresses coming from a combination of heavy rainfall and severe marginalization together with poor planning systems, especially with regard to housing, infrastructure, and drainage management. Infrastructure systems have reached their full capacity and together with poor maintenance, inadequate income, few assets, inadequate shelter, absence of early warning systems, and total absence of safety nets, even small downpours and low intensity rainfall events

have huge knock-on effects and lead to massive disruption of the lives of the poor and subsequently of the whole urban economy. As local communities are not flexible enough to cope with frequent interruptions to their livelihoods, city authorities should not wait for the next disaster to happen. This chapter argues that a better understanding of the urban system is needed to improve the design and implementation of urban housing projects. There is a need to recognize the multiple deprivations that contribute to increasing exposure of low-income communities to stressful urban environments and integrate these into the general city development strategies.

In the world's poorest and most vulnerable nations, most cities and towns face two distinct pressures: rapidly growing population and high levels of vulnerability to the impacts of climate change. Even in towns and cities where overall rainfall totals are declining, precipitation is tending to occur in shorter, more intense bursts that can overwhelm urban drainage systems and trigger flash floods. When informal settlements are built in flood-prone areas, the consequences can be disastrous (IIED 2008).

Kampala city accounts for about 80 per cent of Uganda's industrial and commercial output and 60 per cent of the urban population, and generates over 60 per cent of the national GDP. The economic future of Uganda is therefore intrinsically linked to the performance of Kampala as a locus of productive activity and investment. This, in turn, relies on the city's ability to provide the services and infrastructure to drive and support the realization of the investment potential of the country. Kampala's service delivery capabilities need to keep pace with its economic and demographic growth. Over time, however, key infrastructure including roads, drainage systems, and solid waste services have deteriorated. At the same time, the service delivery capabilities of the City Council

¹ Key words: floods, vulnerability, stresses, flood governance, livelihoods, Kampala.

have encountered serious organizational, management, financial, and human resource challenges that limit the Council's ability to meet the current and future needs of the city. The continued deterioration of the physical infrastructure in Kampala and the weakening of the capabilities of its governance structures are likely to have negative repercussions on the performance of the Ugandan economy as a whole. Increased human activity, unless supported by sound mitigation strategies, is bound to escalate the negative outcomes of environmental degradation.

Kampala lies in that category of urban areas in a low-income country that is described by Satterthwaite, Huq, Pelling et al. (2007) and Romero-Lankao and Tribbia (2009) as highly vulnerable to the impacts of climate change, mostly as a result of both development and governance limitations. In contrast to the situation in most prosperous and well-governed cities, urban dwellers in middle- and low-income countries lack all-weather roads, piped water supplies, drains, and electricity supplies (Pelling 1997). Furthermore, they live in poor-quality homes on illegally occupied or subdivided land, which inhibits any investment in more resilient and flood-proof buildings. Additionally, with some exceptions, the local governments of urban areas in low- and middle-income countries cannot ensure provision for both infrastructure and disaster-risk reduction and disaster-preparedness (Aragon-Durand 2007), or for such good governance practices as stakeholder participation in decision-making, democratic access to knowledge, transparency, and accountability. This makes large sections of the urban population vulnerable to any increase in the frequency or intensity of storms, or increased risk of disease, or constraints on water supplies, or food price increases (Romero-Lankao/Tribbia 2009).

Floods are now endemic in Kampala city, the largest urban area in Uganda. Many flood events have been recorded in the city, and this necessitates a better understanding of the functional relationship between city growth patterns and hydrological systems. Numerous studies have reported similar hydrological impacts due to urbanization. Increases in peak flow magnitudes and occurrences and decreases in base flows are typically observed. An increase in the *total impervious area* (TIA) decreases the volume of precipitation allowed to infiltrate the soil during a storm event, so increasing the volume of surface run-off. If the surface run-off is directly connected to the stream system through roads or storm drains, the stream will produce an increased peak flow magnitude in a shorter time period than observed in an undisturbed

stream system. In his studies on the effects of urbanization on the hydrological environment, Olusegun (2009) noted increasing run-off of about 2 to 6 times from that of undisturbed catchment systems, while Hollis (1975) found that peak flows with recurrence intervals of 2 years increased by factors of two, three, and five with 10, 15, and 30 per cent impervious development, respectively. Hollis also concluded that the effects of urbanization are greatest with more frequent storm events and diminish as flood size and recurrence interval increase.

26.2 Data and Methods

The study was conducted in six low-income settlements; largely classed as unplanned settlements in Kampala City (figure 26.1). The selected parishes were visited to assess and collect data related to biophysical and socio-economic conditions that are closely associated with flooding events. These were harmonized with several observations and participatory appraisal methods in the low-income settlements in the selected parishes. These methods involved a qualitative approach using twelve focus groups that were selected equally among the selected parishes. The twelve focus group meetings were conducted in October and November 2008 and in March and April 2009. All focus group sessions were recorded with the participants' permission and later fully transcribed. The focus groups were carefully selected groups that enabled participants to share their views and feelings about flooding concerns in Kampala City. This was followed by detailed discussions with key informants (city planners, community leaders, and civil society groups). These were complemented with a review of planning documents and policies in the city council to assess the effectiveness of policies in enhancing the resilience of communities in the selected study parishes to climate change impacts in the city.

Use was made of the process model of vulnerability to flooding (figure 26.2), based on several years of research on dimensions of floods. The model sees these floods and their impacts as the net effect of the threat, the mediating influences that moderate that threat for the affected population, and the support capacity in households, communities, and indeed the nation that helps to promote resilience in that population and the capacity to recover from the threat, the event, and its effects.

Figure 26.1: Location of selected study parishes in Kampala City. Sources: Google Earth (?), permissions must be checked.

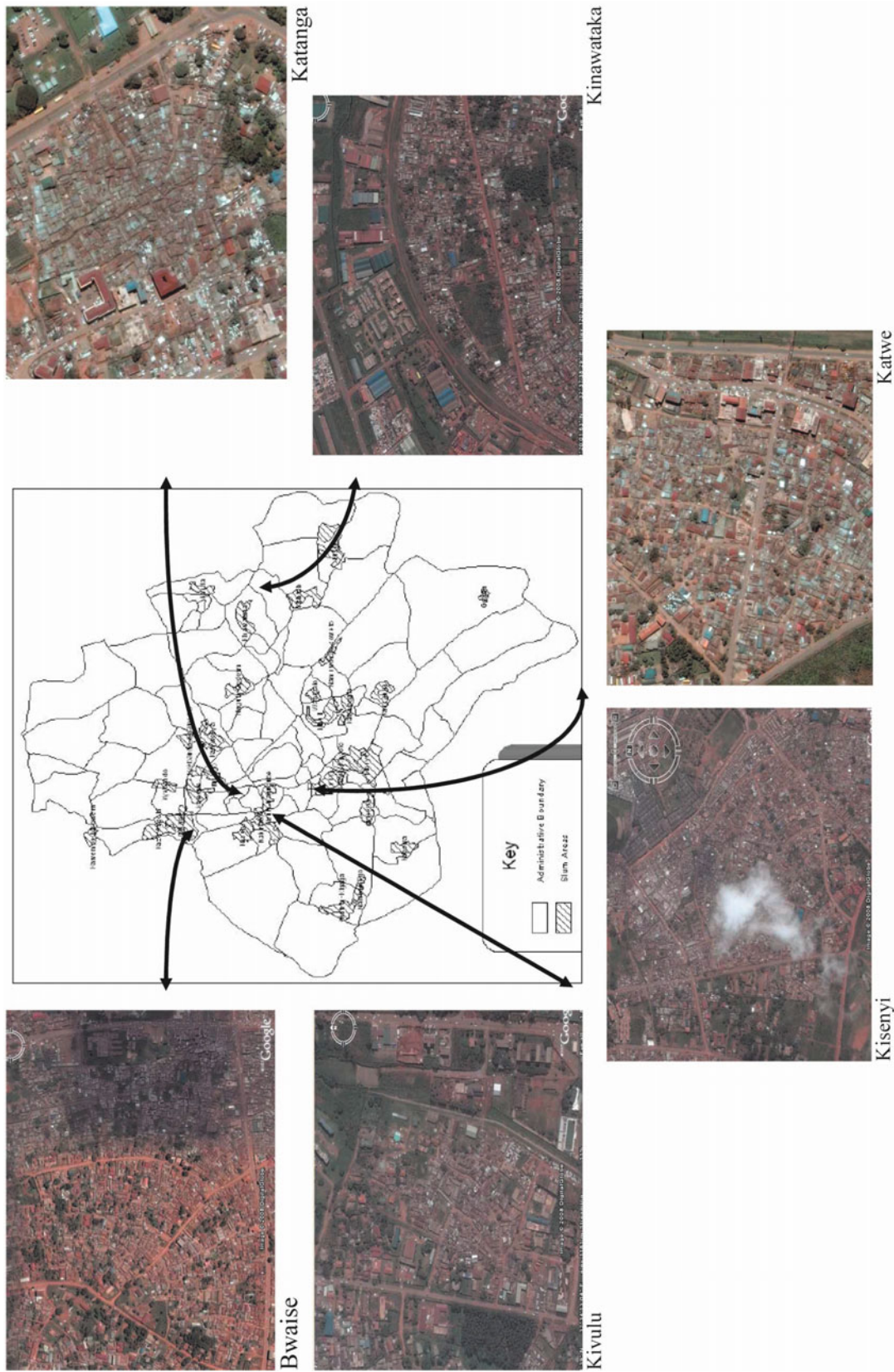
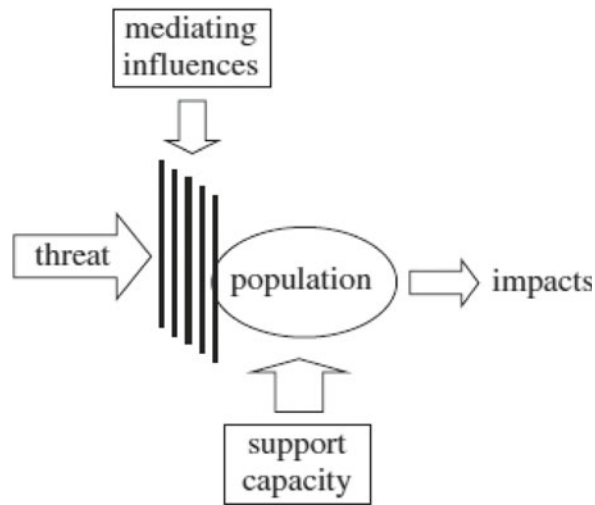


Figure 26.2: The process model of vulnerability to flooding: threats, impacts, and mediating influences. **Source:** Penning and Green (2000: 349).



26.3 Results and Discussion

26.3.1 Flood Zones in Kampala

The city 'region' of Kampala covers an estimated land area of 1,895 km², engulfing the hitherto satellite towns of Entebbe, Wakiso, Mukono, Lugazi, and Gayaza. This is the functional city region in which economic, social, and environmental processes are spatially connected, but where variable effects of climate-change-induced impacts exist in the numerous informal settlements occupied largely by the urban poor (Lwasa 2010).

The landscape characteristics and hydrology of Kampala are such that the city is built on a series of flat-topped hills with steep slopes (figure 26.3), often merging abruptly into long and gently undulating slopes leading into moderately broad valleys dissected by eight major drainage systems (figure 26.3). The eight main drainage systems draining Kampala city include Nakivubo (37.9 km²), Lubigi (65.8 km²), Nalukolongo (32.8 km²), Kansanga (19.2 km²), Mayanja (41.1 km²), Kinawataka (27.5 km²), Nalubaga (25.0 km²), and Walufumbe (2.3 km²) (figure 26.4).

Each drainage system also consists of a series of subsystems (sub-tributaries) that feed water into it. Each drainage system consists of numerous small drains, a number of secondary channels, and a primary channel. Storm water run-off originates as overland flow, accumulating in small drains that flow di-

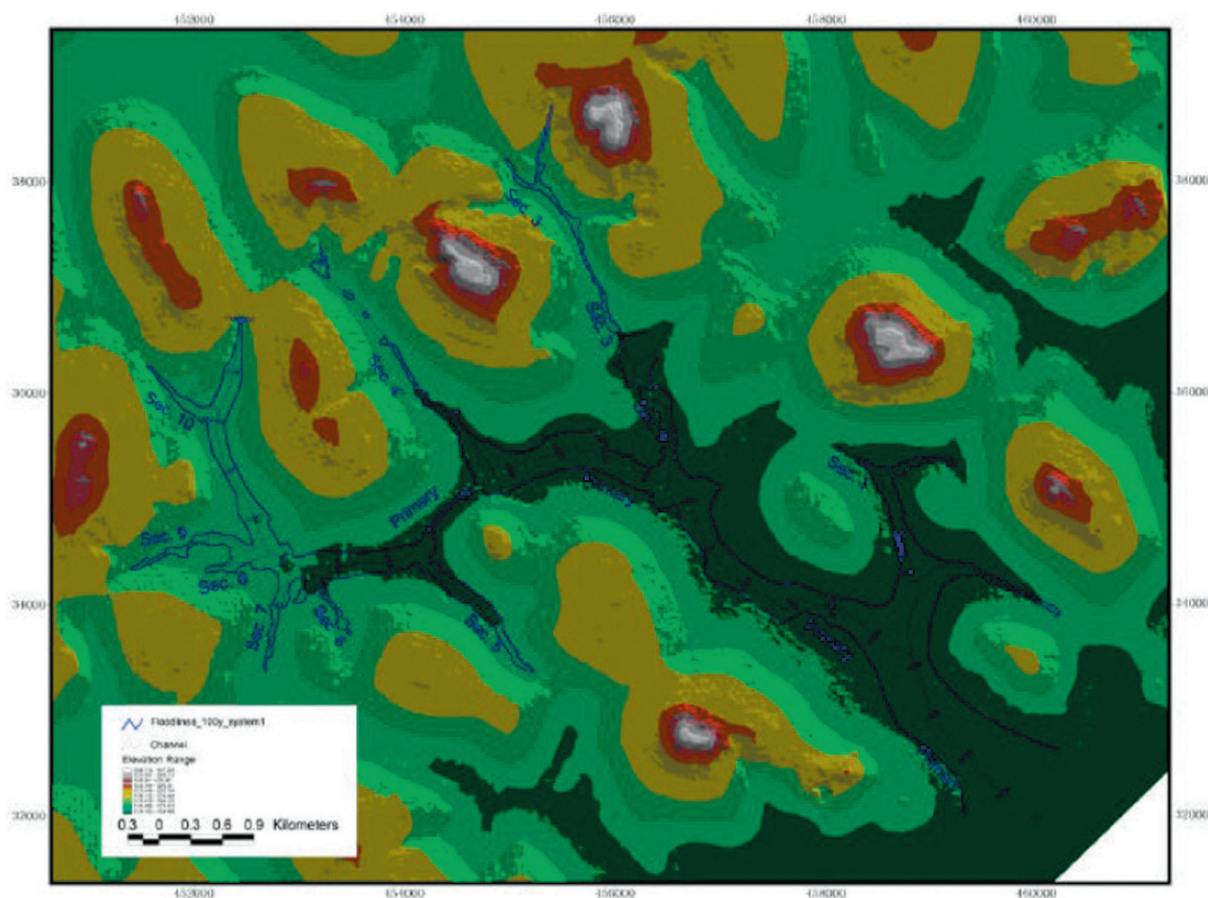
rectly to the primary and secondary channels to discharge points in the watershed. The valleys are mainly wetlands that are permanently or seasonally waterlogged, and most of them are on the same level as Lake Victoria. Most of the low-income settlements that are home to more than 60 per cent of the city's population are located along the lower slopes and valleys. These are the areas that are most severely affected by planning and drainage problems related to the management of flood waters.

Kampala City receives an annual rainfall of between 1750 mm and 2000 mm distributed in two peaks, one being March to May and the other September to November. The two are separated by short dry spells from June to July and December to January. The city has a mean of at least 50 mm in every month. According to Acres and IDC (2002), critical storms occur over short periods. Coupled with the higher rainfall amount are the higher rainfall intensities, and these higher intensities are partly responsible for the floods. Climate change is making weather less predictable and rains more uncertain, and records indicate that most rainfall events are heavy (50 mm received after a single rainfall event). According to the Fourth Intergovernmental Panel on Climate Change Assessment Report, the global climate change models project an increase in average temperatures in Uganda by up to 1.5°C in the next 20 years and by up to 4.3°C by the 2080s. Changes in rainfall patterns and total annual rainfall amounts are also expected.

Based on the models, predictions indicate an increase in rainfall of 10 to 20 per cent over most of the country with a decrease expected over the semi-arid cattle corridor. From the precipitation predictions, it is estimated that there will be 10 to 20 per cent increase in run-off under future climate change scenarios for most of Uganda. Recent recorded rainfall data indicate some significant variations and changes in various parts of the country (Lwasa/Koojo/Mabiriizi et al., 2009).

The unpredictability of rainfall is shown both by observations, such as the large fluctuations in the levels of Lake Victoria in Africa since 1980, and by the experiences of long-term urban slum residents who report much more frequent storms producing floods since 1990 (Action Aid 2006). The most significant climate change impact in Kampala comes from increased precipitation that leads to flooding. Observed flood events have increased from an average five in 1993 to nine in 1997, annually decreasing to three in 1993 and later increasing to eight by 2007 (Lwasa 2010). Floods generally last for about 2 to 3 hours,

Figure 26.3: Digital elevation model of Nakivubo. **Source:** Ministry of Local Government and Kampala City Council (2002).



and occur about 10 to 15 times per year (Ministry of Local Government; Kampala City Council 2002; Ministry of Water and Environment 2006).

26.3.2 Types of Floods in Kampala

26.3.2.1 Floods from the Land

These are frequently a result of intense rainfall that is unable to soak into the ground or enter drainage systems. The local topography and the form of the built environment have a strong influence on the direction and depth of flow of these kinds of floods in the city.

26.3.2.2 Floods from Sewers

In Kampala, these are associated with rainwater that is frequently drained into surface water sewers or sewers containing both surface and waste water known as combined sewers. Here the floods result when the sewers are overwhelmed by heavy rainfall, generally because of their inadequate capacity but most fre-

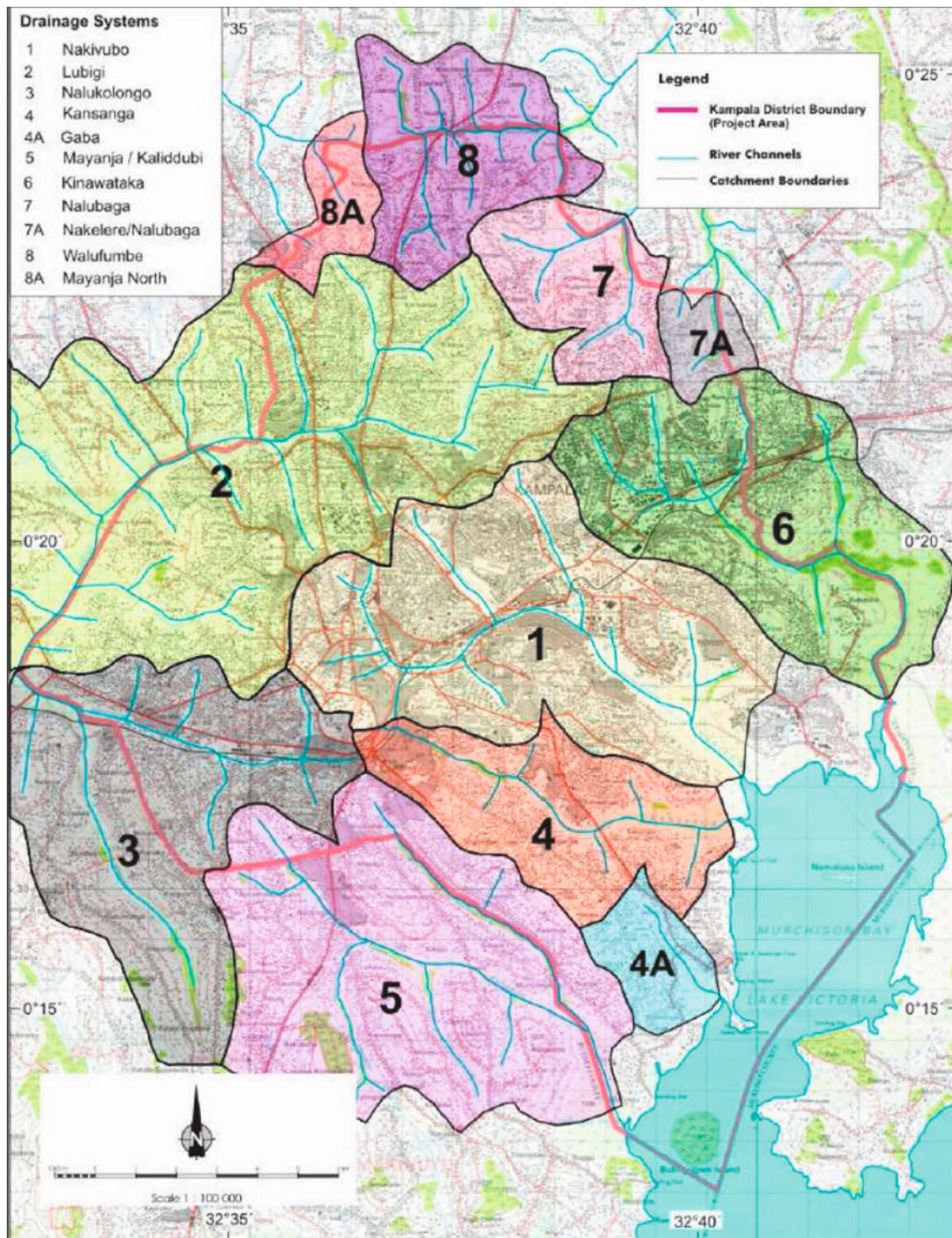
quently because they are blocked by waste materials. Again when this happens to combined sewers, there is a high risk of land and property being flooded by water contaminated with raw sewage.

26.4 Drivers of Floods in Kampala

26.4.1 Population Growth

The population of Kampala city has grown from 0.8 million in 1991 to 1.2 million in 2002. It is projected that the future population could increase to 2.7 million by 2020, and to 4.8 million by 2040. Human settlements and industrial development are extending from the many hills to the lower-lying areas on the banks of the drainage channels within the flooding zones (figure 26.5).

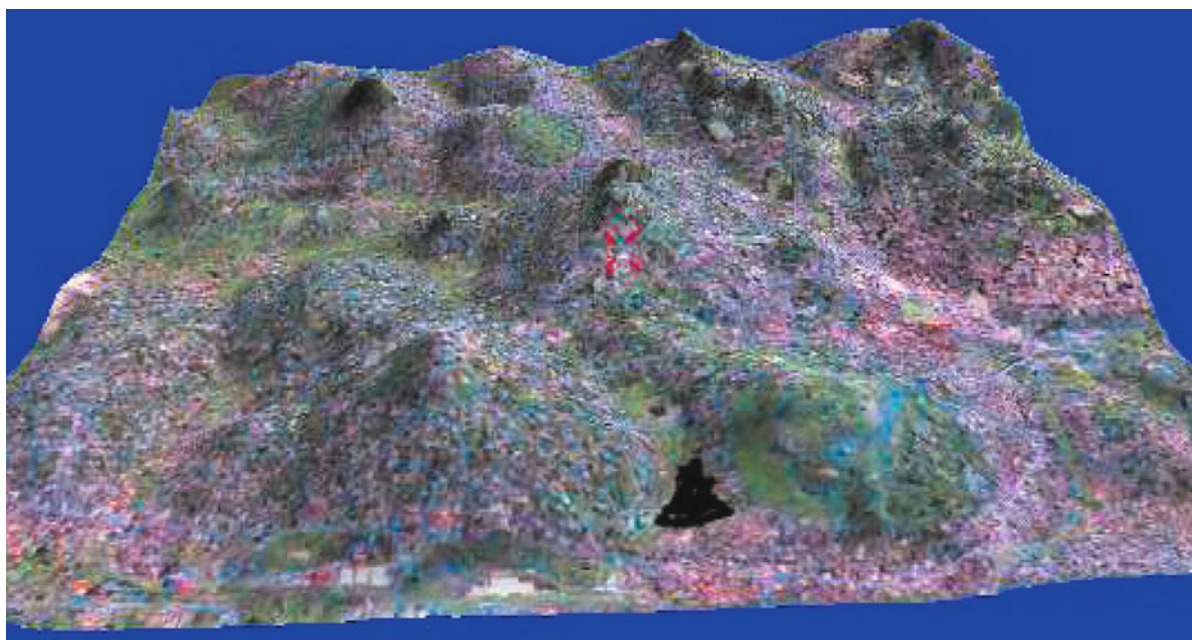
Figure 26.4: Major drainage basins in Kampala. **Source:** Ministry of Local Government and Kampala City Council (2002).



The minimum carrying capacity or density is used as the basic measure of land use or intensity of development and population distribution for the purposes of

the drainage study. It is estimated that 50 per cent of the parishes in Kampala City will have exceeded their carrying capacity by the year 2016, and all the parishes

Figure 26.5: Extensions of the built environment from hills to valleys in Kampala City. **Source:** Lwasa (2010). Permission from copyright holder is needed.



will have done so by the year 2040 (Acres/IDC 2002). The Ministry of Works and Transport (2009) reports that within the next 15 years, Uganda’s population is expected to grow from 27 to 37 million people, while the Greater Kampala Metropolitan Area population is expected to grow to 3.6 million people (table 26.1); these two areas are further illustrated in figure 26.6.

Table 26.1: Population growth rates in Greater Kampala Metropolitan Area (GKMA). **Source:** Ministry of Works and Transport (2009).

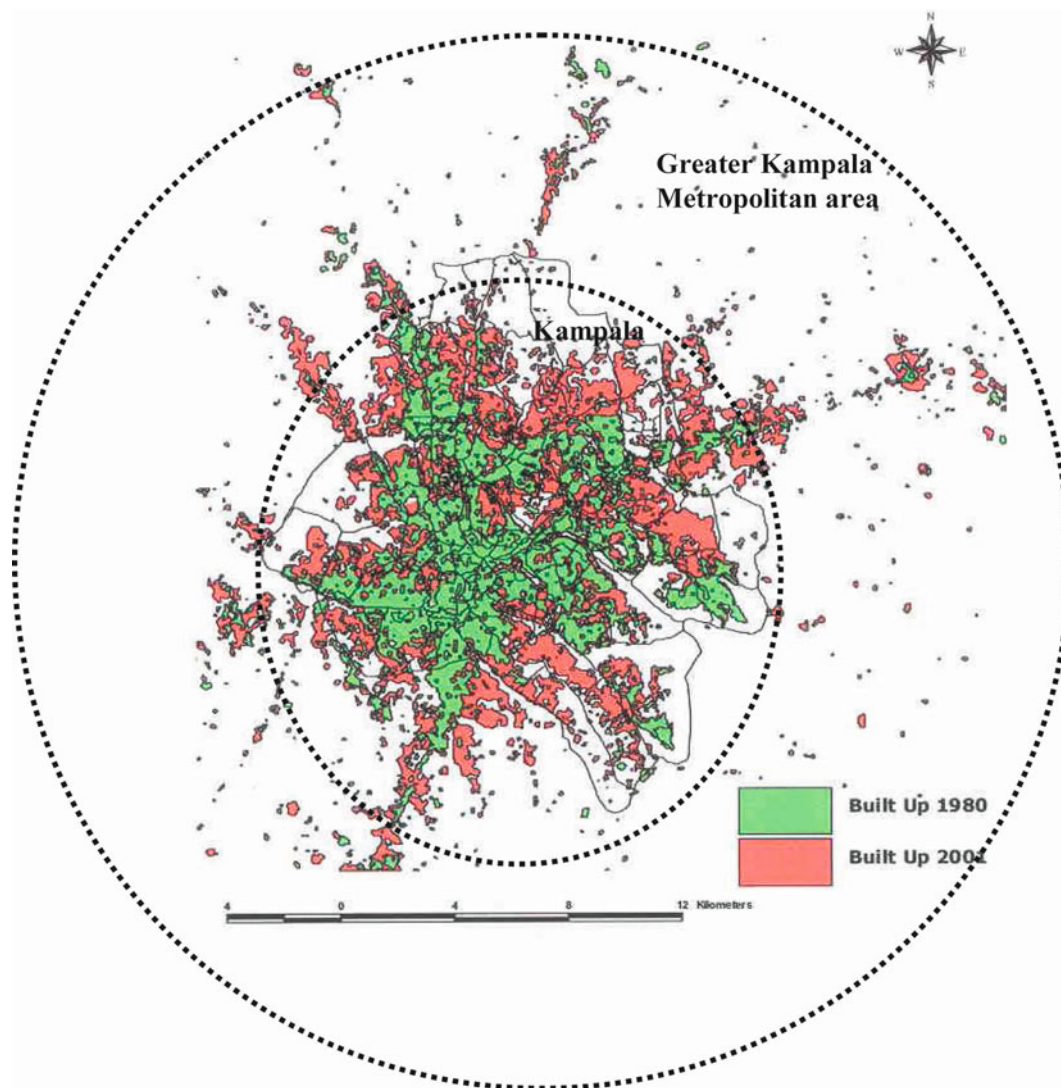
Area	Population growth rates (per cent per annum)			
	2003/08	2008/13	2013/18	2018/23
Kampala City	3.69	3.86	3.63	3.36
Greater Kampala Metropolitan Area	4.11	4.26	4.00	3.72

A key problem is that most of the rapid urban growth is taking place in countries least able to cope with these changes – in terms of the ability of governments to provide, or facilitate the provision of, urban infrastructure; in terms of the ability of urban residents to pay for such services; and in terms of resilience to natural disasters. The inevitable result has been the rapid growth of urban slums and squatter settlements (Mutizwa-Mangiza 2009). The construction of unreg-

ulated settlements by poor people in slum areas has reduced infiltration of rainfall, thereby increasing runoff to six times that which would occur in natural terrain (Action Aid 2006).

The destruction and increased vulnerability of wetlands has reached a critical level worldwide. Over the last 200 years, wetlands have been drained, dredged, filled, levelled, and flooded for urban, agricultural, and residential development (Carbonell/Meffert 2009). Likewise, the city of Kampala has been allowed to spread without adequate control and the danger is that natural ecosystems have been encroached upon. Much of the city was not planned to accommodate even half of the present population and the city planning authority has had less control over the location and timing of development (Bamutaze/Lwasa 2004). With ineffective urban management, the land use pattern has become chaotic, leading to inefficient use. City growth has therefore been entertained and tolerated under the de facto policy of “I own my land and I should develop it in my own way.” In this case, the Kampala City Council merely reacts to growth and stays out of land use decisions. There is no consensus on where growth should occur, or where growth should be directed in order to lessen its impact on the environment (figure 26.7). As a result, while the formal planning programmes and procedures developed previously remain legally in place,

Figure 26.6: Kampala spatial development patterns and built-up area (1980 and 2001). **Source:** Nyakaana et al. (2007). Permission from copyright holder is needed.



they bear less and less reference to what has actually taken place on the ground.

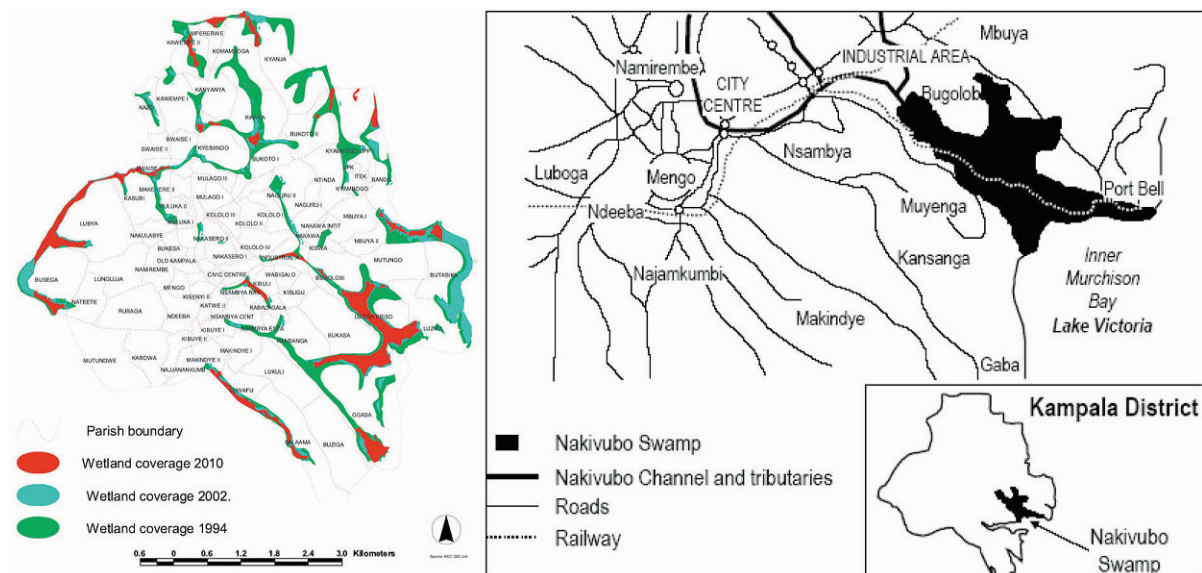
As the city urbanization process continues to unfold, more concrete, stone, brick, and asphalt pavements and buildings cap its surface with a waterproof seal. This urban growth increment means that storm water run-off increases in magnitude and destructiveness. Unable to penetrate the ground, the rain that falls on unstable construction sites, roofs, streets, and parking lots runs off the surface in greater quantities, more rapidly than the same amount of rain falling on the spongy surface of a natural field. The rapid storm water run-off flows into narrower, shallower floodplains, constricted by buildings and clogged with sediment, causing a considerable amount of flooding, es-

pecially in areas developing around the drainage channels. It should be noted that storm sewers transport water from one point to another; they do not reduce or eliminate water, they merely change its location. Traditional storm drainage practice protects local streets, buildings and parking lots from flooding, while contributing to major flood damage downstream.

26.4.2 Drainage Systems

Storm water run-off originates as overland flow, accumulating in small drains that flow directly to the primary and secondary channels or to the roads and then via underground pipes or small open drains

Figure 26.7: (a) Kampala’s wetlands and (b) Nakivubo wetland. **Source:** Emerton/Iyango/Luwum/Malinga (1998).



along the roads (referred to as roadside drainage) to discharge points into the primary and secondary channels. Each drainage system thus consists of numerous small drains, roadside drains, a number of secondary channels, and a primary channel. The minor systems correspond to the small drains between buildings and the roadside drainage. The purpose of the minor systems is to convey storm water to the major systems in such a way that inconvenience to pedestrian and vehicular traffic is minimized. The major systems accumulate all the storm water discharges from the various minor systems and include, therefore, all the primary and secondary channels including wetlands (Acres/IDC 2002). There was general agreement among all participants of the focus groups that the capacity and efficiency of existing drainage systems are declining through siltation and blockage by debris and poor maintenance over recent decades. Participants in Bwaise and Kinawataka indicated that houses built in storm water drainage channels have obstructed the path of the water to such an extent that deep storm water drains now pass people’s verandahs, posing a danger to whole communities.

Major roads often lack proper drainage facilities. At the same time, observations and inspections of the primary and secondary channels show that most of them are not properly sized, except for Nakivubo Channel. The rest of the channels are inadequate to accommodate the accumulated storm water run-off within the systems. Also, the development of minor systems has not kept pace with the rate of development (Ministry of Local Government and Kampala

City Council 2002; Lwasa/Koojo/Mabiriizi et al. 2009). Operational efficiency of drainage channels is affected significantly by the encroachment on the *right-of-way* (ROW) along drainage channels with blockage of the channel alignment; by dumping of refuse in the drainage system; and, in some cases, by direct construction across the channels (Ministry of Local Government and Kampala City Council 2002). When attempts were made to expand the drainage system, unsuitable construction procedures, poor workmanship, and poor supervision have compromised the structural integrity of the retaining walls, thereby exposing them to further collapse with increasing amounts of storm water (Mwakali/Oludai 2002).

The continued loss of wetlands and increased vulnerability of Kampala have been widely discussed and debated among many scientists, engineers, and policymakers for decades. Before 1900, Kampala’s valleys were home to swamps and rivers such as Nakivubo, Kitante, Lubigi, and Nalukulongo. This changed soon after Dr. Cook (one of the earliest medical doctors during colonial rule) discovered in 1903 that mosquitoes spread malaria. He advocated the drainage of swamps and rivers all over British colonial territories. Hence, Kampala’s once open slow-flowing rivers (streams) like Kitante, Lugogo, Mulago, Nakivubo, and Nsambya vanished, giving way to covered large pipes and open-air drainage channels. Nakivubo was the largest project, with all the other channels draining into it en route to Lake Victoria. At that time, the policy seemed to solve Kampala’s mosquito and drainage problems (Adule 2004).

With the rapidly increasing development in the city most of the land reserves that used to serve as flood buffer zones have been being encroached on and destroyed. Wetland areas in the city have been subjected to a gradual process of conversion and reclamation. The area around the wetlands, including the wetlands themselves, are regarded as prime sites for urban development (figure 26.3) due to their proximity to the city centre and industrial district, as a result of land shortage in the city, and because land prices are still relatively cheap compared with other parts of Kampala (Iyango/Luwum/Malinga 1999). Most of the wetlands that would normally provide clean waterways or accommodate excess water have been built up, and torrential water has to find its own paths, leading to floods in the city. This is consistent with the study conducted by Kampala City Council (2006), which further attributed the increasing urban drainage problems to the following factors:

- a) the destruction of the upstream buffer zones in the urban areas that has reduced the run-off concentration time hence increasing the risk of flooding downstream; and
- b) the existing drains regularly get clogged with debris and garbage, reducing their carrying capacity. In the lower areas of Kampala flooding has become a common phenomenon, occurring frequently, even after a one-hour downpour (Ministry of Water and Environment 2006).

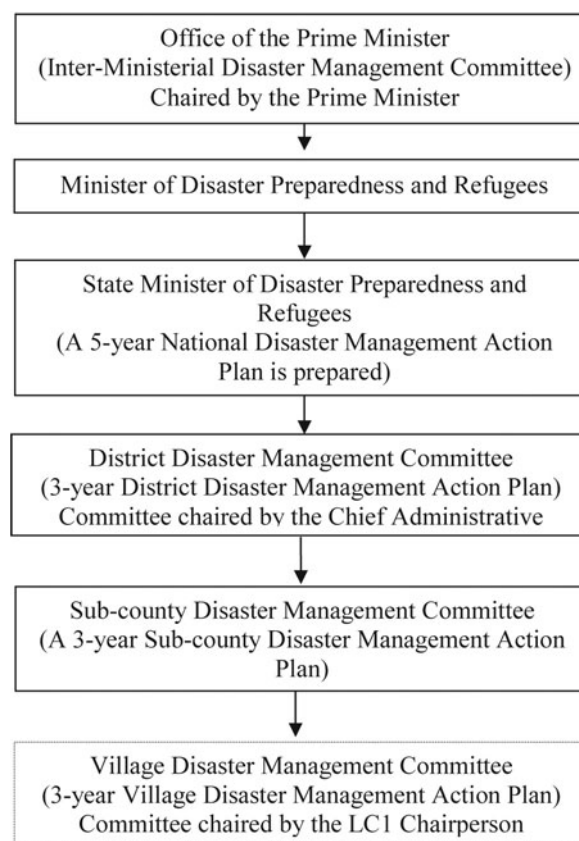
Encroachers invade the wetlands and before the *National Environment Management Authority* (NEMA) gets to know of it, they have already put up structures. Some of the encroachers dodge NEMA by building on weekends and at night, while others hire private security guards to oversee the wetland destruction. The most notable wetlands that Kampala has lost include Wandegeya Children's Park, the Kyambogo wetland, Centenary Park, Bwaise, Luzira, Kinawataka, Bugolobi, Garden City, the Shoprite/Game shopping mall, KCC playgrounds in Lugogo, the Clock Tower, and Nakivubo.

26.5 Flood Management and Planning Regimes and Actions in Kampala

26.5.1 Structure Planning

The urban form of Kampala City is attributed to the dualism which arose between the local *Kibuga* and Kampala Township or municipality. The former was

Figure 26.8: Existing institutional disaster management planning. **Source:** Compiled by the author.



largely unplanned and insanitary, while the latter was fully planned and highly controlled. The *Kibuga* was a highly sophisticated urban community and was growing as an unplanned urban area. The scale of intervention required to reduce and adapt to the effects of climate change will require action at all levels of government and society (Condon/Cavens/Miller 2009). *Kampala City Council* (KCC) is making efforts to ensure wise and sustainable use of wetlands within its jurisdiction. Through a highly participatory process KCC finalized the *Kampala Structure Plan* 1994–2004 and it is now a legal document. Under the plan, wetlands, including the Nakivubo wetland, were zoned off as green corridors. A new structure plan covering the period 2007 to 2017 is also prepared as part of the institutional component of the *Kampala Institutional and Infrastructure Development Project* (KIIDP). In addition, an EIA is required for any development in a wetland area, like the recent rehabilitation and widening of the Nakivubo channel. Under current policy and legislation, the law protects a wetland that is declared a green corridor and it cannot be used for any other purpose without prior written ap-

Table 26.2: Key summary points from the focus group discussions. **Source:** Compiled by the author

Component of community life	Key summary points
Security and livelihoods	<ol style="list-style-type: none"> 1. We feel so anxious when the rains start. 2. We need to have our homes and houses permanently protected from any future flooding events. 3. Floods are disruptive to a whole array of our local activities where we derive our livelihoods. 4. When the rainy season approaches, we have to think about shifting to other places to flee from floods that sometimes reach knee and window height. 5. We feel extremely 'stressed' by the flooding events and recovering from the gravest flooding events is very difficult. 6. The most devastating aspects of the flooding are financial and asset-related where people lose everything they had worked hard for.
Attitudes to city authorities and government	<ol style="list-style-type: none"> 1. City authorities have for a long time responded poorly following flooding events, particularly Kampala City Council. 2. People have never received information from government on realistic weather forecasts and have lost confidence in the national government to predict future flooding events, provide timely warnings, or provide support. 3. For a long time, there has been no real commitment to tackling flooding problems in the city, even with the existence of the Kampala Drainage Master Plan put in place in 2002. 4. Builders and contractors repairing drainage channels are unreliable and provide poor standards of service. 5. The government only makes statements about floods and future action during the election period when they are seeking our votes and, thereafter, nothing is done.

proval from NEMA. Although the recent KCC policies on wetlands which fall within its jurisdiction are somewhat positive, enforcement remains a problem. The population continues to flock to wetlands because they are cheaper compared with the much sought-after dry land, which is more expensive (Kampala City Council 2006).

26.5.2 Policy Frameworks

Disaster management has the goal of saving lives and not leaving people worse off than before. A key component of this is the institutions, both public and private, that are in place to mitigate the effects of disasters resulting from extremes of or variability in climate. With the increasing frequency of flood outbreaks in Kampala, certain governance structures have evolved, reflecting the different roles played by the local government, *non-governmental organizations* (NGOs), and the private sector.

Figure 26.8 shows the existing institutional disaster management planning framework in the country. The figure shows that disaster planning and management is founded on community action at the village level, although there is no specific detail given describing the

roles and responsibilities of each administrative level. Key summary points from the focus group discussions about components of community life affected by floods are given in table 26.2, which illustrates a feeling of anxiety at the onset of the rainy seasons.

Once the rains start, there is total lack of support received from any planning authorities and government agencies in the form of flood information and protection of households from running water. The recurrence of floods in the selected parishes has generated a lot of helplessness and loss of trust and confidence in the ability of planning authorities and government agencies to predict future flooding events, provide timely warnings, or provide support for the rapidly growing city population.

However, several planning and policy frameworks related to flood management exist in Kampala City. Some of these are national and others have been put in place at the city level (table 26.3). For example, Article 24 of the Uganda Constitution calls for the establishment of a National Commission to handle disasters. Old laws did not recognize wetlands as important ecological areas and it was only in 1995 that a law was put in place to protect wetlands. Henceforth it became illegal to encroach on a wetland. The

Table 26.3: Policies and laws related to floods in Kampala. **Source:** Compiled by the author.

Laws and policies	Major goal	Remarks
The Constitution of Uganda, 1995	Is the overriding law of the land and sets out national objectives and directive principles of state policy as a guide to all organizations and persons who interpret and implement the laws of the land. National objectives dealing with protection of natural resources (No. XIII), general social and economic objectives (No. XIV), natural disasters (No. XXIII), and the environment (No. XXVII) feature prominently in the Constitution.	The Constitution gives general guidance on policy directions which impact on storm water drainage in all areas of the country.
National Environment Management Policy, 1994	Extensive legal provision for wetland management is given in Sections 37 and 38 of the National Environment Statute. The City Council has the powers and obligations of a Lead Agency (as defined in Section 2 of the Statute) and requires the approval of the National Environmental Management Authority (NEMA) to undertake works or actions, such as constructing and operating a drainage system, which affects the wetlands.	Appropriate laws to enforce these guidelines have just been put in place and it requires extensive analysis to determine their effectiveness.
The Land Act, 1998	Section 46 of the Land Act requires that the use of land must conform to the provisions of the Town and Country Planning Act. This provides a sound legal basis for land use planning and control, particularly when read with Section 36 and Part 5 of the Second Schedule to the Local Governments Act. This legal arrangement enables the City Council to implement non-structural measures to avoid or at least minimize loss of life and damage to property as a result of flooding by zoning flood-prone areas for low-intensity, non-occupancy uses.	The land tenure system described together with the extreme pressure on land suitable for human settlement (particularly by low-income groups in the community) is a major factor limiting the effective use of sound urban planning mechanisms for storm water management.
National Environmental (Wetlands, River Banks and Lake Shores Management) Regulations, 2000	Clause 3 (2) requires (in this instance) the City Council of Kampala to “hold in trust for the people and protect” the wetlands. This source of ambiguity has an impact on the certainty with which land-use planning and zoning can be carried out by the City Council and on certainty about where responsibility lies for determining and marking on the ground the boundaries of wetlands.	This is an area of concern for the planning of storm water drainage since encroachment onto wetlands by various land uses, without the necessary conditions having been met when this is permissible, nullifies the major advantages of pre-emptive measures such as land-use management in minimizing the effects of flooding by storm water.
The Local Governments Act, 1997	The Second Schedule to the Local Governments Act defines the functions of local governments, always subject to the Constitutional requirement (Section 176 (2)) that there should be decentralization of authority and functions in a democratic way, supported by a sound financial base with reliable sources of revenue. Part 5A of the Second Schedule specifies that the City Council is responsible for the construction and maintenance of major drains and tarmac roads. The City Council must also prepare a master structure plan, approve schemes, approve building plans, and administer Mailo land. Responsibility for “secondary drains”, development and enforcement of building rules, repair of murrum and earth roads, neighbourhood structure plans, and local land management is to be devolved to Divisions within the City in terms of Part 5B of the Second Schedule. Part 4 of the Second Schedule (clause 12) makes specific provision for the City Council to devolve responsibility for “making, altering, diversion and maintenance of culverts, bridges, road drains and water courses ..” to the Divisions.	There is lack of legal clarity as to where actual responsibility lies for planning functions such as land-use planning and zoning.

Laws and policies	Major goal	Remarks
The Town and Country Planning Act, 1964	This governs land use and land planning in urban and rural areas. The Act established guideline for planning schemes and acquisition of land and compensation for acquired lands, as well as considerations to safeguard the natural environment. The purpose of this legislation is to promote the orderly development of urban and rural land by way of outline and detailed schemes in planning areas. Part IV of the Second Schedule to the Act lists drainage as one of the public utility services which could or should be included in outline and detailed schemes. When a scheme has been brought into effect in terms of this Act the planning committee is empowered to execute and enforce the scheme, effectively able to regulate the construction of buildings and the development of land. This land-use control mechanism complements zoning plans, a powerful non-structural measure for minimizing the effects of flooding by storm water.	There is lack of planning and administrative capacity to plan, implement, and enforce planning regulations. In view of the shortage of habitable land, encroachment on wetlands has occurred unabated.
National Water Policy, 1999	The discharge of effluent from industrial areas is subject to a permit in line with the Waste Discharge Regulation (1996) No permit is however required to undertake works of improving drainage systems unless such works impede or change the direction of flow of water.	There is lack of a clear enforcement mechanism to monitor discharge of effluents.
Public Health Act (1964)	Section 7 of the Act provides local authorities with administrative powers to take all lawful, necessary, and reasonably practicable measures to safeguard and promote public health.	This is a very old Act that did not envisage the rapid pace of development of the city. It requires extensive revision to take new growth trends in the city into account.
Local Urban Authorities Act (1964)	This Act empowers urban authorities to effect development control and enforce standards. The law provides sufficient powers, including enforcing standards on land developments, but KCC has been unable to restrain residents from erecting buildings and other property on road reserves.	Kampala City Council has been unable to enforce development controls and enforce standards.
The KCC (Solid Waste Management) Ordinance, 2000	In Section 5 of the Ordinance, no person shall place, deposit, or allow any solid waste to be placed or deposited on his or her premises or on private property, on a public street, roadside, or in a ditch, river, stream, lake, pond, canal, channel, or in a park, or in a gulch, ravine, excavation, or other place where it may be or become a public health nuisance.	There is a backlog in solid waste management and most of the waste from the selected study parishes ends up in nearby drainage channels.
Kampala Drainage Master Plan (2002)	Is the master plan setting guidelines for all levels of government in the city to manage drainage problems and flood-related concerns in the city.	Since its inception in 2002, the master plan has not been implemented. A glaring problem is the blockage of drainage channels by silt and garbage, making them unable to drain the city's storm water adequately. Most of the channels that were constructed or rehabilitated under the Nakivubo Channel Rehabilitation Project four years ago are now clogged. The project, which cost \$9m (sh15b), was implemented with a World Bank loan. Observations revealed that virtually all the drainage channels were choked by silt, garbage, and bushes. The challenge remains the inadequate maintenance that leads to silting and the blockage of water flow.

Ministry of Natural Resources in Uganda (1995) reports that the National Policy for the Conservation and Management of Wetland Resources aims at promoting the conservation of Uganda's wetlands in order to sustain their ecological, social, and economic functions. In addition, regulations for the protection of river banks and lake shores and development of floodplains have also been issued (Ministry of Water and Environment 2006). Participants in the focus group discussions agreed that existing planning regimes and their influence on flood management are ineffective and not taken seriously. They exist only on paper and have little impact on flood management in the city. Whether the Kampala City Council will succeed in instituting appropriate flood management measures and plans and take even more determined action in the future remains unclear, and this ultimately makes the evaluation of their effectiveness a rather challenging task.

26.5.3 Managing Surface Water

Investments in drainage infrastructure are crucial. The ten-kilometre long Nakivubo Channel is the main storm water transport canal for Kampala City in Uganda. It discharges into Lake Victoria. For a long time the channel has been considered to be of inadequate capacity to transport all the storm water generated within its catchment area. To address the problem of flooding, the Channel is currently undergoing extensive rehabilitation, with financing from the World Bank. The rehabilitation includes widening, desilting, re-lining of the sides and bed, and the provision of new and better culvert and bridge crossings. In addition, some residents have undertaken collective work to open up drainage channels or have constructed barriers to water entry at their doorsteps. Some constructed outlets at the rear of their houses, so that any water entering their homes flowed out quickly (Action Aid 2006).

26.6 Conclusions

The reality is that large populations in Kampala City will continue to occupy zones that are vulnerable to periodic flooding, some of it severe. Yet the flood management and planning regimes that the low-income communities rely upon are not robust enough to cope with flooding conditions, thus rendering them vulnerable to the impact of climate variability and change. The increased population growth and

suburbanization, combined with wetland loss, make the city increasingly vulnerable. I

An assessment of the adaptability of low-income settlements in the city indicates that poverty plays a very big role in the vulnerability of the communities to floods. Due to poverty and inadequate early warning mechanisms, the communities lack effective strategies for coping with flooding events. Future flooding management and planning programmes need to take into account the diversity of factors in the city that further expose the low-income settlements to flood risks. Participants agreed that there is no single approach to reducing floods, but a package of measures starting with development and enforcement of policies and serious city engineering is important. Priority action areas identified by participants for the city include:

- a) Investment in drainage infrastructure is crucial to reduce flooding and contribute to effective management of the drainage systems, and therefore contribute to better overall environmental management by the city. This was most noted in Bwaise which among the six parishes selected is the most affected by floods.
- b) Frequent maintenance and desilting of drainage channels together with an effective waste management policy should be encouraged by Kampala City Council.
- c) The twelve focus group discussions expressed a need for better information from the government on possible future flooding events in their communities. This would then allow them to prepare better during the floods.
- d) Further protection of wetlands from encroachment should be encouraged. Halting unauthorized human settlements and buildings and other activities that degrade wetlands, for example, that the *National Environment Management Authority* (NEMA) is demolishing structures that are illegally constructed in wetlands, is a step in the right direction. This should ultimately restore natural landscapes that allow space for flooding to occur. It is time Kampala created urban open spaces that serve the multiple purposes of flood control, water quality improvement, and recreation. These are not new ideas at all but rather the rediscovery of old solutions.
- e) There is a need to steer new development to areas with the lowest probability of flooding. This should be part of a new urban planning system that should recognize new and emerging challenges including climate change, rapid urbanization, poverty, informality, and safety.

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27 Malnutrition and Conflict in Eastern Africa: Impacts of Resource Variability on Human Security

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27.1 Introduction^{1, 2}

Changes in climate, along with anthropogenic pressures, impact vegetation productivity and the related ecosystem services on which human security relies. The impacts of these climate changes on society will be experienced both through changes in mean conditions over long time periods and through increases in extreme events. Uncertainties remain about how short-term changes in ecosystems influence human security. Most studies analysing the relationship between human security and climate are at the country level, ignoring fine-grained spatial heterogeneity in local climatic and socio-economic conditions. In this chapter, detailed spatio-temporal information is extracted from wide-swath satellite data (MODIS) and used to examine the impact of interannual variability in ecosystems on malnutrition and armed conflict in eastern Africa, while controlling for other natural and socio-economic factors. The analysis was performed at subnational and village scales. At the regional level, ecosystem variability was associated with malnutrition. This relationship was not statistically significant at the village level. At both levels of analysis, our results indicated that armed conflicts were more likely in regions with more vegetation. Results suggested that in eastern Africa increased levels of malnutrition were related to armed conflicts. They also showed the importance, in low-income countries, of local eco-

nomical activity and accessibility to reduce the likelihood of malnutrition and insecurity.

There is an ever-greater knowledge of how climate change, along with other socio-political factors, can impact livelihoods and threaten human security. In the past, research has focused on conflicts and famines, separating out the economic and political impacts (De Waal 1997; Sen 1983). Now, with climate change, there is an additional layer of complexity which needs to be understood. Recent studies have analysed the impact of long-term changes in climatic means on food security (Parry/Rosenzweig/Iglesias et al. 1999; Schimel 2006; Schmidhuber/Tubiello 2007) and its influence on the onset of conflict (Raleigh/Urdal 2007). However, besides influencing the mean climatic conditions over long time periods, climate change will also impact on society through increases in extreme events such as droughts, floods, and heat-waves, with relatively small mean climate change in some cases (IPCC 2007). These short-term changes in climate increase the variability and decrease the predictability of ecological production and thus have the potential to influence human security (Barnett 2003). This may be especially true in regions where communities rely directly on goods and services provided by natural ecosystems. Moreover, the capacity of human societies to respond to and mitigate the effects of ecosystem changes, which depends on cultural, institutional, and technological mechanisms, will become more challenging with increasingly rapid climate-induced ecological change. The objective of this chapter is to improve our understanding of the complex interactions between the climate and human security through an empirical analysis, with a specific focus on the impacts of climate-related environmental variability on malnutrition and conflicts.

In the past decades, the theoretical models explaining famines and conflicts have moved beyond a Malthusian point of view, focusing more on the political roots and other social factors (Sen 1983; De Waal

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2 Keywords: Armed conflict, malnutrition, variability, MODIS, eastern Africa.

1997). Environmental and climatic factors have also been introduced as potential causes of food insecurity and conflicts. A theoretical paradigm was developed to show how long-term changes in climatic means increase migration and demands on natural resources, which in turn lead to food shortages and conflict (Homer-Dixon 1991). This idea was supported by several empirical case studies (Percival/Homer-Dixon 1998; Howard/Homer-Dixon 1998) and coarse historical analyses (Zhang/Brecke/Lee et al. 2007). In Darfur, for example, the environmental root cause of the conflict has been suggested by some prominent politicians and academics (Sachs 2006; Moon 2007). This perspective was however challenged by another group of political scientists who emphasized the social, ethnic, economic, and political roots of conflicts, and stress the role of conflict management institutions (Theisen 2006; Nordås/Gleditsch 2007; Kevane/Gray 2008), pointing also to methodological weaknesses and theoretical shortcomings (Gleditsch 1998). One important aspect of climate change, which is often omitted from the discussion, is the impact of climate variability on food security and conflicts. Thus the primary impetus for this case study was to investigate the interactions between short-term changes in climate and malnutrition and armed conflicts, using regional-scale empirical data.

Until now, most studies that have statistically analysed the impacts of changes in environmental conditions and other socio-political factors on human populations have relied on country-level data, using aggregate figures such as *gross domestic product* (GDP) and casualty counts, thereby ignoring local conditions. The level of economic development within a country plays an important role as a mediating factor (De Waal 1997). Moreover, ecosystem changes impact regions unequally, depending on their economic and political status. Thus, to improve our knowledge about the impacts of climate variability on society, more fine-grained analyses at the subnational scale are needed (Barnett 2003; Nordås/Gleditsch 2007). Data extracted from satellite imagery can prove very beneficial as they provide spatially-explicit information about changes in land surface attributes. High-temporal-resolution time series of satellite data have the potential to improve our understanding of the links between the natural environment and humans by providing detailed information on spatial and temporal variations in vegetation activity (Linderman/Rowhani/Benz et al. 2005).

The authors present a study of the geographical distribution of malnutrition and armed conflicts in

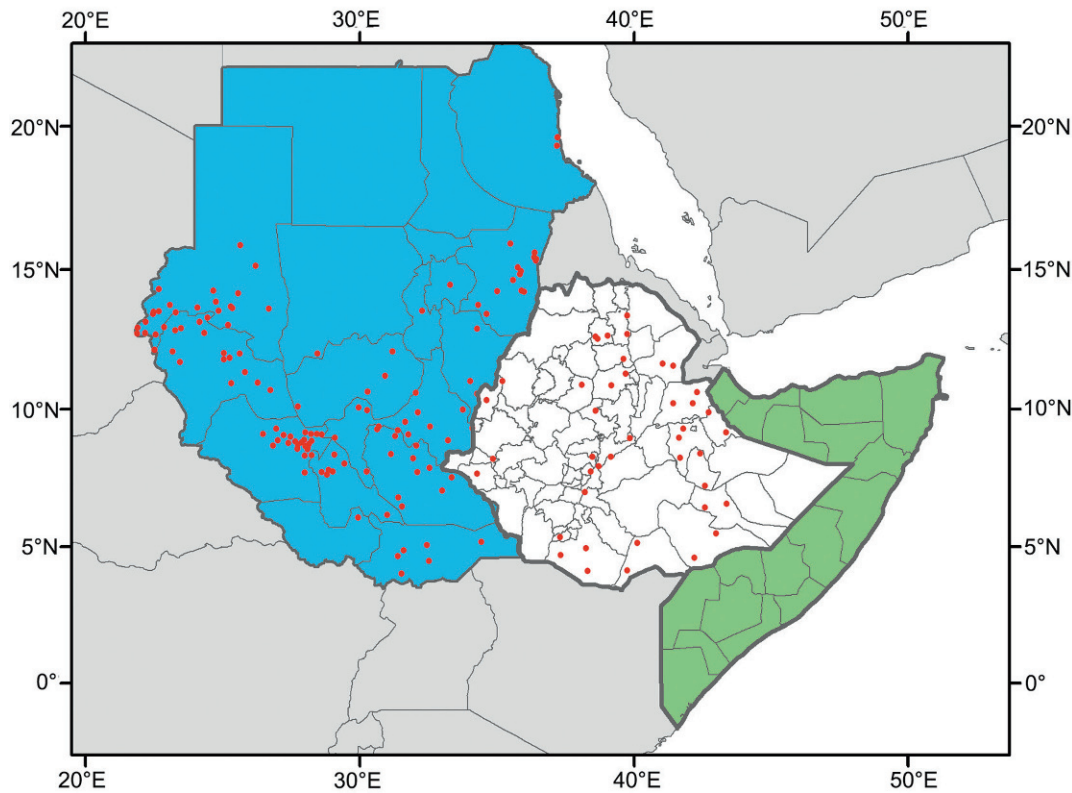
eastern Africa and more specifically in Sudan, Ethiopia, and Somalia. This region is characterized by unstable governments, weak states, and widespread poverty. Recently, these countries ranked 126th (Ethiopia), 173rd (Sudan), and 180th (Somalia) out of 180 countries on the 2008 Corruption Perceptions Index by Transparency International (<www.transparency.org>), and ranked 146th (Sudan - Medium), and 169th (Ethiopia - Low) on the *Human Development Index* (HDI). Somalia is not listed on the HDI (UNDP 2007). Droughts, floods, famines, and violence have affected the region in the past decades. In sub-Saharan Africa, changes in natural ecosystems have the potential to influence human security, along with many socio-economic factors. However, the causal mechanisms of conflicts and malnutrition are known to be very complex. In this chapter, a statistical investigation is made into whether there is a regional-scale association between spatio-temporal variations in ecosystem attributes and the occurrence of malnutrition and conflicts, while controlling for other important factors. Contrary to a widely-held view, our results suggest a positive association between ecosystem productivity and conflicts. Furthermore, this analysis does not show any association between short-term land degradation and either conflicts or malnutrition.

27.2 Study Area

This study focuses on three countries in eastern Africa that have suffered from food insecurity, environmental change, and various conflicts during the past decades (figure 27.1). In the Republic of Sudan, from the early 1980s until recently, the *Sudan People's Liberation Army* (SPLA) fought the government in Khartoum for more autonomy in southern Sudan, causing migration, increased mortality, and land changes. To the west, in the Darfur region, a war is currently opposing Arab militia to different local non-Arab communities. Some authors have suggested that drought, desertification, and overpopulation have pushed the nomads further south as they search for land and water and thus occupy land used by local non-Arab people (UNEP 2007).

In neighbouring Ethiopia, environmental changes are also a key concern. Land degradation, population growth, and drought threaten food security in the area. Extreme weather-related events appear to have already influenced the country's social and political situation (Comenetz/Caviedes 2002). Regional and international armed conflicts have also impacted the

Figure 27.1: Study area showing the different administrative units and the villages (in red) used in this multi-scale study.
Source: The authors.



population in this country. Ethiopian troops were also involved in an insurgency in Somalia, which is currently facing one of the worst humanitarian crises on the African continent. Plagued with droughts, locust invasions, and floods, Somalia has not had a permanent national government since 1991. There are a large number of clans and warlords fighting for control over land and resources. In the centre of the country, Islamist militias are fighting the internationally recognized, transitional federal government for dominance. This has led to an increase in food insecurity and a large number of refugees.

The study region covers more than 4 million km², is host to many pastoralist communities, counts for over 132 million people (Central Intelligence Agency 2008), and includes three of the world's poorest countries (UNDP 2007). The number of refugees and *internally displaced people* (IDP) in 2006 in the region was well above 7 million, with more than 5 million IDPs alone in Sudan (Central Intelligence Agency 2008).

27.3 Data and Method

27.3.1 Nutrition Indicator

A commonly used nutrition indicator was applied to characterize the health situation in the region (table 27.1). The *Global Acute Malnutrition* (GAM) indicator for children under the age of 5 was used to measure nutritional status (Guha-Sapir/van Panhuis/Degomme et al. 2005). Theoretically, malnutrition covers both under- and overnutrition but, in an emergency situation, malnutrition is often used synonymously with undernutrition. A shortage of nutrients at the early stages of life can have disastrous effects. During health surveys (see below), information on three variables is collected for every child from 6 to 59 months: height/length, weight, and age. The ratio weight-over-height measures 'acute malnutrition', which is then compared with expected values from reference tables.

The GAM indicator represents the proportion of children below 2 standard deviations from the average ratio. The z-scores of this indicator at the village level as well as at the different administrative levels in eastern Africa from 2001 to 2006 were obtained from the

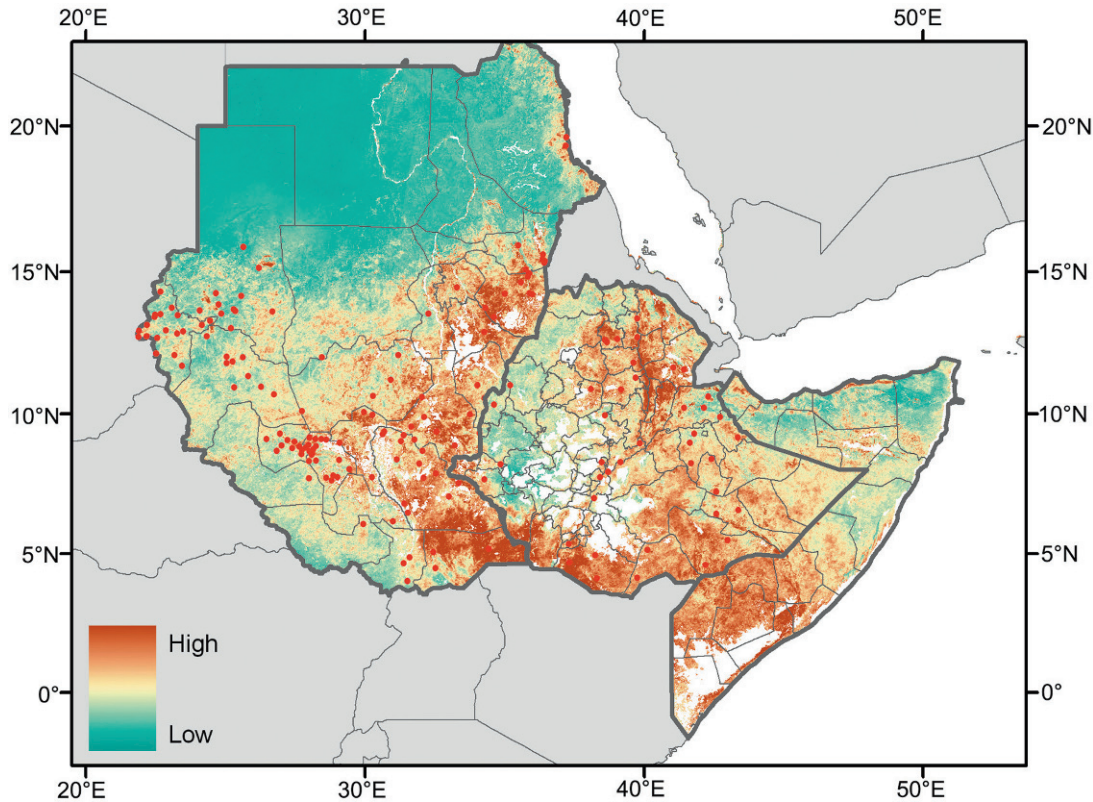
Table 27.1: Summary of all the data used in this study. **Source:** Compiled by the authors.

Variables	Availability	Characteristics	Spatial scale	Temporal scale	Thresholds
Global Acute Malnutrition (GAM)	< www.cedat.be >	Weight-over-height ratio < 2 standard deviations from average ratio.	Different administrative levels.	Variable (>2000 surveys available).	Village or admin. unit set to 1 if at least three surveys were available and the majority of these surveys had a value of GAM>15.
Armed Conflict	< www.prio.no >	Interstate, extra-state, internal, and internationalized internal armed conflicts with at least 25 battle deaths annually, between two or more organized parties, of which at least one is the government of a state.	Centre of conflict with radius (in 50 km intervals) indicating the largest geographic extent of the conflict zone.	1946 – 2005	Village or admin. unit within the region of conflict was set to 1 if malnutrition surveys available.
Vegetation variability (SCV)	Rowhani/ Linderman/ Lambin (in press)	Measure of interannual changes in total photosynthetic activity and in phenology (based on MODIS data).	1 km	Since 2000	Village: mean over years where GAM available. Administrative unit: 80 th percentile over unit.
Ecosystem productivity (iEVI)	Rowhani/ Linderman/ Lambin (in press)	Measure of total photosynthetic activity and used as proxy to measure total annual vegetation activity and the abundance of natural resources (based on MODIS data).	1 km	Since 2000	Village: mean over years where GAM available. Admin. unit: average
Land degradation (trend in iEVI)	Rowhani/ Linderman/ Lambin (in press)	Downward trend in iEVI (2000-2005) over at least 5 of the 6 years of observation, with a difference between the first and last year of at least 20% (based on MODIS data).	1 km	Since 2000	Village: percentage of degraded land. Admin. unit: degraded if > 2% land decreased in iEVI.
Roads	ESRI	All roads were used.	Vector format.	1993	Mean road density.
Economic activity	< gecon.yale.edu >	Geophysically-based economic dataset based on the concept of <i>Gross Cell Product</i> (GCP), which is similar to the <i>Gross Domestic Product</i> (GDP).	1°	2000 (1990, 1995 also available).	Mean Purchasing Power Parity (PPP) cell value over admin. unit/village.

Complex Emergency DATAbase (CE-DAT - <<http://www.cedat.be>>). This project of the World Health Organization Collaborating *Centre for Research on the Epidemiology of Disasters* (CRED) is a compilation of survey results carried out among conflict-affected populations. These nutritional surveys are

currently undertaken by principally *non-governmental organizations* (NGOs) working in the field and are reported to CE-DAT. An analysis of the data has shown that the quality of the nutrition indicators has improved over the last few years and is adequate for comparative analyses (Degomme/Guha-Sapir 2007).

Figure 27.2: The spatial distribution of vegetation variability as measured by the SCV over the study area. The SCV was measured at 1 km-resolution using MODIS data. Some areas were masked out (in white) due to unreliable satellite data (cloud cover, missing data; Rowhani/Linderman/Lambin in press). **Source:** The authors.



27.3.2 Conflict Data

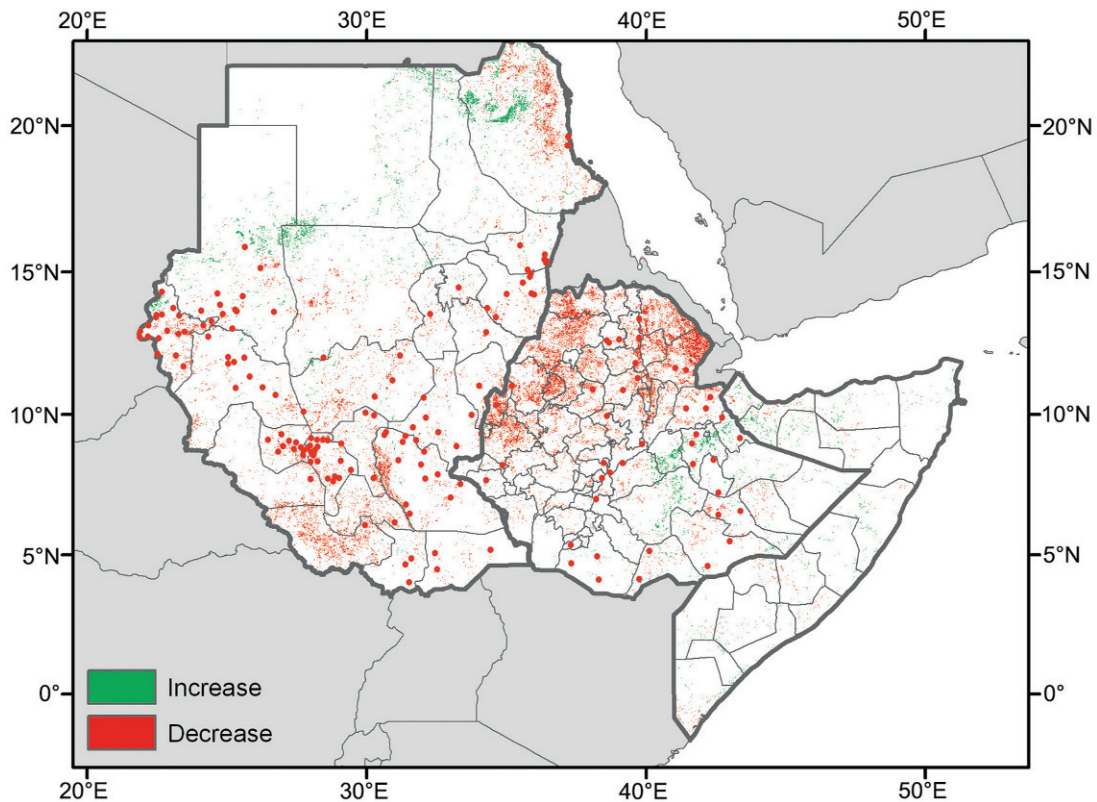
The geo-referenced Armed Conflicts dataset (Version 4, 2006) and the corresponding conflict site extension, developed by the *Centre for the Study of Civil War* (CSCW) at the *International Peace Research Institute, Oslo* (PRIO) and Uppsala University, were used (<http://www.prio.no/cscw/armedconflict>). This dataset covers interstate, extra-state, internal, and internationalized internal armed conflicts with at least 25 battle deaths annually, between two or more organized parties, of which at least one is the government of a state (Strand/Carlsen/Gleditsch et al. 2005). The dataset spans the period 1946 to 2005, and gives the geographic coordinates of the centre of the conflict as well as the radius of the affected area. The radius indicates the largest geographic extent of the conflict zone from the centre point during the course of conflict and is measured in 50 km intervals. The database also provides conflict parameters such as the year of observation, the start of the conflict, the parties involved in the conflict, the type of conflict, and its intensity. This dataset was used to deter-

mine small-to-large-scale violent conflicts. However, it does not take into account smaller violent conflicts which do not necessarily lead to direct human casualties but can degrade livelihoods.

27.3.3 Environmental Change Indicators

Environmental variables were measured using the 1 km-resolution, collection 4, *Nadir Bi-directionally Adjusted Reflectance* (NBAR) MOD43B4 product from the MODIS sensor aboard the Terra platform (Schaaf/Gao/Strahler et al. 2002) for the period from February 2000 to December 2006. To measure inter-annual variability in land-surface attributes we used the “Sum of the absolute values of the change vector” (SCV; figure 27.2), a metric based on the *Enhanced Vegetation Index* (EVI) which measures changes in total photosynthetic activity and in phenology (Linderman/Rowhani/Benz et al. 2005). The SCV was linked to climate variability and also to agricultural land use, fires, and other anthropogenic disturbances (Rowhani/Linderman/Lambin in press).

Figure 27.3: The spatial distribution of land degradation as measured by a continuous decrease in iEVI (a proxy variable for ecosystem productivity) over the study area using MODIS data. Some areas were masked out (in white) due to unreliable satellite data (cloud cover, missing data; Rowhani/Linderman/Lambin in press).



Climate variability intertwined with poor economic conditions can lead to population displacement. People may be forced to move to more fragile ecosystems. The consignment of poor populations to these marginal lands may cause environmental degradation (Homer-Dixon 1991). This ecological marginalization of poverty also increases the risk of malnutrition and conflict.

Furthermore, while in some cases it is resource scarcity that may trigger conflicts, in other cases it is the abundance of natural resources, especially if these generate substantial income (Barnett 2003; Collier 2007). Here, the downward trend in ecosystem productivity was included as a proxy variable characterizing one specific aspect of land degradation (figure 27.3).

The annual *integrated EVI* (iEVI) values, measuring total photosynthetic activity, are used as a proxy to measure total annual vegetation activity and the abundance of natural resources. Land degradation was calculated as a continuous decrease in iEVI over at least 5 of the 6 years of observation, with a difference between the first and last year of at least 20 per cent.

27.3.4 Control Variables and Socio-economic Data

During events of resource shortages, accessibility is of utmost importance for relief assistance (Rosegrant/Cline 2003). Supplies and aid need to reach the affected population quickly to reduce human casualties. Road maps were downloaded from the Digital Chart of the World server (ESRI 1993) to estimate the average road density per administrative unit. The economic activity of a country mediates the impacts of resource variability on human security (Homer-Dixon 1991; Barnett 2003).

In particular, disparities between richer urban areas and poorer rural regions within a country are quite important. To assess the economic activity per administrative unit, the G-Econ database was used, which measures global economic activity at a $1^\circ \times 1^\circ$ resolution (Nordhaus 2006). This geophysically-based economic dataset is based on the concept of *Gross Cell Product* (GCP), which is similar to *Gross Domestic Product* (GDP) but at the resolution of the cell. The data include the *Market Exchange Rate* (MER)

and *Purchasing Power Parity* (PPP) cell GDP values. This latter, purchasing-power-corrected 1995 U.S. dollars GCP was used in this study.

27.3.5 Statistical Model

Two logistic regression models were tested with, as dependent variable, respectively the global acute malnutrition indicator and the armed conflicts, and with the above-mentioned socio-economic and environmental data as independent variables. This statistical analysis was performed at two spatial scales.

Firstly, all the variables were aggregated at different administrative levels. Due to the constantly changing administrative situation in Sudan and Somalia, the analysis in these countries was focused on the first administrative level (states in Sudan and regions in Somalia). In Ethiopia, the analysis was conducted over the second administrative level, the 68 zones. For each year, both environmental change indicators were aggregated at the corresponding administrative level by taking the mean iEVI value to capture the general vegetation status over the unit and the 80th percentile of SCV to capture the most extreme vegetation variability. Both these variables were then averaged over the 2000–2006 time period. At this level, a unit was characterized as affected by land degradation if more than 2 per cent of its area was undergoing an annual decrease in iEVI. For the model explaining malnutrition, each administrative unit or village was assigned a value of 1 if, over the 2001–2006 period, there had been at least three surveys and the majority of these surveys had shown a value of GAM superior to 15 – a threshold commonly used to characterize critical emergency situations. This reduced the number of administrative units to 38. Similarly, for the model explaining conflict, those spatial units for which malnutrition values were available and which fell within the conflict zone (as defined by the centre point and the radius in the PRIO dataset) over the period 2000–2005 were assigned a value of 1. All other units were assigned a value of 0. Thus, this analysis was performed over a total of 71 administrative units.

Secondly, the statistical analysis was performed at the village level for Sudan and Ethiopia, as malnutrition levels were available at the village scale in these countries only. Our sample included 282 villages. A 15 km buffer zone was created around each village within which all variables were measured. The two environmental change indicators were averaged over these zones for each year. The temporal resolution of the study was also increased. Instead of using the average

SCV and iEVI over the entire study period, these variables were used only for those years when a malnutrition survey was available. The percentage of degraded land was also measured over these zones.

All explanatory variables were checked for multicollinearity and transformed when necessary to satisfy the condition of normal distribution. Explanatory variables were kept in the full model if they decreased the *Akaike's Information Criterion* (AIC) value (Burnham/Anderson 2002). The logistic regression model provides coefficient estimates and odds ratio (Hosmer/Lemeshow 1989). Values of the pseudo-R², a measure of goodness-of-fit in logistic regression, between 0.2 and 0.4 represent a very good explanatory power of the model. The *Receiver Operating Characteristic* (ROC) curve measures how accurately the model classifies observations. Good models have an area under the ROC curve above 0.7. The model chi-square test measures the improvement in fit that the explanatory variables make compared with the model with just a constant.

27.4 Results

27.4.1 Malnutrition

An equal number of administrative units showed high levels of malnutrition (19 units) and a GAM value below 15 (19 units). Out of the 38 administrative units used in this analysis only 14 presented important land degradation as measured by a declining trend in iEVI. The model had a good overall explanatory power (table 27.2). It classified the observations rather accurately (area under ROC over 0.81). The model chi-square test was significant, so rejecting the null hypothesis. The variable 'land degradation' was not significant and did not lower the AIC. Similarly, ecosystem productivity (measured by the iEVI) did not influence the presence of malnutrition. At this scale, both of these variables were therefore removed from the model.

Three variables were included in the model at the level of administrative units (table 27.2). The variable representing interannual *variability in land surface attributes* (SCV) was significant with a positive coefficient and a very high odds ratio. At this level, units with variable vegetation productivity had thus an increased likelihood of acute malnutrition. By contrast, both road density per administrative unit and the level of economic activity had negative coefficients. The odds of finding malnutrition in a rich administrative

Table 27.2: Multivariate logistic regression model results using global acute malnutrition (GAM) as the dependent variable. **Source:** The authors.

Variable	Parameter estimate	Standard error	P-value	Odds ratio				
	admin. unit	village	admin. unit	village	admin. unit	village	admin. unit	village
Intercept	22.61	7.36	9.85	2.06	0.0217	0.0003	-	-
log ₁₀ GCP	-3.57	-0.87	1.36	0.258	0.0089	0.0007	0.0283	0.419
Roads	-53.55		25.28		0.0341		5.5·10 ⁻²⁴	
SCV	17.38		8.66		0.0446		3.55·10 ⁰⁷	

At the administrative unit level (38 observations), the model performs relatively well with a pseudo-R² equal to 0.26 and the area under ROC = 0.81. Statistically significant explanatory variables include economic activity (log₁₀GCP), roads, and interannual variability in land surface attributes (SCV). However, at the village level (282 observations), the model is less efficient (pseudo-R² = 0.04 and area under ROC = 0.64), and the only statistically significant variable remaining is log₁₀GCP. At the administrative unit level, SCV represents the 80th percentile of SCV over the unit averaged over the period 2000-2006. At the village level, it represents the average SCV over the 15 km buffer at the year of the survey. Here, the square-root transformation has been used. Parameter estimates and their corresponding odds ratio are shown.

Table 27.3: Multivariate logistic regression model results at the administrative unit level, measuring the relationship between global acute malnutrition (GAM; dependent variable) and the presence of armed conflict (Conflict) (pseudo-R² = 0.19, area under ROC = 0.74). Parameter estimates and their corresponding odds ratio are shown. No relationship is found at the village level. **Source:** The authors.

Variable	Parameter estimate	Standard error	P-value	Odds ratio
Intercept	-1.71	0.77	0.0266	-
Conflict	2.46	0.88	0.0052	11.7

unit were 0.028, i.e. malnutrition was 35.7 times more likely to be found in a poor area with a low GCP. The likelihood of observing malnutrition in an administrative unit decreased with road density. Infrastructure, access to markets, and a healthy economy thus decreased the likelihood of malnutrition, whereas interannual variability in ecosystem productivity increased the odds of malnutrition.

At the village scale, 109 villages had a GAM value less than 15, and 173 villages were affected by a high level of malnutrition. In the models (table 27.2), none of the environmental change indicators were statistically significant. Only economic activity was related to malnutrition at the village level. Thus, environmental change and infrastructure only influence food insecurity at the regional level whereas the economic situation is a key factor at the regional and local scales.

The direct relationship between malnutrition and conflict was also analysed. At the administrative unit level, the two variables were correlated (Pearson's correlation coefficient = 0.50, significant at $p < 0.001$). The logistic regression model analysing the likelihood of malnutrition in conflict areas (table 27.3) showed statistically significant results (pseudo-R² = 0.19,

model chi-square = 0.0008). The observations were fairly accurately classified by the model (area under ROC = 0.74).

The model showed that the nutritional status in this region is associated with the level of violent conflicts. In eastern Africa, GAM values over 15 were 11.7 times more likely to be found in areas affected by armed conflicts. However, no relationship was found between malnutrition and conflict at the village scale.

27.4.2 Violent Conflict

According to the PRIO dataset, from 2000 to 2005 armed conflicts with more than 25 battle deaths took place primarily in southern and western Sudan, and in the border region between Somalia and Ethiopia. This affected 39 of the 71 administrative units analysed. The remote sensing data showed that a declining trend in iEVI impacted half of the units (36 out of 71). At the level of administrative units, the variables characterizing interannual variability in ecosystem productivity, land degradation, and road density were not significant and did not lower the AIC (table 27.4).

Table 27.4: Multivariate logistic regression model results analysing the spatial distribution of conflict (PRIO). **Source:** The authors.

Variable	Parameter estimate		Standard error		P-value		Odds ratio	
	admin. unit	village	admin. unit	village	admin. unit	village	admin. unit	village
Intercept	7.235	2.108	4.08	2.63	0.0762	0.01	1387.06	8.23
$\log_{10}GCP$	-1.089		0.548		0.0471		0.3366	
iEVI	$3.6 \cdot 10^{-05}$	$5.73 \cdot 10^{-05}$	$1.50 \cdot 10^{-05}$	$1.16 \cdot 10^{-05}$	0.0163	$8.04 \cdot 10^{-07}$	1.00004	1.00007

At the administrative unit level, the model's pseudo- R^2 equals 0.08 and the area under ROC = 0.71. Statistically significant explanatory variables include economic activity ($\log_{10}GCP$) and ecosystem productivity (iEVI). At the village level (282 observations), the model performs slightly better (pseudo- R^2 = 0.13 and area under ROC = 0.74), and iEVI is the only statistically significant variable remaining in the model. At the administrative unit level, iEVI represents the average iEVI over the unit from 2000 to 2006. At the village level, it represents the average iEVI over the 15 km buffer at the year of the survey. Parameter estimates and their corresponding odds ratio are shown.

They were therefore removed from the full model. Ecosystem productivity and economic activity, as measured by the iEVI and the GCP, were significant explanatory variables in the model explaining armed conflicts. Both variables improved the fit of the model compared with the null model (model chi-square = 0.012) but the model's overall fit was weak (pseudo- R^2 = 0.08). The area under the ROC equalled 0.71, showing a fairly good classification of the observations. The results showed that, in the study area, regions with a better economic situation were less likely to be subject to armed conflict (table 27.4). The increase by 10 units in GCP reduced the likelihood of war by a factor of 3. On the other hand, armed conflicts were more likely in areas with more vegetation.

At the village level, around 160 villages were found to be in conflict areas during the malnutrition surveys. The model performed slightly better than at the administrative unit level (pseudo- R^2 = 0.13 and area under ROC = 0.74), and iEVI was the only statistically significant variable remaining in the model. As with the model at the level of administrative units, armed conflicts were more likely in regions with more vegetation.

27.5 Discussion

Using detailed information extracted from remote sensing data, this study has presented the influence of climate-induced changes to ecosystem resources on malnutrition and armed conflict, while controlling for other important factors. The results of the models used do not imply strict causal mechanisms but rather associations between variables. However, the results highlight the important relationship between interan-

nual variability in ecosystem production and malnutrition. As malnutrition is associated statistically with armed conflicts, ecosystem variability is also indirectly associated with violent conflicts. Our empirical study of vegetation variability, as well as other historical examples of extreme climatic events (Battisti/Naylor 2008) impacting food security, encourages more detailed research on the influence of climate volatility on society, especially in the wake of projected climate change (IPCC 2007).

Ecosystem variability, which is supposed to increase in the future, has been shown to be influenced by short-term variability in climatic conditions, land use, and other disturbances (Rowhani/Linderman/Lambin et al. in press). The main climatic factor explaining interannual variability in land surface attributes, as measured by the SCV, was rainfall variability. A previous study of sub-Saharan Africa (Hendrix/Glaser 2007) has showed that, at the level of a country, only a lagged interannual variability in rainfall was a more important factor in explaining the onset of conflict than long-term climate change and current year variability. The absence of a direct relationship between the SCV and armed conflicts in this study may be due to the different geographic region covered and the nature of conflict data. The PRIO dataset gives a centre point as well as a radius which approximately measures the area affected by the armed conflict with at least 25 battle deaths annually. The actual location of the fighting is not directly represented.

This study did not show a significant relationship between land degradation and either malnutrition or armed conflicts. According to a widely-held view, degradation of natural resources increases the probability of violence between competing groups (Homer-Dixon

1991). Land degradation can be associated with changes in mean climatic conditions and the ecological marginalization of poverty, leading to desertification. A previous study (Raleigh/Urdal 2007) showed that increasing levels of land degradation were positively related to conflict. Short-term land degradation (characterized here by a downward trend in ecosystem productivity over 6 years) was not associated with armed conflict in this study over eastern Africa. Our analysis covers only a short time period (2000–2006) and decline in vegetation activity might be only temporary. Local communities have, over millennia, developed strategies for adapting to dry situations, as the region has always been prone to droughts. Moreover, due to a lack of reliable land degradation maps, this land degradation metric only captures one aspect of degradation, mostly related to declining rainfall. It tends to be much more conservative than other land degradation maps that are known for having overestimated the problem (UNEP 1992). Improved spatial and temporal metrics of land degradation, including soil moisture and quality, would be needed to better test the hypothesis linking degradation of natural resources to conflicts and human health.

As expected, economic activity is strongly associated with human security at the subnational scale. Previous studies have shown these relationships at the national level. The economic situation of a region thus also influences the impact of resource variability on human security (Homer-Dixon 1991), especially in low-income states. This result shows that, at all scales, economic activity is a key factor in reducing malnutrition and conflicts. In wealthier regions, political institutions are able to respond to food shortages and to the effects of climate change. Economic wealth makes people less vulnerable to changes in ecosystem productivity, especially in regions where societies depend heavily on agriculture. This study has also shown that accessibility decreases the impact of malnutrition. Roads allow food aid to reach affected areas. They also enable farmers to access markets, which will in turn increase their potential for improving their financial status and enhancing the economic situation of the region.

The results also show that increased ecosystem productivity increases the likelihood of war in eastern Africa. There is a large nomadic, pastoralist community in this region. It has been shown that organized raids between pastoralists to steal livestock are more likely during the wet season, when grasses are high (Meier/Bond/Bond 2007). The fact that violent conflicts in general are associated with more vegetated ar-

eas may also be a consequence of the population displacement that follows conflicts, which allows the vegetation to regrow around abandoned villages. In Darfur, livestock migration patterns have been significantly affected by the ongoing conflict, restricting grazing access for pastoralists (Young/Osman/Aklilu et al. 2005). In these cases, ecosystem state is a consequence rather than a cause of conflicts. At a national scale, the abundance of natural resources, if they generate high income, can also ‘trap’ certain countries in poverty and conflict by worsening governance and promoting autocracies (Barnett 2003; Collier 2007), with an adverse impact on the environment and an increase in grievances (Goldstone 2001; Collier 2007).

At two spatial scales this study also highlights the fact that some variables are associated with malnutrition at the subnational administrative level but not at the village scale. This is particularly the case with environmental change and road density. Famines and violence have political, economic, and ethnic roots (De Waal 1997; Gleditsch 1998; Meier/Bond/Bond 2007) that, at a fine scale of analysis, may be more important driving factors than ecosystem changes. When disaggregating the analysis spatially from the national to the village scales, one uncovers more complexity related to the mitigation capacities of communities, the motivation and strategies of rebel groups in starting a conflict, landscape heterogeneity, population displacement, etc. This suggests that small-scale population movements allow localized stresses to be responded to. However, when a larger geographic entity suffers from repeated droughts and low accessibility, then the population may be affected by malnutrition. Detailed data at the household level on the small-scale, informal socio-economic activity would allow this hypothesis to be tested.

If ecosystem productivity can be used as a measure of natural resources, then our results contradict the neo-Malthusian contention that resource scarcity is an important risk factor for famines and violence. Starvation is not always related to a decline in food availability (Sen 1983). Moreover, the low explanatory power of the conflict models used suggests that human security involves much more complexity than that represented by the explanatory variables employed. Other factors have to be taken into account, including feedback between resource degradation, institutions, and population movements. There might also be threshold effects that trigger certain events (Scheffer/Carpenter/Foley 2001; Rockström/Steffen/Noone et al. 2009). A decline in natural resource availability may

only cause conflicts and famines after a threshold is crossed.

The quality of the available data is one of the main shortcomings of this analysis (table 27.1). This is a recurrent problem in regional-scale studies of resource-conflict interactions. For example, the gridded global economic data (G-Econ) lacks information on the informal sector that prevails in many conflict-prone regions, and in countries of the bottom billion (Collier 2007). There are however no official statistics on these informal economic activities. Where malnutrition is concerned, relief agencies and NGOs tend to conduct their surveys in conflict-affected regions, which could introduce a bias and affect data quality. The authors controlled for such a bias in this study by using an equal number of surveys presenting high levels of malnutrition and GAM values of over 15, thus ensuring sufficient variability across the key variables. The armed conflict data used here is the best source of information on conflicts currently available, even though it lacks detailed spatial information and does not take into account conflicts with less than 25 deaths. The latter can impact livelihoods and increase food insecurity. However, the authors believe that the results presented here are sufficiently robust and show a clear relationship between resource availability and variability, and human security.

Clearly the rather short time series of observations, especially for measuring vegetation variability, ecosystem productivity, and land degradation, is a limitation. Longitudinal studies of specific conflict areas could test whether there is a cycle of land degradation followed by conflict and by an increase in vegetation after people have left, or whether some other reasons account for the observed correlations.

Finally, it is important to be cautious about drawing causal links. The models used in this study highlight associations between variables. Malnutrition and conflicts may be the result of environmental instability and/or degradation, economic activity, and road infrastructure in certain cases. However, wars also induce environmental destruction, famines, and displacement, and reduce economic wealth in other circumstances (Gleditsch 1998). To determine the ultimate causes of malnutrition and conflicts defies simple explanation and requires a complementary approach based on local case studies using qualitative methods. For example, the correlation observed between malnutrition and conflict does not imply that one causes the other as they may be both caused by a similar set of socio-economic, political, and environmental circumstances. The main purpose of this study

was to present the importance of short-term changes in ecosystem attributes induced by climate change in the environmental security field compared with changes in seasonal means as these can be reduced by specific mitigation and adaptation strategies that have to be put in place by local, regional, national, and international institutions.

27.6 Conclusion

This empirical study suggests that the impact of environmental change on human security is indirect and mediated by several political and economic factors, such that a spatio-temporal association between areas affected by environmental change and conflict areas is weak. In addition to resource availability and socio-economic factors, the interannual variability in ecosystem productivity also impacts human security. These results also indicate that conflicts are more frequent in regions with more vegetation. This conflicts with a neo-Malthusian view but is consistent with a pattern largely observed for high-value natural resource exploitation. It could also result from vegetation recovery after populations are displaced out of conflict zones. Finally, at a local scale, the environment plays a less significant role in human security than at a regional scale, suggesting that social coping mechanisms dominate at a fine scale. With climatic conditions predicted to become more variable, there is a need to better understand interactions between environmental conditions, food and human insecurity, and socio-economic changes.

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28 Climate Awareness and Adaptation Efficacy for Livelihood Security against Sea Level Rise in Coastal Bangladesh

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28.1 Introduction^{1, 2}

Dealing with livelihood security in the face of future climate change requires concerted efforts from various actors including the local people. How they would respond largely depends on their adaptation efficacy, an individual's perceived ability to initiate adaptive response. Various factors influence people's climate adaptation efficacy including their climate awareness. People's climate awareness is manifested through their familiarity with, perception of, and knowledge about climatic events. This chapter identifies and assesses quantitatively the influences of various factors on coastal people's adaptation efficacy against the impacts of *sea level rise* (SLR) on their livelihood security. Particular attention was given to assessing the roles of three dimensions of climate awareness on adaptation efficacy. These three dimensions of climate awareness are 'familiarity with', 'perception of', and 'intuitive knowledge about' climatic events. A total of 285 respondents from three coastal villages in Bangladesh were randomly interviewed using a semi-structured questionnaire. Inquiry was centred on more than two dozen variables and factors drawn from literature review, presuming that many of these variables and factors would influence people's adaptation efficacy. To bring this large number of variables into a few major categories *principal component analysis* (PCA) was carried out; from this, eight

major categories or factors have emerged. As PCA only identifies the influencing factors but not the extent of influence of individual factors or variables on adaptation efficacy, the backward method of multiple regression was employed to quantitatively assess the influence of each significant factor. The model as a whole is significant ($F(22, 262) = 27.61, p < 0.001, R^2 = 0.45 (R^2_{adj} = 0.43)$). From the comparison with standardized coefficient (beta:) it is evident that among all the factors which affect climate adaptation efficacy positively, perception of *climate change and sea level rise* (CC-SLR) event is the strongest ($\beta = 0.51, p < 0.001$), followed by age ($\beta = 0.33, p < 0.001$) and distance of the settlement from the shoreline ($\beta = 0.10, p < 0.05$). On the other hand, among the factors that affect adaptation efficacy negatively, the habit of seeking external assistance such as contacting the local authority to solve problems is the strongest ($\beta = -0.17, p < 0.001$), followed by frequent exposure to and adaptation against scarcity of fresh water and drier conditions ($\beta = -0.16, p < 0.001$) and salinity intrusion ($\beta = -0.10, p < 0.05$). The above cited factors operate in tandem with climate awareness and guide the adaptation efficacy of people. The finding is substantive for policymakers and planners in designing programmes for enhancing climate adaptation efficacy and raising the climate awareness of the coastal people of Bangladesh so that they may face the challenges posed by climate change and SLR on their livelihood security.

This chapter intends to establish the influence of climate awareness on coastal people's adaptation efficacy against the impact of CC-SLR on their livelihood security. Climate change is viewed as a gradual change in long-term average conditions, greater variability within the range of normal conditions, and change in the type of extreme events which are possible or probable (Hare 1991). Climate change is manifested through change in global mean temperature, pattern of precipitation, amount of melting of snow and ice, and rising global sea level (Nerem/Leuliette/Cazenave 2006).

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2 Keywords are: adaptation efficacy, Bangladesh, climate awareness, livelihood security, sea level rise.

Such change could be due to natural variability or may be a result of human activity (IPCC 1996). However, the *Intergovernmental Panel on Climate Change* (IPCC) in its various reports has established a clear link between global warming, climate change, sea level rise, and coastal livelihood security. The third assessment report of the IPCC (IPCC 2001) has projected a SLR of as high as 88 cm by the end of this century even though it has lowered that limit to 59 cm in its fourth assessment report (IPCC 2007). Nonetheless, acceleration in SLR has raised concern among the inhabitants of heavily populated coastal zones. Due to CC-SLR, the livelihood security of 170 million people from 22 coast-lying countries would be affected (Middleton 1999). Countries that would be severely affected include Bangladesh, Kiribati, Marshall Islands, Antigua, Benin, and Tuvalu (Nicholls 1995; Nicholl/Leatherman/Dennis et al. 1995; Mimura 1999; Nicholls/Hoozemans/Marchand 1999). Drawing on the study by Ahmed and Alam (1998), the World Bank (2000) has warned that coastal tracts in Bangladesh might experience a SLR of 30 cm by the year 2030 and 50 cm by 2050. For every year the average rise is 1 cm. However, projected SLRs of 14, 32, and 88 cm along the coast of Bangladesh for the years 2030, 2050, and 2100 respectively are shown in the *National Adaptation Programme of Action* (NAPA) for Bangladesh (GOB 2005, 2006).

Despite the uncertainty about the extent of SLR along Bangladesh's coast, SLR is considered as the most pressing problem against which the people of Bangladesh in general and the coastal people in particular would have to adapt in this century and beyond to secure their livelihood (GOB 2008). The livelihood of the natural-resource-dependent coastal community in Bangladesh would be affected by various impacts of SLR, including salinity intrusion, coastal erosion, cyclone, storm surge, and coastal flooding. Livelihood security depends on people's knowledge about the source of the threat and their ability to use assets in such a way that they can make a living, meet their consumption and economic needs, cope with uncertainties, and respond to new opportunities (de Haan/Zoomers 2005). A person's livelihood is considered secure when that person can cope with and recover from stresses and shocks and maintain or enhance capabilities and assets both now and in the future, while not undermining the natural resource base (Scoones 1998). This means that the future livelihood security of coastal people of low income societies/countries will depend on their ability to adapt to climatic stressors and perturbations. This

is partly because they depend heavily on ecosystem services and abundance of natural resources for their livelihood (Paton/Fairbairn-Dunlop 2010).

Adaptation involves processes and actions in order to better cope with, manage, or adjust to changing conditions, stresses, hazards, risks, or opportunities (Fankhauser/Smith/Tol 1999; Smit/Pilifosova 2001; Smit/Skinner 2002; Brooks/Adger/Kelly 2005; Smit/Wandel 2006). In a climate change context, the IPCC considers adaptation as an adjustment in natural or human systems in response to actual or expected climate stimuli or their effects; the adjustment moderates harm or exploits beneficial opportunities (McCarthy/Canziani/Leary 2001). People who are vulnerable to SLR can follow any of the three methods of adaptation. These are protection, accommodation, and retreat (Klein/Nicholls/Ragoonaden et al. 2001). Experts have already warned that retreat may not be a sustainable solution for a land-scarce country like Bangladesh as one-fifth of its landmass may go under water due to SLR. Protection and accommodation are rather considered as the most suitable options as these two do not require substantial relocation (Castro Ortiz 1994).

Whether protection, accommodation, or retreat, any adaptive response by and large depends on three important elements. These are timely recognition of the need to adapt, an incentive to adapt, and ability to adapt (Fankhauser/Smith/Tol 1999; Adger/Arnell/Tompkins 2005; Perry 2007). A community with climate awareness can comprehend the need for adaptation. However, comprehension of the need for adaptation alone cannot guarantee any adaptive response in the absence of people's ability to adapt (Smith 1997). When the question of the ability to adapt arises the conventional literature refers to the physical or other capital that is at the disposal of the person in need of adaptation (Blaikie/Cannon/Davis et al. 1994; Smithers/Smit 1997; Pelling/High 2005). Some scholars have indicated the need for access to information as a means of enhancing people's climate awareness, which in turn helps them to adapt (Phillips 2003; Kurita/Nakamura/Kodama 2006; Collins/Kapucu 2008; Leal Filho 2009; Leal Filho/Mannke 2009; Saroar/Routray 2010). The psychosocial and behavioural aspect of adaptation has only recently emerged as an important domain of adaptation research (Patt/Gwata 2002; Grothmann/Patt 2005; Grothmann/Reusswig 2006). Within this domain, adaptation efficacy is considered to be an important sub-dimension.

Adaptation efficacy is the strength of belief of a person about his or her ability to adapt in a particular context (Maddux/Rogers 1983). When a person thinks about his or her adaptation efficacy he or she must consider the full context, i.e. what to adapt, when to adapt, and how to adapt, in order to assess his or her self-adaptation efficacy (Grothmann/Patt 2005). Adaptation efficacy may vary across class and gender in addition to the context in question (Moser/Satterthwaite 2009). Although an enormous growth of the literature on adaptation efficacy in the field of human psychology and behavioural medicine can be observed, in the domain of climate change it is very scanty. In fact, work that assesses the role of climate awareness on adaptation efficacy against the impacts of CC-SLR is in its infancy. In Bangladesh no studies exist that explore the relationships between adaptation efficacy and climate awareness, although many studies have qualitatively assessed the coping and adaptation strategy of people against natural disasters such as floods. Only a few studies have narrated the likely impacts of climate change (e.g. RVCC 2003, Thomalla/Cannon/Huq et al. 2005). In fact, no study has been found to assess quantitatively the extent of influence of various factors including climate awareness on coastal people's adaptation efficacy against the impacts of SLR on their livelihood security. In fact, the livelihood of coastal people in Bangladesh is under constant threat of CC-SLR. Here, livelihood insecurity is understood as susceptibility to the circumstances of not being able to sustain a livelihood (Alwang/Ersado/Tarvinga 2001; Adger 2006).

This chapter focuses on the coastal community in Bangladesh who are most susceptible to the impacts of CC-SLR. In this quantitative inquiry it is first attempted to assess the coastal people's relative level of awareness about climate change by assessing their levels of (i) perception about CC-SLR related events, (ii) familiarity with the climate change and extreme weather signals, and (iii) tacit or intuitive knowledge about the impacts of future SLR. Three indices are introduced, a 'perception index', a 'familiarity index', and a 'knowledge index', as proxy indicators of climate awareness; they are constructed at the second stage. Finally, these three indices along with others factors related to socio-economics, access to information, past adaptive behaviour, and spatial and contextual aspects are quantitatively assessed to predict the influence of various factors on people's adaptation efficacy while securing their livelihood from the impacts of CC-SLR. The policy implications of these findings are that they will help policymakers and planners, first

to devise strategies to intervene on various factors in various combinations, and second to prioritize intervention strategies for enhancing climate adaptation efficacy and climate awareness.

28.2 Sea Level Rise Impacts in Coastal Bangladesh: A Succinct Review

Bangladesh, a tropical low-lying country, is historically prone to various natural disasters such as flood, cyclone, tidal surge, river bank erosion, and earthquake. (Islam/Huq/Ali 1998). Climate-change-induced SLR will extend this list. Numerous studies have already indicated that apart from its own direct impact, SLR may even provide synergy to amplify the devastating power of disasters which ravage the country recurrently (Castro Ortiz 1994; Nicholls/Leatherman/Dennis et al. 1995; Ali 1999; Huq/Karim/Asaduzzaman et al. 1998; Ali Khan/Singh/Rahman 2000; World Bank 2000; Singh/Ali Khan/Murty et al. 2001; Cannon 2002; BMU 2002; Brauch 2002; GOB 2006, 2008). The geographic location and geomorphological condition of Bangladesh have placed it on the list of countries highly susceptible to climate change in general and to SLR in particular (Nicholls/Hoozemans/Marchand 1999; Nicholls 2002, 2004). Bangladesh is located at the interface of two different environments. The Himalayas are in the north and the Bay of Bengal is in the south. This peculiar geography is one of the causes that makes Bangladesh a victim of various natural disasters including SLR. In fact, SLR is now considered as the most important single factor that may induce a chain of impacts such as coastal flooding and inundation, salinity intrusion, cyclone, and storm surge in the low-lying coastal areas of Bangladesh. Almost one-fifth of Bangladesh is under tidal incursions which cover 19 coastal districts in 3 distinct coastal zones: western, central, and eastern (Ali 1999).

As early as 1995 Nicholls (1995) and Nicholls, Leatherman, Dennis et al. (1995) had warned that Bangladesh may experience an unprecedented level of vulnerability to SLR. A one-metre rise in sea level and a 15 per cent increase in precipitation would result in devastating floods, which may inundate 71 million people in Bangladesh. SLR may also result in drainage congestion and waterlogging in the delta during high flow periods in the three major river systems in Bangladesh. Inundation on such a massive scale will have a severe impact on various dimensions of livelihood security including agriculture and forestry, food security,

human health, transport and infrastructure, and settlement and housing.

Another important impact of SLR is the intrusion of salinity. Anticipated SLR would increase salinity on three fronts: surface water, groundwater, and soil (Huq/Karim/ Asaduzzaman et al. 1998). Increase of salinity both in the surface water and the subsurface water table will have serious negative impacts on agriculture. About 0.83 million hectares of arable land is already affected by varying degrees of soil salinity (GOB 2008). More adverse impacts are projected for the years to come. The presently-cultivated rice varieties may not be able to withstand increased salinity. This may have serious repercussions on future food security and on the livelihood of coastal people. This is primarily because agriculture and allied activities are still the most dominant sources of livelihood (Thomalla/Cannon/Huq et al. 2005). Increased salinity might affect forestry and horticulture as well. The IPCC Working Group II has indicated in its *fourth assessment report* (AR4) that in the case of a one-metre rise in sea level, the Sunderban mangrove forest may go completely under water. A similar assertion was made by the *Organization for Economic Cooperation and Development* (OECD) in its study by Agrawala, Ota, Ahmed et al. (2003) and by the World Bank (2000). Likewise, increased salinity together with storm surges may cause a reduction in fish production – another important avenue of coastal livelihood (Choudhury/Neelormi/Quadir et al. 2005). In fact, for the last two decades or so both fresh water and brackish water aquaculture, particularly shrimp farming in the coastal area, have been intensified and appeared as a lucrative business. An increase in salinity and coastal surge may not only jeopardize this lucrative business but may even arrest this trend (RVCC 2003). This will also have serious implications for coastal livelihood.

Further, SLR will cause shoreline retreat, which will increase the basin area. Such an increase in the basin area may contribute to an increase in the length of the path of a cyclone. This will allow the cyclone to remain longer in the water, and acquire and release more latent heat, which may contribute to intensifying the devastating power of the cyclone (Ali Khan/Singh/Rahman et al. 2000). This means that the impacts of the cyclone will be felt further inland than they have been to date (World Bank 2000; Cannon, 2002). For example, surge height might increase 13 to 46 per cent for a SLR of 0.3 and 1 m (Ali/Chowdhury 1997; Ali 1999). Surge water that hits the coastline of Bangladesh will travel far inland thus shifting the *Risk Zone* (RZ) and the *High Risk Area* (HRA) more in-

ward (landward). Since multi-purpose cyclone shelters are located in the current Risk Zone and High Risk Area these shelters may be functionally ineffective as they will be standing on newly-submerged areas.

To summarize, therefore, SLR along the coast of Bangladesh will enhance the risk of coastal flooding, salinity intrusion, storm surge, and even catastrophic cyclones (Ali Khan/Singh/Rahman et al. 2000; Singh/Ali Khan/Murty et al. 2001). Each of these will have various effects on coastal topography and morphology which will cause a chain and network of impacts on the social, economic, housing, and shelter infrastructure of the coastal area. All these ultimately will affect the societal routine life and livelihood avenues of coastal people (RVCC 2003). It is true that many of the above-cited impacts are not altogether new to the coastal people of Bangladesh, who have been coping with and adapting to many of these impacts for generations. Nonetheless, given the context of CC-SLR many of these known impacts will be felt very differently from the way they have been felt in the past. Periodic coastal inundation, for instance, will no more be as it is now; it will increase over time and never recede. Therefore, a problem of a seasonal nature will take the form of a problem of perpetual nature. Low lands, farmlands, and even settlements, and other physical and social infrastructure, may be gradually abandoned over time. Likewise, salinity intrusion may permanently increase the salinity of the surface water, the subsurface water, and even of the soil. In the worst case excessive salt may settle over farmland making it unsuitable for traditional uses including agriculture. Such an irreversible state of the coastal environment will not only seriously impede agricultural productivity but will also damage housing and other physical infrastructure. Further, a crisis in fresh water for drinking will also be felt over time. Experts believe that anticipatory adaptive response is the only answer to these perpetual problems (Adger/Huq/Brown et al. 2003; Grothmann/Patt 2005).

28.3 Research Hypothesis

Earlier works cited above have confirmed that various socio-demographic, economic, and contextual (spatial) factors influence the adaptation efficacy of people against climatic hazards. The hypothesis of this research is that climate awareness is an important determinant of coastal people's adaptation efficacy against the impacts of SLR on their livelihood security.

28.4 Research Design

28.4.1 Selection of the Study Area, Respondents, and Survey Procedures

28.4.1.1 Criteria for the Selection of the Study Area

The coastal zone of Bangladesh covers 19 districts in three major regions. Among these Bagerhat, Barguna, and Patuakhali districts are most prone to SLR and its associated events. Various earlier studies indicated that their susceptibility to SLR-induced coastal flooding, salinity intrusion, cyclone, and storm surge can be attributed to their geomorphological condition, climatic condition, and flat topography. Unlike the other two districts, the coastline along the Patuakhali district is almost unprotected due to the absence of natural protection (e.g. mangrove forests). Hence, the coastline of the Patuakhali district is more exposed to these hazardous events. Therefore, the Patuakhali district is deliberately selected. Within the Patuakhali district, the Kalapara upazila (sub-district) was selected purposely because it covers most parts of the exposed coast and is susceptible to SLR and its associated events. The entire Kalapara sub-district is vulnerable to SLR and its associated events. To represent the whole Kalapara sub-district, three 'Union Parishads' (UPs), Dularsar, Mithaganj and Nilganj, were randomly selected. One village from each of these three UPs was randomly selected to ensure proper representation of the coastal areas. Usually one UP includes 5 to 10 villages. The three selected villages are Mohipur (Nilganj UP), Munshipara (Mithaganj UP), and Kaw-ar char (Dularsar UP).

The key considerations for the selection of the study area were:

- whether they are currently prone to multiple nature hazards,
- whether they are susceptible to SLR and its associated events,
- whether they are close to the exposed coast, and
- whether they represent typical coastal characteristics with regard to the diversity of occupation.

The study villages are 5 to 15 km distant from the exposed coast. The villages are a maximum of 10 km distant from each other. Although the horizontal distances from the coast differ among the three villages, their relative heights from mean sea level (MSL) are almost the same. In fact, the entire study area is flat except for pockets of localized lowland and water bod-

ies. Based on the estimates provided in the NAPA (GOB 2005) the experts opined that the entire study area may experience 10-15, 20-25, and 30-40 cm inundation from accelerated SLR by the years 2020-2030, 2050-2075, and 2080-2100, even according to conservative estimates. Therefore, it is worth noting that these three villages were selected only to properly represent the coastal Kalapara sub-district; by no means for a comparative study among the three villages, which are less than 10 km from each other.

28.4.1.2 Framing of the Sample and Determination of the Sample Size

The number of households in the study area was collected from the respective UP. The total families in the study area are 991. Among these, 311 households are in Kaw-ar char, 324 households are in Munshipara, and 356 are in Mohipur. The sample size was determined according to the formula proposed by Yamane (1967) which is as follows.

$$n = N/(1+Ne^2) \quad \text{Equation 28.1}$$

where n = sample size, N = population size (here the total number of households in the study area), and e = the level of precision.

As the total number of households, N is 991, and the level of precision is .05. The obtained sample size was 285. This 285 sample size was divided among the three villages according to their proportionate households (table 28.1).

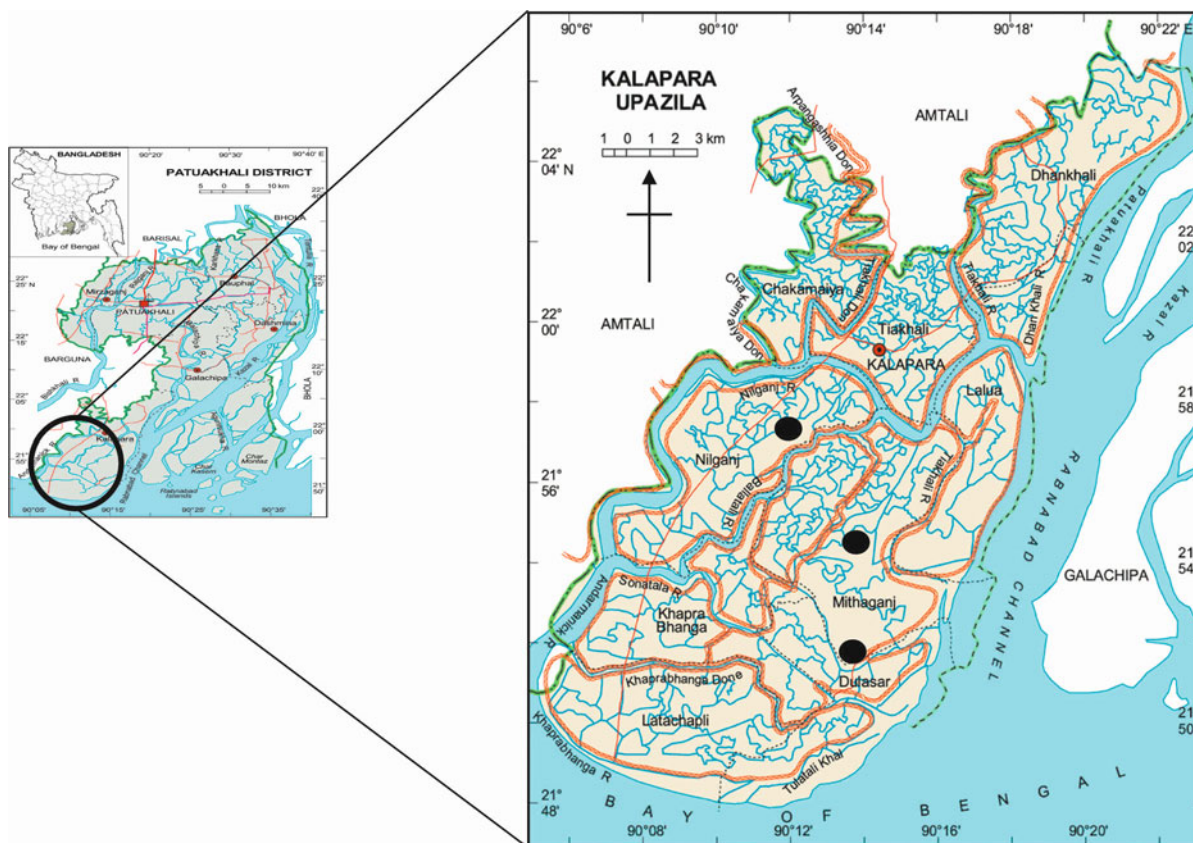
Table 28.1: Sample size for the household survey. **Source:** The authors.

Name of the village	Total households	Sample households*
Kaw-ar char (Dularsar UP)	311	90
Munshipara (Mithaganj UP)	324	93
Mohipur (Nilganj UP)	356	102
Total	991	285

Note: * Sample factor, $n/N = 0.2876$ (~29 per cent) is used.

Therefore, the exact numbers of households that were selected from these three villages are: from Kaw-ar char 90, from Munshipara 93, and from Mohipur 102.

Figure 28.1: Study sites (marked with a black circle) at Dulasar, Mithaganj, and Nilganj 'Union Parishad' of Kalapara Subdistrict in Bangladesh. **Source:** Islam (2003).



28.4.2 Survey Procedure

The settlements are of dispersed type. There is no system of holding numbers (identification number of households as used in urban areas) for dwelling units. Moreover, it was not possible to put an arbitrary number for each household and locate them during the actual survey. Therefore, the use of a random number table for sampling was not possible. Hence, this research avoided using a true random sampling method of data collection at the household level. Instead, a middle course between a perfect random sampling and a convenient sampling, i.e. a systematic random sampling, was followed. In doing so, roughly every third household was selected as a sampling unit. In fact, as the surveyed sample was almost 30 per cent of the sample frame (of total households), it was not difficult to select every third one. However, some compromises were made when the walking distance from one household to the desired one was extremely high. Usually the household heads were interviewed using a semi-structured questionnaire. In the absence

of the head of the household, the senior member was chosen.

Altogether 285 sample households were surveyed during January and April 2009. The Bengali version of the questionnaire was administered while asking questions but the responses were recorded on the original English version. In a few cases the surveyors were given the liberty of explaining the question to an extent that would not influence the responses. Asking questions in a comprehensible and colloquial way was one of the key challenges that almost all survey members including these authors faced. In some cases the local dialect was found to differ greatly from the standard Bangla language used by Bangladeshi people in general. Therefore, during the first few days a new experience was gained of learning how to translate the meaning of the question into a more communicable form for the rural peasant respondents.

28.4.3 Theoretical Underpinning of the Selection of Indicators for Climate Awareness and Adaptation Efficacy

In the context of adaptation against the impacts of a climate-change-induced future SLR, it is of immense importance for the coastal communities to be aware of the changing climatic events, plausible scenarios of SLR for different time frames, and various impacts of SLR on their livelihood security. Having a certain level of understanding about the climate-related events cited above is considered by many scholars as climate awareness. Grothmann and Patt (2005), Grothmann and Reusswig (2006), and Blennow and Persson (2009), for instance, consider 'perception and belief about climate related events' as an indicator of climate awareness. In a more pragmatic way Weber (1997) and Semenza, Hall, Wilson et al. (2008) consider familiarity with 'climate change and extreme weather phenomena' as an indicator of climate awareness. However, others, for example, Vedwan and Rhoades (2001), and Steel, Lovrich, Lach et al. (2005) use ideas that are very similar to 'tacit and intuitive knowledge about the impact of climatic event' as an indicator of climate awareness. Drawing from the literature cited above this study has operationalized the concept of climate awareness as a bundle of perceptions and beliefs about, familiarity with, and tacit and intuitive knowledge about climatic events and impacts. Thus, for this study, three dimensions of climate awareness: perceptions and beliefs about, familiarity and experience with, and tacit and intuitive knowledge about climatic issues have been used. The bottom line is that a person without climate awareness of this kind cannot accurately appraise the threat and identify adaptation efficacy measures (Grothmann/Patt 2005).

28.4.3.1 Measurement of Perception about Climate Change and Sea Level Rise (CC-SLR)

Perception is seen as the enduring disposition of an individual which functions as the generative basis of structured, objectively unified practice (Bourdieu 1977). Gregory and Wiechmann (1991) point out that perception does matter while people assess any event. In the same vein it can be argued that any process of self-assessment of adaptation efficacy against the impacts of climate change can be influenced by one's prevailing perceptions about a climatic event. However, the constant flow of information, recurrent exposure to some unusual realities, and in some cases

value-forming psycho-social elements can change the prevailing perception and belief (O'Riordan/Jordan 1999). If people are guided by any wrong perceptions of CC-SLR there is room for manoeuvre. Hence, knowing about their perception of CC-SLR is just the beginning of any intervention for adaptation. With this in mind, a set of five questions and statements which reflect the respondents' perception about obvious outcomes of CC-SLR (Wilbanks/Leiby/Perlack et al. 2007) was prepared following Hudson, Hite, and Haab (2005), Cabrera, Breuer, and Hildebrand (2006), and Blennow and Persson (2009) in order to establish the respondents' perceptions about CC-SLR. Each response was rated on a 3-point scale (low to high): 'there is doubt; no need to think at all', 'distant and uncertain; still we may start thinking if it really happens', and 'we must act from now on no matter the extent of uncertainty' (table 28.2). For each of the respondents an average score of 'climate perception' was computed to develop a 'perception index'. The process of 'index' development is discussed below (table 28.4).

28.4.3.2 Measurement of Familiarity with Climate Change and Signals of Extreme Weather Events

Climate change and extreme weather phenomena are often felt by the people living in any area for a long time due to their interaction with the local environment. In fact, their familiarity is often associated with particularly important outcomes. For example, farmers who plant a particular crop at the very onset of the monsoon can easily notice if the monsoon deviates from their traditional mental map of the seasonal calendar. The way the apple growers in the Kullu valley in Himalayan India use their traditional mental map of seasonality (familiarity with the climate and weather) to avoid loss of harvest in a changing climate is well illustrated by Vedwan and Rhoades (2001).

Following the mental mapping technique (Vedwan/Rhoades 2001) a set of 10 questions and statements which reflect the respondents' familiarity with climatic change was prepared to assess the 'familiarity with climate change and extreme weather signals' of the respondents (table 28.2). The inquiry was centred on climate-related aspects that have some degree of 'visual silence'. Visual silence is an intrinsic property of a phenomenon which allows the phenomenon to be easily felt and more observable due to the existence of a corresponding psychophysical or psychological processing mechanism (Vedwan/Rhoades 2001). However, the IPCC's report (IPCC 2001), Adger,

Huq, Brown et al. (2003), and Nerem, Leuliette, and Cazenave (2006) were very useful while framing the questions. Each response is rated on a 3-point scale (low to high): 'no idea/cannot remember if heard about, felt, or observed', 'heard from others', and 'observed or felt alone' (table 28.2). For each of the respondents an average score of 'climate familiarity' was computed to develop a 'familiarity index' (table 28.4).

28.4.3.3 Measurement of Tacit and Intuitive Knowledge about the Impacts of Sea Level Rise

Translating climate impacts into lay public language is essential to let people understand the threats to their livelihood security, and participate in or initiate appropriate adaptive responses to deal with those threats (Delli Carpini/Keeter 1996; Leal Filho 2009). Since the respondents were not too familiar with the term 'sea level rise' the essence of SLR was communicated to them using practical means instead of using any abstract term. The use of such techniques is suggested by climate communication researchers (Leal Filho 2009). Respondents were asked to identify 10 possible impacts which they consider are more likely to affect their livelihood, if farmlands next to their homesteads are submerged to almost knee height (up to 30 cm) below saline water, or if storm-surge height increases a few more metres than any times earlier. To facilitate their responses, 10 major categories of impacts were supplied in the survey format. A list of major impacts was prepared from a literature review. Particularly, Smith (1997), Choudhury, Neelormi, Quadir et al. (2005), Wilbanks, Leiby, Perlack et al. (2007), and Tol, Klein and Nicholls (2008) were very helpful in this regard. The respondents' tacit and intuitive knowledge about the impacts of SLR was measured on a 3-point scale (low to high): 'no/inaccurate response', 'accurate response - only with the aid of the surveyor', and 'accurate response without any aid' (table 28.2). For each of the respondents an average score of SLR 'impact knowledge' was computed to develop a 'tacit knowledge index' (table 28.4).

28.4.3.4 Measurement of Adaptation Efficacy

Adaptation efficacy is loosely perceived as a person's belief about his or her ability to respond to alleviate potentially negative effects and amplify potentially positive effects taking into account the specific context where he or she might need to adapt. Grothman and Patt (2005) view adaptation efficacy as the strength of beliefs in adaptive actions or responses to

protect oneself from being harmed by the threat. The literature on adaptation efficacy against climatic threat is still in its infancy. Concrete and agreed guidance as to how adaptation efficacy can be assessed is yet to be developed, although a range of indicators has been identified that are assumed to be useful predictors. Many of these indicators are somehow related to adaptive capacity, and are largely focused on one's belief about the potential for gaining advantage to deal effectively with a perceived threat through information communication, technological options, physical resources, institutional support, human and social capital, and society's risk-spreading norms (Kelly/Adger 2000; Grothmann/Reusswig 2006; Smit/Wandel, 2006; Tol/Klein/Nicholls 2008). However, adaptation efficacy is not a static thing; it may change over time. To measure respondents' adaptation efficacy against the likely threats of CC-SLR, they were asked to rate their adaptation efficacy on a 3-point scale (low to high): 'do not think possible in any way', 'may be possible but only with external assistance' and 'although external assistance may help, it is possible without it as well' (table 28.2). While selecting questions on the 5 major events and impacts which are most likely to affect their livelihood, projected plausible scenarios of SLR were taken into consideration. For each of the respondents, an average score of 'adaptation efficacy against CC-SLR events' was computed to develop an 'adaptation efficacy index' (table 28.4).

28.4.4 Statistical Measures for Checking the Reliability and Usability of the Data

Following George and Mallery (2006), the reliability (internal consistency) of responses for questions concerning indices of 'perception about CC-SLR event', 'familiarity with climate change/weather extreme signal', 'tacit and intuitive knowledge about SLR impact', and 'adaptation efficacy against CC-SLR events' were tested before those indices were constructed. For all cases *Cronbach Alphas* (α) (measurement units) were found fairly above the acceptable limit of 0.70 (table 28.3).

28.4.5 Formulation of Indices for Three Dimensions of Climate Awareness and Adaptation Efficacy

The weighted mean score (index) of each of the three dimensions of climate awareness and adaptation efficacy for each of the respondents were computed us-

Table 28.2: Indicators of respondents 'perception about CC-SLR event', 'familiarity with climate change and extreme weather signal', 'tacit and intuitive knowledge about SLR impacts', and 'adaptation efficacy against CC-SLR events'. **Source:** The authors.

Variable and scale of measurement	Indicator and statement
Perception about CC-SLR event	Respondent's perception about:
<i>Scale of measurement:</i>	<ul style="list-style-type: none"> • Accelerated sea level rise
9 There is doubt; no need to think at all.	<ul style="list-style-type: none"> • Rapid and more inward shift of the coastline
10 Distant and uncertain; still we may start thinking if it really happens.	<ul style="list-style-type: none"> • Permanent encroachment of new areas by saline water
11 We must act from now on, no matter the extent of uncertainty.	<ul style="list-style-type: none"> • Increased frequency and magnitude of storm events and surges • Acute scarcity of salt-free or sweet water for drinking
Familiarity with extreme weather and climate signal	Respondent's familiarity with:
<i>Scale of measurement:</i>	<ul style="list-style-type: none"> • Longer duration of summer in recent years than what it was a decade or so ago
1 No idea, cannot remember if heard about, felt or observed.	<ul style="list-style-type: none"> • Warmer summers in recent years than what they were a decade or so ago
2 Heard from others.	<ul style="list-style-type: none"> • Shorter duration of winters in recent years than what they were a decade or so ago
3 Felt or observed alone.	<ul style="list-style-type: none"> • Less cool winters in recent years than what they were a decade or so ago • Later start of the winter than normal • More prevalence of untimely rainfall in recent years • Increased frequency of storm events in recent years • Increased salinity in rivers and canals • Increased incidence of encroachment on new areas during high tide • Lower presence of migratory birds in recent winters than what it was a decade or so ago
Tacit and intuitive knowledge about SLR impact	Respondent's ability to identify at least one potential [negative] impact of SLR associated with
<i>Scale of measurement:</i>	<ul style="list-style-type: none"> • Crop production and horticulture
1 No or inaccurate response.	<ul style="list-style-type: none"> • Fisheries
2 Accurate response only with the aid of the interviewer	<ul style="list-style-type: none"> • Livestock
3 Accurate response without any aid	<ul style="list-style-type: none"> • Settlement and homestead • Physical infrastructure • Off-farm economic activity • Public health • Social mobility • Other than the above • Ability to identify positive impact of any kind.
Adaptation efficacy	Given the impact of SLR, how strongly the respondent believes that adaptation against
<i>Scale:</i>	<ul style="list-style-type: none"> • Salinity-free drinking water will be possible
1 Do not think possible any way	<ul style="list-style-type: none"> • Inward shift of coastline will be possible
2 May be possible but only with external assistance	<ul style="list-style-type: none"> • Storm events and surge will be possible
3 Although external assistance may help, it is possible without it as well	<ul style="list-style-type: none"> • Disrupted social & physical mobility will be possible • Other threats to livelihood security will be possible

Table 28.3: Reliability of responses measuring climate awareness and adaptation efficacy. **Source:** The authors.

Variable	Number of items/ indicator	Cronbach alpha (α)
Perception of CC-SLR event	5	0.71
Familiarity with climate change/extreme signal	10	0.82
Tacit/intuitive knowledge about SLR impact	10	0.75
Adaptation efficacy against the impact of CC-SLR	5	0.93

Table 28.4: Indices of three dimensions of climate awareness and adaptation efficacy. **Source:** Compiled by the authors.

Dimension of climate awareness	Index mean (out of 1)	Standard deviation
Perception of CC-SLR event	0.75	0.10
Familiarity with climate change and extreme weather signal	0.85	0.14
Tacit/intuitive knowledge about SLR impact	0.74	0.11
Adaptation efficacy against the impacts of CC-SLR	0.68	0.26

ing the formula W_i/n (W_i = individual's weighted score (using either 0.33, 0.67, or 1.0) for each question, n = number of questions). After determining the individual's weighted mean score (index), by using the formula W_i/f_i (where W_i = individual's weighted score for each question, f_i = frequency of that particular score) an 'index mean' was prepared for each of the three dimensions of climate awareness and adaptation efficacy so that a comparison could be made.

The three indices of climate awareness along with other variables selected from *principal component analysis* (PCA) or factor analysis were later used as explanatory variables in the *ordinary least square* (OLS) multiple regression model to compute the influence of significant factors on respondents' adaptation efficacy against the impacts of CC-SLR.

From table 28.4 it is evident that by and large the respondents' familiarity with climate change and extreme weather is higher than their perception about events associated with CC-SLR and the impacts of SLR. However, a higher standard deviation in the familiarity index implies that fewer respondents are highly familiar than respondents with average levels of familiarity. Likewise, some respondents are much less familiar than average respondents in this regard. Furthermore, respondents' adaptation efficacy against the impacts of CC-SLR is rather low. A wider gap is observed in the adaptation efficacy of the respondents. It gives a clear message that some people are much less confident about their ability to adapt against the impacts of CC-SLR. At this point it is interesting to note that if the low adaptation efficacies

of some people are related to their low levels of climate awareness, there is a need for a programme to raise climate awareness along with other measures.

28.5 Results and Discussion

28.5.1 Factor Analysis Identifying the Factors and Variables to be Used in the 'Adaptation Efficacy' Model

Initially, altogether 20 factors and variables were loaded into the *principal component analysis* (PCA) for identifying major components. Among them 12 factors and variables were dummy coded following Hardy and Bryman (2004) and the remaining 8 variables were measured in their respective SI units. However, as the factor and variable 'frequent adaptation against storm/surge (dummy)' is a constant, it is excluded from the final PCA model. Finally 20 factors and variables were loaded into the PCA. The PCA factor analysis is considered statistically valid as a) the value of the determinant of the correlation matrix was found to be 4.73E-05, which is greater than 0; b) the Kaiser-Meyer-Olkin value for sampling adequacy was 0.57; and c) the Bartlett's test of sphericity was significant at $p = 0.000$ (Field 2005). Furthermore, a total of 20 variables for a sample size of 285 meets the requirement for factor analysis (i.e. 5:1 case/variable ratio as recommended by Coakes/Steed 2003). A total of 8 components having *Eigenvalue* >1 were extracted using a varimax rotation with Kaiser normalization to

Table 28.5: Rotated factor loading matrix of components and variables having influence on adaptation efficacy. **Source:** Compiled by the authors.

Variables	Factors							
	1	2	3	4	5	6	7	8
Duration of living (yr)	0.95							
Age of respondent (yr)	0.83							
Changed settlement since birth (freq.)	-0.74							
Total farm land (ha)		0.89						
Total yearly income (BDT)		0.87						
Possession of television (dummy) ^a		0.76						
Education of respondent (yr of schooling)	-0.33	0.57						
Habit of personal contact with official (dummy) ^a			0.88					
Membership status of any entity (dummy) ^a	-0.20		0.87					
Use of newspaper for weather knowledge (dummy) ^a	-0.23	0.24	-0.22	0.70				
Adaptation with recurrent flood (dummy) ^a			0.22	0.57		0.38		0.28
Recurrent exposure to saline water (dummy) ^a				0.23	-0.80			
Recurrent exposure to rainfall (dummy) ^a				0.26	0.69			
Peer and community as a source of knowledge (dummy) ^a	0.31		-0.31		0.45	0.25		
Distance from the shoreline (km)						0.85		
Household size (number)	0.56					-0.59		
Adaptation with recurrent dry spell (dummy) ^a							0.85	
If livelihood is agriculture-related or allied livelihood (dummy) ^a		-0.23		-0.44			0.53	0.20
If respondent is male (dummy) ^a								0.68
Regular access to radio (dummy) ^a			-0.21				-0.31	0.66
Variance (per cent)	13.89	13.51	9.57	7.89	7.70	7.47	6.42	5.61
Cumulative variance (per cent)	13.89	27.40	36.97	44.86	52.56	60.04	66.46	72.07

Note: ^a Variables with dummy coding follow simple logic of applicability or non-applicability. If the response is yes it is coded with 1; otherwise 0 (for details see Hardy/Bryman 2004: 24-25, 210-211).

maximize intra-component variances as suggested by Tabachnick and Fedell (1996). These eight components explained almost 72 per cent of the variances, which is much higher than the threshold recommended by Hair, Black, Babin et al. (2006). Factors loading (loading <0.200 are not shown) are presented in table 28.5

From table 28.5 it can be seen that the first component could be termed as 'attachment with coastal environment', and constitutes 3 variables or factors that explain 13.89 per cent of the variances. The second component could be characterized as 'wealth and social standing' and constitutes 4 variables or factors that explain 13.51 per cent of the variances. The third

component is related to 'social networking' and constitutes 2 variables or factors, explaining 9.57 per cent of the variances. The fourth component could be termed as 'access to print media for flood information', has 2 variables or factors and explains 7.89 per cent of the variances. Likewise the fifth component is 'coping and adaptation with recurrent hazard', which includes 3 variables or factors and explains 7.70 per cent of the variances. The sixth component has 2 variables or factors characterized as 'spatial and demographic causes of exposure to climatic hazard' and explains 7.47 per cent of the variances. The seventh component is related to 'exposure potential to scarcity of fresh water and dry spell due to types of occu-

pation', which includes 2 variables or factors and explains 6.42 per cent of the variances. The last component is characterized as 'gender difference in electronic media use for climate information', which constitutes 2 variables or factors that explain 5.61 per cent of the variances. The PCA identified the components and factors falling under each component; it does, however, fail to denote the exact level of influence of each factor on the respondent's adaptation efficacy. For each of the eight components, factors that have significant influence on adaptation efficacy could be computed through employing eight sub-models in a multiple regression analysis. However, as the number of factors under each component is too low, it is more practical to build a single multiple regression model.

28.5.2 Multiple Regression Model to Determine the Effects of Climate Awareness on Adaptation Efficacy

The adaptation efficacy index developed earlier was used as a dependent variable in multiple regression analysis. The multiple regression method was chosen as appropriate, primarily because of the metric value (interval level measurement) of a dependent variable - 'adaptation efficacy index' (Field 2005). The independent variables include: the variables that were drawn from the PCA analysis cited above (table 28.5) and the three indices of climate awareness, namely the 'perception index', the 'familiarity index', and the 'knowledge index' (table 28.4). Explanatory (independent) dummy variables were coded with a binary coding system following Hardy and Bryman (2004). The backward method of multiple regression analysis was employed to compute the extent of the effect of all explanatory variables. The advantage of the backward method of regression analysis is that at the end of the analysis it offers only the independent variables or factors that statistically significantly influence the dependent variable and at the same time eliminates all other insignificant variables or factors (George/Mallery 2006). For this analysis a $p = 0.05$ level of significance was chosen. All independent or explanatory variables were entered at one time and the model removed insignificant variable(s) at various steps of iteration. At the end of the necessary iterations, the process stopped and the model offered only the explanatory variables or predictors that significantly influence the dependent variable or 'adaptation efficacy'.

Before running the regression model a bivariate correlation matrix was computed to identify if there exists any significant collinearity or multicollinearity

among some of the independent variables. Following Hair, Black, Babin et al. (2006) the variable 'total yearly income' was excluded from the model because of its extremely high collinearity ($r > 0.90$) with 'land holding', and the presence of a higher number of outliers (i.e. extreme values at both ends). Other independent variables, whether multicollinearity was still a problem or not, were assessed through scrutiny of the 'tolerance value' and the 'variance inflation factor' (VIF) in the regression model's output. The tolerance value indicates whether the effect of a particular predictor on the dependent variable is its own or shared by other predictors, i.e. the extent of a variable's own effect (not shared by others). Usually 0.80 and above is excellent. The VIF is influenced by tolerance; it should be below 5, but up to 10 is acceptable (Field 2005).

28.5.3 Analysis and Interpretation of the Output of the Regression Model

From table 28.5 it is evident that the regression model has identified seven factors altogether that statistically explain significantly 45 per cent of the variations in adaptation efficacy of the respondents against the impacts of CC-SLR [$F(22, 262) = 27.61, p < 0.0001, R^2 = 0.45$]. The amount of variances (45 per cent) explained by the model is robust in view of the nature of explanatory variables, i.e., a combination of dummy, discrete value, and index value (Field 2005). It is noteworthy that among the 22 predictors 12 are dummy variables; usually a higher presence of dummy variable brings down the R^2 value. Robustness of the model is also reflected through collinearity statistics. The tolerance value equals 0.80 or more and a VIF lower than 5 in most cases indicates that the effects of all seven significant factors are not much influenced by other underlying latent factors. The model shows that among the factors related to *attachment with the coastal environment* the 'age of the respondent' and 'number of times changed settlement' have statistically significant influence on the respondents' adaptation efficacy in the context of CC-SLR. Among the factors related to *wealth and social standing* the 'total farmland holding' has significant influence. Similarly among the *social networking* factors, the expression of 'often need contact with local officials' has significant influence. Likewise, among the factors characterized by the *spatial and demographic causes of exposure to climatic hazard*, 'distance from the coast (km)' has significant influence. Among the factors related to *coping and adaptation to recurrent hazard* (dummy),

the reference to 'frequent adaptation against drier conditions' has significant influence. However, among the three dimensions of *climate awareness* only the 'perception of CC-SLR event' has statistically significant influence on adaptation efficacy against the likely impacts of CC-SLR. Contrary to expectations, the finding reveals that the influence of climate familiarity and tacit and intuitive knowledge about SLR on the adaptation efficacy of the people are rather insignificant. Nonetheless, these are important elements of climate awareness.

The unstandardized coefficient (B) suggests that for one unit (year) increase in age, adaptation efficacy increases by 0.008 unit (index unit). It means that an older person possesses more adaptation efficacy than a younger person. The reason could be attributed to lifelong experiential learning and to the struggle with nature. This finding is consistent with the existing literature that suggests that the importance of the experiential learning process for problem-solving is no less important than a rational system of problem-solving (Epstein 1994; Epstein/Pacini/Denes-Raj et al. 1996; Slovic/Finucane/Peters et al. 2002; Leiserowitz 2006). Climate adaptation efficacy is positively associated with the frequency of change of settlement. For a one-time change of settlement, adaptation efficacy is expected to change 0.05 units. This is because, as coastal tracts are always vulnerable, people move inward (inland) to feel more secure. It gives a very clear message that in the future people may move further inward, which may result in mass relocation. Although moving inward is an expensive venture for a person as it involves various costs, including psychosocial ones, people may still prefer an inward move for livelihood security. Similarly adaptation efficacy increases with the increase of distance of the settlement from the shoreline. People living farther away from the shoreline possess more adaptation efficacy than those who are living close to the shoreline. This finding conforms to the existing body of knowledge of resilient coastal communities (Adger/Agrawala/Mirza et al. 2007). Climate awareness factors, such as 'perception of CC-SLR event' influence adaptation efficacy highly positively. For every one unit (index unit) increase in perception, people can expect an increase of 1.28 (index units) in adaptation efficacy. This finding is consistent with few studies, for instance, with Grothmann and Patt (2005), and Pelling and High (2005), which places a question mark against the importance of physical resources for adaptation efficacy in the absence of other resources like self-understanding about the hazard. From the comparison of standardized co-

efficients (beta: β) it is evident that among all factors that affect people's adaptation efficacy positively, 'perception of a CC-SLR event' is the strongest ($\beta = 0.51$, $p < 0.001$), followed by 'age' ($\beta = 0.33$, $p < 0.001$) and 'distance from the coast' ($\beta = 0.10$, $p < 0.05$). This gives a clear message that climate awareness is an indispensable component of people's adaptation efficacy against the impacts of CC-SLR on their livelihood.

On the other hand factors that negatively influence people's adaptation efficacy against the impacts of CC-SLR are 'farmland holding', the 'habit of contacting local officials', 'frequent adaptation against salinity intrusion', and 'drier conditions'. With the increase in farmland holding, adaptation efficacy against CC-SLR decreases. This finding is inconsistent with most conventional literature, which puts a higher emphasis on resources at the disposal of a person than psychosocial elements as key factors governing adaptive capacity in general (Blaikie/Cannon/Davis et al. 1994; Smit/Skinner 2002; Adger/Huq/Brown et al. 2003; Smit/Wandel 2006). However, this finding is supported by a few studies, for example by Weinstein (1989), Patt and Gwata (2002), Grothmann and Patt (2005), and Grothmann and Reusswig (2006), which are extensions of Maddux and Rogers's (1983) classic '*protection motivation theory*' (PMT) and imply that (past) threat experience creates a higher fear appeal (e.g. a lack of self-confidence) among the resource-rich people than the poor people due to the higher concern among rich people for the protection of their resources. In fact, this is exactly the case in the coastal area. People holding more land are more concerned about their inability to maintain the real value of land in the face of CC-SLR. They perceive the risk from the viewpoint that permanent inundation by saline water must degrade the quality of their land parcels. They will have no choice but to face the challenge of decline in land prices (in real terms). This fear probably leads them to score low in adaptation efficacy. People with less land think they will encounter less trouble to manage (dispose of) their limited land.

As intention towards adaptation often differs from actual behaviour, in the actual event of SLR, resource-poor people may also demonstrate their inability to face the challenges, because it is not surprising that while answering the question related to their adaptation efficacy they may have overestimated their action scope (adaptation efficacy) due to their myopia about the extent of the impacts of SLR. This kind of overestimation usually takes place while people deal with hypothetical situations, which in the literature of psychology are termed as *illusions of control* (Wortman

Table 28.6: Multiple regression model of effects of factors on adaptation efficacy against CC-SLR impacts. **Source:** The authors.

Independent variables	Coefficient B ^a (β) ^b	Std. Error	t statistics	Sig.	Tolerance	VIF
(Constant)	-.669	.120	-5.557	.000		
Age of respondent (yr)	0.008*** (0.33)	.001	6.573	.000	.797	1.25
No. of times changed settlement (number)	.052* (0.09)	.029	1.794	.074	.763	1.31
Total farmland (ha)	-0.010* (0.09)	.006	-1.782	.076	.856	1.17
Often need contact with local officials (dummy)	-0.115*** (-0.17)	.031	-3.762	.000	.930	1.08
Distance from the coast (km)	0.006** (0.10)	.003	1.995	.047	.843	1.19
Frequent adaptation against saline water (dummy)	-0.052** (-0.10)	.025	-2.109	.036	.921	1.09
Frequent adaptation against drier conditions (dummy)	-0.089*** (-0.16)	.026	-3.435	.001	.878	1.14
Perception of CC-SLR events (index)	1.28*** (0.51)	0.122	10.473	.000	.851	1.17
F	27.61***					
DF	(22, 262)					
R ² (Adjusted R ²)	0.45 (0.43)					
N	285					

Note: Dependent variable: Climate adaptation efficacy (index);

^a Unstandardized regression coefficient; ^b Standardized regression coefficient;

* significant at $p < 0.10$; ** significant at $p < 0.05$; *** significant at $p < 0.01$.

1976). Furthermore, people having no land may have been guided by fatalism as Schmuck (2000) rightly pointed out, e.g. in Bangladesh religious [poor] people go in for wishful thinking or *Allah* (God) will save us. Due to this kind of wishful thinking poor and ignorant people often demonstrate an unrealistic optimism (Weinstein 1980, 1987), probably a vital cause for scoring high in adaptation efficacy. People who depend frequently on external assistance, for instance, taking advice from local officials or other authorities on everything to be done, possess less adaptation efficacy than those who do not depend so much. This finding is consistent with the existing literature. However, contrary to expectation and conventional belief the research finding shows that people with more exposure to natural hazards, such as salinity intrusion, seasonal scarcity of fresh water, and dry spells possess less adaptation efficacy than those who are exposed less. This probably happens for two reasons. First, those who have faced recurrent exposure have gained experience in adapting; many of them, however, have already exhausted their resources (energy, time, money) and so cannot adapt further. After

becoming aware of CC-SLR matters, they perceive the hazard as more likely to happen time and again. This attitude, often known as *availability heuristic* (Tversky/Kahneman 1974; Crocker 1981) in psychological research, creates fear among the people about the recurrent occurrences of (hazardous) events. Hence, respondents are often hypersensitive to any further occurrence of events because of the belief that any future event would exceed their coping range (Blaikie/Cannon/Davis et al. 1994; Oppenheimer/Todorov 2006); probably, this fear appeal is also the reason why some people score less in climate adaptation efficacy. Second, some people, probably from the educated section, experienced in recurrent hazards, know of the limit to adaptation, and this probably made them conservative in assessing their adaptation efficacy (Adger/Barnett 2009; Adger/Dessai/Goulden et al. 2009). Finally, comparison of standardized coefficients (beta: β) reveals that among all the factors that affect climate adaptation efficacy negatively, the 'habit of seeking external assistance' such as contacting the local authority to solve a problem is the strongest ($\beta = -0.17$, $p < 0.001$), followed by frequent ad-

adaptation against drier conditions ($\beta = -0.16$, $p < 0.001$) and salinity intrusion ($\beta = -0.10$, $p < 0.05$) (table 28.6).

28.6 Policy Implications of the Findings and Conclusions

Estimates of the extent of the possible impacts of CC-SLR are yet to be confirmed. Nevertheless, people in the coastal area need to be prepared for anticipatory adaptation against such impacts based on current knowledge and scientific advances concerning CC-SLR. It is believed that climate awareness influences people's adaptation efficacy against climatic stresses. Since climate adaptation efficacy is perceived as part of a broader aspect of adaptive capacity (Grothmann/Patt 2005) it is equally believed that physical, cultural, and information resources that influence adaptive capacity have similar influences on people's adaptation efficacies. How far these hypotheses hold is tested in this research. However, this research is quite new in singling out the role of climate awareness in the climate adaptation efficacy of people who are likely to be affected by CC-SLR. Although the research largely explored the possible influence of three dimensions of climate awareness on coastal people's adaptation efficacy, the influences of other socio-economic, political, instructional, and psychological and behavioural factors were equally addressed.

From the PCA, 19 variables that explain 72 per cent of the variances in the adaptation efficacy of the respondents were selected. Along with these 19 variables, three additional variables, i.e. three dimensions of climate awareness, were entered into the OLS multiple regression model to quantify the extent of influence on climate adaptation efficacy. So far, the findings suggest that among the three dimensions of climate awareness only one dimension, i.e. perception of a CC-SLR event, has a statistically high and significant influence on people's adaptation efficacy against the impact of CC-SLR. The other two dimensions of climate awareness are important for people's adaptation efficacy; however, they are not very significant. Nonetheless, this finding is robust for two reasons. First, it re-emphasizes the need for a climate awareness programme before the implementation of any adaptation measures, where there is a need for the involvement of the local community, because there is no doubt that, for the coastal communities to adapt against CC-SLR, there is a need for a vulnerability reduction programme of various kinds. Unfortunately, past experiences show that programme components

that deal with natural disasters are disproportionately biased towards measures related to technical and managerial sciences. The construction of embankments, levees, polders, cyclone shelters etc. is very common. While these are necessary, the need for the development of the people's socio-psychological elements, such as belief, awareness, strength of collective actions etc. was overwhelmingly ignored in the past. Given the findings of this research, future intervention must incorporate many of these socio-psychological elements in order to enhance people's adaptation efficacy. While determining people's climate adaptation efficacy, they should be encouraged to consider the wider context where they might need to adapt. In this respect a full understanding of the awareness of people in the various dynamics of climatic events and SLR is as equally important for policymakers and planners as knowing of the various resources at their (the people's) disposal.

Second, it brings the issue of climate awareness to the forefront of the debate about the broader issue of livelihood security against the impacts of CC-SLR. As livelihood security relates to some other aspects such as low exposure to disastrous events besides secured access to food and earnings, the issue of exposure to disastrous events needs to be addressed for a comprehensive understanding of adaptation efficacy against livelihood insecurity. For example, people who have changed location of settlement several times have demonstrated more climate adaptation efficacy than those who changed less or not at all. This means that people who had moved inward from the shoreline felt more confident in facing the impacts of CC-SLR. Similarly, people who have been living relatively far from the shoreline demonstrate more adaptation efficacy against CC-SLR than people who are on the shoreline. Somehow, both findings are giving the same message, i.e., to secure their livelihood from the threat of CC-SLR, some people may start evacuating from the coast to resettle in places which are more secure, and probably located further inward from the current shoreline. If this holds true, which is more likely from the model output, avoiding a mass relocation in the long run would be a serious concern for a land-scarce country like Bangladesh. Such a mass inward move may happen even earlier, because people who have been encountering natural disasters for years, for example, salinity intrusion and seasonal scarcity of fresh water and drought, are already at the limit of their coping range for securing their natural resource-based livelihood. Any additional episode of same kind of disaster, which is more likely in the future, will severely erode their remaining

adaptation efficacy, which is already exhausted as they think they are crossing their coping threshold. This refers to the notion of the limits of adaptation (Adger/Dessai/Goulden et al. 2009).

Bangladesh, being a land-scarce country, may not be able to afford the luxury of relocating millions of coastal people to new locations as every parcel of land is already densely populated. To avoid this situation and to encourage adaptation *in situ*, measures for building climate adaptation efficacy need to be initiated under a coordinated programme. In this respect, as these findings suggest, climate-awareness-raising programme components may be bundled with other programme components which may provide the people with some extrinsic and tangible benefits in securing their livelihood even in the short run. From these findings, it is also evident that people rely on external assistance by seeking material or non-material support from local officials of both governmental and non-governmental organizations to solve their problems, rather than doing it themselves. This has two dimensions. First, this kind of dependence should be discouraged as this undermines and lowers people's own adaptation efficacy. Furthermore, recent studies in a developed country context reveal that some of this kind of networking does help a little in climate vulnerability (Wolf/Adger/Lorenzoni et al. 2010). However, this must be achieved through a gradual process of developing a local endogenous organizational set-up. The inherent philosophy should be adaptation for the people and by the people. In this regard, the lifelong experience and wisdom of senior citizens (elderly active people) could be used as social capital to encourage other people, especially younger people, to be self-reliant, as a way of increasing adaptation efficacy. In fact, in the socio-cultural context of rural Bangladesh, the advice of senior citizens is well adhered to by others.

Finally, it could be argued that a carefully designed intervention needs to be initiated without further delay to let coastal people become aware of CC-SLR adaptation. This would help remove any wrong conceptions about CC-SLR, and this will help to enhance adaptation efficacy. This in turn would encourage their anticipatory adaptation against future SLR. These findings point to a new direction of research for exploring the relationship between climate adaptation efficacy and the preference for various adaptive measures to secure livelihood against the threat of CC-SLR in coastal Bangladesh.

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29 Security Implications of Climate Refugees in Urban Slums: A Case Study from Dhaka, Bangladesh

Sujan Saha

29.1 Introduction¹

There is an increasing realisation that climate change is a core challenge to international peace and security. As climate change could induce mass migration, implications concerning its effects in leading to violent conflicts arise. Although much has been written about climate refugees and conflicts, there is a lack of empirical studies which analyse the interactions of micro-level actors and how such interactions lead to violent conflict. One question is of particular interest: are climate refugees a threat to peace and security?

This chapter aims to determine, through a micro-level analysis, where the areas of concern lie. The chapter is based on interviews with 300 households in slum areas of Dhaka, Bangladesh. The data reveal two things. First, people have been migrating for 36 years for climatic reasons. Second, climate change is still today one of the prime causes of migration. Furthermore, the chapter identifies additional factors which exacerbate violent conflicts in the slum areas of Dhaka. These factors are: a lack of basic necessities, deteriorating living conditions, the prevalence of crime and the availability of small arms, and a lack of justice. This chapter argues that climate change causes migration which, interlinked with existing social stresses, may challenge peace and security in urban areas of Dhaka.

Bangladesh is one of the countries most vulnerable to climate change. The negative consequences of climate change for the small but densely-populated country have been widely discussed. Inhabitants of the coastal belts and low-lying regions of the country often live in absolute poverty. People are highly dependent on the environment for their livelihoods. However, climate change, causing the intrusion of saline sea water, coupled with frequent extreme storm

surges and land erosion, is destroying livelihood options for millions of people. As a result of these extreme changes and events, the very poor are forced to migrate. Researchers believe that mass migration could trigger violent conflicts (Reuveny 2005; Chowdhury 2007). Extensive research has been conducted on the possible impact of climate change on Bangladesh (UN Habitat 2008; MoEF 2008; World Bank 2007; NAPA 2005; UNEP/GRID-Arendal 2000; Agrawala/Ota/Smith et al. 2003; Klein/Nicholls 1999; Ali 1996), but there are only a few studies (Darlymple/Hiscock/Kalam et al. 2009; Chowdhury 2007; Reuveny 2005) which focus on the relationship between climate migration and conflict. Furthermore, none of the studies takes a closer look at the role of climate refugees in violent conflict.

This chapter will provide a comprehensive examination of the climate-induced instability thesis through empirical evidence. The focus of the chapter is to tease out the areas of concern using a micro-level analysis. It aims to add nuance, texture, and detail to the debate on the security implications of climate change. The chapter is based on a survey of individuals who have migrated to the slum areas of the capital of Bangladesh, Dhaka city. The aim of the survey is to examine the role and the interactions of migrated individuals and groups in leading to violent conflicts at the micro level. The key question of the chapter is: are climate refugees a threat to peace and security?

29.2 Research Design

It has been suggested that there are three primary methods for conducting empirical research into environmental migration. According to Reuveny (2005), these are: (1) measure individual calculations by interviewing migrants; (2) collect data over many years and perform statistical analyses; and (3) employ a case study methodology. Contrary to Reuveny's (2005)

¹ Keywords: Climate change, migration, slums, violent conflict, micro-level analysis, Dhaka, Bangladesh.

work on Bangladeshi refugees where he adopted meta-analysis and depends on historical accounts, this chapter has adopted a painstaking approach: collecting primary data through interviewing climate refugees.

29.2.1 Conceptual Framework: the Micro Approach

Violent conflict is a complex phenomenon, as it can be linked to several underlying factors of political, social, economic, religious, and psychological origin. In traditional conflict discourse, poor individuals, groups, and households are caught up in conflicts and often seen as victims (Appadurai 1999; Brown 2001; Collier/Hoeffler 2001, 2004; Gurr/Moore 1997; Kalyvas 2004; Luckham 2003, 2004; Singer/Small 1994). Much of the current research on violent conflicts focuses on regional, national, and international perspectives (Tambiah 1996; Varshney 2002; Valentino 2004; Justino 2004, 2006; de Vletter 1999; Westley/Mikhail 2002; Woodward 1995; Young/Osman/Aklilu et al. 2005). These studies are largely based on secondary data and media reports on conflicts. There are also anthropological studies on conflict-prone regions (Tambiah 1996; Comaroff/Comaroff 1999; Berman 2000). Most of these studies are context-specific. Hence, it is difficult to draw general conclusions from them. Still, the studies serve as a basis for intervention policies which aim to promote mediation and peace (Collier/Hoeffler 2004; Gurr/Moore 1997; Kalyvas 2004; Luckham 2004; Singer/Small 1994). However, these perspectives ignore the role of the individual, household, and group interactions which may also lead to violent conflicts.

Micro-level analyses of conflict are rarely applied to this context. This is despite the fact that at a fundamental level, violent forms of conflict originate from an individual's behaviour and interaction with immediate surroundings, social groups, and institutional norms (Justino 2007).

In contrast to 'macro' perspectives, a micro-level approach uses individuals, households, and groups as units of analysis. This chapter proposes a theoretical framework, placing the individual and household participation at the start of analysis, as the author believes that these factors are the prime agencies promoting conflict. In addition, a micro-level analytical perspective is fundamental to understanding the relationship between climate refugees and violent conflict. Furthermore, its role is crucial in the maintenance of peace and security at a local level.

29.2.2 Methodology: The Case Study Approach

Climate change is a global phenomenon, but its effects vary greatly between regions. In order to acquire in-depth knowledge of local situations, a case study approach is followed. The purpose of the proposed case study is to uncover much-needed fundamentals of local conflict in the context of climate change, while placing the interactions of individuals and groups at the centre. It is hoped that the assembled micro-data concerning individuals and groups will help us to understand the role of climate refugees in violent conflicts.

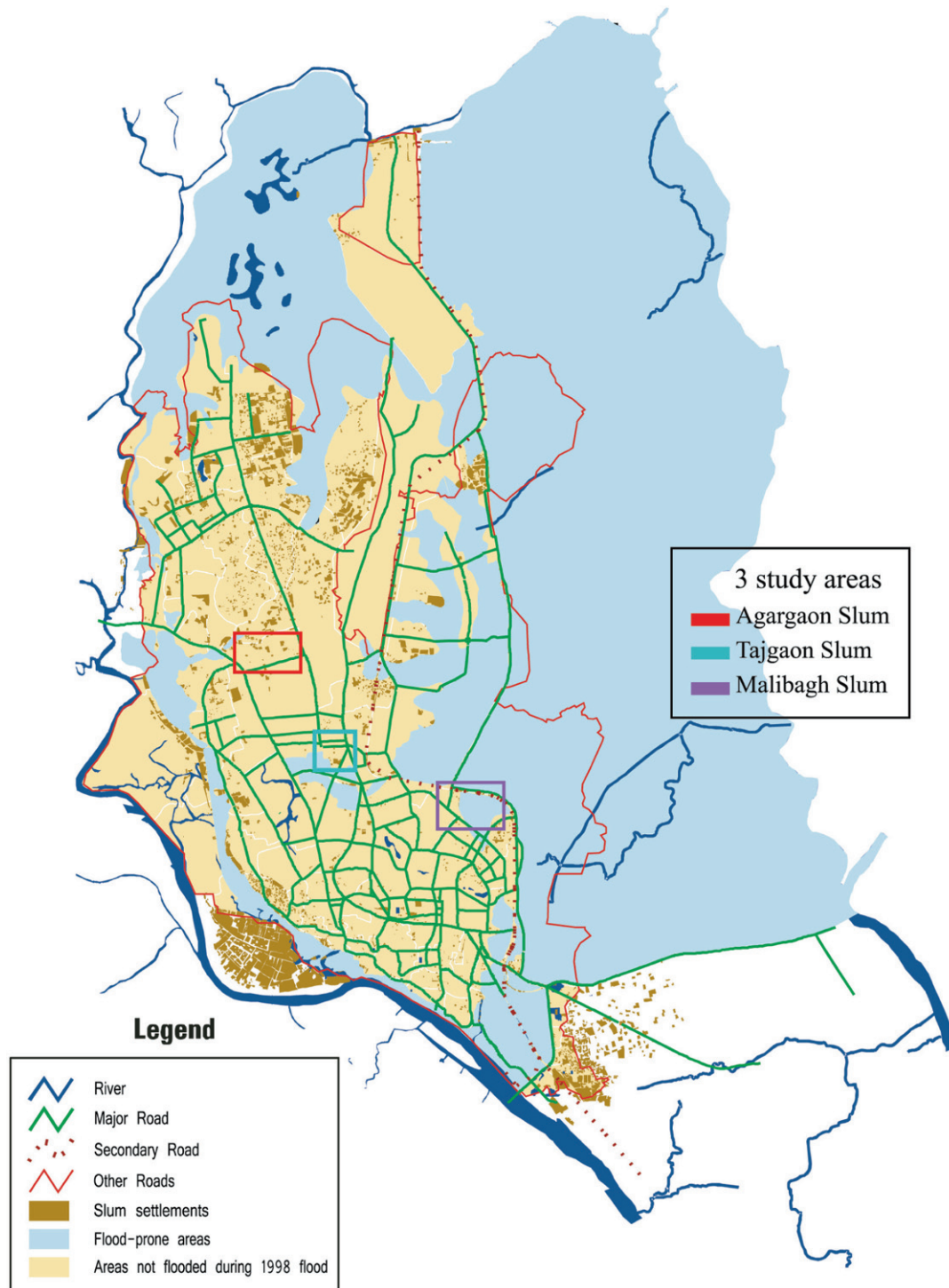
29.2.3 Study Areas: The Slums

The study areas chosen were in Dhaka city, the capital of Bangladesh. Dhaka has grown enormously since the independence of Bangladesh. Its current population is over 13 million (Bangladesh Bureau of Statistics 2008). Dhaka is not only a place for the educated and elites of Bangladesh, but also serves as a shelter for the poor. The city has become a centre for marginalised people who have been displaced from their homes. Many displaced people take refuge in urban areas (DRC 2008). Around 3.4 million people live in the 5,000 slums of Dhaka (Islam/Mahbub/Nazem et al. 2006). A slum is locally called *bosti*. In total 3 slum areas were surveyed: Malibagh Railgate slum, Tajgaon Pakistani slum, and Agargaon slum. These particular slums were selected because of their close proximity to urban centres. They are also located close to the entry points of the capital. Because of their close proximity to the capital, these slums are often the place where many displaced people seek shelter first. The selection of these slums is promising for generating new insights into migration processes and for examining conflict constellations, especially in urban areas.

29.2.4 Data Collection

Primary data was collected in the above-mentioned slums in Dhaka city via surveys using a semi-structured questionnaire (box 29.1). The questionnaire was formulated after an in-depth literature research. The questions were chosen because many scholars argue that they target the factors contributing to the formation of violent conflicts, and they were placed within the context of Bangladesh. These questions can help us to understand the factors of conflict constellation in the broader context of climate change and security.

Figure 29.1: Flood-prone slums and the case study area in Dhaka. **Source:** Adapted from UN Habitat 2008:153, based on data from Centre for Urban Studies (Slum Map), Bangladesh, 2005, and Bangladesh Centre for Advanced Studies (Flood Map), 1998.



A total of 300 households were surveyed, 242 women and 48 men. The surveys were conducted between 11 am and 4 pm. As it is common for men to

work during the day while women work at home, the majority of respondents were women. The households (only one person per household was inter-

viewed) were selected through simple random sampling. Interviews took place on doorsteps, with four interviewers going from door to door. It took the respondents approximately 25 to 30 minutes to fill in the questionnaire. The questions concerned household information, migration history, risk, and opportunities in the respondents' past and present locations. The survey also included questions regarding rural and urban income differences, past history of conflicts, social institutions, and government initiatives, etc. All interviews were conducted between September and October 2009.

Before proceeding any further, two concepts need elaboration since they will be referred to frequently; they are 'climate refugee' and 'violent conflict'.

Although the term 'climate refugee' has not been recognized by the international legal regime for the protection of refugees (Biermann/Boas 2008), we can look to the *United Nations Environment Programme's* (UNEP) definition of 'environmental refugees'. UNEP defines environmental refugees as "those people who have been forced to leave their traditional habitat, temporarily or permanently, because of marked environmental disruption (natural and/or triggered by people) that jeopardized their existence and/or seriously affect the quality of their life" (El-Hinnawi 1985).

This chapter adopts the concept of 'violent conflict' as defined by Reuveny (2005). Reuveny describes several kinds of violence, including one-sided violence (genocide and politicide), non-state violence (between groups, but where the state is not formally involved), and unorganized violence.

29.3 Outline

The next section will review literature focusing on climate-change-induced conflict. It is divided into three parts, where each part aims to provide a general view of current research into the context. This section also provides the basis of formulating questions for the survey. The main body then follows; it is based on case studies from slum areas. Following a short introduction, it focuses on three cases which illustrate the stresses placed on Dhaka city. This section also includes an analysis of the surveyed data. The final section includes a recommendation, again on the basis of the survey, and a conclusion.

29.4 Literature Review

The seminal research body on climate science, the *Intergovernmental Panel on Climate Change* (IPCC), warned that climate change increases the frequency and intensity of severe weather systems which can trigger mass migration (IPCC 2007). Similarly, the Stern Review, while mainly focusing on the economics of climate change, warned of "mass migration and conflict" (Stern 2007: 92) as a possible consequence of climate change in the developing world. However, the IPCC's comments on climate change and conflict were criticised as scattered and largely unsubstantiated by evidence (Gleditsch/Nordås 2009). Nevertheless, security threats posed by climate change are a frequent topic in the media and in public debate, despite the fact that the rhetoric is based on speculative sources.

In 2003, the US Department of Defense painted a grim picture of the future with a serious warning of massive social disturbance as a result of dramatic climate change (Schwartz/Randall 2003). This warning was the first of its kind. The warning speculated that climate change would challenge US national security in ways which should immediately be addressed. Similarly, eleven retired US generals and admirals argued that "climate change can act as a threat multiplier for instability in some of the most volatile regions of the world" and that this "presents significant national security challenges for the United States" (CNA 2007: 1).

In the EU, a report from of the German Environment Ministry (BMU 2002: 4) found that "evidence is mounting that the adverse effects of climate change can, particularly by interaction with a number of socio-economic factors, contribute to an increasing potential for conflict". The British Foreign Minister in 2007 argued that the impacts of climate change, such as crop failure and lingering drought, sea-level changes, and river basin degradation, "went ... to the very heart of the security agenda" (UN 2007: 1).

Concerns about climate-change-related violent conflicts have not only arisen in the minds of political authorities. Many NGOs have also expressed significant concerns about its implications. For example, *Christian Aid* predicts that "on current trends, a further 1 billion people will be forced from their homes between now and 2050" (Christian Aid 2007: 1). *International Alert* also concluded that "there is a real risk that climate change will compound the propensity for violent conflict which, in turn, will leave communities poorer, less resilient and less able to cope with the

consequences of climate change” (Smith/Vivekananda 2009: 3).

Academics such as Jeffrey Sachs (2005), Rob Swart (1996), and Thomas Homer-Dixon (2007) also contribute to the discourse by arguing that climate-change-related migration raises significant concerns about human security, and could trigger violent conflicts. There are also more sceptical voices, such as Barnett (2001a, 2001b; 2003) and Suhrke (1997). Barnett (2003) cautions against over-securitizing the issue of climate change, while Suhrke (1997) contests the number of climate refugees. Apart from general discussion and speculation about the number of climate refugees, there is also extensive research on the link between climate change and conflict. The following sections explore the links between climate-change-related migration and violent conflict.

29.4.1 On the Causal Links

Researchers have discussed various links between climate change and violent conflict. Among these, two mechanisms have received a great deal of attention. First, resource scarcity may increase economic inequalities, exaggerate social cleavages, and cause mass migration, which all make ethnic clashes more likely (Homer-Dixon 1999). Scarcity is likely to worsen the general standard of living, which makes the population more vulnerable to infectious diseases and lowers the opportunity cost of joining dissident activities. The investigation of these pathways to armed conflict is guided by a theoretical framework which pays attention to local triggering factors. To some extent, there will always be competition over access to a resource as long as it is valuable, scarce, or both. The essential question remains, however: which immediate and contextual factors are able to account for the spatial and temporal dynamics in how local resource competition escalates to the use of armed force? Environmental degradation, resource mismanagement, and resulting economic stagnation may simultaneously ignite communal violence and force people to flee the affected area. Displacement may also in turn exacerbate over-consumption and generate new clashes over access to resources in the receiving region, which is illustrated by the connectedness of these elements. As one can see, the notion of displacement due to climate change is far more complex than it seems.

Secondly, environmental degradation may also be linked to instability and conflict in a more indirect manner. For example, extensive logging in tropical areas tends to desalinate the soil and contribute to ero-

sion and desertification, which make the land much more vulnerable to natural hazards, in particular flooding and landslides. In Haiti, for example, unrestrained deforestation has had catastrophic effects. Decreased land productivity and eradication of the island’s natural defences against seasonal storms have caused massive poverty and forced people to risk their lives on a daily basis in trying to reach the shores of Florida. There are clear links between these significant environmental problems and Haiti’s unstable political situation (UN 2004). However, environmental insecurity is not like a diffuse disease that afflicts all countries, but is rather a phenomenon that varies significantly in intensity across space and time. Yet, most empirical research in this area is conducted at the state level and is restricted to events that involve the central government. It therefore offers only limited clues as to how resource scarcity is associated with local instability and communal violence (Esty/Goldstone/Gurr et al. 1998; Ellingsen/Hauge 2001).

Some studies have found links between global economic change and the formation of violent conflict. For example, when a state adopts *Structural Adjustment Programmes* (SAPs), the state’s capacity to provide freedom and opportunities could be weakened. Subsequently the state could cut the funding of basic services, and this could spark protests about the lack of basic necessities, and hence promote violent conflict (Bax 2002; Gourevitch 1998; Kahl 2006). Similarly, Leichenko and O’Brien (2008) illustrate the connections between climate change and globalisation. Through case studies, they explain how the interactions between global environmental change and globalisation create situations of ‘double exposure’. The double exposure framework analyzes recent and current climate-related events: Hurricane Katrina in New Orleans, recurring droughts in India, and the melting of Arctic sea ice. The case studies each demonstrate a different pathway of interaction between globalisation and global environmental change. Through exploration of these pathways, the double exposure framework shows how broader human security concerns such as growing inequalities and vulnerabilities, as well as unsustainable rates of development, are closely connected with globalisation and global climate change. In the case of Indian agriculture, they argue that Indian farmers are exposed to two stresses. In some areas, climate-sensitive crops are negatively affected by the impacts of climate change, while pressure of globalisation through imported foods and competition over export-oriented crops, coupled with global uncertainty over food prices, undermines local

food security. Eventually the double exposure makes the local farmers vulnerable. It has been acknowledged that exposure to multiple stressors is a real concern, particularly in developing countries, where food security is influenced by political, economic, and social conditions, in addition to climatic factors. Barnett and Adger (2007) also argue that climate change will reduce the state's capacity for mitigating these problems, an argument that is in line with the argument of Fearon and Laitin (2003) stating that weak states are more prone to civil war.

Research has also been published into more direct links between climate-change-induced migration and violent conflict. Scholars argue that the absence of an effective justice system and of law and order are among the main contributory causes of violent conflict (Nafziger/Auvinen 2002). Some believe that a past history of violent conflict may trigger new conflicts (Collier 2000). Boutwell and Klare (1999) argue that the risk of violent conflict depends on the availability of weapons. These assumptions will be tested in the context of climate-change-induced migration in Bangladesh. Before doing so, the next section reviews the existing studies in this context.

29.4.2 Research on Bangladesh

Research on environmentally-induced displacement in Bangladesh shows that migration is a survival strategy employed in disaster-prone areas (Zaman/Weist 1991). Lein (2000) found that migration (in response to flood-induced erosion) is principally local. This is because of the prohibitive cost of moving greater distances, and because of people moving only few kilometres from their previous residence, hoping to resettle and reclaim their land as flood water recedes. Hutton and Haque (2004) also found that this might help them remain close to family and ancestral lands. Although most people return to re-establish their livelihoods when new land subsequently re-emerges, a considerable proportion (between 10 and 25%) moves to urban centres to seek refuge in slums (DRC 2008; Islam 1996). However, these urban migrants also cited economic factors, including landlessness, poverty, unemployment, and natural hazards, as major causes of the rural push (DRC 2008; Islam 1996).

Lein (2000) argues that despite the persistence of conflict over islands (locally called 'chor') in the Jamuna River, there are major social institutions which help affected people to resettle effectively. In his recent work, Lein (2009) argued that communities in Bangladesh will, in many cases, be surprisingly resil-

ient, as people gain experience from different types of hazards (e.g. floods, riverbank erosion). He concludes that the role which environmental factors play in explaining (forced) migration is highly overrated. Contrary to Lein (2009), the Bangladesh Institute of International and Strategic Studies and Saferworld have found that climate change initiates land-related conflicts in Bangladesh (Darlymple/Hiscock/Kalam et al. 2009).

Despite the fact that the Bangladeshi people are resilient and have begun to learn to cope with natural hazards, the negative consequences of climate change are often much more destructive and rapid. The climatic consequences differ from other natural hazards (e.g. normal floods and rains) as people are often unable to return to their home and are forced to relocate to urban slums.

On the conflict constellations in Bangladesh due to migration, Reuveny (2005) looked into two incidences: Bengali immigration from the plains into the Chittagong Hills, and Assam, a state of India in which mass conflicts between immigrants and host communities have taken place. In both cases, a sudden flux of immigrations triggered tension between outsiders and host communities. However, Reuveny (2005) misses the fact that both migration processes had a political instigation, and some vested interest groups used the tensions for their own political gains. In the case of the Bangla-speaking people intrusions into the Chittagong Hills, the migration was backed by political authority (Rizvi in Islam 1992). In the other case, immigration into the Indian state of Assam was in fact encouraged by the political decision of the British government to partition the Indian subcontinent into two states based on religious differences. These new immigrants were often not welcome due to various socio-economic and cultural factors. It is worth mentioning here that in urban slum areas the notion of host and outsider is irrelevant, as the slum dwellers face common problems.

Afsan Chowdhury, a renowned journalist, activist, and researcher, argues in his documentary that climate-change-induced migration has profound implications on security and that this could instigate violent conflict. The conflict will not only be a security concern for Bangladesh, but could even escalate into an inter-border conflict as mass migration due to climate change will spill over into neighbouring India (Chowdhury 2007). However, Chowdhury did not provide any empirical evidence for his assumptions. A rare empirical study commissioned by the *Bangladesh Institute of International and Strategic Studies* (BISS) and

Saferworld argues that urban slum dwellers are competing for income and water, and that this competition could prove the multiplier effect for conflict constellation in Bangladesh (Darlymple/Hiscock/Kalam et al. 2009). However, the study has not looked into pathways to violent conflict and the role of climate refugees in contributing to violent conflicts.

Lennon and Smith (2007) also warned that climate change could destabilize struggling poor countries and create breeding grounds for terrorists. This argument urges that, well before glaciers melt or sea levels rise, global climate change will spur instability on a global scale, which will exacerbate many of today's national security challenges, such as terrorism. The risk is high in south Asia, particularly in Bangladesh, which has been devastated by frequent tropical cyclones. Hundreds of Taliban and jihadists have already found safe haven in this region in the wake of the US invasion of Afghanistan (Lennon/Smith 2007). The combination of deteriorating socio-economic conditions, radical Islamist political groups, and environmental insecurity brought on by climate change could prove volatile (*ibid.*).

A Japanese ambassador noted that it is highly likely that Bangladesh will become a fundamentalist Islamic country, if not within a few years then in about 20 years. The argument was firstly that fundamentalism is nurtured by poverty, which is a prolonged and chronic issue in Bangladesh. Secondly, Jamaat-e-Islami, a religion-based party and close to being fundamentalist, has been increasing its influence through its alliance with the BNP (*Bangladesh Nationalist Party*). Thirdly, there is a sharp increase in the number of *madrasas* (Islamic religious schools) with assistance from Islamic countries and accordingly, more young Bangladeshi people receive an education influenced by Islamic fundamentalist values (Embassy of Japan 2005).

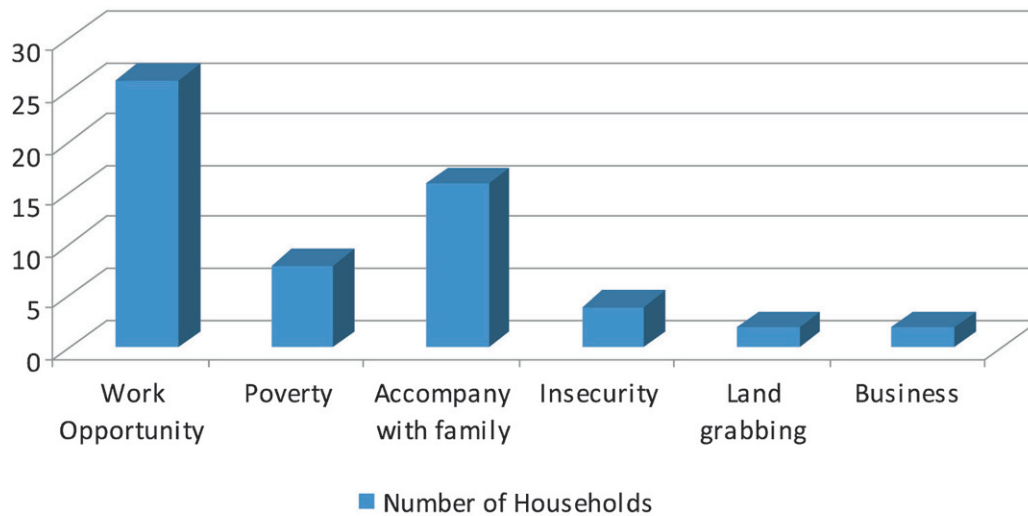
The following section will provide an introduction to climate refugees in the slums of Dhaka. The aim is to understand why they migrate to the slums. In order to analyze the potential impact that climate refugees might have on conflict and security dynamics in the urban slums, it is first necessary to clarify the situation of urban migration and climate change in the slums of Dhaka.

29.5 Climate Change and Migration in the Slums

Bangladesh is globally considered one of the most vulnerable and exposed countries to climate change (Harmeling 2010). Bangladesh is geographically exposed to a multitude of the adverse impacts of climate change, because of its location in the tropics, its geographical location in the deltas of three of the world's biggest rivers, and its flat low-lying deltaic topography (Thomalla/Cannon/Huq et al. 2005). Moreover, the country has a low adaptive capacity due to its extreme poverty (World Bank 2000; Rijsberman/van Velzen 1996; ADB 1994). Climate change poses major threats to the people of Bangladesh. Many predict that around 17 million people will be affected and 16 per cent of the land will be lost if sea-level rise reaches 1.5 m (UNEP/GRID-Arendal 2000). This could displace a significant number of people both internally and internationally from coastal districts in Bangladesh (IPCC 2007).

Most of the displaced people, after losing their land, home, and livelihoods, come to Dhaka to find a place to live and a livelihood. They proceed to the slums and squatter colonies spread all over the city. It is estimated that about twenty-five per cent of the total population of Dhaka lives in slums and squatter colonies (Majumdar 1992). A recent study found that every day 2213 people enter the city, and many of them end up in slums (Hanif/Hossain 2010). Currently, 79 per cent of the households in Dhaka are classified as slums (UN Habitat 2008: 112). The results of the survey conducted for this research reveal that the flow of migration to the major cities of Bangladesh has multiple causes. Around 81 per cent of slum inhabitants stated that climate-change-related causes such as declining harvests and fish stocks, frequent floods, cyclones, high tide, and less water for irrigation were among the main causes of migration. This survey also confirms that many people have migrated for non-climate-change-related reasons such as work opportunity, joining their family, conflict over family property, land grabs by powerful local men, insecurity of single women, poverty, etc. (*figure 29.2*). The main push factors of migration are rural-urban inequalities in income, poverty, employment opportunity, relative safety for single women, and environmental causes such as river erosion and floods.

Around 25 households migrated because of work opportunities in Dhaka. Around 6 households named poverty as the cause for leaving their village. Further causes were the perceived safety of single women in

Figure 29.2: Causes of Migration. **Source:** The author.

Dhaka and land grabbing in their local home areas. 20 households migrated to the slums with their parents. This is the second highest cause of migration. They left their village over 36 years ago. They came at a young age together with their families. It is obvious that climate-change-related migration had started long before. Therefore, migration is not a problem of the future for the slum people in Dhaka city. It has already become one.

The next section illustrates the stresses that the climate refugees impose on the slum areas. The aim is to understand the role of these stresses in violent conflict constellation. There will be three case studies highlighting three different issues of the role of climate migrants in leading to violent conflicts.

29.5.1 Case I: A Place of Inhumane Conditions

The Malibagh Railgate slum has been built along the railway tracks; it is close to the central railway station of Dhaka City. Inhabitants of this slum are from the Khulna, Maymensing, Pabna, Chadpur, and Nonakhali districts, the flood-prone areas in Bangladesh. Many of them are from the same villages or have relatives living in this slum. Many people work as vendors in nearby supermarkets, in garment factories, and as rickshaw pullers. Children work as vegetable sellers. Many women work in garment factories or as housemaids, and occasionally as brick breakers.

The shacks are mostly built using plastic sheets, bamboo walls, tin sheets, or cardboard. They often leak when it rains, and are very susceptible to the risk of fire. People live in tiny rooms with all adult and children members of a family in a single room. They

have to share a toilet with as many as 20 to 30 households. Each household has an average of 5 family members. People are living in an inhumane situation. In addition, inadequate income and overall poverty results in increased incidents of domestic violence. This slum has some piped-in water, but women have to shower in an open-air bathroom. There is no gas supply in the slum. Inhabitants cook on stoves made of mud, burning huge amounts of wood and bamboo. Children use the surface drains as latrines. The air is dusty and the running water is polluted. Scattered waste is visible here and there in open places. There are no facilities for waste disposal. It is very common for children to suffer from diarrhoea; the investigators were informed that children suffer from water-borne diseases such as diarrhoea and cholera. The slum has become a breeding centre for disease rather than being a shelter for poor people. Inhabitants suffer from various medical complications but they do not get proper treatment. The inhabitants accuse the government of not doing anything about it. The investigators were informed that there are some NGOs that provide free basic medicine and maternal support, and that some NGOs also work on HIV prevention. Still, basic needs are not met (UNICEF 2006; Podymow/Turnbull/Islam et al. 2005). Health, water, and electricity services are already scarce or are becoming scarce. There is an acute scarcity of safe drinking water and electricity. This situation puts pressure on public services across Dhaka's slums. In addition, the increasing number of people puts pressure on the infrastructure of the whole city. Water points often turn into scenes of verbal dispute as women quarrel over access to and distribution of water. Dhaka's

transport system which is close to collapse (Dhaka Mirror 2009).² The increasing traffic has made commuting very difficult. Furthermore, frequently people violently demand their basic necessities such as water, gas, and electricity. The situation has become worse over the last couple of summers. People have clashed violently with law enforcement authorities across the slum areas (Bangladesh News 2008; Woodrow Wilson International Center 2010).³

Climate refugees aggravate this situation, as the majority are unable to satisfy basic needs such as housing, water, and electricity. Therefore, climate refugees and migration act as a catalyst for poverty and hardship for those affected. Moreover, this also acts as a source of unrest and of some types of violence (e.g. violent protest against the government), including one-sided violence against marginalised people (e.g. the poor and women).

29.5.2 Case II: A Problem Forever?

Tajgaon Pakistan slum or Tajgaon Railgate slum is one of the oldest slums in Dhaka. The slum is built on both sides of the rail tracks. It is a highly dangerous site as trains run through the slum every 10 minutes. Every month people, especially children, are injured or run over and killed by trains. The slum is growing fast because of the nearby attractive business areas of Framgate and Kawranbazer. Inhabitants of this slum were in fear of the government's eviction plan in December 2010. The slums have been hit by fire several times, destroying belongings and killing many people. Each time, the slum inhabitants become poorer, as they lose their belongings in the fire. There is also a shortage of water and other basic necessities. Among the many health problems, respiratory problems are the most prominent.

Most of the inhabitants come from the Nonakhali, Chadpur, and Maymansing areas. The displaced people have been living in the slum for more than 36 years. Many even have built their own houses and rented them out. Climate change was among the root causes of their eviction. Floods, droughts, river ero-

sion, and saline water damaged their livelihood and left many people rootless. Most of the inhabitants of this slum are unwilling to go back to their villages as many have been born and brought up here. Only 6.6 per cent (20 out of 300 households) would consider returning to their villages under certain conditions. The main conditions are: opportunity to work, agricultural land, and a place to live. Most of them will be unable to return to their villages as flooding, river erosion, and sea-level rise have taken away their land, home, and livelihood. The climate refugees have no other place. Their life in the slums is likely to be permanent. As new climate refugees enter the slums, the slums expand outwards to the open lands. Slum pockets are visible in every part of the city. Some slums are big and some are small. In 1988, there were only 1125 slums and squatter settlements in the city; the number had increased to 3007 by 1996 (Islam 1996).

The number of slum pockets is growing faster than ever. In the near future these slum pockets could make up most of the city area of Dhaka. This development is speeded up by new climate refugees. The government has undertaken some initiatives for improving living conditions in urban slums and rehabilitating slum dwellers. However, these initiatives are highly insufficient (Rahman/Alam 2006).

29.5.3 Case III: A Place of Insecurity

Agargaon slum is the biggest slum in Dhaka. It consists of three parts called Agargaon BNP slum, Agargaon Comilla slum, and Agargaon Shakertak slum. These slums are characterised by crime, smuggling, and drug trafficking. The drugs (phensydl, heroin, marijuana, alcohol) and small arms businesses are thriving (Siddiqui/Ahmed/Awal et al. 2000). The narrow and winding paths of the slum provide a favourable environment for criminal and antisocial activities. The areas have become almost inaccessible to security forces. Often groups of *mastans* (local goons) engage in gunfights in attempts to gain control of the slums. The government has tried many times to tackle the criminal activities. However, after a short period of time, crime flourishes again. An astounding 90 per cent of respondents in this survey stated that they had been affected by crime and violence. The respondents identified different types of crime. Among the most commonly reported crimes and violence are toll collection, drug and alcohol dealing, land grabbing, gambling, illegal arms dealing, arson in slums, murder and kidnapping, and domestic violence. Violence against women, particularly domestic violence, is very fre-

2 Dhaka Mirror, 2009: "City traffic system heading towards total collapse", in: *Dhaka Mirror* (13 August 2009), in: <<http://www.dhakamirror.com/?p=7498>> (10 January 2010).

3 Bangladesh News, 2008: "Hundreds protest over water shortage in Dhaka", in: *Bangladesh News* (24 April 2008), in: <<http://www.independent-bangladesh.com/200804244714/country/hundreds-protest-over-water-shortage-in-dhaka.html>> (24 January 2011).

quent. Most of the crimes are reported as occurring within the slum. However, frequently the violence spreads out to neighbouring areas such as nearby markets. Mastans allegedly have links with corrupt police and political leaders. Together, they make the area a safe harbour for illegal activities. Mastans control every aspect of the slum dwellers' lives. They collect protection money or 'tolls' from all businesses. This study noted that local gangs were threatening migrants. They are restricting access to land and collect money for 'rent'. The mastan gangs also generate significant income from the illegal tapping of the electricity and water grids. The slum dwellers have to buy water at extortionate prices from the mastan gang. The gangs also block access to legal help, in cooperation with corrupt police and political representatives. Therefore, the activities of the mastan gangs form a barrier which prevents the slum dwellers from having access to reasonably priced basic services and legal rights (Titumir/Hossain 2004).

The urban poor appear to deeply mistrust the justice system and the police. Residents in the slums hardly perceive any security in their life. In fact, most slum dwellers feel discriminated against by the legal system. The majority of victims (60 per cent) stated that the incidents of crime and violence are not reported to anyone. When reports are made, it is to community leaders and family members. Only 3 per cent say that they have reported incidents to the police and even fewer have reported incidents to local elected representatives. In only 1 per cent of all cases have the police taken action against a reported perpetrator. Similarly, a study by the World Bank in 2007 showed that, while there are considerable differences between slums, overall crime and insecurity is a major problem (World Bank 2007). Recent crime statistics show that levels of crime and violence have risen in slum areas. Therefore, it can be seen as likely that climate-change-related migration to urban slums would lead to an increase in crime and insecurity.

The sheer scale and diversity of crime and violence in the slums of Dhaka indicate that crime and violence have been 'routinized' and 'normalized'. Crime and violence have become an integral part of daily life for the slum dwellers. The survey shows that climate refugees play a dual role in the slums. On the one hand they become victims of the system of insecurity. On the other hand, the climate refugees willingly or unwillingly become part of the crime and violence and hence act as a multiplier and creator of stress and insecurity.

29.6 Analysis

An analysis of the data shows that the majority of households surveyed (242 out of 300) left their villages because of climate-change-related causes. These causes include floods, river erosion, crop destruction, seawater intrusion, droughts, and flash floods. Other non-climatic reasons are lack of income opportunity, family affairs, land grabs, lack of security, and even rejoining family. People have been migrating to slums for 36 years. It is clear that people began migrating due to climate change long before the recent discourse picked up momentum in the public debate.

The research found that climate refugees migrated from different areas of the country. No differences were found between outsiders and members of the host communities. This finding suggests a low likelihood of inter-group conflicts in slum areas. However, there is the increasing trend of dispute and quarrel over basic necessities which might result in blaming the other group.

Most of the displaced people take refuge in the urban slums. As new climate refugees enter the slums each month, the slums are rapidly expanding. The slum pockets are spreading all over the city. Therefore, climate refugees could turn the whole city into a slum-like place. However, the worsening conditions in the slums are not a new phenomenon. The number of slums in Dhaka has been growing since Bangladesh achieved independence in 1971. Generally, living conditions in the slums go from bad to worse. There are a number of studies on the inhumane condition of Dhaka's slums (World Bank 2007; UN Habitat 2008; Akter 2010). Many local NGOs have been active in illustrating the vulnerability of the slums. A World Bank study warned that where there are slums with rapid growth compounded by a high concentration of population, this would bring unbearable miseries to residents. The study estimated that by 2020 the city would be home to more than 20 million people, mainly living in slums (World Bank 2007). Similarly, the environmental group WWF rated Dhaka among the megacities most vulnerable to the effects of climate change, after Jakarta and Manila (WWF [Undated]). Akter (2010) argues that climate migration is contributing to food insecurity for the urban poor. Based on the socio-economic condition of slum dwellers and their consumption pattern, Akter argues that the majority of slum dwellers do not have access to nutritious food. Very recently, the *Bangladesh Rural Advancement Committee* (BRAC), the biggest NGO in Bangladesh, has commissioned a study (BRAC

2011). The study aims to look into the effect of climate change on urban slums. Generally, the study will explore the vulnerability and opportunity of slums in a changing climate. With support from the UN Framework Convention on Climate Change, the government of Bangladesh has launched the *National Adaptation Programmes of Action* (NAPA 2005). NAPA aim to identify and address urgent adaptation needs for facing the impact of climate change. The Government of Bangladesh has already started implementing this mechanism for developing mitigation and adaptation policies for the country (ibid.). However, it does not address the possibility of large-scale migration and its associated consequences. There are no clear recommendations as to how vulnerable communities could avoid the pressures of climate refugees and potential conflict.

None of the existing studies reflect on the role of climate refugees in Dhaka's slums, especially with respect to conflict constellations. In other words, existing researches neglect the nexus of climate refugees and the living conditions in the slums. The present research has linked especially degrading living conditions, crying out for basic needs, and the insecurity of Dhaka's slums with climate migration. It is suggested that the increasing numbers of climate refugees are not only stress multipliers; they also create these social stresses in the slums.

Generally, the slums increase the stresses on the city's environment, which already struggles to maintain its basic provision of water, electricity, transport, and health services. New slums are developing around the capital. Many of these slums are characterised as hot spots of crime, drug smuggling, physical insecurity, sexual abuse, and trafficking. Clearly, these areas are becoming crime zones inside the city, where the government has little control and where it is unable to maintain basic law and order. In some cases the government has failed to curb antisocial activities, bring justice, or provide remedies. The survey data reveal some conditions essential for the formation of violent conflicts: lack of a functioning legal system and availability of arms, which some scholars (Nafziger/Auvinen 2002; Boutwell/Klare 1999) believe could influence violent conflicts. In the slums surveyed, this research found that small arms are available in urban slum areas in the hands of mastans, making it attractive for destitute people to use armed violence to make a living or simply to survive. Therefore, the lack of a functioning legal system and the availability of small arms can be seen as a precondition for violent conflict. The state's failure to provide effective justice

and legal systems leads to an erosion of public trust in the government. Although these preconditions alone are insufficient for creating violent conflict, they are indeed the necessary ingredients of violent conflict. The more preconditions are present, the more likely violent conflict becomes. According to Crenshaw (1981), violence does not come out of nothing. It needs a trigger. Without a spark, fire cannot burn. However, once violence has been sparked, it can spread quickly and 'burn' for a very long time (Fanon 2004). Crenshaw calls the spark a triggering event. This event could start from marginalisation, lack of basic needs, or the absence of justice and remedies. However, in the case of climate refugees, their direct role in creating such an event is uncertain. Still, their role in creating the channels of social stresses is evident. These stresses could result in the violence that we have seen in the slums. From this observation, it could be said that climate refugees are exacerbating the existing factors. In some cases, climate refugees could proliferate and participate in the support - voluntarily or not - of violent conflicts. In a nutshell, the stresses of climate migration add to this situation of instability and insecurity.

The survey finds that 12 out of 300 households send their children to religious schools called *madrassas*. Although the number is still small, this could become a matter of concern. Lintner (2004) believes that religious schools are a breeding ground of Islamist terrorism. However, it is also a contested assumption that the majority of students attending a madrasa end up in Islamist terrorist networks. Madrasa education is an integral part of the Bangladeshi education system (Bano 2007). According to the Ministry of Education, the *Aliya madrasa* system educates 1.77 million students. This amounts to 30 per cent of the total state-regulated secondary education in the country (Ministry of Education 2006). *Aliya madrasa* covers the same core courses as the general stream at primary, secondary, and post-secondary levels, but puts additional emphasis on religious studies. After the post-secondary level, however, the focus shifts primarily to religious education (ibid.).

Besides these, there is an equally large parallel structure of private madrasas called *Qomi madrasas*. *Qomi madrasas* constitute a non-formal stream of religious education with a lack of interest in and capacity for the teaching of science and modern languages e.g. English, Mathematics, Sciences. The difference between the two types of madrasa is the source of funding. While *Aliya madrasas* are state-sponsored, the *Qomi* system represents the madrasa stream that

has chosen to reject state funding, relying on community support instead. A majority of Qomi also houses and educates orphans. Poor students are provided with books and free food (Bano 2007).

However, since early 1990s, there have been growing concerns about the rise of religious militancy in Bangladesh. Qomi madrasas are often implicated in this debate, as groups involved in religious militancy have been argued to have links with Qomi madrasas. Islamic Oikya Jote, *Harkat-ul-Jihad-al Islami* (HUJI), the Jihad Movement, Arakan Rohingya National Organization, and Rohingya Solidarity Organization are the prominent Islamic groups blamed for Islamist militancy. These groups are said to be sympathetic to Al-Qaida and the Taliban (Lintner 2004).

According to a report by the *Asian Centre for Human Rights* (ACHR), it is not only Saudi funds that ferment extremism across the world, including Bangladesh. The government of Bangladesh has been using assistance for education from UN agencies, western donors, and other multilateral financial institutions to fund the madrasas. There are about 9,000 government-registered madrasas and more than 15,000 Qomi madrasas registered under the Bangladesh Qomi Madrasa Education Board. However, the government has no control over the Qomi madrasas, who develop their own curriculum. There are also thousands of private madrasas (established by individuals), which are not registered under any organization. These madrasas have been consistently used as training centres by the Jihadis (UK Home Office 2007).

It is obvious that the number of climate refugees will increase in the coming years. It could provide an opportunity for many fundamentalist groups to recruit young activists and train them for specific destructive purposes, including suicide bombing. Climate refugees recruited by Islamist fundamentalism would be a great challenge not only for Dhaka but also for Bangladesh and the Western world.

29.7 Limitation of the Study and Further Research

There are considerable limitations to this study, including the small sample size. The study covered only 3 slums and interviewed 300 households, while the city has 3.4 million people living in the 5,000 slums of its capital city Dhaka (Islam/Mahbub/Nazem et al. 2006).

The main aim of this study is to look into individuals' and groups' interactions in the formation of vio-

lent conflict. However, none of the respondents directly admitted participation in any violent conflict. This might be because the people interviewed were asked for their name, age, and origin. These are sensitive subject matters, and respondents may not wish to reveal too much about themselves. It may be also because, in most cases, the representatives of the households (mostly female) were not interviewed alone. Often, other people, such as family members, were present, and sometimes joined in the discussion. This resulted in an unwillingness to report personal involvement in conflicts. Therefore, a more rigorous research design and honest responses is essential in further study of the micro-level analysis of conflicts.

This study also did not have scope for reflecting on the discourse on climate-change-induced inter-border conflicts e.g. between Bangladesh and India. This would be a promising area for future study.

Additionally, further research could look into the consequences of climate refugees for social institutions, as well as the long-term effect of climate migration, which this study did not cover.

29.8 Recommendations

Climate change causes migration which, interlinked with existing social stresses, may challenge peace and security in urban areas of Dhaka.

From this observation, it appears that conflict and climate change should not be thought of separately. Policies to mitigate the impacts of climate change should be seen as policies for sustainable and peaceful urban development as well. Furthermore, cities like Dhaka are at risk of climate change. Therefore, greater efforts are needed to accommodate climate refugees. Resilience and the ability to adapt to increasing stresses are needed to cope peacefully with climate-related migration.

The survey reveals that despite the precarious living conditions in the slums, most of the dwellers are unwilling to return to their villages. Any resettlement of climate refugees must be voluntary. However, some may want to return if the government provides land, housing, and income opportunity. The government should help to generate income in rural areas, so that people will be more willing to stay instead of migrate. The government needs to consult with local residents and take the needs of the people into account in order to respond to climate-related migration. Any politically motivated use of climate refugees would prove

fatal; hence, political parties must avoid pitting groups against each other.

With the majority of residents living in insecurity and uncertainty, a stable society is still out of reach. Law and order must be maintained in order to curb disorder and illegal activities in urban slum areas. It is also crucial that the government maintains law and order in rural areas. This would decrease the likelihood of rural residents migrating to the slums of Dhaka. So, the government must maintain law and order and place an effective legal and justice system at both ends of migration: the slum areas and the rural areas.

29.9 Conclusion

This study has found that the majority of the slum inhabitants are displaced by climate-change-related causes. However, there are also other reasons for individuals to migrate to the slums. In addition, this study confirms that climate refugees are internally displaced people from various disaster-prone areas of Bangladesh.

These climate refugees are not only adding further hardship to the slum population, but also creating social stresses. Climate refugees live in inhuman conditions without any basic amenities. Increases in the number of climate refugees will also result in pressure on infrastructures such as transport, water supply, waste managing, electricity, and health services.

Currently, the slums of Dhaka serve as shelter for millions of migrants. However, this development is not sustainable and it cannot continue forever. The pace of the migration raises concerns about the future of the city. This chapter has identified two main areas of concern. First, climate refugees aggravate the inhumane conditions in the slums. Second, they contribute to crime and violent conflicts. Climate refugees create stresses on the social order and existing facilities. They increase the vulnerability of slums to crime and violence. This research has confirmed that climate refugees create social stresses by participating in illegal activities and in periodical confrontation with law enforcement. In many slums gunfights break out and individuals and groups challenge the legitimacy of the law enforcement authorities. The slum pockets are increasing at an alarming rate in urban areas in Dhaka. The slums bring stresses for the whole city. This chapter points up the overall human insecurity in the slums, as well as the increasingly articulated demand for basic necessities, in leading to violent protests and illegal activities. Climate-change-related mi-

gration increases the existing social stresses and hence could contribute to violent conflicts. Hence, the social stability of Dhaka is threatened.

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30 A Psychological Perspective on Climate Stress in Coastal India

Ruchi Mudaliar and Parul Rishi

30.1 Introduction¹

We (psychologists) must seek out and interact with the other sustainability science players. We must tell the economists, technologists, and climate modellers what psychology can do. The climate scientists are merely the messengers, the technologists merely make machines, and the economists still think largely in terms of pricing. Without the help of psychological science, these disciplines, although valuable in their own ways, will not be able to ameliorate the impacts of climate change (Gifford 2008: 279).

India has been identified as one amongst 27 countries which are most vulnerable to the impacts of global warming related to accelerated sea-level rise (UNEP 1989). In view of the perceived potential threat to coastal India, it becomes more important that people of these cities should be thoroughly studied also from a psychological perspective, alongside the technical studies of the potential physical impacts of changing climate. This chapter offers a pilot study undertaken at a coastal site in India. It is aimed at developing a conceptual framework for the behavioural analysis of people in the context of climate change and how they have adapted to whatever climate changes they believe have occurred or are likely to occur. Current concern over global climate change stems, in part, from the predominant evidence that its causes are anthropogenic, i.e. the result of human behaviour. However, it is less widely recognized that the solutions are also rooted in human behaviour.

This chapter is in line with article 6 of the New Delhi Work Programme of UNFCCC (2007), in which a special effort to foster psychological and behavioural change through public awareness has been stressed. The psychological assessment of the human-climate interface, behavioural adaptation, and the subjective well-being of people residing in Indian coastal cities are therefore crucial topics of concern. The

study was conducted based on a sample of 31 adults at Veraval, a coastal city located on the shores of the Arabian Sea in Gujarat. The purpose was to elicit people's perceptions about climate change, climate stress, and associated psychological dimensions. Item-wise scale averages and agreement percentages were calculated, which were further subjected to component-wise scale averages of cognitive, conative, and affective dimensions, with a focus on perceived climate stress. Respondents showed a relatively strong agreement with the statement that the earth is getting warmer (96.76 per cent), posing a risk to national resources and people (96.75 per cent) by creating an environmental crisis (67.73 per cent). Respondents were found to be emotionally concerned about the phenomenon of climate change (agreement percentage = 73.78 per cent). An overall agreement percentage of 77.41 per cent was indicative of the conative or pro-environment behavioural tendencies of the respondents.

Climate change is a global issue of concern owing to not only its environmental impacts but also the threats that it is posing on the social and economic fronts. Coastal sites all over the world are facing safety and security threats in view of the accelerated *sea-level rise* (SLR) related to global warming. Population and economic density in the coastal zones are greater than on other areas of the earth's surface (Nicholls 2010). The impact of climate change has been exacerbated by population growth and urbanization, the development of megacities, and environmental degradation caused by human activities. In 2007, for the first time in history, more people were resident in urban than in rural areas. The concentration of people into smaller areas and building in unsuitable places (e.g., flood plains) makes communities much more vulnerable to natural hazards (Uzzell 2008).

The vast majority of credible climate scientists (well over 95 per cent) are of the opinion that average temperatures of the oceans, of the land surface of planet, and of the lower atmosphere have been rising at an accelerating rate (Blakemore 2005). In such an

1 Key words: climate change, human-climate interface, behavioural adaptation, subjective well-being.

alarming situation, human-environment interaction ought to be 'sensible', something that depends not only upon resource use per person but equally upon personal attitudes, sensitivity, values towards the environment, and realization of future risks to the environment, coupled with individualized efforts at owning responsibility for the protection, maintenance, and development of the environment. Human-climate interaction is an ongoing and never-ending process. The impacts of climate change have started to attract attention on the social, ethical, and cultural fronts, but the psychological impacts are still underrated or paid less attention. However, equilibrium with nature can only be arrived at by striking a balance at the human-climate interface.

Public understanding of climate change extends over a vast range of 'levels of knowledge', from the most basic level of recognizing phrases such as 'global warming', to understanding simple causal relationships, personal contribution to climate change, timescales, and the detailed interrelationships of natural processes (Anable/Lane/Kelay 2005). Overall, the current evidence suggests that recognition of the concept of climate change among the global population is different in different parts of the world.

Nicholls/Hanson/Herweijer et al. (2008) conducted a global screening study which made a first estimate of the exposure of the world's large port cities to coastal flooding due to storm surge and damage from high winds. This study investigated how climate change is likely to impact on each port city's exposure to coastal flooding by the 2070s, alongside subsidence and population growth and urbanization. The assessment provided a much more comprehensive analysis than earlier studies, focusing on the 136 port cities around the world that have more than one million inhabitants. The analysis demonstrated that a large number of people are already exposed to coastal flooding in large port cities. Across all cities, about 40 million people (0.6 per cent of the global population or roughly 1 in 10 of the total port city population in the cities considered) are exposed to a 1 in 100-year coastal flood event. Also, the study suggested the 10 most vulnerable cities in terms of population exposure to coastal flooding by the 2070s; these include the Indian coastal cities of Kolkata and Mumbai, as well as the cities of Dhaka, Guangzhou, Ho Chi Minh City, Shanghai, Bangkok, Rangoon, Miami, and Hai Phòng. The study led to the inference that given the heavy concentration of people and assets in port city locations and their importance in global trade, failure to develop effective adaptation strategies would inevi-

tably have not just local but also national or even wider psychosocial and economic consequences. Cities with the greatest population exposure to extreme sea levels also tend to be those with the greatest exposure to wind damage from tropical and extra-tropical cyclones.

Vlek and Steg (2007) state that social and behavioural research is crucial in securing environmental sustainability and improving human living conditions. Psychology plays an indispensable role in understanding environmental problems and finding solutions. To fill this role, psychologists must work within an interdisciplinary effort to build a scientific understanding of human-environment interactions (Stern 2000). Psychological assessment of the human-climate interface, behavioural adaptation, and the subjective well-being of people residing in Indian coastal metropolitan cities is a crucial topic of concern in view of the vulnerability of Indian coasts to climate change hazards. The study intends to gain insight into issues such as what perception the coastal population of Indian cities has about climate change, how aware and concerned they are, what guides their opinions, judgments, behaviour, and actions, how efficient they find themselves in adapting to the situation, what adaptive measures would be feasible for them, how competent they find themselves in terms of coping strategies and the level of their environmental resilience, and what their subjective well-being is in relation to the current phenomenon of the changing climate. This would facilitate probing the issue and thus gaining an insight into the larger canvas of climate change of which psychological and behavioural factors are a part.

30.2 Indian Coastal Scenario

Out of the numerous projected impacts of climate change in India, coastal zones are apprehended to suffer the most devastating effects. It has been suggested that the total area of 5,763 km along the Coastal States of India, i.e. 0.41 per cent, could be inundated, and almost 7.1 million people, i.e. 4.6 per cent of the coastal population, could be directly affected (TERI 1996). Past observations of the mean sea level along the Indian coast indicate a long-term rising trend of about 1.0 mm per year on an annual mean basis. However, the recent data suggest an increasing trend of 2.5 mm per year in sea-level rise along the Indian coastline. The corresponding thermal expansion related to sea-level rise is expected to be between 15 and 38 cm

by the middle of the century and between 46 and 59 cm by the end of the century (Aggarwal/Lal 2000).

The high degree of vulnerability of Indian coasts can be mainly attributed to the extensive low-lying coastal area, high population density, frequent occurrence of cyclones and storms, and the high rate of coastal environmental degradation on account of pollution and non-sustainable development. Most of the people residing in coastal zones are directly dependent on the natural resource bases of coastal ecosystems. Any climatic change induced by global warming, such as an increase in sea surface temperature, change in frequency, intensity, or tracks of cyclones, or sea-level rise may aggravate the potential risks to coastal zones.

The rise in sea level associated with changing climate is a major environmental threat, rendering coastal resources, infrastructure, and population highly vulnerable. Researchers all over the world have dealt with various aspects of climate change in their own ways, touching several dimensions of the issue in question. The physical and environmental impacts of climate change have caught much attention among the global scientific community everywhere. However, what is unfortunate is that less attention has been given to the potential psychological and social impacts of global climate change and to factors that moderate and mediate those impacts. A literature review of most of these sources reveals that out of the majority of work done up till now, psychological dimensions associated with climate change have been touched upon by very few researchers. Although some localized and/or immediate consequences, such as injury or stress resulting from more extreme weather events, may be perceived to result from climate change, most psychosocial effects are likely to be gradual and cumulative, and the connection to global climate change may be less clear in the minds of those affected (APA 2009). Previous global studies have tended to consider either the potential impacts of SLR, e.g. the number of people affected (Hoozemans/Marchand/Pennekamp 1993; Nicholls 2004), or the economic implications of SLR, e.g. impact and adaptation costs (Fankhauser 1994; Tol 2004). Keeping in view that most of the work, if not all, on climate change focuses on the technicalities of the subject, this chapter addresses the psychological aspects underlying or concerned with climate change.

Climate change is a phenomenon which is not only caused by natural factors; anthropogenic forces contribute to it to a significantly large extent. There is much evidence from the available research that cli-

mate change is associated with a number of psychosocial impacts, many of which are often influenced by a number of personal or situational factors that may further augment or diminish the psychosocial impact or its perception. Moderators of impacts may include proximity to climate-related events (Neutra/Lipscomb/Satinet et al. 1991) and sources of vulnerability and resilience (Brklacich/ Chazan/Dawe 2007; Bullard 2000; Peek/Mileti 2002). An individual's perceptions of climate change impacts can be moderated by social norms (Cialdini/Reno/Kallgren 1990; Leiserowitz 2005) and by the individual's environmental identity (Clayton/Opotow 2003). The impacts of climate change are also likely to be mediated by various types of cognitive appraisals, such as estimates of personal risk and attributions of responsibility (Leiserowitz 2007), and media representations of health impacts (Dunwoody 2007; Rese 2009).

30.3 Climate Stress

Climate stress has been found to be generated by *changes* in the environment, as opposed to the regular stresses caused by *activities* within that environment. Climate stressors are typically not evident in day-to-day life but do have indirect impacts upon one's physical and mental capacities. Confronting climate stressors might require low to moderate to extreme adjustments depending upon the extent and severity of the stressor. Studies of the effects of climate stressors indicate that they do have impacts upon one's behaviour, moods, lifestyle, cognitive function, physical health, and/or psychological well-being. Climate change in coastal areas is much associated with flooding, sea-level rise, land inundation, storms, cyclones, etc. The multifaceted nature of climate change makes it distinct from other stressors and disasters because of its global scope and magnitude, a duration which may encompass many generations if not centuries, and the unprecedented character of these global changes in known human history.

Those who directly experience the biophysical environmental impacts of climate change will likely experience stress due to their immediate personal experiences with climate change as well as their expectations about future impacts of climate change. Stressors can manifest themselves in many different ways including as discrete or chronic events and as natural or technological disasters (Swim/ Clayton/ Doherty et al. 2009). Distinctions among types of stressors have implications for the rest of the stress

process. Stressors range from discrete events to continuous events (Wheaton 1996, 1999). Climate change can be experienced as and anticipated to be both *discrete and continuous*. Largely unpredictable, more frequent and severe weather-related incidents including the increased frequency and heightened intensity and severity of natural disasters such as storms, hurricanes, tornadoes, floods, bush fires, and other events of rapid onset are examples of discrete events. At the other end of the stress continuum, climate researchers have projected chronic conditions, for instance, in the form of drought and other more incremental and persistent environmental changes such as soil loss and erosion, salination, and gradual environmental toxification (APA 2009).

Ambient stressors are a type of chronic stressor particularly relevant to environmental stressors (Bell/Greene/Fisher 2001). Ambient stressors can represent regional conditions of the environment, such as pollution or toxicity, that affect a large number of people but may not be considered acute because they are similar to low-level background noise and may go unnoticed either because they are subtle or because people habituate to them (e.g. Adeola 2000; Edelstein 2002). Climate change can be understood as an ambient stressor because the changes are often in the background due to, for instance, the change being embedded in natural variations in climate, the patterns being difficult to detect, the relatively slow progression of the changes which can lead to a normalized habituation and expectancy, or the effects being perceived to be relevant more for future generations than for one's own generation (Swim/Clayton/Doherty et al. 2009). Because climate change is associated with a range of environmental impacts on all forms of life on earth, it can be considered as a threat. Coping with and adapting to climate stress are therefore issues of concern for experts worldwide.

30.4 Climate Change and Human Behaviour

Environmental problems are a function of human behaviour, and human behavioural changes will be necessary in order to address them. Psychology is not only relevant to conservation initiatives, but is among the most relevant disciplines as the one most devoted to the study of human behaviour and behavioural interventions (Clayton/Brook 2005).

Current concern over global climate change stems, in part, from the predominant evidence that its

causes are anthropogenic, i.e. they are the result of human behaviour. However, it is less widely recognized that the solutions are also rooted in human behaviour. Effective solutions must draw on a broader understanding of social systems and human behaviour (Ehrhardt-Martinez 2007). Gifford (2008) presents the basis for psychological science as a key part of the solution to the problem and describes the challenges to this both from within psychology and from other points of view. This is important because minimizing the personal and environmental damage caused by climate change necessarily is a multidisciplinary task, but one to which psychology not only should, but must, contribute more than it has so far. Human *behaviour* (B) and its interaction with the *environment* (E) can best be explained by the equation $B = f(P \times E)$ by Lewin (1951). Hence, any change in the environment brings changes in a person's behaviour as well.

The psychosocial and mental health implications of climate change have gained attention in the context of disaster recovery from extreme weather events (Few 2007). A number of studies have examined psychological and social impacts across the spectrum of natural and technological disasters (Bell/Greene/Fisher et al. 2001; Gifford 2007; Reyes/Jacobs 2006). Direct impacts, such as extreme weather events, are likely to have immediate effects on the prevalence and severity of mental health issues in affected communities and significant implications for mental health services. Vulnerable communities will experience ongoing disruptions to the social, economic, and environmental determinants that promote mental health in general, and climate change as a global environmental threat may create emotional distress and anxiety about the future (Fritze/Blashki/Burke et al. 2008).

Climate change and related extreme climate events can be associated with a number of mental health issues such as acute and post-traumatic stress disorder and other stress-related problems, such as complicated grief, depression, and anxiety disorders, in addition to elevated vulnerability of those with pre-existing severe mental health issues. Personal experience of extreme weather events can lead to psychological and mental health effects associated with loss, disruption, and displacement, and cumulative mental health impacts from repeated exposure to natural disasters (Few 2007; Peek/Mileti 2002).

Some of the potential psychological impacts may include:

- *Anxiety/pathological worry*: Anxiety is accompanied both by physiological arousal and by a number of cognitive responses, including hyper-

vigilance for threat and danger and, at intense levels, fear and panic (Barlow 2002). Media accounts of 'eco-anxiety' about climate change describe symptoms such as panic attacks, loss of appetite, irritability, weakness, and sleeplessness (Nobel 2007). Extrapolating from current diagnostic guidelines (American Psychiatric Association 2000), differentiating between normal and pathological worry regarding climate change would include examining the content and pervasiveness of climate-related worries, interference with functioning as a result of worry, and the degree of perceived control over the worry process.

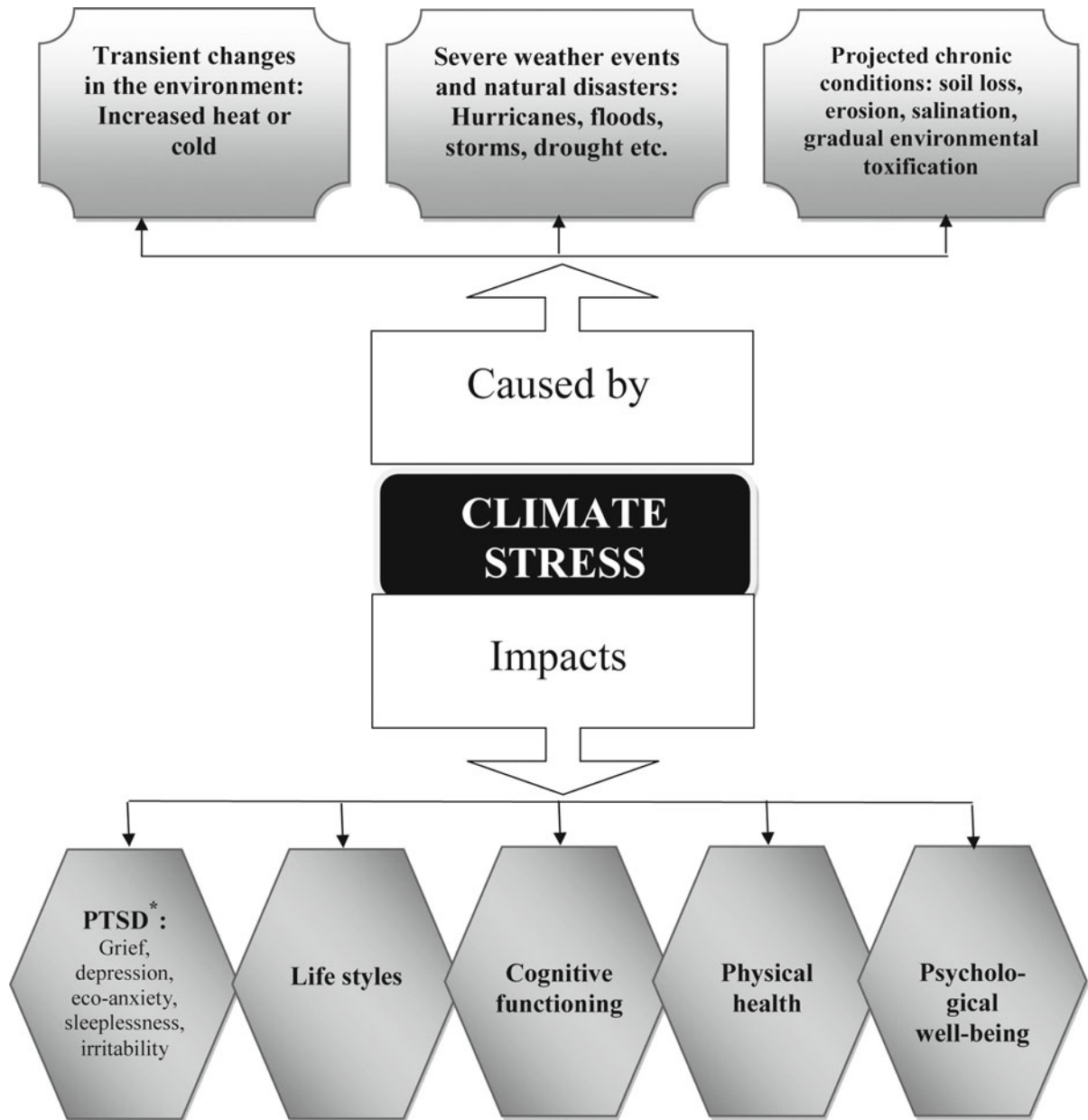
- **Emotions:** Langford (2002) identified responses to the risks posed by climate change including: (a) active denial associated with a strong reliance on rationality over emotion and intolerance for scientific uncertainty; (b) disinterest associated with external locus of control and fatalism; and (c) engagement associated with a preference for emotion and intuition to justify opinions and actions, a sense of empowerment and personal responsibility, and belief in communal efficacy. Environmental problems have long been associated with numbness or apathy (Macy/Brown 1998; Gifford 1976; Searles 1972). Moser (2007) differentiates numbness as a secondary reaction following the realization of the magnitude of climate change threats and the perceived inability to affect their outcomes. The public's apparent apathy regarding climate change is actually paralysis in light of the size of the problem (Lertzman 2008). He reframes the issue in terms of psychological defence mechanisms such as denial and splitting (i.e., retaining intellectual knowledge of the reality, but divesting it of emotional meaning), which are both strategies for managing and coping with such experiences by defending against them. Apparent apathy regarding environmental issues may also be a function of adaptation to existing conditions.
- **Guilt:** The issue of 'eco-guilt' has received coverage in the popular media (Foderaro 2008). Recent research into the reactions to 'guilt appeals' indicates that it is important to distinguish between people feeling guilty for their own behaviour and their reactions to their group's behaviour (Mallett 2009; Mallett/Swim 2004), as well as between the recipients of messages, with some recipients being more receptive and others more defensive (Brook/Graham 2009; Mallett 2009; Mallett/Huntsinger/Sinclair et al. 2008).

The social and community impacts of climate change, on the other hand, may be related to issues of heat and violence. As suggested by Anderson (2001), any increase in average global temperature is likely to be accompanied by an increase in violent aggression. Furthermore, climate change would also directly impact inter-group relations. Reuveny (2008) has noted that diminishing resources set the stage for inter-group conflict, either when two groups directly compete for the remaining natural resources or when ecological degradation forces one group to emigrate from its own territory and become immigrants into another group's territory. Climate change is also directly going to give rise to problems of displacement and relocation. Communities are already being forced to relocate because of current or anticipated climate changes (Agyeman/Bullard/Evans 2009). These forced migrations can be extremely taxing situations, severely impacting upon mental health in view of people suffering loss of place, identity and social networks, thus leading to emotional grief and anxiety (Figure 30.1).

Strong reactive responses are likely to emerge from issues of climate change and associated socioeconomic disparities among the developing and the developed nations. Inter-group tensions are expected to intensify over the growing identification of some major western countries that contribute more to global climate change with the resulting impacts being borne by the less-developed nations. Nations that benefit most from the *status quo* and perceive themselves to be less severely affected have less incentive to push for action on climate change (Agyeman/Bullard/Evans 2003; Kasperson/Dow 1991), while other more vulnerable nations recognize that their very existence is threatened by the possibility of e.g. rising sea levels. As a result, one cannot expect a naturally fair response in respect of sharing responsibility by nations for the changing climate.

The intensity or strength of the impacts of climate change is affected by several psychosocial 'moderators'. Proximity can be a moderator of climate change impacts when one directly experiences an extreme weather event (Few 2007). It is also likely that the time-delayed, abstract, and often statistical nature of the risks of global warming will not evoke strong reactions and so will diminish alarm and urgency about risk management (Weber 2006). Conforming to popular societal perceptions about climate change can also influence people's climate change responses. Some groups perceive that society will be able to adapt to any adverse changes related to climate change once those changes arrive (Moser 2007).

Figure 30.1: Causes and impacts of climate change. **Source:** The authors.



* Post Traumatic Stress Disorder

Marshall, Bryant, Amsel et al. (2007) have identified that perception of personal risk is likely to mediate how individuals experience the impacts of climate change. A sense of risk or empowerment regarding the impacts of climate change may also be mediated by attributions of responsibility (Leiserowitz 2007). The mental models people hold about climate change also influence their perception and understanding of the issue. Since weather is generally seen as beyond

human control, this in turn may lead to a sense of helplessness or resignation about climate change (Bostrom/Lashof 2007). The representation of climate change in the media is a very powerful and essentially a key mediator for much of the general population. This is because media representations are likely to remain a useful variable for understanding the psychosocial impacts of climate change as the issue and mes-

sages associated with it are presented within various frameworks (Dunwoody 2007).

In view of the numerous inevitable psychosocial impacts of climate change, it becomes imperative to take concrete steps that enable people across the globe to both cope with and adapt to climate change on psychosocial fronts. There is the potential for psychological benefits from taking action about climate change, including opportunities for positive coping (Kates 2007) and enhanced personal meaning and satisfaction from engaging in climate change mitigation or adaptation activities (De Young 1996; Johnson/Haeuble/Keinan 2007). Qualitative analyses by Langford (2002) and Maiteny (2002) suggest that some individuals respond to the threat of climate change with an increased emphasis on collective engagement and associated positive emotions. From the perspective of stage models of behaviour change (Prochaska/DiClemente/Norcross 1992), individuals and organizations may progress from contemplation to action regarding pro-environmental and sustainable behaviours (Doppelt 2008). A report from the *American Psychological Association* (APA) (2009) suggests that further research is needed that is explicitly directed at addressing individual and societal responses to the reality of climate change - the anxieties, the extreme weather events, the dislocations, and the increased social inequality.

Many environmentalists believe that in order to avoid or at least reduce climate change, one needs to change one's lifestyle - to drive less, use less electric power, and generally live more simply. In their study of views about climate change in Britain and in Italy, Lorenzoni and Langford (2002) concluded that people are less willing to translate their concern about this problem into personal action because they perceive the "unwillingness of others to take action because of ignorance or lack of concern and the failure of institutions to provide leadership and effective legislation". Those who believe that, in acting to help the environment, they would be relatively isolated rather than part of a large public effort are likely to feel that they lack social support and that their lone efforts do not really matter.

A workshop on 12 November 2004 at Princeton University aimed at addressing the psychological dimension was motivated by the notion that environmental policies that target human behaviour should incorporate insights about behavioural change and decision-making, topics central to the behavioural sciences. The objective was to inform climate scientists about the current state of understanding of how peo-

ple think about global warming and, hopefully, initiate a collaborative dialogue between climate and behavioural scientists.

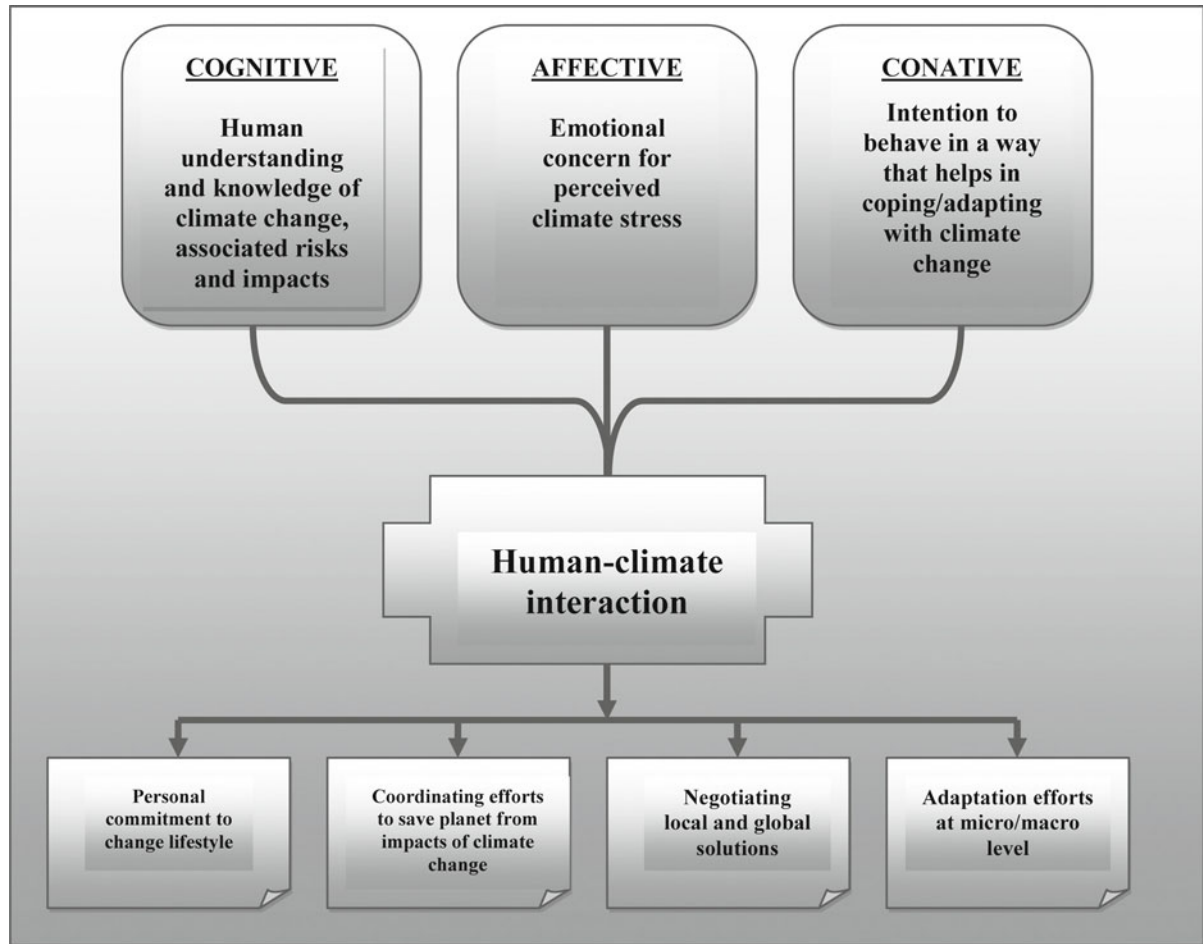
As a part of the amended New Delhi work programme (2007) to implement Article 6 of the Convention², six elements, education, training, public awareness, public access to information, public participation, and international cooperation were emphasized. Under public awareness, a special effort to foster psychological or behavioural change has been stressed. Therefore, this study is aimed at conducting a psychological analysis of the 'human-climate interface' by studying the behavioural adaptation and subjective well-being of the people residing in a coastal city of India. The main objectives are to assess the cognitive, conative, and affective dimensions of this 'human-climate interface' with a focus on perceived climate stress. It will also assess the level of environmental resilience as well as subjective well-being in regard to changing climate and identify the behavioural adaptation measures and coping strategies practised by people to combat the adversities of changing climate. Finally, an awareness generation plan for the sample sites will be proposed.

There are three components presumed to be responsible for human behaviour. The cognitive components deal with knowledge and awareness, without which no logical or reasonable behaviour can take place. The affective component is related to feelings and emotions associated with any behaviour. These may not be visible to everyone but they are the strong guiding force for the third component, conative behaviour or the actual action, to take place.

In view of the dynamics of 'human-climate interface' and adaptation (Figure 30.1), from a psychological perspective it can be said that a substantially good level of human understanding about the changing climate has been found among the respondents. However, their ability to perceive the magnitude of global risk and to modify their consumption patterns in consequence to that is relatively limited. Meta-cognitive knowledge has been linked to perceptions of climate change risk. Individuals often report feeling confident about their climate change knowledge (e.g., Lorenzoni/Pidgeon 2006), but this meta-cognition, in turn, may decrease perceptions of risk. For example, when individuals feel that they are well-informed about cli-

2 UNFCCC (2007): Decision_/CP.8 New Delhi work programme on Article 6 of the Convention; see at: <http://unfccc.int/cop8/latest/14_cp13_sbsta23add1.pdf>.

Figure 30.2: Dynamics of 'human-climate interface' and adaptation. **Source:** Rishi (2009).



mate change issues, they are less likely to be concerned (Kellstedt/Zahran/Vedlitz 2008).

The central idea behind the proposed research is to address the psychological dimensions through questions such as

- What motivates people to demonstrate a pro-environmental behaviour and what restricts their actions?
- What are the things that people find stressful with regard to climate change?
- What are the cognitive-affective-conative dimensions of the human-climate interface?
- How have people reacted to climate change in the past and adapted to newly occurring changes?
- What is the level of preparedness of people to meet future challenges associated with climate change?
- What coping strategies do people opt for in crisis situations? etc.

Besides studying the behavioural aspects, an attempt is made to educate the public and create awareness among the masses of climate change issues, as well as to suggest possible behavioural coping strategies and intervention plans to combat the adversities of climate change.

30.5 Methodology

30.5.1 Study Site

A preliminary study was conducted in *Veraval*, one of the coastal sites of western India falling in the moderate risk zone in regard to vulnerability to sea-level rise (TERI 1996). It is located in the western part of India in the state of Gujarat at 20.9°N 70.37°E. The climate of Veraval is quite harsh, with summer being warm and dry and temperatures reaching in excess of 36° C. The winter, by contrast, is quite pleasant with the av-

erage lowest temperature dropping to approximately 11° C. As of the 2001 India census, Veraval had a population of 141,207 with 51 per cent males and 49 per cent females.

30.5.2 Sampling

A sample of 31 adults, both males and females (age 18 years and above) was taken from different age groups using a convenient sampling technique based on the willingness of respondents to cooperate with the study. An attempt was made to select the sample from different age groups such as young adults, adults, and senior adults as available. The demographic details of the sample are shown below:

Table 30.1: Demographic details of the sample. **Source:** The authors.

Sr. No.	Categorical variable	Description	Percentage distribution in sample
1.	Age group	Young adult (18-24 years)	22.6
		Adult (25-45 years)	32.3
		Senior adult (> 45 years)	45.2
2.	Sex	Male	58.1
		Female	41.9
3.	Educational qualification	Graduate	21.4
		Postgraduate	57.1
		Other	21.4

30.5.3 Tools and Techniques

Since this chapter is based on a preliminary study, only limited behavioural dimensions particularly in regard to people's perceptions about cognitive, conative, and affective dimensions of climate change were assessed, by administering a sub-section of the *Climate Change Perception Inventory* (CCPI) especially designed by Rishi, Prakash, and Mudaliar (2009). It consisted of a four-point Likert-type response format ranging from 'strongly agree' as 4 to 'strongly disagree' as 1. The inventory consisted of 18 items, categorized in cognitive, affective, and conative dimensions. It also contained qualitative questions to assess the respondents' coping styles or adaptation measures to climate change. Reliability of the scale by Cronbach's Alpha method was found to be 0.84. Sample items of the CCPI are the following:

1. The earth is getting warmer and warmer every day (cognitive).
2. I am frustrated that not enough is being done to reduce the impact of climate change or to mitigate climate change (affective).
3. I am confident that individual efforts will be able to slow down the impacts of climate change (conative).

30.6 Results

To conduct the psychological analysis of the 'human-climate interface' at the cognitive, conative, and affective levels with a focus on perceived climate stress, item-wise scale averages and agreement percentages were calculated, which were further subjected to component-wise scale averages of the above behavioural dimensions.

30.6.1 Cognitive Level Analysis

Cognitive analysis is primarily concerned with the knowledge component and the level of awareness about different dimensions of climate change. It includes within itself the basic factual knowledge about different climate issues. This section had 4 items. Respondents showed a relatively strong agreement that earth is getting warmer (96.76 per cent). This poses a risk to national resources and people (96.75 per cent) by creating environmental crises (67.73 per cent). However, fossil fuels are not the only source of climate change (29.02 per cent) and some natural climatic and environmental processes may also be accountable for possible upcoming climate stress (M-Cog = 3.41).

30.6.2 Affective Level Analysis

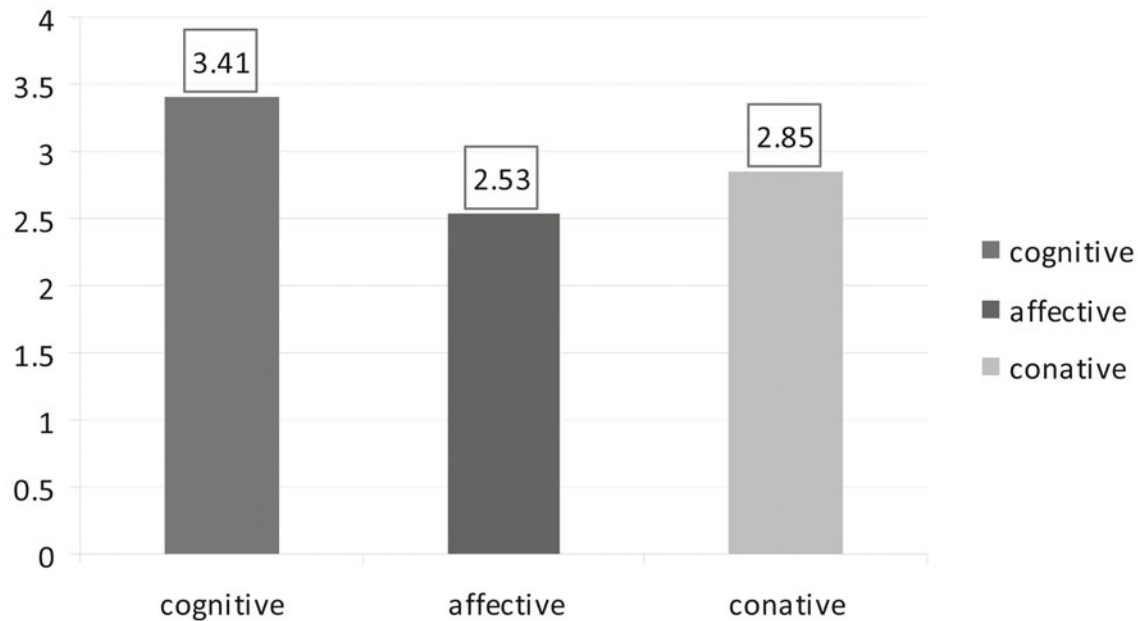
The affective domain is specifically concerned with the respondents' emotional concern for perceived climate stress. This section contained 8 items. Respondents were found to be emotionally concerned about the phenomenon of climate change (agreement percentage = 73.78 per cent). Most of the respondents (90.3 per cent) were frustrated and not satisfied with current attempts to mitigate climate change. However, about 58.05 per cent were also of the opinion that the correct measures are being taken to address the severity of climate change. Only 16.12 per cent of the respondents showed apathy towards the changing climate scenario by not really being much bothered

Table 30.2: Scores received on various items. **Source:** The authors.

Category	STATEMENT	AGREE	DISAGREE	SCALE AVG.
Cognitive	1. The earth is getting warmer and warmer every day.	96.76%	3.22%	3.84
	2. Global warming is posing/ will pose a risk to our nation's resources/ people.	96.75%	3.22%	3.74
	3. More evidence is needed to claim that global warming is caused by vehicle and fossil fuels.	29.02%	67.73%	2.83
	4. Climate change has started creating environmental crises such as earthquakes in our country.	67.73%	29.03%	3.23
MEAN		72.57%	25.80%	3.41
Affective	5. I am frustrated that not enough is being done to reduce the impact of/ mitigate climate change.	90.31%	9.67%	3.52
	6. I am positive that we are doing the right things to address the severity of climate change.	58.05%	41.92%	2.45
	7. I am not really bothered about climate change	83.86%	16.12%	1.65
	8. The issue of climate change is a myth and it has never made me upset as it is just to frighten the public.	80.64%	12.90%	1.48
	9. It frightens me to think that we are heading towards an ice age.	54.83%	38.71%	2.79
	10. There is nothing much to worry about as climate change is only the problem of developed nations (US/UK).	67.73%	29.03%	1.87
	11. When I think of the ways big developed nations are using electricity and energy, I get frustrated and angry.	77.41%	22.57%	3.16
	12. There is a need for more stringent environmental laws to control human-induced global warming.	77.41%	22.57%	3.32
MEAN		73.78%	24.19%	2.53
Conative	13. I am confident that individual efforts will be able to slow down the impact of climate change.	87.09%	13%	3.26
	14. It is primarily the Government which is responsible for doing something about checking global warming.	61.28%	38.71%	2.29
	15. A policy for public transport should be compulsory for institutions/organizations for their students/employees in order to control traffic and pollution.	74.19%	25.80%	3.13
	16. I would like to initiate a campaign for car pooling and walking for shorter distances or the use of public transport.	87.09%	12.89%	3.39
	17. There are not many govt/ non-govt institutions in my city to create awareness among the public about an environmentally healthy lifestyle.	77.41%	22.57%	3.19
	18. I generally forget to switch off lights and the fan/AC after use.	77.41%	22.57%	1.87
MEAN		77.41%	22.57%	2.85

about it and 80.64 per cent respondents believed that climate change is actually taking place and is not a myth. Fear about heading towards an ice age was expressed by 54.83 per cent of respondents, while 29.03 per cent disagreed with the fact that climate change is only a problem for developed nations such as the US

and the UK. There was considerable frustration and anger among respondents (77.41 per cent) over the unjust use of electricity and energy by the developed nations, together with a strong belief favouring the need for stringent environmental laws to control human-induced global warming (77.41 per cent). Over-

Figure 30.3: Scale averages of behavioural dimensions. **Source:** The authors.

all, a significant level of emotional concern ($M\text{-Aff} = 2.53$) on the affective domain was noticed among respondents.

30.6.3 Conative Level Analysis

The conative domain corresponds with commitment to environmentally responsible activities and a pro-environment behaviour. It is dependent on the effort of mind or willpower and is related to the behaviour of a person who is striving for something. It is actually an intention to behave, not actual *behaviour*. This domain was represented by a total of 6 items and an overall agreement percentage of 77.41 per cent was indicative of the fact that the respondents were of the opinion that *Actions Speak Louder Than Words*.

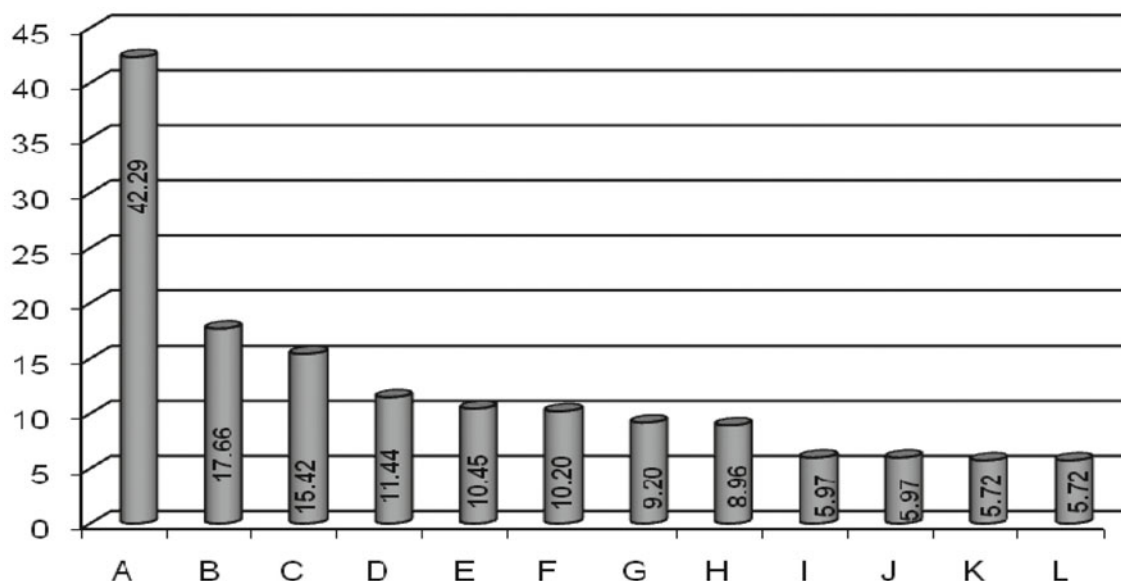
Confidence in individual efforts to slow down the impact of climate change was expressed by 87.09 per cent of the respondents. About 74.19 per cent supported the policy for public transport to be made mandatory by institutions or organizations for their students and employees while 87.09 per cent agreed to initiate campaigns for car pooling, walking for shorter distances, or the use of public transport. However, 77.41 per cent were unhappy with the absence of most of the government and non-government institutions in their city that could create public awareness about climate change. About 38.71 per cent respondents have held the government solely responsible for efforts to deal with global warming while

61.28 per cent believe that besides the government there is much that can be done by the general public as well. About 22.57 per cent of the respondents accepted their irresponsible behaviour regarding remembering to switch off lights and fans and air conditioning (AC) after use. By and large the respondents showed an appreciating conative behaviour as reflected by $M\text{-Con} = 2.85$.

Regarding coping and adaptive capacities to climate change, only 25.8 per cent of the respondents claimed that they have the social, economic, or physical resources to cope with climate change. The remaining 74.2 per cent were either not capable of or were in the process of attempting to cope with or adapt to the changing climate conditions. Thus, it is evident that a very small proportion of the population feels competent to cope with the scenario of a changing climate.

There was a major disagreement (89.6 per cent) among respondents over the fact that their city has any adapting strategy of its own for coping with or adapting to the changing climate. This indicates that respondents considered their city as vulnerable and too inefficient to cope with any kind of adversities or coastal hazards related to climate change. Only 10.3 per cent of the respondents regarded their city as efficient enough in terms of adapting strategy to cope with or adapt to climate stress.

It was found that 53.6 per cent of the respondents rated a combination of individual approach, institu-

Figure 30.4: Priority order of coping and adaptation measures by percentage. **Source:** The authors.

- A plantation together with saving water and energy
- B use of renewable sources of energy
- C reduced vehicle usage
- D stopping deforestation
- E rainwater harvesting
- F energy-efficient homes
- G use of public transport
- H reducing pollution
- I educating the public
- J use of solar energy
- K treatment of industrial waste
- L controlling one's personal needs and maintenance of good health

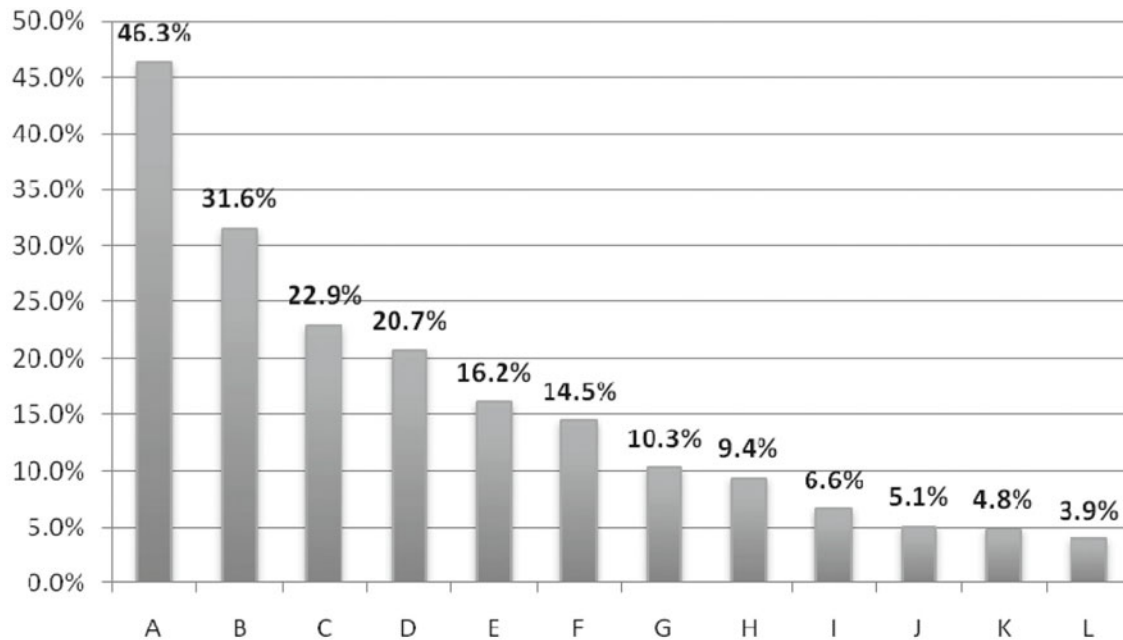
tional measures taken by the government, together with voluntary/NGO services as the most effective measure for coping with or adapting to the changing climate. This suggests that people are aware that the overall responsibility lies not with one particular individual or agency. Collective action is rather required, which is only possible by joining forces for the cause.

30.6.4 Coping with Climate Stress

Qualitative information regarding the perceptions of people towards changing climate was sought for several dimensions. It was found that planting of trees together with the conservation of water and energy (42.29 per cent) were reported to be the best means by which the respondents found themselves capable of coping with climate stress. Use of renewable sources of energy (17.66 per cent), reduced vehicle us-

age (15.42 per cent) to curb pollution, and a halt to deforestation (11.44 per cent) were also reportedly some of the important aspects. On the personal level, controlling one's personal needs and maintaining good health (5.72 per cent) to bear the stresses and strains of climate change were also strategic options expressed by a few.

When asked to make suggestions specific to their city concerning adaptation to climate change, again tree plantations emerged as the most preferred proposal (46.3 per cent) by most of the respondents. Reducing the wasting of water and electricity (31.6 per cent), reducing vehicle usage (22.9 per cent), reducing pollution (20.7 per cent), and putting a check on industries (16.2 per cent) were some of the other highly-reported measures suggested, besides stopping deforestation (14.5 per cent) and encouraging the use of public transport (10.3 per cent). Environmental educa-

Figure 30.5: Suggestions for adaption to climate change for Veraval. **Source:** The authors.

- A plantation
- B reducing water and electricity wastage
- C reducing vehicle usage
- D reduction in pollution
- E putting a check on industries
- F stopping deforestation
- G use of public transport
- H environmental education/spreading awareness among the general public
- I treatment of industrial wastes
- J green building initiatives
- K rainwater harvesting
- L joint approach by both government and individuals

tion and the spreading of awareness among the general public (9.4 per cent) was also felt to be important. Industrial organisations were expected to properly treat their industrial wastes (6.6 per cent) before discharging them into air or water. In the light of changing construction patterns and green building initiatives (5.1 per cent), the construction of energy-efficient homes with provision for rainwater harvesting (4.8 per cent) was also suggested by the respondents, reflecting their concern and knowledge updates on the environmental front. Government action for the enforcement of environmental laws and a joint approach by both government and individuals (3.9 per cent) were also some of the significant suggestions received.

Based on the above suggestions, an awareness generation plan was developed with a special focus on

school and college students in view of the fact that the group that is still in the phase of receiving education can best receive the information related to climate change. Thus, it can best contribute by changing its individual behaviour at this still flexible stage of life for a longer period.

The plan included three phases starting with 10-minute clips on the impact of climate change extracted from different media sources followed by a brainstorming session on who should tackle the problem of climate change. In the third phase, an informative video-recorded lecture on “Climate change: you, me, and planet Earth” was played, followed by an open discussion. This whole programme was facilitated by teachers of environmental education.

30.7 Discussion

The respondents' perceptions about climate change, climate stress and associated psychological dimensions of cognition, affection, and conation were assessed to address both overt and covert behavioural aspects such as readiness to act, to take initiatives, to learn new ways of living, to change lifestyles, and to adjust and negotiate solutions so that climate stress can be dealt with in a functional way.

Results indicate that respondents were cognitively aware of various dimensions of changing climate and had substantial factual knowledge about climate change and its impact on human population and natural resources. As the world's population increases and the per capita consumption of natural resources increases, we will have an even greater effect on these environmental problems, exacerbating them further (Harris 2004). There is evidence of prominent increases in the intensity and frequency of many extreme weather events such as heatwaves, tropical cyclones, prolonged dry spells, intense rainfall, tornadoes, snow avalanches, thunderstorms, and severe dust storms in the Asian region (Cruz/Harasawa/Lal et al. 2007). Cognitive awareness regarding the nature of the problem and how it is going to affect the population, in turn, forms the basis for people being emotionally concerned about the whole issue. A comprehensive understanding of which cognitions are typical of climate change will reveal how humans conceptualize this complex environmental problem, as well as how governments and organizations can best communicate the issues to the public. Indeed, much remains to be uncovered about the cognitive and behavioural aspects of climate change, and this critical task is well suited for the social psychologist (Gifford 2008).

It was found that respondents were emotionally concerned about climate stress to a significant level, and accepted that even though developed nations are more responsible for climate change because of their lifestyle, responsibility lies with developing nations as well to modify their lifestyles since they are the ones who are going to be most adversely affected by climate stress due to their resource dependence and population size. The *Third Assessment Report* (TAR) of IPCC rightly states that the impacts of climate change will fall disproportionately upon developing countries, thereby exacerbating inequalities in health status and access to adequate food, clean water, and other resources. The effects of such changes are already being felt. Some 262 million people have been

adversely affected by climate disasters between 2000 and 2004, and 98 per cent of these live in developing countries (Yechuri 2008). The reason for high emotional concern among respondents might also stem from the acceptance that anthropogenic activities are major contributors to the changing climate, and that every form of life on this planet is likely to be subject to the impacts of human action through changes in climate (Pachauri 2004).

A sufficiently good cognitive awareness among respondents of climate change taking place in reality and an understanding of the associated risks was in turn reflected in their conative or action-based behaviour, as it was rated highest by the participants of the study. Absolute faith was placed in the power of individual efforts, which means that there is a readiness on the part of the respondents to behave in pro-environmental ways and to do whatever they can to reduce climate change and its related stress. Various environmental problems like global warming are rooted in human behaviour (DuNannWinter/Koger 2004; Gardner/Stern 2002; Vlek/Steg 2007), and can thus be managed by changing the relevant behaviour to reduce their environmental impacts. Changes in human behaviour are believed to be necessary because technical efficiency gains resulting from, for example, energy-efficient appliances, home insulation, and water-saving devices tend to be overtaken by the growth of consumption (Midden/Kaiser/McCalley 2007).

Behavioural scientists have successfully applied the principles of behaviour analysis to increase the proportion of pro-environmental behaviour and decrease the proportion of behaviour that damages the environment (Lehman/Geller 2004). In the area of environmental psychology (e.g. Bell/Greene/Fisher et al. 2001; Bonnes/Bonaiuto 2002; Gifford 2007), a central emphasis over the past several decades has been on environmental concern, and the role played by the risk-appraisal process and its outcome, and by motivational state, in the adoption of pro-environmental behaviours and possibly mediating psychological distress (e.g. Edelman/Makofske 1998; Gifford/Scannell/Kormos et al. 2009; Hansla/Gamble/Juliusson et al. 2008; Schmuck/Schultz 2002).

Knowledge about climate change exerts its effects on behaviour because knowledge represents the availability as well as accessibility of climate change constructs in memory. As such, this knowledge serves as a readily available heuristic that guides intention and behaviour (e.g. Förster/Liberman 2007). Another explanation is that knowledge about the causes and potential consequences of climate change effectively en-

courages action because it provides individuals with a rationale for adopting relevant behaviour and policies. This occurs via a reflective system that relies on “if-then” propositions to categorize stimuli and reach behavioural decisions (Strack/Deutsch 2007).

Importance is a key cognitive element in climate change engagement and behaviour. However, although people are aware of the existence of climate change and many are concerned about potential negative consequences (e.g. Heath/Gifford 2006), its importance is diminished when individuals consider climate change in relation to other issues (Lorenzoni/Pidgeon 2006; Poortinga/Pidgeon 2003). Several British surveys have revealed that health, family, safety, finances, and concerns about terrorism took precedence over climate change issues (Norton/Leaman 2004; Poortinga/Pidgeon 2003).

Lehman and Geller (2004) have reviewed the contributions and merits of an applied behaviour analysis approach to encouraging pro-environmental behaviour, along with a discussion of the ways in which behavioural science can play a greater role in protecting the environment. After presenting the most serious threats to the earth's environment, the targets, settings, and techniques of the behavioural intervention literature are reviewed, arguing that behaviour analysis can play a greater role in solving environmental problems through (a) re-examination and expansion of intervention targets, (b) increased focus on long-term maintenance of pro-environmental behaviour, and (c) more effective dissemination of intervention strategies and research findings.

It has been suggested that the total coastal length of 5,763 km along the coastal states of India, i.e. 0.41 per cent, could be inundated, and almost 7.1 million people, i.e. 4.6 per cent of the coastal population, could be directly affected (TERI 1996). A high level of cognitive awareness among respondents in a coastal city like that of our study site Veraval can be a motivating cause for the public to behave in environmentally responsible ways. An orientation towards action-based pro-environment behaviour would help a great deal in terms of not only bearing the impacts of any increase in the frequency or intensity of cyclones due to global warming and subsequent sea-level rise but also in terms of lessening the paralyzing devastation in small low-income town areas of India. As rapid sea-level rise inundates islands and coastal settlements, this is likely to limit possibilities for adaptation, with potential options being limited to migration (Barnett/Adger 2003; Barnett 2005). A high conative dimension of human behaviour would orient the respond-

ents towards a fighting response strategy in such situations, together with instilling psychological preparedness to meet likely adversities.

With regard to Lorenzoni's typology (2004) of people's attitudes towards climate change, the respondents of this study were found to be 'engaged', i.e. knowledgeable, committed, and responsive to new information, but at the same time they also looked for excuses to avoid action and tried to leave the primary responsibility of combating climate change to the government.

The whole analysis clearly spells out that since climate change is going to seriously affect human beings directly or indirectly in the near future, knowing about people's understanding and how seriously they are concerned about the possible impacts of climate change for generations to come and their emotional involvement with the problem is an issue of serious concern. The danger of humans producing irreversible harmful changes to the environmental conditions that support life on earth is grave and imminent. Since this threat to the environment is caused by human behaviour, behavioural and social scientists have an important role to play in reducing it. The goal of their efforts must be to determine and encourage patterns of life that can be sustainable into the indefinite future (Oskamp 1995).

The New Delhi work programme amended at COP 13 also indicates the importance of knowledge-attitude-behaviour surveys to establish a baseline of public awareness that can serve as a basis for future work and support monitoring of the impact of activities. Stern (2000) has enumerated eight widely-held beliefs about human-environment interactions and assessed the strengths and limitations of each belief. He suggested that psychology can contribute more strongly by counteracting disciplinary biases, focusing research where behavioural analysis identifies major opportunities, making appropriate modest claims, collaborating with other disciplines, and building on psychology's relative strengths among the human sciences.

30.8 Conclusion

Overall, this pilot study revealed sound cognitive awareness, appreciable emotional concern, and motivated behavioural intentions (conative component) among the respondents. The study site, being a small coastal city, might not provide very good information compared with other major urban coasts of India, yet the people have ample general awareness about the

occurring phenomenon of climate change and its related impacts. However, there seems to be relatively less emotional concern for the issue, although the participants have expressed intentions of pro-environmental behaviour. The fecundity of knowledge is realized only when it is put into action, i.e. there is a need to lessen the gap between attitude and behaviour. Mere cognitive awareness cannot solve problems alone unless the affective concerns of the people are aroused and get strengthened by way of efforts to help them relate their awareness to what they should feel and how they must act or react. This can be brought about by a greater emphasis on environmental education, campaigns, programmes etc. People need to know what difference can be made by switching over from merely 'wanting change' to actually 'working for change'.

30.9 Ways Ahead

This study is a micro-level attempt to test the application of behavioural methodology to one of the smaller coastal cities of India. It will be expanded to two major coastal metropolitan cities, Mumbai and Chennai, with extended behavioural dimensions and an elaborated methodology, in order to identify the climate stressors and the behavioural adaptation measures adopted by the people. Furthermore, the study will provide an understanding of the mindset of people in urban settlements with regard to climate change. Not only this, it will also help find out about the level of awareness of people with regard to climate change and also what their actions and reactions are with respect to the scenarios of a changing climate.

Through an assessment of the perceptions and attitudes of people with regard to the cognitive, conative, and affective dimensions of the human-climate interface, it will become possible to determine the extent to which responsibility for coping with the changing climate can be shared. By studying the pattern of behavioural adaptation to climate change, it would be possible to identify what coping strategies people in coastal metropolitan cities of India are using, or which would be required to deal with the phenomenon of climate change.

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31 Routine Violence in Java, Indonesia: Neo-Malthusian and Social Justice Perspectives

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31.1 Introduction¹

This chapter examines the role of population pressure and inequality and their possible joint effects on routine violence across districts in Java. It looks at violence from the perspectives of neo-Malthusian and social justice. These issues are highly relevant for Java. Inhabited by 128 million people, it is the most populous island on earth and the most densely populated island in Indonesia, making it classically Malthusian. Furthermore, the effects of global climate change (e.g. of rising sea level) and environmental degradations are likely to deepen the Malthusian scenario for Java. We employ a count data panel data regression technique of 98 districts in Java covering the period 1994–2003. Using population density as the indicator of population pressure, we find empirical evidence of the neo-Malthusian conflict scenario. However, support is only available for the population density indicator. The effect is worse if higher population density coincides with higher population growth. Although the role of vertical inequality in conflict has been largely discounted in empirical cross-country studies, we find empirical support for the violence-inducing effect of vertical inequality. This finding is based on the apparent existence of an inverted-U relationship between inequality and income as hypothesized by Kuznets (1955). The finding on the inequality effect helps explain the inverted-U relationship between income and violence found elsewhere. The effect of income on violence is channelled through inequality. Inequality-induced grievances would be more intense and spread more quickly in more densely populated localities, pointing to an unsafe mixture of vertical inequality and population pressure.

Among the many determinants of violent conflict, the roles of population pressure and inequality are

possibly the most disputed. The first is due to the discrepancy between individual case studies (usually at a national level) and large cross-country studies (Urdal 2008), while the second concerns the differentiation between vertical and horizontal inequalities (Stewart 2000, 2008). This chapter seeks to empirically scrutinize these two determinants of violent conflict, and their possible joint effects, in the case of routine-everyday violence in the ethnically rather homogenous and densely populated island of Java, Indonesia. Routine-everyday violence is neither civil war nor ethno-communal violence. It refers to regular group violence that is not episodic in nature. The two most important variants of routine-everyday social violence are vigilant violence and inter-neighbourhood, village, and group brawls.

Contemporary violent conflicts in Indonesia can be broadly categorized into episodic and routine. The episodic ones consist of secessionist and ethnic violence. This chapter concerns the other category: routine violence, which is essentially a residual category of violent conflict. Routine social (or group or collective) violence has neither the explicit political aim of overthrowing the state as in the case of civil war, nor the emasculation of a rival group as in the case of ethno-communal violence. It is also not simply crime, although it could have criminal dimensions. The theoretical underpinnings for routine violence are similar to those utilized to explain mass political violence short of internal war in Hibbs (1973).

While civil wars seem to be caused by or related to ‘underdevelopment’, specifically the lack of economic growth, routine violence may be a consequence of growth and globalization when the fruits of progress are inequitably distributed. It tends to occur spontaneously and sporadically without being led by any organized gang. It also does not lead to capture of anyone’s possessions. Routine violence is largely confined to the poor and low-income people. In general, routine violence can be a manifestation of frus-

1 Keywords: Indonesia, routine violence, inequality, population pressure.

Figure 31.1: Map of Indonesia. **Source:** <http://www.nationsonline.org/oneworld/map/indonesia_map2.htm>. This map is in the public domain.



tration by the lower socio-economic segment of society rather than the greed of those involved. However, what is interesting is that routine violence is more common in the ethnically largely homogenous and densely inhabited island of Java, while the majority of episodic conflicts occur mainly in the outer islands (outside Java),² which are ethnically very diverse but sparsely populated. Therefore, it is imperative to consider demographic factors along with socio-economic factors in analysing routine violence.

Among the demographic factors, population density and the dominance of youth in the population distribution are likely to play a role in routine violence,

2. Secessionist violent conflicts in Indonesia were confined to the westernmost province of Aceh and the easternmost province of Papua. In addition, Indonesian East Timor could also be added to this category. Major sites of Christian-Muslim violence were the provinces of Maluku, North Maluku, and Central Sulawesi, while anti-Madurese violence took place in west and central Kalimantan.

which is often referred to as the neo-Malthusian conflict scenario (Homer-Dixon 1991, 1994, 1999; Kaplan 1994). Mere physical proximity in a densely populated area makes it easier to engage in violence, as well as increasing the chances of friction among people. Furthermore, the majority of participants in any kind of violence are generally found to be youth aged between 15 and 24. Urdal (2006, 2008) finds that youth bulges correlate positively with conflict in both cross-country and individual country (India) studies. In other words, youths are an important agent of violence (Huntington 1996). This is likely to be heightened when their socio-economic achievement is less than their expectations or than the national average. For example, if there is a large educated unemployed segment in the population, one can expect a higher level or frequency of routine violence. Education generates an expectation of a decent job and a better life. When that is not fulfilled, youths suffer from a sense of relative deprivation and their anger or frustration may manifest itself in routine violence, something

which does not have an explicit political or criminal motive.

The rest of the chapter proceeds as follows. The next section reviews past research on violent conflict in Indonesia and sets out the context of the present analysis (3I.2), followed by a discussion of the framework of analysis of routine violence, linking it to population pressure and inequality (3I.3). The fourth section explains the model and data issues (3I.4), while the next section presents the results (3I.5), and some conclusions are offered in the last section (3I.6).

31.2 Literature Review and Context

An early empirical study of routine violence by Tadjoeidin and Murshed (2007) examined the socio-economic determinants of routine violence across districts in Java by focusing on the level and growth of income, education level, poverty rate, and human development index. They found an inverted-U-shaped relationship between routine violence and levels of development (proxied by income and education). That is, violence initially increases with the increase of income and education and then declines. They also found a violence-increasing effect of poverty, and a violence-reducing impact of human development. Tadjoeidin and Murshed attributed the initial positive relation between income and violence to the frustration and anger of the less fortunate, and the later negative relationship to better law and order and the higher opportunity cost of engaging in violence. However, this explanation appears less satisfactory in light of the fact that routine violence is not led by any organized gang, nor does it lead to theft of possessions. In a later study, Murshed, Tadjoeidin, and Chowdhury (2009) have found that fiscal decentralization had a violence-reducing effect in the case of routine violence. They argue that fiscal decentralization, and the increased size of local government, can alleviate pent-up frustrations with a centralized state, as local government expenditure is seen to satisfy the needs of communities that people identify with more closely. This explanation seems to apply more to the collective mood rather than to the individual's propensity to violent acts triggered by a sense of deprivation. One way this can be captured is by examining the role of inequality in routine violence.

An important dimension in the analysis of violence and conflict is the perceived and actual equitability of distribution of the fruits of economic progress among the population. In short, income ine-

quality does matter, and the link between inequality and violent conflict is an age-old concern, although more recently it has been dismissed by prominent analysts. However, its role has not been systematically examined in the context of Indonesia. There are two types of inequality: (a) vertical and (b) horizontal. Vertical inequality refers to inequality in a population and is commonly measured by the Gini coefficient. Another widely used measure is the decile dispersion ratio, which presents the ratio of the average consumption or income of the richest 10 per cent of the population divided by the average income of the bottom 10 per cent. It indicates how the bottom decile of the population (in terms of income) fares in comparison with the top decile. Horizontal inequality refers to inequality between different ethno-social groups or regions. It can be measured simply by the ratio of mean or average incomes of two groups (or regions). It can also be measured by the relative size of different groups' (or regions') income shares in the total – *Gross National Income* (GNI), group Gini coefficients, or by a metric akin to the coefficient of variation. Horizontal inequality thus shows the relative welfare of different socio-economic or ethno-religious groups or regions. Horizontal inequality generates a sense of relative group deprivation, while vertical inequality causes a general sense of personal deprivation among the poor and lower-middle-income people.

Cramer (2005: 1) reviews the literature on the link between inequality and violent conflict, and suggests that “it is almost a universal assumption that an inequitable distribution of resources and wealth will provoke violent rebellion”. However, at the empirical level there is no consensus about the pattern of the relationship. The range of predictable patterns include positive linear, U-shaped and inverted-U-shaped relationships, and some have even suggested that there is no relationship. Thus, as Cramer (2005) points out, some characteristics of inequality, rather than inequality itself, may be more relevant. They may include the process or causes of inequality, and society's tolerance level (a threshold inequality), determined by socio-political factors.

Horizontal inequality between different regions and ethnic groups has played a significant role in the separatist and ethnic conflicts in Indonesia (Tadjoeidin/Suharyo/Mishra 2001; Tadjoeidin 2009). Since Java is ethnically very homogenous and routine violence has nothing to do with ethnic groupings, the notion of *horizontal* inequality seems to be less relevant. While Indonesia, as a country, is ethnically very heterogeneous and some of its areas in the outer islands

are ethnically highly polarized, the issue of *vertical* inequality becomes pertinent for Java due to its ethnic homogeneity. The western part of Java is predominantly ethnic Sundanese, while the central and eastern parts are dominated by ethnic Javanese. The two ethnic groups account for around 85 per cent of Java's population. Higher levels of ethnic homogeneity are found at district levels, too; for example, ethnic Javanese account for more than 95 per cent in more than two-thirds of the districts in the provinces of Central and East Java.

However, in an ethnically homogenous society, *vertical* inequality might be an important factor in aggravating a general sense of frustration manifested in low-intensity routine violence. This is especially so in a densely populated area with a relatively low income level, where competition for resources (survival) can be more intense. It may be mentioned here that except for a few districts (such as Jakarta, Surabaya, and Kediri) Java is a relatively poor island compared with the resource-rich outer islands.³

Focusing on demographic and population factors and income inequality in the context of routine violence is a relatively new area of inquiry. In a cross-provincial analysis in Indonesia, Østby, Urdal, Tadjoeeddin et al. (2011) have found that in provinces where population growth is high, greater levels of child mortality between religious groups – an indication of horizontal inequality among them – tend to increase the risk of routine violence. This conclusion is based on the significance of the interaction term between population growth and horizontal inequality. However, the variable of horizontal inequality by itself never proved to be significant. As *horizontal* inequality is more appropriate in explaining the context of secessionist and ethnic conflicts, we would argue for the more relevant role of *vertical* inequality in the case of routine violence.

The issue of population pressure (density) is highly relevant for Java. The island is inhabited by 128 million people (in 2005), making it the most populous island on earth and the most densely populated island in Indonesia (table 31.1).⁴ The effects of global climate change (e.g. rising sea level) and environmental degradations are likely to deepen the Malthusian scenario for Java. Rising sea level, in particular, is a clear future danger for the northern lowland coastal area of the is-

land. The northern part of Java is more developed and more prosperous than the southern part. Therefore, climate change may increase the already high population pressure in the island. On average, youths aged between 15 and 24 account for around 25 per cent of total adult population (aged 15+).⁵ The figures are more or less similar across provinces, but they vary more across districts, since urban districts tend to have a higher proportion of youth. While youths have higher educational attainment, the unemployment rate is the highest among this age cohort. This is related to the main characteristics of unemployment in Indonesia generally. That is, unemployment rates are higher among the youth, the educated people, and the urban population (Chowdhury/Islam/Tadjoeeddin 2009).

Table 31.1: Population density by main islands (population/km²), 2005. **Source:** BPS data (for Indonesia and its main islands) and World Bank data (for Bangladesh).

	Population size	Density (population/km ²)
Java	128,470,536	1,007
Sumatra	46,029,906	96
Kalimantan	12,098,036	21
Sulawesi	15,787,955	82
Maluku-Papua	4,654,081	10
Indonesia	218,868,791	116
Bangladesh	144,319,628	1,063

The trends in Gini coefficients are more or less similar across regional aggregations (provinces in the island of Java, and Indonesia as a whole, see table 31.2). The peak of the Gini coefficient was in 1996 prior to the Asian financial crisis, declining thereafter, reaching its lowest point in 2000. Thereafter, the Gini coefficient shows an increasing trend. The magnitudes of the Gini coefficients in the provinces of Java are roughly similar with those for Indonesia as a whole; however they vary across provinces. The variations are even wider across districts (see table 31.10). Furthermore, districts in Java are generally poor rela-

3 See table 31.10 for details.

4 If Java is treated as a single country and small city states are excluded, it will be the second most densely populated area in the world after Bangladesh.

5 This figure is moderate. In 2000, the age group 15–24 made up 17 per cent or less of the total adult population in almost all developed countries, while the figures for developing countries were around 35 per cent (Urdal 2006). However, the variation of the figures across districts in Java is more important than the overall average.

Table 31.2: Gini coefficient, 1994-2003. **Source:** Calculated by the authors from BPS data.

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
West Java	0.36	0.33	0.38	0.33	0.33	0.31	0.31	0.31	0.33	0.32
Central Java	0.31	0.31	0.32	0.30	0.30	0.29	0.30	0.30	0.32	0.29
East Java	0.33	0.35	0.35	0.35	0.34	0.31	0.32	0.32	0.34	0.32
Banten	0.34	0.35	0.35	0.32	0.32	0.29	0.33	0.33	0.33	0.31
Java (4 prov)	0.34	0.34	0.36	0.33	0.33	0.31	0.32	0.32	0.34	0.32
Indonesia	0.35	0.34	0.37	0.35	0.34	0.34	0.32	0.32	0.35	0.33

Table 31.3: Population pyramid (2003). **Source:** Calculated by the authors from BPS data.

	Age groups							Total
	0-14	15-24	25-34	35-44	45-54	55-64	65+	
West Java	29.5	18.4	16.4	15.0	10.4	6.0	4.3	100
Central	27.3	18.3	15.4	14.9	10.7	6.9	6.5	100
East	25.0	16.8	16.7	15.8	11.9	7.6	6.2	100
Banten	33.3	19.1	17.8	14.9	8.6	4.2	2.0	100
Java (4)	27.4	17.8	16.3	15.2	10.9	6.8	5.6	100
Indonesia	30.6	18.6	16.5	14.4	9.9	5.7	4.3	100

tive to the Indonesian average: the per capita regional *Gross Domestic Product* (GDP) of 83 districts (85 per cent) out of the 98 districts in our sample is lower than the national average (table 31.10).

There is also the possibility of interaction between population and demographic factors and vertical inequality in routine violence. That is, the impact of inequality on violence is likely to be higher in the presence of high population density and a large youth bulge. Therefore, it would be an interesting endeavour to analyse how inequality and population variables might interact in aggravating low-intensity routine violence in Java.

31.3 Violence, Population Pressure, and Inequality

31.3.1 Population and Demographic Factors

Increased population results in a decline in per capita resource availability (without technical progress), which in turn creates more competition with the potential to result in conflict (Homer-Dixon 1991, 1994, 1999). This belongs to Homer-Dixon's notion of *demand-induced scarcity* primarily caused by population growth.⁶ Supporting this view, in a widely publicized article, Kaplan (1994) predicted future world anarchy sparked off by resource scarcity and environ-

mental degradation. Such a view is often referred to as a neo-Malthusian perspective.

Although Homer-Dixon's argument is quite appealing, his approach has been criticized for being anecdotal and relying on case studies that nicely coincide with his hypothesis. When a more systematic approach is used, namely cross-national quantitative studies employing country-level measures of population pressure and resource scarcity, de Soysa (2002) and Urdal (2005) found only marginal support for this neo-Malthusian hypothesis of conflict. It has been suggested that the level of analysis may be the cause of the discrepancy between cross-country and case studies. National demographic aggregates tend to disguise the local-level diversity of population dynamics. While the cross-country studies mostly focus on the high profile armed conflict such as civil war and ethnic violence, it may be argued that the local-level population dynamics cause local conflicts (Urdal 2008). As mentioned earlier, the impact of youth bulges on conflict is likely to be greater if there is high unemployment among youth.

⁶ In addition to *demand-induced scarcity*, Homer-Dixon identifies the other two main sources of resource scarcity: *supply-induced scarcity* resulting from depletion of natural resources, and *structural scarcity* that applies only to certain groups, in relative terms, because they are excluded from equal access to particular resources.

Densely populated Java is an ideal place to test the Homer-Dixon hypothesis since Java is classically Malthusian. Land is a major fixed factor of production. The conditions of diminishing returns for other agricultural inputs and agricultural labour are at work. However, the classic problem in Indonesia and Java in particular is that, for several reasons, the pace of industrialization and the development of other non-agricultural sectors has not been rapid enough to absorb labour from agriculture. Therefore, the structural transformation of the Indonesian and the Javanese economy was not matched by a similar transformation of employment patterns. Between 1971 and 2003, the contribution of agriculture to the Indonesian economy sharply declined from 53 to 17 per cent, while the share of labour in the sector fell only from 66 to 46 per cent.⁷

In addition to population density, the youth cohort – widely termed youth bulge – may also play a role in routine violence. As shown in table 31.3, population pyramids of provinces and districts in Java have a higher proportion of youth. Unemployment is also high among youth.

The following hypothesis is therefore put forward for the three key indicators of population and demographic factors to explain routine violence, namely population density, youth bulges, and population growth.

H1: Districts that experience higher population pressures tend to experience a higher level of incidence of routine violence.

Furthermore, possible interaction effects are tested among the three indicators of population pressure and for the following set of hypotheses:

H2a: The joint effect of population density and population growth on routine violence is positive.

H2b: The joint effect of population density and youth on routine violence is positive.

H2c: The joint effect of youth bulges and population growth on routine violence is positive.

⁷ Taken from BPS data (National Income Account and *Sakernas* – National Labour Force Survey, various years).

31.3.2 Inequality

The link between inequality and conflict is an age-old concern. Many theorists have suggested that the former breeds the latter, for example Gurr (1970), Huntington (1968), and Russett (1964).⁸ Cramer (2005: 1) argues “it is almost a universal assumption that an inequitable distribution of resources and wealth will provoke violent rebellion”. Kanbur (2007: 5) states that “it seems to be generally accepted that poverty and inequality breed conflict”. In general, inequality creates a sense of injustice that is central to the grievance motive for any kind of violent conflict. Nafziger and Auvinen (2002) find that large income inequality exacerbates the vulnerability of populations to humanitarian emergencies. Muller (1997: 137) argued that “a high level of income inequality radicalizes the working class, enhances class polarization, and reduces the tolerance of the bourgeoisie for political participation by the lower classes”. In a cross-country study, he showed a positive correlation between income inequality and the binary variable of stability and instability of democracy between 1960 and 1980. These studies support Alesina and Perotti (1996) who found that income inequality was associated with social discontent and political instability, which in turn are correlated with lower investment.

However, the two most widely cited cross-country empirical studies on civil war by Fearon and Laitin (2003) and Collier and Hoeffler (2004) have largely dismissed the role of inequality in conflict. From a political science perspective, Fearon and Laitin imply that inequality does not matter because of state capacity (the suppression power of the state). Collier and Hoeffler’s view is more akin to banditry or warlordism; see Murshed and Tadjoeeddin (2009) and Murshed (2010) for reviews. That is, to them the root cause of conflict is not social pathology (e.g. inequality), but individual pathology (e.g. greed). They also ignore the collective action problem as discussed in Olson (1965), because Fearon and Laitin are blinded

⁸ Since Aristotle, social philosophers have speculated that economic inequality is a fundamental cause of political violence and revolution. De Tocqueville ([1835] 1961: 302) stated the classical hypothesis succinctly: ‘Almost all of the revolutions which have changed the aspect of nations have been made to consolidate or to destroy social inequality. Remove the secondary causes which have produced the great convulsions of the world, and you will almost always find the principle of inequality at the bottom’.

by power and neo-classical economists like Collier only see selfish greedy motivation.

Since these studies use the Gini index of *vertical* income inequality that measures inequality between individuals for the entire country, its differentiation from the *horizontal* inequality that focuses on inequality between groups within country becomes critical. In this regard, Stewart (2000, 2008) argues that it is the latter (horizontal inequality) that matters for conflict. Groups' horizontal inequalities help in building in-group solidarity and, in turn, solve the collective action problem. Stewart presents several case studies in support of her argument. Later on, the horizontal inequality argument has received empirical support in a recent cross-country study of civil war (Østby 2008), as well as in ethnic conflict across districts in Indonesia (Mancini 2008).

Another strand of study relates the role of *vertical* inequality in conflict with the democratization movement. For example, Acemoglu and Robinson (2006) believe that the demand for democracy is partly driven by aspirations for redistribution. In most cases, the democratization movement in its early phase has involved violent actions against authoritarian regimes. The violence involves not only the citizens and the security apparatus, but also the beneficiaries of the system (the elites and their private armies) and the general public.

Therefore, it would be unwise to totally discount the role of *vertical* inequality in conflict and solely focus on the *horizontal* inequality, as the latest developments in the area of research seem to suggest, see for example Stewart (2008) and Østby, Urdal, Tadjoeuddin et al. (2011). Both kinds of inequality create a sense of frustration essential to fuelling grievances among the general population and socio-economic/ethno-religious groups. We argue that the opposing findings may be due to the different types of conflict being studied. While the studies that do not find much support for vertical inequality look at the high-profile violent conflicts such as civil war and ethnic conflict, or what we term as episodic violence, our study examines low-intensity routine violence. In such cases, the general sense of deprivation among the population due to high inequality of income and assets may play a significant role. Routine violence in some sense is a manifestation of frustration and can be seen as a competition among the lower strata of the socio-economic class in the absence of a class war.

The work of Tadjoeuddin and Murshed (2007) on routine violence in Java can be extended to study the role of *vertical* income inequality. One of their find-

ings on the structural factors behind routine violence is the general sense of grievance in the population, arising from a situation where progress in education is not commensurate with improvements in income. *Vertical* income inequality can be seen as another potential source of a general sense of grievance. Therefore, we propose the following hypothesis:

H3: Vertical income inequality would have a positive effect on routine violence.

31.3.3 Joint Effect of Population Pressure and Inequality

Now we consider the potential joint effects between vertical inequality variable and the two population/demographic indicators. It is highly possible that grievances resulting from vertical inequality become more intense in the presence of population pressure. In other words, the positive effect of a similar level of inequality on violence is higher in a society with higher population density. This is because inequality-induced grievances would be more intense and spread more quickly in more densely populated localities.

Since youths are the main perpetrators of any kinds of social violence, the existing level of inequality potentially adds to their frustration. Therefore, it might be the case that the combination of high inequality and large youth bulge is an undesirable mixture in the case of routine violence. We therefore propose the following hypothesis with respect to the two indicators of population pressure (population density and youth bulge).

H4: The positive effects of vertical inequality are higher in a district (region) with higher degrees of population pressure.

31.4 Data and Model

31.4.1 Data on Routine Violence

The data on the dependent variable, the number of incidents of routine social violence across districts in Java, are taken from a unique *United Nations Support Facility for Indonesian Recovery* (UNSFIR) dataset on social violence in Indonesia (UNSFIR/UNDP 2004).⁹ Each incident of violence is recorded in a template which covers the following information: place, date, duration, category, fatalities (killed, injured), property damage (houses, shops, and public buildings). The data can be disaggregated up to the district

level; most can be disaggregated up to the sub-district level, and most village names where violent incidents took place can be traced. The dataset is based on daily reports from leading provincial newspapers.¹⁰

Although not perfect, this dataset can be regarded as the most comprehensive nationwide data on social violence available in Indonesia, covering 14 provinces in Indonesia for the period 1990–2003.¹¹ The UNSFIR/UNDP social violence database has been criticized as an underestimate by the World Bank, who in turn developed its own database for 12 districts (seven in East Java province and five in East Nusatenggara province) for the period 2001–2003, based on district or sub-provincial newspapers (Barron/Sharpe 2008). The practical application of the World Bank approach of using district newspapers on a wider scale is highly questionable, given the fact that district newspapers are not evenly available across regions in Indonesia. Another data set was gathered by Welsh (2008), who collected data on all vigilante violence in four provinces (West Java, Bengkulu, Bali, and South Kalimantan) from all available provincial and district newspapers supplemented by data from police offices at the district level. Both alternatives give higher figures, but their data are limited to a few regions: Welsh (2008) for four provinces and only for vigilantism (1995–2004); Barron and Sharpe (2008) only cover 12 districts (2001–2003). The last dataset available is conflict data at the village level, collected by BPS-*Statistic Indonesia* (*Badan Pusat Statistik* – Central Statistical Agency) through the long-standing PODES-village potential survey for all 69,000 villages in Indonesia for

the year 2002, based on information provided by village heads. This is the first attempt made by BPS to collect conflict data; the definition of conflict is somewhat ambiguous and the data are available only for one year (Barron/Kaiser/Pradhan 2009).¹² The four datasets, UNSFIR/UNDP, World Bank, JHU, and BPS-*Statistic Indonesia* have different approaches to violence – in terms of definition and methodology.¹³

Due to the fact that routine violence is not episodic, all incidents of non-ethno-communal violence in the UNSFIR database are categorized as routine violence. This database does not include data on separatist violence, which exclusively refers to violence in Aceh and Papua where separatist movements were/are in place. “Ethnic” in the UNSFIR database is broadly defined as in Horowitz (1985), who argues that all conflicts that are based on *ascriptive* (birth-based) group identities – race, language, religion, tribe, or caste – can be called ethnic. Can ethno-communal violence be routine in nature? This is possible, as in the case of Hindu-Muslim violence in India, and it may be argued to be a feature of everyday life in particular Indian localities (Brass 2003). However, based on the fourteen years of data available in Indonesia, ethno-communal violence is more appropriately described as episodic, since these incidents are concentrated in particular places and times and do not occur with an empirical regularity sufficient to warrant description as part of the everyday life of the society. In empirical terms, however, a group brawl may have an ethno-communal dimension. The UNSFIR database carefully considers which incidents belong to the ethno-communal category. An incident of violence (brawls, riots, or vigilantism for example) is coded ethno-communal if ethno-communal symbols were present in the incident – information that is unlikely to be missed in the newspaper report of the event. Furthermore, all available detailed case studies or specialized reports on social violence were consulted in constructing the dataset.

31.4.2 Other Data

Data on population numbers and population density are derived from the population census (conducted

9 For detailed explanations of the dataset see Varshney, Tadjoeeddin, and Panggabean (2008). Jakarta and Yogyakarta are excluded, but the remaining provinces cover 90 per cent of Java’s population.

10 It should be pointed out that all conflict data, including the highly-regarded PRIO-Uppsala dataset on conflict, are collected from a variety of anecdotal sources comprising the media, human rights groups, and the Red Cross. At the country level, as another example, a database on Hindu-Muslim riots in India 1950–95, based on *THE TIMES of India*, was put together by Steven Wilkinson and Ashutosh Varshney, see Wilkinson (2004) and Varshney (2002).

11 The fourteen provinces are Riau, Jakarta, Banten, West Java, Central Java, East Java, Central Kalimantan, West Kalimantan, South Sulawesi, Central Sulawesi, East Nusatenggara, West Nusatenggara, Maluku, and North Maluku. It is estimated that the fourteen provinces account for 96.4 per cent of total deaths in non-separatist violence in Indonesia (see Varshney/Tadjoeeddin/Panggabean 2008).

12 Similar data were also gathered in the subsequent PODES survey in 2005.

13 In fact, the Indonesia country office of the World Bank is expanding and updating the UNSFIR database (Barron/Varshney/Palmer/Jaffrey 2009).

every 10 years) and inter-census population surveys (conducted between two censuses). Data on the size of the young age cohort relative to adult population (youth bulges) and the Gini coefficient of income are calculated from the annual National Socio-economic Surveys (*Susenas*). Data on per capita regional gross domestic product are taken from the regional income accounts. All other data are from the *BPS-Statistic Indonesia*.

31.4.3 Estimation Strategy

The unit of analysis is the district-year in the form of a panel dataset of 98 districts in Java over the period 1994–2003. The dependent variable we seek to explain is the number of routine violent incidents across districts in Java. This variable is in the form of count data that may take on any non-negative integer value, including zero. Therefore, the dependent variable is discrete, and cannot be treated as a continuous random variable.

The most basic model for estimating count data is the Poisson regression model for rare events.¹⁴ However, in most cases, Poisson suffers from the over-dispersion problem; therefore, negative binomial is a much better alternative. The *fixed effects* variant of negative binomial is used since fixed effects help in controlling for time-invariant district characteristics (unobserved heterogeneity) that correlate with the independent variable. Unobserved heterogeneity is particularly acute when modelling social phenomenon such as social violence. One has to admit that many factors play a role in determining violence intensity and only a few of them can be included in the model. Factors such as local culture, institutions, policing, and so on are left out simply due to unavailability of data or difficulties in finding a sensible proxy for inclusion in the model. Moreover, such factors barely change within a relatively short time period, a decade in our case. The use of a fixed-effects model should help in addressing this issue, and it has been noted in recent cross-country studies – see for examples Acemoglu and Robinson (2008) and Papaioannou and Siourounis (2008).

The main explanatory variables are vertical income inequality measured by the Gini coefficient of income and the three measures of population pres-

sure: population density, youth bulges, and population growth. In addition, the interaction terms between inequality and the three measures of population pressure are considered. Following the study on routine violence by Tadjoeuddin and Murshed (2007) and a later work by Murshed, Tadjoeuddin, and Chowdhury (2009), the authors include the following control variables: population size, growth of per capita *Real Gross Domestic Product* (RGDP), level of per capita RGDP, and its squared term.

31.5 Results and Discussion

31.5.1 The Role of Population Pressure

The effects of population pressure on routine violence (H_1) are tested in Models 1–3 of [table 31.4](#) for each of the three indicators of population pressure, namely population density, youth bulges, and population growth, respectively. The standard model of routine violence, introduced by Tadjoeuddin and Murshed (2007), is used as the point of departure and the three indicators to it are added. Only empirical support is found for the violence-inducing effect of population density (Model 1). In the case of population growth and youth bulges, the coefficients are insignificant, although they have the expected signs (Models 2 and 3). The results do not change when the three indicators of population pressure (Model 4) are put together. The significance of population density is quite logical as physical proximity increases the probability of friction. Youth bulges may become a statistically significant variable in the presence of unfulfilled expectations, such as lack of job opportunities.

On the interaction terms among the three indicators of population pressure, empirical evidence is found only for the joint effect between population density and population growth (Model 6). It shows that the violence-inducing effect of population density is higher in districts with higher population growth (H_{2a}). In fact, once the interaction term is included, the variable of population density loses its statistical significance, indicating the more dominant role of the interaction term. This corroborates with the findings of Urdal's (2005) cross-country study focusing on the higher-profile internal armed conflict with the threshold of 25 battle-related deaths.

The above finding confirms Urdal's (2008) claim that the level of analysis may be the source of the discrepancy between cross-country studies and many of the case studies concerning the conflict-inducing ef-

14 For more details on count data regression, one may consult Cameron and Trivedi (1998). Count data regressions are common in certain types of empirical research such as criminology.

Table 31.4: Routine violence and population pressure (Fixed effects negative binomial regression). **Source:** Calculated from BPS data.

	1	2	3	4	5	6	7
Pop density (000/km ²)	0.069 **			0.087 **	0.087	0.031	0.081 **
	(0.032)			(0.038)	(0.142)	(0.042)	(0.038)
Youth bulges (15-24)		0.015		-0.013	-0.013	0.002	0.002
		(0.023)		(0.026)	(0.033)	(0.026)	(0.032)
Pop growth (%)			0.032	0.076	0.076	-0.076	0.323
			(0.052)	(0.060)	(0.061)	(0.079)	(0.317)
Density*Youth					0.000		
					(0.006)		
Pop density*Growth						0.052 ***	
						(0.015)	
Youth*Pop growth							-0.010
							(0.013)
Pop (million)	0.357 ***	0.379 ***	0.387 ***	0.353 ***	0.353 ***	0.334 ***	0.337 ***
	(0.108)	(0.107)	(0.106)	(0.109)	(0.109)	(0.110)	(0.110)
Growth	-0.034 ***	-0.035 ***	-0.034 ***	-0.032 ***	-0.032 ***	-0.034 ***	-0.032 ***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Income (IDR million)	0.191 *	0.247 ***	0.247 **	0.154	0.154	0.198 *	0.158
	(0.108)	(0.106)	(0.105)	(0.110)	(0.111)	(0.112)	(0.111)
Income ²	-0.015	-0.016	-0.016	-0.013	-0.013	-0.014	-0.013
	(0.011)	(0.011)	(0.011)	(0.010)	(0.010)	(0.010)	(0.010)
Obs	980	980	980	980	980	980	980
Wald ² (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: Standard errors are in parentheses, ***, ** and * indicate 1%, 5%, and 10% levels of significance respectively and each regression has a constant term.

fects of population pressure. While previous cross-country studies have only found moderate support for the idea that population pressure may lead to violent conflict,¹⁵ this study finds statistically significant evidence for the case of the violence-inducing effect of population density, and a significant positive joint effect of population density and population growth on routine violence across districts in Java. Urdal's (2008) study across Indian states finds similar effects of pop-

ulation density in the case of armed conflict and of the population density-growth interaction term in the case of violent political events.

National demographic aggregates, as in the case of a cross-country exercise, may not capture the diversity of local population dynamics (within-country variations) very well, and such local processes may be argued to cause local, low-intensity conflicts, as in the case of routine violence. In a cross-country study, Indonesia is only a unit of observation that lumps together the densely populated Java and the sparsely inhabited outer islands. Arguably, this study accounts

15 See among others de Soysa (2002), Hauge and Ellingsen (1998), Theisen (2008), and Urdal (2005).

for demographic diversity much better since it studies densely populated Java in a disaggregated fashion.

31.5.2 The Role of Vertical Inequality

The Gini coefficient of inequality and income together cannot be placed as independent variables at the same time in the routine violence regression because a systematic relationship might exist between the two (the Kuznets [1955] hypothesis). A two-stage regression process is formulated to anticipate the validity of the Kuznets hypothesis on the relationship between inequality and income. The first regression is a Kuznets equation postulating an inverted-U shape between Gini and income; the second one investigates the role of Gini in routine violence. The predicted values of Gini are used from the Kuznets regression to predict violence in the second stage regression. Such a system of two-stage regression tests the link between inequality and violence and at the same time serves to check the presence the so-called Kuznets curve.

First stage: Kuznets equation

$$GINI_{it} = \phi_0 + \phi_1 INC_{it} + \phi_2 INC_{it}^2 + \epsilon_{it}$$

Second stage: Routine violence equation

$$VIOLENCE = \delta_0 + \delta_1 predictedGINI_{it} + \delta_2 GROWTH_{it} + POP_{it} + \epsilon_{it}$$

Using the predicted value of Gini obtained from the Kuznets equation, a positive effect is found of inequality on routine violence, which confirms the postulated hypothesis (table 31.5, panel B). Furthermore, empirical evidence supporting the Kuznets curve is found in Java (table 31.5, panel A). These findings hold when we employ 2SLS regression as a robustness test (table 31.6)¹⁶. Another robustness check is carried out by removing the outlier district of Kota Kediri, which has a relatively very high average income.¹⁷ By doing so,

the Kuznets relationship behaves according to expectations, the predicted Gini retains its significance in the random effects negative binomial estimation,¹⁸ and the 2SLS estimation also performs well.¹⁹

Table 31.5: Gini, income, and violence: two-stage regression. **Source:** Calculated from BPS data.

Panel A. First stage – pooled OLS		
	Gini	
Income	0.0094	***
	(0.0013)	
Income-squared	-0.0004	***
	(0.0001)	
Obs.	980	
R-squared	0.054	
Panel B. Second stage - fixed effects NB		
	Violence	
Gini-predicted value	24.266	**
	(9.681)	
Growth	-0.035	***
	(0.005)	
Pop (mil)	0.388	***
	(0.106)	
Obs.	980	
Wald χ^2 (p-value)	0.000	

Note: Standard errors are in parentheses, ***, ** and * indicate 1%, 5%, and 10% levels of significance respectively and each regression has a constant term.

The result concerning the violence-inducing effect of inequality helps better explain Tadjoeiddin and Mursheed’s (2007) finding regarding the inverted-U-shaped relationship between violence and income. That is, it seems that at an initial stage the violence-inducing effect of rising income is driven by an accompanying rise in inequality as predicted by the Kuznets hypothesis. In other words, income effect on violence is channelled through inequality. At a higher average income level, violence starts to decline since inequality also declines. Therefore, inequality effects work at the upswing as well as at the downswing parts of the

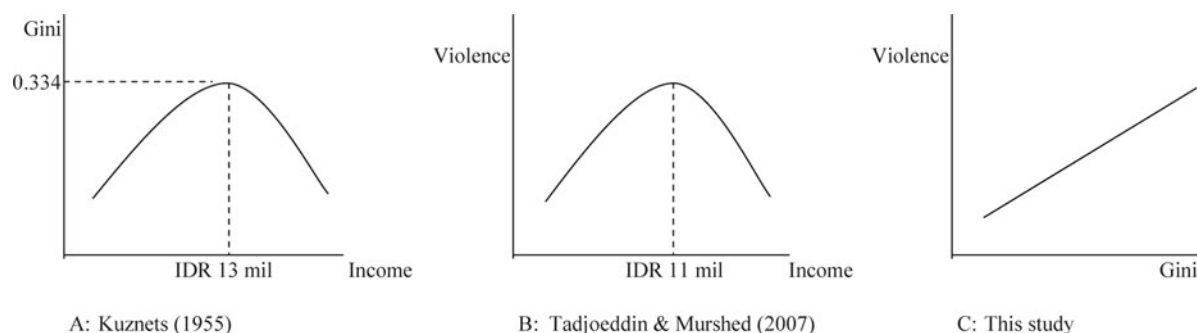
16 The use of 2SLS regression is appropriate since both equations in the simultaneous equation system are over-identified.

17 The extremely high per capita GDP in the district is because the city of Kediri is the home of Gudang Garam, the world’s biggest clove (*kretek*) cigarette maker and Indonesia’s largest cigarette producer, employing more than 40,000 workers. See at: <<http://investing.businessweek.com/research/stocks/snapshot/snapshot.asp?ticker=GGRM:IJ>> (21 September 2010).

18 In fact, RENB is preferable to FENB according to the Hausman test.

19 Detailed results are available from the authors.

Figure 31.2: Violence, income, and inequality. **Source:** Sketched by the authors (Panel A depicts districts in Java according to the Kuznets (1955) framework, Panel B is based on findings by Tadjoeeddin and Murshed (2007) and Panel C illustrates the relationship between inequality and violence based on the findings of this chapter.



inverted-U-shaped curve of violence and income (see figure 31.1). The results also imply that inequality is not tolerated beyond a certain point as hypothesized by Hirschman (1973).²⁰

Tadjoeeddin and Murshed (2007: 691) intuitively explain their finding as follows, “an increase in prosperity may encourage predatory behaviour in the form of private violence (akin to the concept of routine violence) by the less fortunate. Once growth progresses further, violence has to decline to sustain the security of investment, and the state has to perform regulatory functions.” The findings of this study shed additional light on the mechanism, namely inequality. The violence-inducing effect of inequality can be interpreted as a grievance arising out of an inequitable income distribution. The relationship between routine violence and inequality, on its own, is positive;

20 Hirschman (1973) explained the notion of tolerance for economic inequality through the workability of a ‘tunnel effect’. The tunnel illustration originates from Hirschman’s explanatory analogy with traffic in a two-lane tunnel traffic jam. The traffic jam is legally confined to one lane but initially stirred into hope by movement in the second lane; eventually some drivers will illegally cross into that lane if it seems that the traffic jam appears to be clearing there. In this illustration, the ‘tolerance’ limit is the maximum duration of how long drivers in the first lane are patient enough before they start to illegally cross the lane. Hirschman argued for the existence of a social mechanism that could contain relative deprivation or envy due to the rise in inequality. As development proceeded, some people’s fortunes improved while others were left behind, and thus inequality typically increased. But the expectations of those left behind might be raised rather than plagued by anger. Greater inequality can flag social and economic change that could be interpreted as a signal of hope even for those not immediately benefiting from development.

Table 31.6: Gini, income, and violence: 2SLS regression. **Source:** Calculated from BPS data.

Violence		
Gini	46.4997	***
	(13.7545)	
Growth	-0.0752	***
	(0.0149)	
Pop (mil)	1.8642	***
	(0.1390)	
Gini		
Income	0.0013	***
	(7.5300)	
Income-squared	-0.0004	***
	(0.0001)	
Obs.	980	

Note: Standard errors are in parentheses, ***, ** and * indicate 1%, 5%, and 10% levels of significance respectively and each regression has a constant term.

violence and growth are negatively related; population pressure and violence are positively related.

Our findings are similar to those of André and Platteau (1998) in Rwanda. Distributional conflicts over a relatively short range of inequality may combine with other causes to induce violence or its spread. For example, André and Platteau (1998) argue that although inequality nationally was not the prime source of the paroxysm of violence in Rwanda in 1994, the increasing local level of intensity of distributional tension contributed to the speed with which political violence spread through the Rwandan soci-

ety. Like us, they also find evidence of demographic pressure adding to intensity of local social conflict and disputes.

31.5.3 Interaction Effects: Inequality and Population Pressure

The test results for the hypotheses on the joint effects of inequality and the three measures of population pressure (H4) are presented in table 31.7. The three indicators of population pressure are interacted with the predicted value of Gini from table 31.1. Support for the hypotheses is found in the case of positive joint effects between inequality and population density (Model 2, table 31.7). This means that the violence-inducing risk of higher inequality is aggravated if it coincides with a greater population density.

Table 31.7: Joint effects of inequality and population pressure. **Source:** Calculated by the authors from BPS data.

	1		2		3	
Gini-predicted value	22.937	**	16.1926		21.728	**
	(9.957)		(10.5498)		(10.545)	
Growth	-0.034	***	-0.0337	***	-0.035	***
	(0.005)		(0.0048)		(0.005)	
Pop (mil)	0.390	***	0.3587	***	0.381	***
	(0.106)		(0.1078)		(0.107)	
Gini-predicted* pop. growth	0.095					
	(0.175)					
Gini-predicted*pop. density			0.0002	**		
			(0.0001)			
Gini-predicted* youth					0.051	
					(0.081)	
Obs.	980		980		980	
Wald χ^2 (p-value)	0.000		0.000		0.000	

Note: Standard errors are in parentheses, ***, ** and * indicate 1%, 5%, and 10% levels of significance respectively and each regression has a constant term.

31.5.4 Some Implications

What are the practical implications of the finding on the importance of population density and inequality, and their joint effect on violence? In order to answer this question, one needs to classify districts in terms of the dominance of the violence-causing variables.

Table 31.8 presents the results of such an exercise. **Bold** numbers indicate that values of the concerned variable are higher than ‘average plus one standard deviation’, while *italic* numbers denote values between ‘average’ and ‘average plus one standard deviation’. Consistent with the findings, some medium-size urban districts (Kota Cirebon, Kota Blitar, Kota Mojokerto, Kota Madiun, and Kota Bogor) have combinations of both high population density and high inequality (the respective figures are either in bold or italic), and at the same time their levels of violent incidences are indicated by bold numbers. Alarming, the three biggest cities in Java (all are provincial capitals), Kota Bandung, Kota Semarang, and Kota Surabaya, and the second largest city in Central Java, Kota Surakarta, have a combination of high population density and high inequality (both in bold numbers). Although their levels of violence still marked by italic numbers, by having a combination of high population density and inequality (both in bold numbers), their violence levels have the potential to escalate. Furthermore, policy-makers in other urban districts with a relatively low record of violent incidences such as Kota Bekasi, Kota Malang, and Kota Magelang should remain alert regarding social developments in their regions, since these cities have the explosive combination of high population density and high inequality as well.

In short, areas where high population pressure overlaps with high inequality are prone to suffer from the neo-Malthusian conflict scenario. These are mostly cities or urban areas that share the characteristics of high population density and high income inequality.

On the other hand, in the predominantly rural district of Indramayu (in West Java province), which is well-known for its higher prevalence of routine violence in the form of inter-village brawls, population density and inequality do not seem to matter (see table 31.8); the problem possibly lies in other more prominent underlying factors for routine violence, such as low income and lack of growth and human development as indicated by Tadjoeiddin and Mursheid (2007). The Indramayu district, however, is not alone. Other predominantly rural districts such as

Table 31.8: Violence, population density, and inequality, 1994-2003 (annual averages). **Source:** Calculated by the authors from BPS data.

	Violence incidents (per million pop.)	Pop. density (per km²)	Inequality (Gini)
Indramayu	5.96	780	0.279
Kota Cirebon	5.58	7163	0.305
Situbondo	5.29	415	0.293
Kota Blitar	4.87	3787	0.304
Kota Mojokerto	4.57	6653	0.303
Kota Pasuruan	3.54	12455	0.268
Kota Madiun	3.51	5695	0.315
Kota Bogor	3.28	4377	0.303
Kota Tegal	3.13	7293	0.245
Kota Bandung	2.78	13961	0.334
Kota Surakarta	2.75	11573	0.325
Kota Semarang	2.72	6050	0.352
Kota Tangerang	2.20	8000	0.299
Kota Surabaya	2.13	7260	0.355
Kota Probolinggo	2.05	7743	0.271
Kota Malang	1.68	7033	0.360
Kota Salatiga	1.66	6747	0.289
Sidoarjo	1.54	2523	0.295
Blitar	1.49	676	0.312
Kota Bekasi	1.44	6619	0.322
Tangerang	1.40	2444	0.323
Kota Pekalongan	1.27	18018	0.260
Malang	1.01	777	0.332
Tulungagung	0.97	880	0.311
Kota Magelang	0.83	6656	0.318

Sumedang, Pasuruan, and Demak share the characteristics of Indramayu. A closer look at the data reveals that these rural districts, which are marked by bold numbers in terms of their levels of violence, in fact marked by bold and italic numbers in terms of the income, economic growth, or human development (education) indicators (table 31.9).²¹ This indicates that in rural districts economic policies promoting economic growth and human development are more important with respect to violence prevention. The simultaneous promotion of economic growth and human development implies inclusive or shared growth that prevents inequality from rising during the process of economic

growth. Inclusive economic and human development policies should also seek regional balance so that they do not create pull and push factors for people to move from underdeveloped to more prosperous regions. Therefore, such policies that focus on employment-rich growth, public provision of basic education and health, and regional development will be both economically and socially stable in the long run as they are violence-reducing. These kinds of policies will avoid the mistakes of the past that led to the build-up of high population density and high inequality in the bigger cities of today.

Table 31.9: Violence, GDP growth, and human development, 1994-2003 (annual averages). **Source:** Calculated from BPS data.

Districts	Violence incidents (per 1 million pop.)	GDP growth (%)	Per capita GDP (IDR million)	Schooling (years)
Indramayu	6.0	1.3	3.0	4.9
Situbondo	5.3	3.0	1.4	4.9
Sumedang	3.4	2.9	1.2	6.7
Pasuruan	3.4	2.8	1.1	5.6
Demak	3.3	3.2	0.8	6.1

31.6 Conclusion

This chapter has examined the role of population pressure and vertical inequality and their possible joint effects on routine violence across districts in Java. It looks at violence from the perspectives of neo-Malthusian theory and social justice. These issues are highly relevant for densely populated Java. Furthermore, the effects of global climate change (e.g. rising sea level) and environmental degradation are likely to deepen the Malthusian scenario for Java. Unlike the country as a whole, the island is ethnically relatively homogenous. Count data panel data regression technique of 98 districts in Java during the period from 1994 to 2003 is employed.

21 The bold figure for income, growth, and human development is classified as having values of these variables that are less than 'average minus one standard deviation', while the italic number refers to values of these variables that fall between the 'average minus one standard deviation' and 'average'. Data regarding these variables are available from the authors.

Using population density as an indicator of population pressure, empirical evidence of the neo-Malthusian conflict scenario has been found. The effect gets worse if higher population density coincides with higher population growth.

Although the role of vertical inequality in conflict has been largely discounted in empirical cross-country studies, empirical evidence for a violence-inducing effect of vertical inequality is found. This finding is based on the empirical validity of the Kuznets hypothesis of an inverted-U relationship between inequality and income. The finding on the inequality effect helps in explaining the inverted-U relationship between income and violence by Tadjoeeddin and Murshed (2007). The effect of income on violence is channelled through inequality.

The violence-inducing risk of higher inequality is aggravated if it coincides with a higher population density. Inequality-induced grievances would be more intense and spread more quickly in more densely populated localities. In sum, this finding points to the extremely unsafe mixture of vertical inequality and population pressure, making strategies of growth with redistribution imperative.

The implications of the findings on the importance of social policies controlling population density and income inequality with respect to violence prevention, however, seem to be more relevant to urban districts. In contrast, in rural districts economic policies promoting income, growth, and human development are found to be of greater importance.

Statistical Appendix

Table 31.10: Gini and PC RGDP by district in Java (continued). **Source:** Calculated from BPS data.

	Gini 2003	PCRGDP 2005 (Indonesia=100)
West Java		
01. Bogor	0.279	66
02. Sukabumi	0.260	42
03. Cianjur	0.258	41
04. Bandung	0.260	68
05. Garut	0.274	50
06. Tasik Malaya	0.302	43
07. Ciamis	0.313	48
08. Kuningan	0.246	34
09. Cirebon	0.249	37
10. Majalengka	0.269	35
11. Sumedang	0.296	58
12. Indramayu	0.311	136
13. Subang	0.240	51
14. Purwakarta	0.241	83
15. Karawang	0.242	101
16. Bekasi	0.231	217
71. Kota Bogor	0.341	43
72. Kota Sukabumi	0.227	65
73. Kota Bandung	0.287	119
74. Kota Cirebon	0.322	174

	Gini 2003	PCRGDP 2005 (Indonesia=100)
75. Kota Bekasi	0.343	76
Central Java		
01. Cilacap	0.273	294
02. Banyumas	0.326	30
03. Purbalingga	0.281	28
04. Banjarnegara	0.258	35
05. Kebumen	0.288	23
06. Purworejo	0.264	38
07. Wonosobo	0.294	24
08. Magelang	0.268	32
09. Boyolali	0.283	40
10. Klaten	0.331	46
11. Sukoharjo	0.259	54
12. Wonogiri	0.265	28
13. Karanganyar	0.297	56
14. Sragen	0.314	32
15. Grobogan	0.295	21
16. Blora	0.242	24
17. Rembang	0.240	34
18. Pati	0.244	37
19. Kudus	0.234	207
20. Jepara	0.278	38
21. Demak	0.290	26
22. Semarang	0.268	58

	Gini 2003	PCRGDP 2005 (Indonesia=100)
23. Temanggung	0.260	32
24. Kendal	0.286	52
25. Batang	0.269	36
26. Pekalongan	0.269	38
27. Pemasang	0.274	27
28. Tegal	0.261	22
29. Brebes	0.250	33
71. Kota Magelang	0.299	81
72. Kota Surakarta	0.286	87
73. Kota Salatiga	0.283	59
74. Kota Semarang	0.303	128
75. Kota Pekalongan	0.233	70
76. Kota Tegal	0.235	48
East Java		
01. Pacitan	0.274	26
02. Ponorogo	0.309	34
03. Trenggalek	0.317	26
04. Tulungagung	0.314	69
05. Blitar	0.290	49
06. Kediri	0.292	39
07. Malang	0.301	55
08. Lumajang	0.296	52
09. Jember	0.252	43
10. Banyuwangi	0.281	57
11. Bondowoso	0.272	29
12. Situbondo	0.288	54
13. Probolinggo	0.287	59
14. Pasuruan	0.272	43
15. Sidoarjo	0.273	148
16. Mojokerto	0.280	58
17. Jombang	0.266	48
18. Nganjuk	0.275	44
19. Madiun	0.293	42
20. Magetan	0.330	49
21. Ngawi	0.278	35
22. Bojonegoro	0.250	47
23. Tuban	0.275	51
24. Lamongan	0.239	35
25. Gresik	0.284	123
26. Bangkalan	0.290	37

	Gini 2003	PCRGDP 2005 (Indonesia=100)
27. Sampang	0.266	26
28. Pamekasan	0.242	26
29. Sumenep	0.281	49
71. Kota Kediri	0.254	899
72. Kota Blitar	0.295	51
73. Kota Malang	0.319	143
74. Kota Probolinggo	0.245	86
75. Kota Pasuruan	0.244	61
76. Kota Mojokerto	0.258	101
77. Kota Madiun	0.269	66
78. Kota Surabaya	0.358	274
79. Kota Batu	-	64
Banten		
01. Pandeglang	0.251	36
02. Lebak	0.249	33
03. Tangerang	0.363	58
04. Serang	0.270	91
71. Kota Tangerang	0.263	163

Table 31.11: Summary statistics, routine violence. **Source:** Calculated from BPS data.

Variable	Obs	Mean	Std. Dev.	Min	Max
Violence (incidents)	980	2.0	3.0	0	21
Growth of income (%)	980	3.6	6.4	-30.6	64.9
Income (Rp. million)	980	1.7	2.4	0.5	26.1
Population (million)	980	1.1	0.7	0.1	5.2
Pop. growth (%)	980	1.1	1.4	-0.6	10.7
Pop. density (/km ²)	980	2,283	3,251	332	22,182
Gini	980	0.286	0.035	0.196	0.535
Youth (%)	980	20.3	2.7	13.3	30.6

Table 31.12: Matrix of correlations, routine violence. **Source:** Calculated from BPS data.

	Violence	Growth	Income	Pop	Pop. growth	Pop. density	Gini	Youth
Violence	1							
Growth of income	-0.168	1						
Income	0.006	0.072	1					
Population	0.458	-0.023	-0.071	1				
Pop. growth	0.087	0.143	0.056	0.136	1			
Pop. density	-0.016	0.061	0.235	-0.171	0.074	1		
Gini	-0.035	0.105	0.123	0.130	-0.006	0.207	1	
Youth	0.118	0.144	0.270	0.122	0.444	0.5811	0.239	1

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32 Territorial Integrity and Sovereignty: Climate Change and Security in the Pacific and Beyond

Achim Maas and Alexander Carius

32.1 Introduction¹

In June 2009 the United Nations General Assembly acknowledged, with resolution A/64/281, that climate change may have implications for security (chap. 33 by Kurtz). The small island states were among the main drivers behind the resolution because of their concerns regarding the impacts of climate change. Two years earlier, in April 2007, several countries had mentioned during the debate at the United Nations Security Council that the small island states are those which are particularly threatened by climate change (UNSC 2007). The General Assembly resolution was adopted without any objections in June 2009. Furthermore, the report of Secretary-General Ban Ki-Moon (UNSG 2009) identified statelessness induced by *sea-level rise* (SLR) as one of the five main challenges of climate change. However, this chapter argues that the impacts of climate change on the Pacific region, in particular on the Pacific island states, is underlined by a degree of complexity which goes beyond the current political discourse on ‘climate refugees’ (chap. 15 by Biermann/Boas) and vanishing atolls.²

This chapter aims to provide a review of the possible security implications of climate change in the Pacific for different sectors, ranging from non-traditional security threats – such as threats to human security, food and energy insecurity, disasters, and others – to traditional security challenges relating to territorial integrity and sovereignty (PSIDS 2009; Marshall Islands 2009). It draws on an extensive review of secondary literature, the results of a scenario work-

shop carried out in Suva (Fiji) on 10 September 2009 with regional stakeholders³, and the perspectives outlined by regional governments on the impact of climate change on security. The chapter takes an explorative approach in this regard, focusing on outlining and reflecting upon key threats in the region to various dimensions and aspects of security.

To achieve these aims, the chapter is divided into the following sections: firstly, there will be a short discussion on the meaning of security with regard to climate change and security on Pacific small island states (32.2). Next, the implications of climate change for the Pacific will be reviewed (32.3). Thirdly, the potential security implications of climate change at the domestic level are outlined (32.4). Lastly, impacts on borders, territories, and statehood will be discussed (32.5). In the closing remarks, the authors reflect upon five key challenges identified with regard to their global implications and how to possibly turn these challenges into opportunities.

32.2 Prelude: Security Conceptions

Conceptions of security in the Pacific have seen a broadening over the past decade. The *Forum Regional Security Committee* (FRSC) – a body of the Pacific Island Forum, which includes all Pacific small island states – identified in 2006 “that potential security challenges included political insecurity, population growth exceeding economic growth, land availability, ethnic politics and public policies of social exclusion, environmental insecurities (land, water, energy), ur-

1 The authors would like to thank Halvard Buhaug, Hans Günter Brauch, and the reviewers for their comments on various versions of this chapter.

2 For a critical overview of the concept of ‘climate refugee’, see Jakobeit/Methmann 2007; see chap. 16 in this volume.

3 The workshop was part of a series of regional workshops carried out by the authors as part of an EU-funded research project on climate change and international security. For more information, see <http://www.adelphi.de/en/resources/project_database/dok/43525.php?pid=296>.

banisation and food shortages” (quoted in Cole/Shanahan/Furi 2010: 33). This is the result of a gradual evolution, documented in various declarations including the 1992 Honiara Declaration on Law Enforcement Cooperation, the 1997 Aitutaki Declaration on Regional Security Cooperation, the 2000 Biketawa Declaration, the 2000 Nadi Framework Initiative, and the 2002 Nasonini Declaration on Regional Security, among others (Cole/Shanahan/Furi 2010: 34–35).

This broadening reflects a political and academic trend recognizable since at least the latter stages of the Cold War. Most famously, the *United Nations Development Programme* (UNDP) outlined the concept of human security, which encompasses a variety of dimensions, including (in alphabetical order) community security, economic security, environmental security, food security, health security, personal security, and political security (UNDP 1994: 24–25). Since then, entire libraries have been filled with writings on the countless nuances of these different aspects of security in their various academic, political, and regional interpretations.⁴ What they have in common, however, is that human and other conceptions of security are often contrasted with ‘traditional’ or state-centered definitions of security, which focus on issues such as territorial integrity and defence (Buzan/Wæver/de Wilde 1997).

When it comes to the security implications of climate change for small island states, this contrasting of human and state security loses meaning (Marshall Islands 2009). Though it has been pointed out that deliberations on the security implications of climate change have often used confusing definitions of security, leading to less useful analysis (Brzoska 2009), there are probably few areas in the world so comprehensively impacted as the small island states. As will be outlined below, not only are human security issues such as access to food, health, or continued existence as a socio-cultural identity threatened, but the territory itself and its habitability is threatened by climate change. Focusing on either state- or non-state-centred conceptions of security would be overly reductionist (PSIDS 2009; Marshall Islands 2009).

At the same time, this chapter will not be limited to either state- or non-state-centred conceptions of security. However, more emphasis will be placed in the latter parts of this chapter on issues of territory and sovereignty, as human security aspects of climate

change for small island states have been extensively addressed and discussed elsewhere (Kinnas 2009; Barnett 2009).

32.3 Climate Change and the Pacific: An Overview

The focus of this chapter will be on small and developing island states in the Pacific. In particular, the following countries and territories will be addressed: the Cook Islands, the *Federated States of Micronesia* (FSM), Fiji, Kiribati, the Marshall Islands, Nauru, Niue, Palau, *Papua New Guinea* (PNG), Samoa, the Solomon Islands, Tonga, Tuvalu, and Vanuatu. Their total combined population is approximately 9 million and they have a land mass of around 500,000 km², which is comparable to the size of Spain, and PNG accounts for more than 60 per cent of both. On the other hand, their combined maritime territory is approximately 20 million km², around four times the size of the *European Union* (EU) (Carius/Maas/Barkemeyer 2009; Chasek 2009).

Size, geography, development, and population vary greatly, from relatively large, high-rising island states such as Papua New Guinea, with over five million inhabitants, to small atoll countries such as Tuvalu, which rises only a few metres above sea level and has just over ten thousand inhabitants. Conversely, PNG has the lowest population density with just 15 people per km², while Tuvalu has 383 inhabitants per km² of land. Similarly, economic and human development differs significantly across the island states.⁵

Despite these differences, the Pacific island states share a number of common traits: subsistence farming and fishing are among the main sources of food, income, and employment. Tourism is a major economic sector as well as a source of foreign currency. Fishing rights within their *exclusive economic zones* (EEZs) are occasionally granted. Their resource base with regard to arable land and fresh water is in most cases limited, owing to their small size. Many goods need to be imported, including energy (mostly fossil fuels), processed food, raw materials, and manufactured goods (Booth 2006). Population, settlements, and

4 The Hexagon series provides a comprehensive overview of these different developments and debates, see e.g. Brauch/Oswald Spring/Grin et al. (2009).

5 For more socio-economic and demographic data, see UNPD (2008) and UNDP (2009). However, it should be noted that significant data gaps remain, and for instance for the Cook Islands, FSM, Kiribati, Nauru, Palau, and others, there is insufficient data to calculate the human development index (UNDP 2009).

economic activity are mostly concentrated in coastal areas. A further main source of income is remittances by islanders living abroad, which, however, have started to decline over time with the onset of the world financial crisis (ADB 2009). A newly emerging field for economic activity is deep-sea mining, i.e. mining minerals and other natural resources on the ocean floor. The first mine in PNG waters is scheduled to become active in 2010 (Carius/Maas/Barkemeyer 2009).

The small size of the island countries makes it difficult for them to profit from economies of scale, resulting in disproportionately large administrations and the need mentioned above to import many goods (UNDESA 2007). Increasing population growth is expected to further exacerbate land and resource scarcity (Booth 2006). High population densities, tourism, and unsustainable exploitation of natural resources have a negative impact on ecosystems, including groundwater resources, soil fertility, forests, and coastal areas (Barnett 2009). Over-harvesting of fish and under-reported and illegal fishing pose a threat to food security, marine biodiversity, and state revenues, and the recent food price crisis heavily impacted import-dependent small island states (ADB 2009a). Furthermore, while deep-sea mining may provide a new source of revenues, there are environmental concerns about its impact on marine ecosystems and hence on fishing (UNSG 2010). Despite the potential, the possible trade-offs between deep-sea mining and other uses are not yet well assessed throughout the Pacific.

However, the April 2010 oil leak in the Gulf of Mexico, resulting from an accident on the Deepwater Horizon oil platform, may highlight potential environmental damages. The effort to stop the oil leak has proved to be extraordinarily challenging and may have vast economic and environmental costs (Deepwater Horizon Response 2010).⁶ The accident also demonstrates that even a disaster on the high seas may have repercussions for coastal communities. With the concentration of island states' population and economic assets in coastal areas, such an event may have a proportionally larger impact than in the United States. This risk was highlighted among others by the *UN Secretary-General* (UNSG) in his report to the Com-

mission on Sustainable Development regarding mining trends in small island developing states (UNSG 2010; chap. 33 by Kurtz).

Generally, the Pacific island states are relatively peaceful and stable, with few reported human rights abuses. However, Fiji, the Solomon Islands, and PNG have seen coups and violent conflicts in the past decades. Furthermore, violent riots have occurred in several countries. Land is mostly customarily owned in the Pacific and disputes over land tenure and land rights have been frequent; traditional and modern governance structures do not co-exist without friction, making it more difficult to settle disputes. The 2004 violent escalations in the Solomon Islands have been partly attributed to land disputes (Pacific Islands Forum Secretariat 2008), but they also had ethnic components in view of the way in which Chinese residents and property were targeted (Dobell 2007). Similarly, the 1987, 2000, and 2006 coups in Fiji have been related to tensions between indigenous Fijians and Fijians of Indian descent (Leuprecht 2008).

Against this background, climate change is likely to become a serious challenge for the Pacific island states. Three main concerns arise in particular: change in sea level (box 32.1); extreme weather events and disasters; and livelihood degradation.

32.3.1 Sea-level Change

Sea levels are not uniform across the globe, and, much like terrestrial landscapes, consist of valleys and mountains (Paskal 2010). While it is internationally agreed that sea levels are rising, estimates diverge substantially. The *Intergovernmental Panel on Climate Change* (IPCC) estimates a potential global rise in sea level of 0.18 m to 0.59 m by the end of this century (Solomons/Qin/Manning et al. 2007). Local SLR in the Pacific could be even higher, with estimates for American Samoa ranging up to 0.88 m (Mimura/Nurse/McLean et al. 2007). More recent studies show that in the case of insufficiently mitigated climate change, global SLR of 2.0 m may be a possibility (Allison/Bindoff/Binschadler et al. 2009). However, the forecast of a 2-metre rise is somewhat theoretical, with 1-1.5 metres being more realistic and likely according to several authors (Vermeer/Rahmstorf 2010; Grinsted/Moore/Jevrejava 2010; Pfeffer/Harper/O'Neel 2008). The change will neither be uniform nor linear across the globe and may exhibit inter-annual and inter-decadal variability – hence, sea level may rise faster in some areas of the world and in some decades, only to rise slower or even decrease in

6 See also additional reporting by the *New York Times*: “Gulf of Mexico Oil Spill”, 24 May 2010; at: <http://topics.nytimes.com/top/reference/timestopics/subjects/o/oil_spills/gulf_of_mexico_2010/index.html> (25 May 2010).

Box 32.1: Climate change, science, security, and the Small Island States. **Source:** The information was compiled by the authors based on the cited literature.

The image of sinking islands in particular captures the attention of mass media as far as climate change and small island states are concerned. This image is frequently used as an indication of the urgent need for climate mitigation. Indeed, prior to the climate negotiations in Copenhagen in 2009 the cabinet of the Maldives conducted a highly symbolic and much publicized session under water.^{a)} On closer examination, however, this portrayal of victimhood is a stylization rather than the result of robust science (Farbkoto 2010).

As outlined elsewhere in this chapter, many uncertainties remain (CSCAP 2010). The uncertainties regarding change in sea level (Grinsted/Moore/Jevrejeva 2010; Vermeer/Rahmstorf 2010), as well as responses by islands to issues such as changes in coral growth patterns (Webb/Kench 2010), allows a general overall trend to be identified but limits any concrete, local assessment. Furthermore, rates of change are difficult to predict, and changes in sea level will not be uniform across the globe but could vary greatly across time and space (Solomons/Qin/ Manning et al. 2007; Mimura/Nurse/McLean et al. 2007).

The lack of systematic knowledge is not limited to sea-level rise. Often, research does not cover *all* islands within a *single* island state. Indeed, for several island states, there is insufficient data to calculate a human development index (UNDP 2009). The remoteness of some outlying islands results in research often focusing on the main islands or a few of the larger islands. Research often captures only a snapshot of some regions. These gaps also extend to the activities of various stakeholders such as *non-governmental organizations* (NGOs) working on adaptation in the Pacific, which are often only recorded in a limited way (Barnett/Campbell 2010). The majority of national communications submitted to the secretariat of the *United Nations Framework Convention on Climate Change* (UNFCCC) date back to 1997–2003. The most recent addition was Fiji, whose national communication dates back to 2006 (UNFCCC 2011). In particular, the recent scientific findings on change in sea level (see below) call for an update.

a) For reporting on the event, see Andrew Revkin: “Maldives Officials Dive to Push CO2 cuts”, in: *New York Times*, 2009: at: <<http://dotearth.blogs.nytimes.com/2009/03/16/maldives-seeks-carbon-neutrality-by-2020/?scp=1&sq=maldives%20cabinet%20underwater&st=cse>> (22 February 2011).

As a consequence, there is only a fragmented picture available, and at the same time much analysis is based on inference from selected, well-researched cases, and requires validation. For instance, the evacuation of the Carteret Islands of Papua New Guinea has been considered the first case of climate refugees by NGOs and has been much publicized (Luetz 2008). However, natural erosion processes and population growth also played a significant role (O’Collins 1990) and, in fact, evacuation had been considered more than 40 years ago (Müller 1972). Although climate change may have aggravated the situation, this case shows the need for sound analysis and the understanding of causal mechanisms and linkages.

These uncertainties do not render climate change a less serious issue. Indeed, there is sufficient knowledge of general trends to indicate that climate change will be amongst the most serious challenges facing island states in the future. Instead, the uncertainties highlight the need to go beyond the coarse picture of vanishing islands and conduct more down-scaled and fine-grained analysis in order to identify specific vulnerabilities and policy needs.

Several authors have discussed the possible security implications of climate change for the Pacific, including Kinnas (2009), Barnett (2009), and Barnett/Adger (2003). The focus has been mainly on the internal dimension, and has ranged from issues of food security over migration to armed conflict. However, analysis often remains at the macro level, complemented by individual case studies or anecdotal evidence. What is needed is more systematic, empirical, and comparative analysis.

Recently, the prospect of changes to maritime boundaries – and the implications for statehood and sovereignty – have started to attract scholarly attention (Yamamoto/Esteban 2010). Though neither territorial disputes nor statelessness are new phenomena, climate-induced border changes are unprecedented in international law or other disciplines. In particular, the question of maritime territory is one which is relevant not only for small island states but for all coastal nations.

the following time period. The Pacific has already witnessed above-average increases in the 1993–2003 period (Solomons/Qin/Manning et al. 2007: 412). However, there have recently been indications that some islands may rise above sea level as they consist largely of coral debris, which may accumulate over time and thus allow some islands to grow with SLR

(Webb/Kench 2010). Whether the ‘rate of growth’ can stay ahead of the rate of sea-level rise is a different matter and requires more research (Webb/Kench 2010). Still, unsustainable coastal management marked by severe erosion caused by an increased concentration of urban infrastructure and settlements may further aggravate the situation. Coastal erosion

may also be accelerated by a probable increase in the intensity of extreme weather events (PSIDS 2009; Barnett 2009). The geographical differences between the various islands will lead to greatly varying impacts: some, like Tuvalu and Kiribati, are low-lying atoll countries, rising only a few metres above sea level. Any increase in sea level will have a considerable impact on their land mass. Others, such as Fiji and PNG, are high-rising and even have mountains. While in all cases settlements are still concentrated in coastal areas, Fiji and PNG are thus far less threatened from inundation than are low-lying island states. Continued SLR is a persistent threat: it is estimated that sea levels are likely to rise for the next few centuries because of the inertia of the oceans (Solomons/Qin/Manning et al. 2007). The full extent is unclear and depends on many factors, but will be for all practical purposes an issue for many coming generations.

32.3.2 Extreme Weather Events and Disasters

The Pacific is likely to experience an increase in the frequency and intensity of extreme weather events. This includes heatwaves and droughts and also tropical cyclones and storm surges (Mimura/Nurse/McLean et al. 2007). In the past, disasters have often led to a decline in tourism due to the resultant impacts on tourism sites. A good example is the case of Niue: Cyclone Heta in 2004 resulted in waves in excess of 50 metres in height devastating large parts of the island and destroying houses built as high as 25 m above sea level (Barnett/Ellemor 2007). Cyclone Orfa in 1990 even turned Niue from a food-exporting country to a food-importing country for two years, due to the destruction of important agricultural infrastructure (Mimura/Nurse/McLean et al. 2007). Climate-related SLR and coastal erosion are likely to make future disasters more devastating even if they do not increase in size and intensity.

32.3.3 Livelihood Degradation

Sea-level rise will increase saltwater intrusion, degrading fresh water resources. Increased air temperatures will lead to higher evaporation rates, reducing the availability of fresh water. This will diminish agricultural production unless new resistant crops are introduced to offset these impacts. In addition, coral bleaching may intensify over the coming decades with a probable reduction in inshore fishing leading to a potential collapse of the fishing industry in the region (Alling/Doherty/Logan et al. 2007; Gillett/Cart-

wright 2010). As a consequence of degradation, human health and well-being are likely to be negatively affected because of the spread of climate-sensitive diseases (Mimura/Nurse/McLean et al. 2007).

The combined impacts are likely to compromise the socio-economic foundations of the island states: the potential for subsistence farming and fishing is diminishing while demands will increase due to population growth. Dependency on imports is likely to increase; again, the case of Niue is interesting, as past disasters transformed the country into a net food importer for a period of time. However, the recent food crisis highlighted the vulnerability of these countries to global market fluctuations (ADB 2009). Disasters, coastal erosion, and coral bleaching, among other things, may diminish the potential for tourism. Thus the main sources of income and employment may also decrease, making it difficult to acquire goods internationally. Unless foreign aid and/or remittances increase, new sources of income may become necessary such as more concessions for deep-sea mining or increased blue-sea fishing (Carius/Maas/Barkemeyer 2009).

32.4 Security Implications of Climate Change in the Pacific

A principal threat of climate change for the small island states will be human insecurity, particularly access to food, threats of diseases and disasters, economic marginalisation and loss of income, reduction of available land, and possible community disintegration (Barnett 2009; Kinnas 2009). The *Pacific Small Island Development States* (PSIDS) have collectively and individually highlighted this challenge in the context of the United Nations (UNSC 2007; PSIDS 2009; Nauru 2009; Tuvalu 2009; Solomon Islands 2009; Marshall Islands 2009; Micronesia 2009).

A second challenge emerges from the geographical alteration of productive landscapes. Shrinking land mass and loss of income opportunities may fuel current migratory processes, particularly from the outer islands to the main islands (PSIDS 2009; Barnett/Campbell 2010). Resource pressures on the main islands may thus escalate, further aggravating the first challenge outlined above. However, as all land is customarily owned, re-settling on the main islands may be difficult and people may be forced to settle in marginalized areas - which may be still contested (Pacific Island Forum Secretariat 2008). Furthermore, because all lands are customarily owned and have been

passed down for generations, land is of great importance for the islanders' identity and social cohesion (Campbell 2010). Indeed, the loss of land and uprooting could be traumatic, with climate-induced inundation of islands threatening the collective identities of communities and island societies (cf. UNSG 2009; Solomon Islands 2009; Marshall Islands 2009; Kiribati 2009; Rayfuse 2009; Yamamoto/Esteban 2009).

Out-migration of islanders to other countries as a result of climate change may also occur (FSM 2009). However, it is unlikely that this will become a major issue internationally, as the total population is relatively small. Also, only a fraction of the islanders have the necessary social and economic capital to migrate. Out-migration of skilled islanders would result in a brain drain (PSIDS 2009; Marshall Islands 2009): Due to the above-mentioned impacts, the opportunities for unskilled labour may diminish, increasing dependencies on remittances. It may also lead to an exodus of those with the skills needed to cope with the impacts of climate change locally. However, high levels of education and development make it considerably easier for islanders to move and some countries, such as Kiribati, intend to create dedicated educational programmes to migrate in dignity and contribute actively to their host societies. As such, they may also be more welcomed in host societies. Negotiations with neighbouring countries, particularly with Australia and New Zealand, are under way to facilitate migration, though with limited success so far (Rayfuse 2009).

The combination of impacts may lead to a third challenge: political instability as a result of climate-accentuated pressures. The multiple stresses may give rise to several conflict constellations, where the interactions of climate change with other factors may increase the risk of violent conflict (WBGU 2008).⁷ Disputes over land as a result of inequalities and friction between traditional and introduced land management systems as well as intra-state migration may be aggravated (Marshall Islands 2009; Solomon Islands 2009). Other islands may face developments similar to those in the Solomon Islands or PNG, as the impacts of climate change may increasingly compromise the capacities of states to mediate conflicting interests between different groups (Pacific Island Forum Secretariat 2008).

⁷ For a more elaborate overview of the debate on climate change, security, and armed conflict, please see WBGU 2008, Buhaug, Gleditsch, and Theisen (2008), and Gleditsch and Nordås (2009).

While the majority of island states are at present relatively stable and peaceful, the impacts of climate change will be much more pronounced due to the small size of the respective countries, and may accelerate already threatening trends. Addressing in particular the first two challenges will be vital in order to avoid impacts on political stability and escalation into violent confrontation. The major risk is that island states may become increasingly fragile, i.e. no longer capable of providing public services such as security, a working justice system, welfare, participation, etc. (Kinnas 2009; Barnett 2009). In such a situation, a singular crisis event – be it a food shortage crisis or a natural disaster – may trigger a violent release of the tensions resulting from disputes (WBGU 2008).

32.5 No Island, No Claim? Territoriality and Geopolitics

In contrast to other world regions, island states face additional unique impacts arising from sea-level rise. They can be subdivided into two challenges: first, the territorial integrity of Pacific island states due to rising yet fluctuating sea-levels, and second, a challenge to the sovereignty of Pacific island states in the case where they become submerged or deserted (PSIDS 2009; Micronesia 2009; UNSG 2009; Tuvalu 2009). These challenges exist even if islands adapt geologically, as that process is likely to be uneven and lead to changing shorelines (see Webb/Kench 2010).

At present, the combined exclusive economic zones of the Pacific island states are several times larger than the whole of the EU. With the potential of blue-sea fishing and deep-sea mining, the EEZs are important economic assets. As has been outlined above, inter-annual and inter-decadal fluctuations of sea-level may lead not only to contracting but also to expanding maritime territories. The *United Nations Convention on the Law of the Sea* (UNCLOS), however, is not designed to handle dynamically changing boundaries, and presumes a more or less “fixed” coastline extending from the land mass of a country (Paskal 2010). As a result of SLR and coastal erosion, it becomes uncertain how far the EEZ and thus the maritime territory of the island states may actually change, with conventional international law currently offering little advice.

The melting of the Arctic demonstrates the impacts of climate change on international relations (Crawford/Hanson/Rummills 2008). Fears have also emerged that newly available resources in the Arctic

may lead to confrontation between the littoral states (Paskal 2010). Although the chances of direct violent interstate conflict are low (see Lee 2009), disputes may become militarized; for instance, the Canadian government has stated its readiness to defend Canada's sovereignty (Maas/Briggs/Cheterian et al. 2010: 27).

Climate change has similar potential for disputes in the Pacific, but from a different perspective: instead of opening up new resources, sea-level rise is likely to lead to shrinking maritime territories and to international disputes over the extent of current boundaries. The resultant problem is highlighted in two recent cases: first, in the Gulf of Mexico, one island claimed by Mexico could no longer be located.⁸ As a consequence, the USA stated that without an island, there could also be no claim on the EEZ, which would lead to a dramatic reduction of Mexico's maritime territory – after all, even a small inhabited island would have access to a 200-nautical-mile radius EEZ, a maritime territory of over 430,000 km², which is nearly the size of Sweden. In a second case, a longstanding dispute between India and Bangladesh over an island, which even involved military deployments, was resolved as sea-level rise and coastal erosion led to the disappearance of the island.⁹

In the case of the Pacific island states, 95 per cent of their territory is maritime in nature and every loss of land may result in the loss of thousands of square kilometres of maritime territory (PSIDS 2009). Theoretically, there are several ways of avoiding the loss of territory. For instance, states could agree to fix maritime boundaries, e.g. based on satellite footage from a specific year (Yamamoto/Esteban 2010). However, this would require agreeing on a specific date, which could be difficult: as anthropogenic climate change is already occurring and increases in sea levels have been identified in the past decades, it may be difficult to agree on a date when coastlines were sufficiently unaltered by climate change. In such a case, the island lost by Mexico may re-emerge as well. Furthermore, the maritime territory of some island states may actually grow if the coastlines of neighbouring islands were to erode faster or more substantially due to geological

reasons – an incentive not to agree on a date in the past to fix coastlines.

Alternatively, islands could be preserved by building sea defences, called the “Dutch scenario” by Yamamoto and Esteban (2010). Apart from the technical difficulties, building and maintenance may be a costly activity as it may require building hundreds of kilometres of sea walls on each island. Given the uncertainty over the actual amount of SLR over the next decades, and the fluctuation of sea-levels, the size of such sea walls is difficult to estimate. The construction costs would be on top of the other costs of adapting to higher temperatures and disasters. It also poses the risk of preventing the growth of islands mentioned above.

Apart from actual changing coastlines, UNCLOS distinguishes between islands and rocks in article 121: the former is defined as a naturally formed area of land, surrounded by water, which is above water at high tide and can sustain human habitation. Rocks by definition cannot sustain human habitation or economic life of their own (Yamamoto/Esteban 2010: 21; Charney 1999). Rocks also do not qualify for an exclusive economic zone, only a much reduced safety area. As climate change may make islands unviable – due to disasters, soil erosion, groundwater salinization, etc. – the question arises as to whether they may become reduced to rocks according to UNCLOS (Rayfuse 2009). Hence even if islands do not become fully submerged and unprotected, territory may still be considered ‘lost’ under international law.

Dynamically changing maritime boundaries will have implications for access to maritime resources and may lead to legal disputes (PSIDS 2009), and not only between island states: several external powers have shown increasing interest in the natural resources of the Pacific, including fish, minerals, and energy resources to meet growing domestic demands and to diversify import sources (Wesley-Smith 2007). As climate change is compromising the current economic bases and major sources of income of Pacific island states, dependency on external supporters may increase – and this may provide opportunities for “win-win” situations, where Pacific island states trade access to resources for external support. Indeed, concessions for mining and fishing may be one of the few remaining major sources of income for financing adaptation or sea defences (see Carius/Maas/Barke-meyer 2009).

However, a caveat is potential corruption, which has been a critical issue for several island states, and has led to large amounts of lost revenues (Tsamenyi/

8 Cleo Paskal, 2010: “Strange case of disappearing island”; at: <http://www.nzherald.co.nz/world/news/article.cfm?c_id=2&objectid=10635956> (20 May 2010).

9 See Shiv Sahay Singh, 2010: “New Moore no more: rising sea claims island in Bay of Bengal”; at: <<http://www.indianexpress.com/story-print/594929/>> (20 May 2010).

Hanich 2006). Furthermore, there is increasing competition in the Pacific between regional powers such as Taiwan and China (Paskal 2010). Both vie for increased influence in the Pacific island states, and not only because of the riches the EEZ has to offer in terms of geological or biological resources: in the case of Taiwan, recognition by the island states provides it with legitimacy¹⁰ and provides an avenue for indirectly influencing international organizations in its favour by convincing actual member states – such as island states – to vote in Taiwan’s favour.

China has broken formal diplomatic relations with those countries recognizing Taiwan and is attempting to reduce Taiwan’s influence (Tsamenyi/Hanich 2006). The actions of both countries have been described as a ‘chess game’, akin to the Cold War where the superpowers vied for influence in other countries (Dobell 2007). Indeed, both countries have exploited divergent positions within other countries, leading to governmental instability (Paskal 2010). Some authors attribute the violence in the Solomon Islands in part to the influence of external powers, as it has fuelled corruption and polarized the society (Dobell 2007). Competition for access is not limited to Taiwan and China, but is most pronounced between these two for historical reasons.

At the same time, the difficult international landscape may receive an additional layer of complexity if sea levels start to shift. This adds to the domestic challenges of climate change facing island states and may further reduce their “interaction capacity” (Halden 2007) to tackle either of the emerging problems fully and sufficiently due to the constraining impacts on them.

32.6 Sovereignty and Climate Change

Beyond the question of territory, another unique challenge that arises for small island states and in particular for low-lying atoll countries – in the Pacific, these are the Marshall Islands, Tuvalu, and Kiribati – is the threat of total inundation, or that the islands become for all practical purpose uninhabitable (Marshall Islands 2009; Tuvalu 2009; Kiribati 2009). Indeed, several island states such as Tuvalu (Rayfuse 2009) are already negotiating relocation options with New Zea-

land and Australia. Others, like Nauru, see the relocation of entire populations or similar measures as a possible future necessity (Nauru 2009). Such an event would challenge the definition of statehood and sovereignty and may affect privileges of statehood, such as membership of international organizations, diplomatic immunity, trade relations, eligibility for development aid or loans from the World Bank and the International Monetary Fund (IMF), access to the *International Court of Justice* (ICJ), etc. (Kiribati 2009).

No internationally or academically agreed definition of statehood or sovereignty exists (Yamamoto/Esteban 2010). While sovereignty is normally attributed to having control over a specific territory (ibid.)¹¹, this does not necessarily lead to state recognition: many political entities such as Kosovo, Taiwan, or other entities such as Abkhazia and South Ossetia only enjoy a very limited recognition. Some political entities such as Transnistria, Nagorny Karabakh, and Somaliland are not recognized by any UN member state. Somaliland is an interesting case as it exhibits state-like properties such as having a working constitutional democracy, its own currency, and other aspects, while it is unsuccessfully striving for international recognition as a sovereign state independent of its suzerain Somalia (Bradbury 2008; ICG 2006). Instead, Somalia’s *transitional federal government* (TFG) is recognized as a legitimate government, though it was formed outside Somalia and subsequently relocated within Somalia – with limited success in re-establishing statehood throughout the country (ICG 2008).

The case of Somalia demonstrates that *de jure* recognition as a state by other states is of key importance for those having lost any territorial control – in contrast to entities such as Somaliland and Taiwan who exhibit state-like properties, as listed in the Montevideo Convention, but are only recognized by a few states, if any. States at risk of losing their territory may thus continue to be recognized even after the relocation of their seat of government and population. However, in the case of Somalia, there is at least the prospect of return to a defined territory – an option

10 Currently, 23 countries recognize Taiwan, including six Pacific island states: Kiribati, Marshall Islands, Nauru, Palau, Solomon Islands, and Tuvalu (Taiwan Government Information Office 2009).

11 For instance, the Montevideo Convention on Rights and Duties of States has as four defining criteria 1) a permanent population, (2) a defined territory, (3) a government, and (4) the capacity to enter into relations with other states (CFR no date). The Convention, however, has only 33 signatories. The UN Secretary-General in his report on climate change and security also mentions territory as an important aspect of statehood (UNSG 2009).

which may be unavailable for island states until sea levels begin to fall again.

However, there are precedents for sovereign entities without territory: the *Sovereign Order of the Military Hospitaller Order of St. John of Jerusalem, of Rhodes and of Malta* (SMOM) as well as the *International Committee of the Red Cross* (ICRC). The Order lost its territory in 1798 due to the Napoleonic wars, but continues to have bilateral relations with 104 countries.¹² SMOM also issues passports to its members.¹³ The ICRC is formed as an association under the Swiss civil code, but is mentioned explicitly in the Geneva Convention and has negotiated privileges with host countries similar to other international bodies (Gabor 2004). While both are considered as sovereign and have a standing invitation to the UN General Assembly, they are neither considered as non-member states (such as the Holy See) nor as international organizations (such as the EU). Accordingly, they also have no voting rights. SMOM and ICRC are funded through contributions made by members and through donations.

Theoretically, island states may not necessarily be without territory: historically, land has been traded between different countries such as when Alaska was bought by the USA from Russia. While this option may be conceivable, it appears unlikely today that territory may be ceded unless it is devoid of any other use or purpose, including being culturally insignificant to the selling state (Rayfuse 2009). Indeed, within Russia, politicians have even suggested reconsidering the sale of Alaska and reintegrating it into the Federation, although such activities rather support nationalistic rhetoric than represent any plans for action (Lo 2008; Znamenski 2009). Portions of land which governments are prepared to sell may be marginal, without infrastructure and/or significant natural resources, and thus generally “expendable” (Rayfuse 2009). An interesting case was Australia’s declining the request made by Tuvalu to receive its population in the event of total submergence (Rayfuse 2009: 10). Thus, while it may be likely that countries offer residence to island states losing territory – similar to

SMOM – it appears unlikely that they would gain sovereignty over this land.

Against this background, three possible developments may be envisaged:

- First, island states with completely submerged territory continue to be recognized as sovereign states although their population and seat of government are relocated. Infrastructure, such as a lighthouse, may serve as a “sovereignty marker” (Yamamoto/Esteban 2010) to denote where once the island existed, in case sea levels decrease one day. The island states remain members of international organizations with voting rights.
- Second, some countries choose to no longer recognize states with fully submerged territory, effectively breaking off diplomatic relations. However, according to article 6 of the United Nations charter, states could only be expelled for persistently breaking the principles of the charter and after a recommendation by the UN Security Council.¹⁴ Furthermore, non-recognition by other UN member states does not necessarily lead to expulsion from the UN or other bodies. For instance, Turkey does not recognize Cyprus, nor does North Korea recognize South Korea. Thus, this development would be similar to the first, but with reduced international recognition by other states.
- Third, fully submerged island states remain sovereign entities, but similar to SMOM lose their ‘statehood’, i.e. they are no longer member states of international organization nor eligible for them. While negotiations could assure relocation and privileges, such as the extraterritoriality of embassies, they would lose their voting rights in international organizations and other benefits, but keep passports and the other privileges of sovereign entities.

The last two developments may particularly exacerbate the potential “no island, no claim” situation outlined above. Yet all three developments would imply that citizens of submerged islands do not necessarily become stateless, as even sovereign entities other than states such as SMOM issue recognized passports. Also, it appears unlikely that they will be removed from UN membership. The matter may be more prob-

12 See the official website of the Order of Malta: at: <<http://www.orderofmalta.org/english>> (21 May 2010).

13 Interview with Andrew Bertie, official head of state of SMOM, with *Corriere della Sera* in 2002; at: <<http://www.orderofmalta.org/news/en/139/%E2%80%99Cthe-knights-of-malta-at-the-service-of-the-poor%E2%80%9D>> (20 May 2010).

14 Taiwan represented China in the United Nations, but its place was taken by the People’s Republic of China – thus, from the perspective of the UN, Taiwan was not evicted, but replaced with the “legitimate” representative of China (Hamilton 2004).

lematic for organizations which have more preconditions for membership than the United Nations. An interesting case for example would be the Maldives, which are a member of the *World Trade Organisation* (WTO) but would no longer have any recognizable border (and thus authority over customs, a precondition for WTO membership¹⁵) after their submergence. So should Tuvalu, the Marshall Islands, or Kiribati then be removed from the WTO?

While these developments will not fundamentally challenge the international system of mutually recognized states and sovereign entities, the phenomenon of “sovereignty without territory” would proliferate (Rayfuse 2009). It is unclear how this may – if at all – affect current questions of sovereignty and the recognition of Taiwan, Somaliland, or others which are formally parts of other states. More likely than not, the fate of islands may become a special case in international law and have no practical effect on the (non-)recognition of other states.

However, island states may rely on the goodwill of other states to house their populations and governmental structures. Actually, this may make hosting island governments attractive for other states due to the ensuing dependency and potential privileged access to resources: The Maldives are currently negotiating with India on relocation, with India likely to receive access to the Maldives’ substantial EEZ in exchange (Paskal 2010).

32.7 Reflecting on the Challenges and Opportunities of Climate Change

The Pacific island states will be particularly impacted by climate change due to their vulnerability to sea-level rise and their limited resource base. Five major challenges have been identified for the Pacific islands which will challenge them domestically and internationally. However, not all countries will be affected equally. Some challenges, such as SLR leading to potential changes in maritime territory, will impact all island states. But only a few, and in particular low-lying island states, will be threatened in their sovereignty and statehood. Similarly, while all face challenges to human security, not all may experience political instability as a result. However, political stability may be impacted by all the challenges of climate change. If a country becomes unstable and no longer

capable of responding to the other challenges, it may create a feedback loop leading to the exacerbation of all the other challenges – and thus diminish its capacity to peacefully mediate domestic and international conflicts. In the case of an outbreak of violent conflict, this may have further implications for the territorial integrity and sovereignty of the island states, as their capacities to reassert both diminishes.

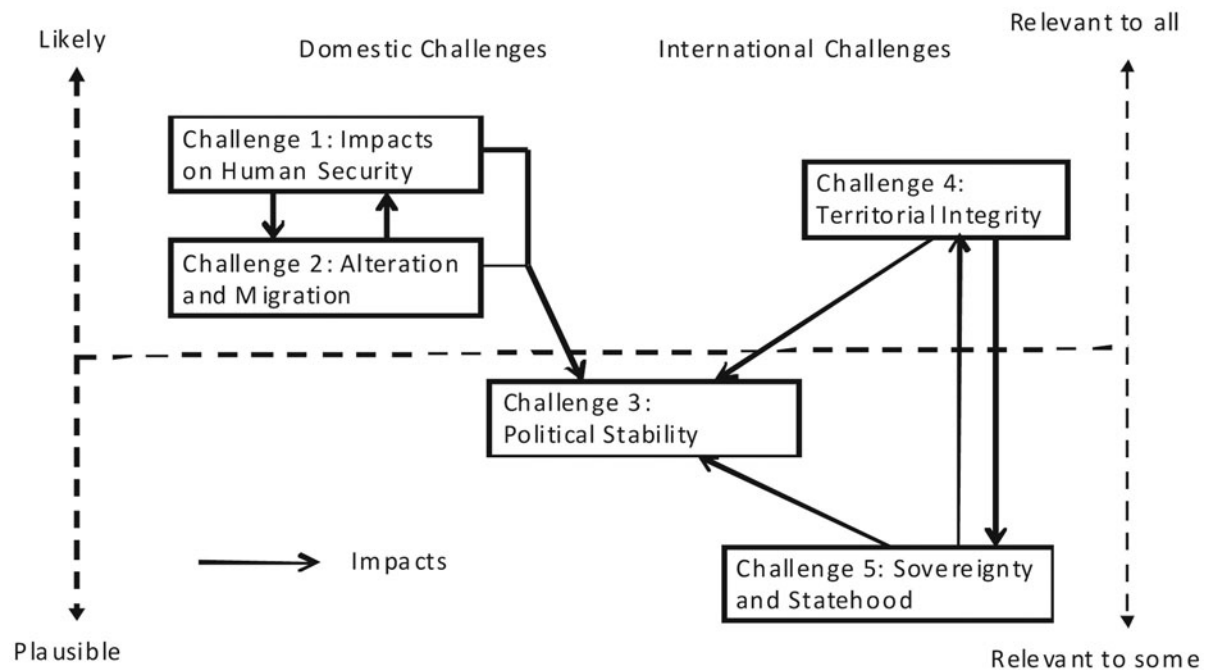
Given the non-linear nature of sea-level change (see 32.2 above) and lack of data, it is next to impossible to attribute specific timescales for either challenge 4 or 5. In addition, while those challenges are conceptually plausible, it remains to be seen to what extent they materialize, as some islands may be able to grow with sea levels (Webb/Kench 2010). Further research is necessary to understand the concrete impacts, though existing information indicates that challenges 1, 2, and 4 in particular are already starting to materialize, while challenge 5 may possibly be decades down the road (e.g. UNSG 2009).

In addition, waiting until these challenges materialize may be imprudent. The impacts of climate change will reveal that current international structures and legislations are not well adapted to environmental change (Paskal 2010). This includes not only the UN Convention on the Law of the Sea, but also what defines statehood, and to which entity are attributed the privileges of sovereignty. Possibly, the island states may become a special case which does not fit current international law. This opens the possibility for conflict and disputes, particularly when it comes to access to maritime territories.

These developments are plausible and expectable. However, difficult domestic socio-economic situations leading to friction within societies or international border disputes are not new issues. Most likely, early recognition and action on adaptation to avoid domestic stresses overwhelming local governing capacity may defuse tensions. Also, as the sections above on the flexibility of states in recognizing other states have shown, finding agreement with neighbouring states may defuse tensions and the potential for conflict and facilitate finding a pragmatic solution to issues of sovereignty. Both will require the necessary political will on the part of the stakeholders concerned.

Indeed, there is the possibility of turning the challenges into opportunities for further development. Migration from the outer islands to the main islands may support the development of the necessary economies of scale.¹⁶ While it is questionable whether they could ever become competitive in international mar-

15 See at: <http://www.wto.org/english/thewto_e/acc_e/acc_e.htm> (11 May 2010).

Figure 32.1: Five main challenges for small island states. **Source:** The author based on UNSG (2009).

kets, it may reduce transaction costs within island states. Finding a sustainable solution for potential disputes due to customary landownership is vital for this, and may defuse related potentials for conflict. Another opportunity arises from the challenge of sea-level rise and building disaster-resilient communities: coping with this challenge will require innovation and education in the first place. The example of Kiribati could serve as a blueprint for educational programmes on other islands. This knowledge could also become an economic asset, as many countries in the world and hundreds of millions of people face the risk of coastal erosion and sea-level rise and will be in need of suitable solutions.

Lastly, taking advantage of the large EEZ may provide also much-needed funds as global resource demands are likely to continue to grow for the foreseeable future. The Pacific Island Forum Secretariat, as the regional organization, may provide a platform for mutually agreeing on maritime territories, fixing them, and developing a common monitoring system. To avoid the risks of corruption, they could, in the same way as states such as Uganda (Westerkamp/Houdret 2010), approach countries like Norway in an effort to identify best practice for finding a transparent mechanism for developing sovereign wealth funds

for the good of society. They could also serve to support reconstruction, develop monitoring capacities for EEZs, and mitigate global price fluctuations for important goods such as food and energy.

Given the current limited capacities of island states to monitor the maritime area, as well as the smallness of their economies, they will require external aid in turning the challenges of climate change into opportunities. The adaptation funds within the United Nations Framework Convention on Climate Change may provide a start, and may also be appropriate for defusing conflict potentials. However, significant amounts of funds will be necessary, and this will require involvement by international financial institutions and also by extra-regional entities less involved in regional rivalries such as the EU, which may provide important contributions here. Norway as a neutral state with experience in managing resource wealth has already been mentioned. Such extra-regional stakeholders could also support monitoring and policing of the area.

In addition to these immediate issues, more critical and innovative questions arise over the potential future kaleidoscope of international relations as a result of climate change. It may consist of 'traditional' sovereign states; several state-like political entities having only limited recognition such as Taiwan or Kosovo that are not member of any international organization; supra-national entities such as the European Un-

16 The authors would like to thank Halvard Buhaug for this idea.

ion; plus potentially island states losing their territory but remaining recognized as sovereign states. These entities may have varying memberships of international organizations, being members of bodies such as the WTO but not of the UN (e.g. the EU), or of neither of them despite having state-like properties (such as Taiwan), or of both despite having lost its territory and authority (such as the Maldives, if they become submerged). Also, boundaries and territories are likely to shift not only for island states, but for virtually all states having a coast, the Arctic being another prominent example of climate-induced uncertainties regarding boundaries and territorial claims.

Various international forums, such as the climate negotiations or the Doha development round, have revealed the great diversity of interests and thus also the very limited space for consensus in several policy areas. It appears unlikely that a global consensus on how to deal with the impacts of climate change on sovereignty and territory will emerge. Instead, it is quite likely that fragmentation may further increase, with various states choosing to recognize or not recognize states dispossessed by climate change. The main consequence of climate change in the Pacific and elsewhere may thus be that international relations become more complex, and approaches to dealing with various entities claiming political legitimacy become more pragmatic in the absence of global consensus.

This would further erode the global system of nation states symbolized by the United Nations, making the definition of states ever more arbitrary and blurred. While the fate of the island states may only be one factor among many, it may contribute to international relations increasingly not being resolved according to globally recognized principles and laws, but instead being largely based on pragmatic, geographically and possibly temporally limited approaches in order to accommodate these realities. In fact, the actions suggested above for turning the challenges of climate change into opportunities may also help towards regional solutions and approaches with limited global applicability. While such regional approaches would open up possibilities for developing innovative, more reflective, and more adequate institutions and mechanisms at a regional level, this global devolution may also bear the risk of fracturing international solidarity in times when the challenges of climate change would require global, coordinated responses.

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Part VIII Improving Climate Security: Cooperative Policies and Capacity-Building

Chapter 33 Securitization of Climate Change in the United Nations 2007 – 2010

Gerrit Kurtz

Chapter 34 Climate Change, Peacekeeping, and Perspectives for UN Reform

Bo Kjellén and Peter Wallensteen

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Tagelsir Mohamed Gasmelseid

Chapter 37 Policy Responses to Climate Change in the Mediterranean and MENA Region during the Anthropocene

Hans Günter Brauch

Gerrit Kurtz

33.1 Introduction¹

The debate about climate change and security in the United Nations main organs provides a practical example of the strategic use of discursive strategies such as rhetorical entrapment and forum-switching in the securitization of non-traditional threats. By relying on a revised theory of securitization, this chapter argues that the dominant storylines changed significantly between the Security Council debate in 2007 and the General Assembly negotiations of 2008–2009. The emphasis of the small island developing states on climate change as a threat to livelihoods and human security was apparently much more acceptable than the environmental conflict storyline employed by many European countries in the Security Council.

In the policy field of climate change, security considerations have gained increasing attention in the last few years (Brauch 2009: 80–82). Several reports by both governmental (Schwartz/Randall 2003; Haldén 2007; WBGU 2007, 2008) and non-governmental institutions (Campbell/Gulledge/McNeill 2007; Smith/Vivekananda 2007) have argued in favour of a link between the consequences of global climate change and security aspects such as mass migration, conflicts over scarce resources, and the threat to the survival of small island states.²

It was not until 2007, however, that an international organization took up the issue of “climate security” (Trombetta 2008: 595) in its official political deliberations³. On the initiative of the British presidency, the *Security Council* (SC) of the *United Nations* (UN) held an open debate on “climate, energy, and security” on 17 April 2007, in which the differences be-

tween the main groupings in the UN became very clear. Nevertheless, the group of *Small Island Developing States* (SIDS) introduced a draft resolution in the *General Assembly* (GA) on that topic in autumn 2008 which sparked a furious debate. After heavy editing and amending,⁴ resolution 63/281 was finally adopted in June 2009 by the GA. It invited all relevant UN organs “to intensify their efforts in considering and addressing climate change, *including its possible security implications*” (UNGA 2009a:1, emphasis added).

Although the framing of environmental concerns as security issues is not a new phenomenon (Homer-Dixon 1994; Barnett 2003; Trombetta 2008), the debate in the United Nations on the possible security implications of climate change merits further attention. It provides a practical example of the strategic use of discursive strategies as part of a legitimization discourse in the process of securitization. Exploring and analysing this legitimization discourse and the instruments employed by the speakers involved is the main contribution of this chapter. Consequently, the analysis is focused on the following research question: how do specific discourse strategies make the securitization of a given reference object possible and how are the objectives uttered by the speakers reflected in those strategies?

This chapter employs an in-depth interpretative analysis influenced by important strands from discourse theory to look into the speeches by representatives of member states as well as surrounding documents. Such an approach might help us to understand the intentions and policy implications behind the po-

1 The author would like to thank the two anonymous reviewers and Hans Günter Brauch as well as the other editors of this book for valuable questions and comments.

2 Cf. Brzoska (2009) for a comparative analysis of four of these reports.

3 International organizations have dealt with the issue of environment and security in a larger and often more operational sense for a longer time, for example, within the framework of the *Environment and Security Initiative* (ENVSEC) that was started in 2003 by OSCE, UNDP, UNEP, UNECE, and REC; see UNECE (2006).

4 This becomes clear if one compares the original draft (UNGA 2008) with the resolution finally adopted (UNGA 2009a).

sitions presented. Putting this into the context of the United Nations' main organs from 2007 to 2010 will enable a better understanding of policy-making at the global level and will identify possible spheres of action in the field of climate politics. The analysis builds upon the work done by Detraz and Betsill (2009) while expanding and extending their focus to the most recent developments and to a more sociological understanding of securitization.

The theoretical framework of the subsequent analysis builds on a revisited securitization theory. The Copenhagen School sees securitization as a highly exceptional process of transferring an issue classed under the auspices of 'security' outside the realms of politics (Buzan/de Wilde/Waever 1998; Trombetta 2008: 588). This gives a negative connotation to the securitization process. Although this approach might fit well with issues like immigration or the fight against terrorism, where it might be argued that a securitized policy contributes more to the problem than to the solution, it hits its limits once it comes to environmental issues and climate change. Notwithstanding the merits of linking climate change and security, it is necessary to apply a broader perspective of securitization in order to analyse the intentions and consequences of the securitization of climate change in a more neutral way before being able to make a comprehensive judgement.

This is where the 'sociological' approach of the so-called Paris School (Balzacq 2010) of securitization comes into play. This understands securitization differently, seeing it as consisting of a securitizing move by a securitizing actor (1) and subsequent security practice (2) by this actor. The actor thus relies on a justification discourse to legitimize his/her actions.

The analysis will proceed as follows. The next (second) section will be dedicated to a further discussion of the theoretical and methodical framework of a revised securitization theory that also addresses some concerns of critical security studies regarding intentions and policy implications (33.2). The third and fourth are the main empirical sections, where this framework is applied to identifying discourse coalitions in the United Nations debates with regard to a common understanding of security (33.3) and to a functional analysis of the discursive tools employed by the speakers, i.e. linguistic tools and their combination with certain frames, narratives, and storylines (33.4). The fifth section discusses the results of these analyses by placing them in the explicit institutional and temporal context. It also tries to answer the questions of why climate change is securitized in the

United Nations and what the corresponding policy implications are that can be discerned from the actors' discourse strategies (33.5).

33.2 Revisiting Securitization Theory

According to the Copenhagen School, an issue becomes part of the security realm if a *securitizing actor* presents a *reference object* (usually the state) as being threatened by a certain *existential threat*, seeking legitimacy by a target *audience* for some *extraordinary measures* that lie outside the normal sphere of public policy (Buzan/Wæver/de Wilde 1998: 21). This *securitizing move* is the first stage of securitization. It includes reference to a certain security language that evokes an image, according to Buzan and Wæver, of a rather traditional understanding of security,⁵ even a "logic of war - of challenge - resistance (defence) - escalation - recognition/defeat" (Wæver 1995: 52). Contrary to the claim that the (illocutionary) speech act⁶ achieves what it strives for by itself, the authors of the Copenhagen School assert that this securitization move needs to be accepted by an identified *audience*, i.e. by displaying the readiness for exceptional measures that lie outside the normal political sphere.⁷

This approach has been criticized from a range of viewpoints. Particular targets have been the Copenhagen School's understanding of security (McDonald 2008: 574; Stritzel 2007: 366; Knudsen 2001: 359-360), the structure of the securitization process, and the normative stance of the Copenhagen School on securitization (McDonald 2008: 579; Williams 2003).

Regarding the structure of securitization as a two-step process consisting of the securitization move and acceptance by the audience, students of securitization theory point to the Copenhagen School's inconsistency regarding the nature of the speech act and the importance of the audience (chap. 13 by Karafoulidis).

5 However, the authors of the Copenhagen School argue that this traditional notion of security can be transferred to more sectors and reference objects, placing themselves in the debate on the widening and deepening of security beyond the classical realm of military-diplomatic issues (Tarry 1999; Krause/Williams 1996).

6 The Copenhagen School builds on the speech act theory developed by John Austin (1975).

7 This is articulated in the *facilitating conditions* of a securitization process by the Copenhagen School which consist of three elements: a grammar of security, the power position of the securitizing actor, and the nature of the referent object itself that needs to have some history of securitization (Buzan/Wæver/de Wilde 1998: 33).

Speech acts might create their own interpretative communities as those actors react to those speech acts which they find meaningful, additionally rendering certain readings intelligible and legitimate while dismissing others (McDonald 2008: 572). Balzacq (2005, 2010) goes even further by moving from what he calls a ‘philosophical’ perspective of securitization centred on speech acts to a ‘pragmatic’ one focused on a sociological understanding of securitization. He points to the under-theorized role of persuasion in the securitization process, i.e. the process by which the securitizing actor convinces his/her target audience to see the world in a specific way and act on its implications. Consequently,

patterns of *heuristic artefacts* (metaphors, image repertoires, analogies, stereotypes, emotions, etc.) are contextually mobilized by a recognized agent, who works persuasively to prompt a *target* audience to *build a coherent network of implications* [...] by investing the referent subject with such an *aura of unprecedented threatening complexion* that a *customized political act must be undertaken immediately* to block its development (Balzacq 2010, emphasis in the original).

This emphasis on discursive strategies has important methodological consequences which are discussed below.

Securitization represents a legitimacy-seeking discourse, requiring the use of effective rhetorical strategies to convince the target audience by more than simple (yet often costly) coercive means. Establishing lasting mechanisms of norm compliance (i.e. acceptance and execution of extraordinary measures) requires voluntary commitment by the target actors which can be achieved by means of persuasion (Buzan/Wæver/de Wilde 1998: 25). This has already been brought forward by Max Weber in his theory of legitimate governance (*Herrschaft*) in which he notes that governance always requires a minimum of acceptance by those who are to be governed (Weber [1922] 2005: 159). At the same time, once a securitizing actor has employed a particular argument relating to a specific fact or norm to legitimize his proposition, he/she cannot fall behind that any more without risking losing a considerable amount of credibility. If he/she intends to deviate from a previous statement, he/she has to find a convincing reason why a certain normative standard should no longer apply. In other words, he/she is trapped. Risse (1999: 28) refers to this process as *rhetorical entrapment* or “argumentative self-entrapment”, which might be used as a specific discursive strategy by the securitizing actors.

As the authors of the Copenhagen School argue, to securitize an issue or to accept a securitizing move “is always a political choice” (Buzan/Wæver/de Wilde 1998: 29). In that sense, an issue is presented in a deliberate way, relying on dominant discourses, contextual factors, and advantageous heuristic artefacts to achieve a “strategic social construction” (Finnemore/Sikkink 1998: 909–915). Therefore, one might argue, we can expect to find that securitizing actors employ ‘rhetorical action’ (Schimmelpfennig 1997) to persuade a target audience to enter into a dialogue on the security effects of the threat described by the securitizing actors, similar to the ‘tactical concessions’ stage in the ‘spiral model’ proposed by Risse, Ropp, and Sikkink (1999) in the field of human rights. ‘Rhetorical action’ combines the use of arguments designed to persuade an audience with a strategic understanding that refrains from entering into the full-fledged open deliberation demanded by Habermas’ (2007) discourse theory. Actors relying on this instrument are usually not prepared to be persuaded themselves.

Being challenged to respond, one should expect the members of the target audience, on the other hand, to enter into this dialogue and to give non-self-serving reasons for their positions. The publicity surrounding the debates in the United Nations should reinforce this process (Elster 1986). This should provide an insight into how the process of securitization works and which conditions seem to facilitate or obstruct its successful completion. This is all the more true for a debate in a multilateral setting such as the main organs of the United Nations, where specific formulations are fiercely negotiated in order to establish certain interpretations, without too great a regard for immediate and direct implementation.

The empirical analysis of the securitization of climate change at the United Nations relies on interpretative analysis influenced by elements of Foucault’s discourse theory (Keller 2007) focusing on the dominance of competing discourses and enhanced by Balzacq’s sociological model of securitization. In order to establish the underlying intentions and implications of this process, a mere textual analysis is therefore insufficient, as it is also essential to take into account dominant storylines, narratives, and the surrounding institutional, temporal, and substantial context of the discourse (Balzacq 2010). According to discourse theory, social reality is constructed by means of language. In particular, it includes the question of how systems of social meaning are constituted by speakers, the audience, rules, and social actions. Discourses determine which actors are allowed to speak

and which validity claims that actors make are acceptable and which are not (Milliken 1999: 229–230).

The analysis is basically a three-step process. First, the chapter will look at the ontological aspects, i.e. the agent level and the ‘map of the world’ presented by the actors, in Balzacq’s terms. To be more precise, this refers to a comparative textual analysis of the different understandings of (environmental) security in the Security Council, the General Assembly debates, and the Secretary-General’s report. Depending on the respective definitions of security, apparent for example through the association of a security language with specific sectors (military, diplomacy, sustainable development, economics, and environment), these understandings of security constitute their own interpretative communities or discourse coalitions. This section largely builds on existing literature and the valuable analysis by Detraz and Betsill (2009).

The subsequent examination of the functional dimension of securitization is based on these discourse coalitions for the defining cleavages. This part refers to the act level of Balzacq’s terminology, concerning the specific

- *action types*, i.e. an appropriate language in a grammatical and syntactical way,
- *heuristic artefacts*, i.e. stylistic devices such as metaphors, similes, and climaxes, and
- *practices and policy tools*, i.e. any indications as to how securitization is employed strategically as a policy instrument that goes beyond the mere text, such as forum-switching or rhetorical entrapment (Balzacq 2010).

Intertwined into this analysis of the development from the Security Council to the General Assembly and the Secretary-General’s report is the careful examination of dominant narratives, storylines, and frames by the speakers in the debates. This should demonstrate how the textual dimension is transcended in order for specific meanings to be acquired and how the speakers try to bind the target audience to their understanding of the issue. It forms the core of this analysis.

Lastly, the third section tries to make sense of the institutional and temporal context as well as to bring the policy implications of the state of discourse in the United Nations to the fore.

Case selection has to be done very carefully to avoid a possible selection bias, especially in qualitative studies. The cases chosen are the distinguishable securitization attempts in the main organs of the United Nations between 2007 and 2010, i.e. the debate in the

Security Council in 2007, the GA debate on resolution 63/281, and the report of the Secretary-General with its subsequent discussion. They each provide discrete instances of the class of events (George/Bennett 2004), and are clearly paradigmatic cases in the international climate change debate.⁸ This case selection provides some variation on the ‘dependent variable’, i.e. the acceptance of the securitization move by member states. The SC debate could be seen as a failed securitization move while the adoption of the GA resolution and the subsequent SG report might be considered a successful securitization. This selection on the dependent variable allows an assessment of the effectiveness of the discursive strategies, the independent variable. The institutional framework might have some influence as a context variable, considering for example the different voting structures in the SC and the GA. It should be noted, though, that the aim of the analysis is not a positivist test of hypotheses, but a careful understanding of the discursive process in the securitization of climate change.

The discourse material to be analysed therefore consists of the verbatim records of the official debates as well as any accompanying documents such as letters, resolutions, and reports. The analysis is confined to the official debates, so that only inferences can be drawn from these about the informal negotiations behind the scenes. On the one hand, the official debates can be better compared given their equal preconditions of publicity, legitimacy, and justification of arguments and speakers. The official statements are usually carefully crafted, with close attention to wording and the use of specific narratives. On the other hand, there are no minutes available from the informal negotiations. Whatever might have happened there, it cannot diminish the member states’ obligation to justify their respective positions publicly.

8 It can be argued whether the debate should rather be disaggregated into the individual speech acts performed by the delegations. As a positivist understanding of a research design cannot be entirely integrated with the discourse analysis approach chosen here, however, it is worth seeing these cases as providing the institutional, temporal, and substantial contextualisation as possible explanatory factors for the differences found in the discursive tools, strategies, and coalitions observable in the debates.

33.3 Defining Security – Identifying Discourse Coalitions

In order to analyse the securitization process, it is first necessary to determine the competing notions of security and their respective relations to climate change. This mapping exercise should provide an insight into the main discourse coalitions that share roughly the same position on the link between climate change and security, i.e. they rely on a similar narrative. This exercise builds on a thorough review of the existing literature and some original research. The discourse coalitions are constituted as interpretative communities about which three aspects need to be determined at the agent level: how they perceive themselves, how their identity is socially constructed, including its effects on their behaviour, and the nature and capacities of the respective audience, often consisting of the other actors present (Balzacq 2010).

Basically, there are three different understandings of security that can be distinguished: ‘national security’, ‘human security’, and an ‘environmental conflict’ narrative see chap. 7 by Trombetta.⁹ The distinction made between an environmental security (in effect, human security) and an environmental conflict narrative by Detraz and Betsill (2009) is expanded using a very traditional understanding of security.¹⁰

Many leading developing states such as Brazil, South Africa, China, and India have employed a traditional understanding of security in the debates (Sindico 2007: 33), further underscored by the common positions of G77 and the *Non-Aligned Movement* (NAM; UNSC 2007b, 2007c).¹¹ For them, economic, social, and environmental matters have no bearing on security, only on sustainable development, thus deny-

ing any possible link between security and climate change, an argument also underlying their fervent rejection of the institutional venue of the Security Council for this issue (UNSC 2007d: 27). This can be referred to as the ‘national security’ narrative. It is thus clear that the traditional cleavage in the United Nations between the developed and the developing countries was not as sharply edged in this debate. Although the main groupings, G77, NAM, the EU, and the African Group presented common positions in the Security Council debate, their members often took significantly varying positions in the Security Council debate.¹²

For a second group of actors, security enjoys a broad definition under the umbrella term ‘human security’ (UNDP 1994), which also combines economic, social, and environmental factors in line with the ‘widening’ debate in security studies. These countries include many small island states and some Western countries such as Japan, for which the consequences of climate change pose primarily a threat to livelihoods and, as emphasized by some speakers, the very survival of entire (small island) states.¹³ It is noteworthy that the way this link is accentuated differs greatly, as Western speakers rather point to the obligations concerning mitigation and adaptation under the UN Framework Convention on Climate Change (UNFCCC) process and some small island states compare the effects of climate change to those of armed conflict.¹⁴ Detraz and Betsill (2009) refer to this understanding of the link between the environment and security as the ‘environmental security’ narrative, deeply founded in ‘human security’.

Lastly, many European countries argued in the Security Council debate for a combination of these two

9 Barnett (2003) also includes the role of armed conflict and the military on the environment, but this is not relevant in the context of the United Nations debates.

10 For an overview of different security understandings in the climate change debate, cf. Brzoska (2009).

11 Sindico (2007) identifies three sub-groups among these sceptics. One group of states stresses the infringement of the Security Council on the rights of other UN organs better suited to discuss the issue, fearing that a securitization of climate change might change the established principle of “common but differentiated responsibilities”, while others concede that there are possible security implications of climate change that could be validly discussed in the General Assembly. The third and smallest group consists of the fiercest opponents among the oil-producing countries such as Venezuela that do not want energy security to become an international issue, guarding their national sovereignty over this issue.

12 Namibia, for example, explicitly acknowledged the threat posed by climate change as being “a matter of life and death” for the country, though rejecting the institutional venue of the Security Council (UNSC 2007d: 31).

13 There are still subtle differences among the delegations in this group, as some only want to use the United Nations Security Council to raise awareness, others intend to include the issue in the general deliberations of the Council on conflict prevention, and still others want it to take concrete action on emission targets (Sindico 2007: 32).

14 For example, Tuvalu stated the following in the Security Council debate: “The world has moved from a global threat called the cold war to what should now be considered the ‘warming war’. Our conflict is not being fought with guns and missiles but with weapons from everyday life – chimney stacks and exhaust pipes” (UNSC 2007e: 8).

understandings by acknowledging the link between climate change and security as a ‘threat-multiplier’ for all forms of security threats, in particular for armed conflicts. Armed conflict is not merely employed as a rhetorical analogy, but as a dependent variable. Though usually stopping short of claiming a direct link between climate change and natural phenomena such as droughts, floods, and desalination, this view is considerably narrower than the environmental security perspective since it focuses on the military-diplomatic dimensions of the link between climate change and security. Detraz and Betsill (2009) call it the ‘environmental conflict’ narrative that relies on the central storyline of scarcity as intervening variable (Homer-Dixon 1994).

So, what was the main thrust of each of the three instances with regard to these narratives? Since the Security Council debate was initiated by the United Kingdom as president of the Security Council with a background note relying on the ‘environmental conflict’ narrative,¹⁵ this seemed to be the general direction of the debate, though it sparked fierce opposition from developing states. In particular, the background paper lists six drivers of conflicts that might be influenced by specific consequences of climate change such as a rise in sea level or an increased number of extreme weather events.¹⁶ In that regard, Beckett calls climate change “a threat-multiplier for instability” (UNSC 2007d: 18) that reaches beyond all levels of human activity and affects all human beings, thereby touching on a wide understanding of security that is collective and open to new threats.

By contrast, the small island developing states who tabled the draft resolution on climate change and security in 2008, which was up for debate and adoption in June 2009, continued their sole focus on the ‘environmental security’ narrative, presenting the threat posed by climate change to livelihoods and the basic survival of human beings endangered by natural phenomena such as floods and a rise in sea level.¹⁷ Since the report by the Secretary-General subsequent to resolution 63/281 adopted during the latter debate was to take into account the submissions of member

states and international organizations,¹⁸ it includes chapters on both perspectives (UNGA 2009c).

33.4 Functional Aspects – How Climate Change is Securitized in the United Nations

The functional analysis of the debate on climate change and security in the United Nations looks at three important aspects of the documents: the appropriateness of the language in relation to the institutional venue, the use of heuristic artefacts such as similes, metaphors, or analogies, and specific framing strategies and narratives that actors refer to (Balzacq 2010). The examination will proceed in the temporal sequence of the debates, while looking at the securitizing actors in each case first before comparing their speech acts, heuristic artefacts, and frames with their target audience, both reinforcing and opposing the securitization move. In contrast with a sequence strictly along the lines of analytical categories, this allows a more refined look at the discursive nature of narratives and speech acts strengthening and weakening the argumentation.

33.4.1 Debate in the Security Council

As president of the Security Council, Margaret Beckett, the British foreign secretary, seems well prepared to adjust her language to the demands of a multilateral body such as the SC. She includes a number of references to unity, collectivity, and ‘togetherness’ in her speech. She speaks about the “impact on the security of all of us – developed and developing countries alike” (UNSC 2007d: 2), “a shared understanding” (UNSC 2007d: 18), and that climate change “is a threat that can bring us together if we have the wisdom to prevent it from driving us apart” (UNSC 2007d: 19). This strategic emphasis on cooperation oriented towards a common good becomes especially

15 The background note states explicitly: “The focus of the debate will be on the security implications of a changing climate, including through its impact on potential drivers of conflict” (UNSC 2007a).

16 The paper lists border disputes, migration, energy supplies, other resource shortages, societal stress (i.e. from economic consequences), and humanitarian crises as possible channels of influence (UNSC 2007a).

17 Even the draft resolution that was significantly amended in the course of the debate only included a paragraph in the preamble spelling out the link with international peace and security: “*Deeply concerned* that the adverse impacts of climate change, including sea-level rise, trigger population relocation and threaten the territorial integrity and sovereignty of some States, thus endangering international peace and security” (UNGA 2008, emphasis in the original).

18 See operative paragraph 2 of that resolution (UNGA 2009a).

clear when compared with the speech Beckett gave just the night before the SC debate in front of an audience of business leaders, where she used a much more rationalist or economic language.¹⁹ In this context, it is worth noting that though Ms Beckett might have approached this topic in a particular way since she had been the minister for the environment before she was appointed the UK's foreign minister by Tony Blair, the then British prime minister, the drive for the acknowledgement of the security implications of climate change were and are part of the British government's overall security strategy. This is asserted by subsequent official documents commissioned by Gordon Brown's and David Cameron's administrations, respectively.²⁰

Besides this language of multilateralism, Beckett also refers to a rather traditional logic of security of the kind predicted by the Copenhagen School (Buzan/Wæver/deWilde 1998: 25), emphasizing urgency, top priority, high impact, and, possibly, a point of no return, e.g. by such phrases as "the threat we face has grown larger in scale and sharper in outline" (UNSC 2007d: 18) or "increased risks of conflict and insecurity within and between states" (UNSC 2007d: 19).

This resonates well with some member states such as the other European countries (Jaggard 2008). Germany delivered a statement on behalf of the European Union in which it strengthened the British securitization move by emphasizing the significance and urgency of an agreement on mitigation and adaptation to the effects of climate change: "The cost of action on climate change is far outweighed by the consequences of inaction" (UNSC 2007d: 20). For the EU, the debate is placed in the SC's comprehensive framework on conflict prevention, thus referring to the 'environmental conflict' narrative and thereby going even further than the UK. The Netherlands employs dra-

matic language as well: "We urge the Secretary-General of the United Nations to alert the Security Council of climate related crisis situations which might endanger peace and security" (UNSC 2007d: 21). In line with the EU statement and further supporting the securitization move, the Netherlands also demand that "all economies", i.e. not only developed countries, need to commit credibly to a reduction of greenhouse gas emissions to mitigate the development of climate change (UNSC 2007d: 22). Japan underscored this request by calling for "the maximum number of countries responsible for any significant emissions [...] developed and developing countries alike" (UNSC 2007d: 29) to participate in any effective post-Kyoto agreement. One underlying intention on the speakers' part becomes quite clear: to expand the obligations regarding mitigation efforts to major developing countries, an issue which has been at the centre of climate change negotiations from the beginning (Paterson/Grubb 1992).

The letters and speeches of Pakistan in the name of the G77 and Cuba in the name of NAM, which include very similar formulations, make much less use of elaborate metaphors or other stylistic devices. This probably reflects the way the positions were found in groups comprising more than one hundred member states each.

They do not engage in the debate on the possible security consequences of climate change in substance, i.e. both groups do not give explicit reasons why climate change and security should not be considered together except for procedural and formal arguments. Pakistan points to the fact that "energy and climate change are vital for sustainable development" (UNSC 2007c), thus trying to frame climate change in development rather than in security terms.

The objectives of G77 are rather clear: they explicitly refer to the Rio principles agreed in 1992, especially the principle of "common but differentiated responsibilities", and call on developed countries to fulfil their emission targets as well as to support developing countries by technological transfer, financial assistance, and capacity building (UNSC 2007e: 24). In this way, as in international climate politics in general,²¹ the G77 and NAM countries try to lay the burden of action as exclusively on the developed countries as possible. Furthermore, they completely reject a possible role for the SC in climate politics, possibly

19 Margaret Beckett 2007: "Climate Change 'The Gathering Storm'" presented at the annual Winston Churchill Memorial Lecture, 16 April, British American Business Inc., New York; at: <<http://collections.europarchive.org/tna/20080205132101/http://www.fco.gov.uk/servlet/Front/TextOnly?pagename=OpenMarket/Xcelerate/ShowPage&c=Page&cid=1158051196918&cto=true&ca=KArticle&aid=1176453874175>> (15 November 2010).

20 "The National Security Strategy of the United Kingdom: Update 2009. Security for the Next Generation"; at: <<http://www.cabinetoffice.gov.uk/media/216734/nss2009v2.pdf>> (15 November 2010); "A Strong Britain in an Age of Uncertainty: The National Security Strategy" October 2010; at: <http://www.direct.gov.uk/prod_consum_dg/groups/dg_digitalassets/@dg/@en/documents/digitalasset/dg_191639.pdf> (15 November 2010).

21 Though the emerging countries' position has shifted slightly in the last few years towards a bigger recognition of their own role in mitigation strategies (Dröge 2009).

because they want to avert any infringement on their position by giving climate politics more credit than it deserves, as far as they are concerned. They want to avoid any increase of the possibility of effective (and costly) mitigation measures by themselves.

Though the G77 and NAM statements are very close in substantial terms, they differ in the degree of formulations used to express their discontent about the SC debate. Whereas the NAM letter notes the “concerns of the Movement regarding the continued and increasing encroachment by the Security Council” (UNSC 2007b), the G77 letter is more outspoken: “The ever-increasing encroachment by the Security-Council on the roles [...] of other principal organs of the United Nations represents a distortion of the principles and purposes of the Charter, infringes on their authority and compromises the rights of the general membership of the United Nations” (UNSC 2007c). Both refer to a narrative concerning the case for SC reform which has been on the agenda of the United Nations and those groups in particular for quite some time (Fröhlich/Hüfner/Märker 2005: 8–9).

Assessing the increasing role of the SC very critically, the groups also refer to a narrative that one might call ‘democratic deficit’, since the SC has only a very limited membership and privileges its five permanent members heavily, whereas the most ‘democratic’ UN organ, the GA, is sidelined. This is a very powerful narrative that can potentially also find some support among Western states more in favour of the juxtaposition of climate change and security as they aspire to become permanent SC members themselves.²² It is also noteworthy that the two groups refer to quite a significant number of international legal regulations, both citing the UN Charter. Cuba even refers to a specific article (24) concerning the competencies of the SC (UNSC 2007d, 27). As they also mention that this debate should not set a precedent, G77 and NAM underscore their position as a ‘persistent objector’ who can block the emergence of international customary law (Johnstone 2003).

Thus, G77 and NAM both attempt to avoid even entering into a substantial dialogue on climate security and rather refer to strong narratives of SC reform and the prevalence of international law to argue their case. Strongly centred on the role of the SC, their arguments should lose power when the issue is transferred to another body like the GA, which they deem

22 Exactly how the decision-making process in the Security Council could be made more legitimate is, however, heavily contested (Hurd 2008).

more appropriate. It is to this debate that the analysis now turns.

33.4.2 Debate in the General Assembly

Compared with the British concept paper, the SIDS draft resolution includes a slightly different description of the security consequences of climate change. It emphasizes the effects of sea-level rise in terms of mass migration and threats to the “territorial integrity and sovereignty of some states” (UNGA 2008). The submitting states do not see climate change as a mere ‘threat-multiplier’ (UNSC 2007d: 18) with indirect effects on international peace and security, but as a direct threat to their continued existence.²³ This version of the ‘environmental security’ narrative diminishes any social contingencies of the projected threat as a rise in sea level does not need to be mediated through a social process to yield the alleged security-related effect.²⁴ This narrower framing should make it decisively harder for possible opponents to negate the threat from sea-level rise for SIDS, facing the possibility of ceasing to be states under international law as their territory is fully submerged or becomes completely uninhabitable.²⁵ It therefore places the focus of the debate on the possible consequences of this danger, including possible measures the international community might employ as a whole (see note 24 above).

As a region of the world that is significantly affected by rising sea levels attributed to climate change, small island developing states, especially in the Pacific,²⁶ have been firm advocates of decisive action on climate change for decades.²⁷ The president of the

23 The inclusion of “threat to territorial integrity” in the draft resolution echoes art. 2 para. 4 of the UN Charter, relating to the prohibition of the use or threat of the use of force, thus implying a level of threat comparable to a military conflict between member states.

24 The Pacific SIDS do, however, mention in a UNGA speech that climate change will also intensify competition for scarce resources and exacerbate conflicts, in addition to its threat to territorial integrity, see *Pacific Small Island Development States* (2008): “Statement on Human Security, Delivered by Permanent Representative H.E Mrs Fekitamoeloa 'Utoikamanu, Permanent Mission of Tonga to the United Nations, presented at the General Assembly Thematic Debate on Human Security”, May 22, New York; at: <<http://www.un.org/ga/president/62/ThematicDebates/humansecurity/psids.pdf>> (15 November 2010).

25 As the delegate from Nauru averred in her statement introducing the revised draft resolution (UNGA 2009d: 2).

GA organized a thematic debate on climate change in February 2008. With this opportunity, the delegate for Palau made quite clear his country's understanding of how the nexus between climate change and security should be furthered in the United Nations. Comparing climate change to an "invading army", he called on the SC to declare climate change a "threat to international peace and security" under article 39, chapter VII of the UN Charter.²⁸ The SC should then impose mandatory emission caps on all states, passing sanctions in the event of non-compliance. Here is, obviously, a clear case of 'extraordinary measures', going far beyond the normal political process of consensually agreed emission targets within the purview of the UNFCCC. The speech also gave other states an indication of the actions the SC could possibly adopt if it took on the issue once again as the SIDS had stipulated in their draft resolution introduced on 10 September 2008.²⁹

Even more than the UK, the SIDS' objective is to mobilize support for decisive collective action so as to avoid the most devastating consequences attributed to climate change that directly affect their populations. By aiming for an adoption of the draft resolution by consensus, the SIDS try to tie other member states to the obligation of effective mitigation and adaptation, especially to secure the continued existence of the SIDS.³⁰ Interestingly, apart from claims by individual member states such as Palau for binding SC measures on all member states concerning climate change, the collective SIDS statement as well as the

draft resolutions submitted do not specify which concrete actions the SC should take. Palau's proposition thus seemed to lie outside the realm of possible arguments circumscribed by the climate security discourse of the SIDS.³¹

Nevertheless, the SIDS try to convince the other member states by employing a range of discursive strategies, since the decision to shift the discussion on security and climate change from the SC to the GA, in which all member states have a say, might have been strategically motivated. Based on art. 35 para. 1 UN Charter, the SIDS could have brought climate change to the SC, or they could have chosen another forum such as the Conference of Parties meeting to the UNFCCC or the Commission on Sustainable Development. The General Assembly, however, probably provides a theatre with scope for rather greater attention in the United Nations system, as well as the greatest representativeness by providing every member state with the same speaking and voting rights. Power asymmetries are constrained by the egalitarian rules of procedures for all member states as well as accepted principles of informal negotiations. This could accord greater weight to rational, fact-based arguments,³² on which a successful securitization by SIDS ultimately depends, since they lack material power resources and authority in the international realm. The similar socialization and common language of diplomats further facilitates rational deliberation in the GA (Deitelhoff 2006: 126–128). Even though widely different personal capacities reinforce existing power conditions, the change to the GA robs the sceptical countries of the possibility of relying on the powerful narratives of SC reform and a 'democratic deficit' of the deliberations among the limited membership of the SC. The conditions of possibility for the actors are influenced by the differences in the rules of procedures, in particular the voting structures.

In such an institutionalized public setting, actors need to give non-self-serving reasons supporting their position, which should work in favour of the SIDS since they subscribe to a very basic norm of international law, territorial sovereignty and the self-preservation of statehood, which G77 and NAM in particular have always asserted. Nauru, speaking on behalf of

26 The following analysis will look both at statements by individual SIDS as well as by delegates speaking in their collective name, as the alliance of SIDS is rather weak and their members frequently build on earlier actions of individual member states.

27 See, for example the early statement by the representative of the Maldives in 1989 (UNGA 1989: 113).

28 Palau Permanent Mission to the United Nations, 2008: Statement by H.E. Mr. Stuart Beck, Ambassador Extraordinary and Plenipotentiary/Permanent Representative presented at the Thematic Debate of the UN General Assembly "Addressing Climate Change: The United Nations and the World at Work", February 13, New York.

29 The draft resolution was introduced in concert with Western states such as Australia, Austria, and Canada (UNGA 2008).

30 Nauru's delegate stated: "The adoption of the draft resolution will prove that we are seriously concerned not only about the global environment but, more importantly, about the survival of whole populations and the existence of their lands" (UNSC 2007d: 3).

31 However, even if not focusing on this issue, other SIDS do support sanctions as one possible tool: interview with the permanent representative of Tuvalu to the United Nations, New York, 9 November 2010.

32 Deitelhoff (2009: 44) argues that this might motivate actors to employ forum-switching strategically.

the SIDS in the GA session just before the adoption of resolution 63/281, resorted to a number of specific linguistic mechanisms as part of its arguing strategy.³³ One consistent example is the use of opposites, such as the contraposition of the small size of many of the islands concerned and the phrase “the great ocean that surrounds us” (UNGA 2009d: 2). This reinforces the size of the task and the sense of danger the SIDS wants to highlight. Nauru further stresses that the effects of climate change are real and are already affecting the SIDS’ population: the delegate uses the adjective ‘real’ five times in her last two sentences. She thereby attempts to establish the alleged danger of climate change as ‘reality’, i.e. something one cannot argue against.

Though starting from the situation for the SIDS themselves, Nauru shows how the projected threats of climate change will affect the whole world order. She emphasizes the possible submergence of whole states, either literally or at least in terms of international law as they become uninhabitable. She does that quite graphically by closely describing possible pathways to how a state could become uninhabitable, e.g. “a country that has been deeply affected by severe drought can no longer sustain itself because its hydro-power is non-operational and its drinking water non-existent, and can no longer produce crops to feed its people” (UNGA 2009d: 2). This account works as dramatization by displaying a worst-case scenario.

The effect is reinforced by the extension of this ultimate threat to the survival and thus identity of any state: “We will all suffer sooner or later. No country is immune [...], and the smallest of the SIDS will be the first” (UNGA 2009d: 2). Having established this threat framework, the conclusion that these are “matters of international peace and security” (UNGA 2009d: 2), i.e. matters for the SC, becomes a logical consequence. In addition, the delegate for Nauru stresses the urgency required: the “time to act is now” (UNGA 2009d: 3), making quite plain the traditional notion of security displayed.

This whole narrative of submergence, danger to world order, and the need for urgent action forms a decisive background to Nauru’s formal introduction of the (amended) draft resolution. Two observations

about this last part of the speech remain to be made. First, Nauru offers the SIDS’ interpretation of some key clauses of the draft, indicating that there is a clear role for the SC in dealing with “the security aspects” of climate change (UNGA 2009d: 3). Second, Nauru also states that the report of the Secretary-General to be drawn up under the provisions of the draft resolution is only “a critical first step” (UNGA 2009d: 3), which might indicate that the SIDS see it as part of a strategy to deliberately “trap” the UN member states into accepting that the security consequences of climate change cannot be denied and might need to trigger some specific action in the future.

In summary, the SIDS see a direct connection between climate change and security, especially relating to a rise in sea level and the possible submergence of whole states. Being already confronted with sea-level rise, they have a clear interest in averting these consequences. Some small islands states such as Palau even demand SC sanctions against the greatest violators of emission targets. The SIDS strategically switched to the plenary of the GA to find a forum that is more suitable for their persuasion attempts. In its speech introducing the draft resolution, Nauru resorts to references of size, history, urgency, threat, drama, and the affirmation that the negative security consequences of climate change are already a reality.

It is revealing that most (sceptical) speakers in the GA debate did not explicitly deny the link between climate change and security, and rather spoke about the role of the SC or climate change as a topic of sustainable development. Only Brazil and China warned that the debate on climate change should not be shifted from development to security and, moreover, the resolution adopted should not be construed in any way as supporting a link between climate change and security (UNGA 2009d: 20). This explicitly contradicts the interpretation of the SIDS and many other states uttered in the debate. In effect, with Nauru and Nicaragua speaking respectively for and against this recognition just before the adoption of the resolution, there is no consensus on the meaning of the resolution’s language. The ensuing conflict over the interpretation of its clauses in the subsequent ‘explanations of vote’ vividly testifies to that.

This struggle for the determination of meanings can also be seen in Nicaragua’s statement on behalf of 17 states in which it states that the GA and the *Economic and Social Council* (ECOSOC) “are *exclusively* responsible for the course of action to be taken regarding the possible security implications of climate change” (UNGA 2009d: 4, emphasis added). This

33 Although the negotiations are finished at that point of time, of course, the speakers in the debate reconstruct their basic arguments to legitimize their positions and the outcome with regard to the public audience as well as to establish some baseline interpretations of the resolution for further consideration in the future.

means that by rejecting any role for the SC, Nicaragua at least enters into a dialogue with the securitizing actors by acknowledging that climate change might have security implications.

The objectives of Nicaragua and the Arab states, whose statement was delivered by Bahrain, are more or less equal to those of G77 and NAM in the SC debate: stressing the developed countries' failure and/or responsibilities to engage in effective mitigation and adaptation measures as well as supporting the developing countries technically and financially. Emphasizing their readiness to join the "consensus adoption of the resolution" (UNGA 2009b: 6), they show that they want to be part of the international community and possibly indicate that they pursue similar aims.

Concerning discursive strategies, Nicaragua and Bahrain again employ two important narratives. The first refers to the competencies of the SC and international legal provisions regarding the role of the UN organs and committees, the second invokes the narrative of sustainable development, thus trying to shift the focus back towards sustainable development and away from security. The Security Council still figures prominently in their arguments because the SIDS' first draft highlighted its specific role in targeting the security implications of climate change (UNGA 2008). Since they still pursue a strategy of avoidance and denial, it seems difficult to acknowledge that the states sceptical of the securitization of climate change have been "trapped" in the argument for possible security implications of climate change.

Other speakers in the GA debate of resolution 63/281, though displaying sympathy for the cause of the SIDS, suggested a cautious approach to 'possible' security implications.³⁴ By taking on the agreed language of the final resolution,³⁵ these states may have intended to indicate that a common and inclusive approach to all facets of climate change is often more important than the strongest language possible. As a matter of fact, the adoption of the resolution by consensus was one of the main goals of the small island states, as the representative of the Solomon Islands pointed out (UNGA 2009d: 13).³⁶

34 These states include Haiti for the Caribbean Community, as well as Indonesia and Canada.

35 The extent to which the juxtaposition "possible security implications" is already influencing delegates is quite apparent by the fact that representatives of small island states also use this phrase, even if they elaborate on the actual reality and presence of the threat posed by climate change, as with the Marshall Islands and the Maldives (UNGA 2009d: 8, 18).

33.4.3 Report of the Secretary-General and the Most Recent Debate

The comprehensive report of the Secretary-General on the possible security implications of climate change was published on 11 September 2009 and discussed in the GA plenary on 16 November 2009. Although the report contains also a sub-chapter on the impact of climate change on the likelihood of intra-state and inter-state conflicts, the greatest attention is given to threats to human well-being and livelihoods, i.e. human security. In the ensuing debate, only states supporting the concept of such a link took the floor, which may indicate that the member states sceptical of the inclusion of this agenda item did not want to give credibility to the report by taking the floor in the first place, or intended to avoid entering a dialogue where their arguments could no longer flourish.

Having a comprehensive report by the Secretary-General as well as a second debate on this issue in a short time (the last GA debate with regard to resolution 63/281 had been in June 2009) will probably contribute to its establishment as a regular agenda item of the General Assembly³⁷ and might have also helped to push member states to bring the issue to the Security Council again. Since the sceptical states chose not to speak on the issue, member states supporting this approach had the chance to display their interpretation of the report's conclusions and the way forward without being disputed.

In this connection, the European Union made the opening statement with a very clear call for action. The representative relied on the stylistic device of tricolon, with an effect that nearly equals that of hendiatis, to underscore the universality of the threat posed by climate change. Climate change, he said, "affects us all [...] is [...] of concern to us all [and since it] brings shared challenges, we need to respond with a comprehensive approach at all levels and with all policy tools at our disposal" (UNGA 2009e: 1). This is also a reminder of the demand for greater responsibil-

36 This point is underscored by several other delegates such as those for Fiji, Samoa, and New Zealand.

37 Sweden, on behalf of the EU, spoke about the "watershed report" marking "the beginning of a new field of work for the United Nations" and that "climate change and its security implications [...] should be kept regularly on the agenda of the General Assembly, underpinned by regular reports of the Secretary-General" (UNGA 2009e: 1, 3), while Palau on behalf of the SIDS reiterated its call to include the issue of "security and climate change" as a permanent agenda item (UNGA 2009e: 5).

ity of the major developing countries for the mitigation targets previously mentioned. The Czech council presidency felt the need to highlight the neo-Malthusian hypothesis concerning climate change causing increasing resource scarcities leading to conflicts (UNGA 2009e: 5). The Swedish statement, however, only mentions conflict in passing, when talking about the Arctic region, international cooperation regarding conflict management, and EU strategy concerning climate change and security (UNGA 2009e: 2-3).

It is quite remarkable to note the development of the United States' policies in the debates under consideration. While the United States under the Bush administration talked about climate change and security in unrelated terms (UNSC 2007d: 10-11), they not only joined the list of sponsors for resolution 63/281, but President Obama also included the security implications of climate change in his first address to the General Debate of the United Nations in 2009, in which he unequivocally took up the responsibility for greater leadership by his administration on the issue, stating that "there will be no peace unless we take responsibility for the preservation of our planet" (UNGA 2009e: 13). These comments were frequently quoted by the US representative in the GA debate when discussing the report. The dramatic language is particularly striking: "the danger [...] cannot be denied", "Our responsibility to meet it must not be deferred", as well as the short, clipped sentences in this paragraph (UNGA 2009e: 11).

Meanwhile, the SIDS continued their strategic securitization in this second GA debate. Palau took the opportunity to speak on behalf of this group, stating that development and security should no longer be seen as alternatives in the debate on climate change, as G77 had always tried to argue, but climate change should rather be seen in a holistic manner, where development and security are mutually reinforcing and interdependent (UNGA 2009e: 3). This is a significant statement since it aims at taking the wind out of the main argument of the sceptical states. In this context, Palau also seems to have inserted the argument it had made previously but that had not been featured in the common SIDS statements concerning concrete actions expected from the Security Council. Here, the ambassador of Palau concludes his GA speech with an urgent call upon the powers of the Security Council to deal with statelessness and the complete submergence of whole member states. The Council should "creatively use its powers under chapter VII of the Charter to develop enforceable emission targets" (UNGA 2009e: 5). Clearly, such an argument signifi-

cantly lessens the possibility of the sceptical states' agreeing to a possible role for the Security Council.

Furthermore, members of the SIDS used many other opportunities to call on the Security Council to consider the matter on its agenda as a regular item. They used the annual open debate on the implementation of resolution 1325 (2000) on women, peace, and security to remind the members of the Security Council that the security implications of climate change could have repercussions for a whole range of topics.³⁸ The Pacific small island states, supported by the NGO *Islands First*, also sent a formal letter to all member states of the Security Council in May 2010, requesting a follow-up to resolution 63/281 by taking up the issue of climate change and security.³⁹ Even though their call on the member states who held the presidency of the Council in the remainder of the year to organize an open debate on the subject did not succeed, Germany made it one of its campaign promises to do that during its presidency of the Council.⁴⁰

That this attempt will not be fruitless might be expressed by a statement of the Secretary-General of the Arab League in a debate in the Security Council in January 2010. The Arab States had been some of the fiercest opponents of the securitization of climate change (UNGA 2009d: 6). Now Amr Moussa said: "I propose that the Security Council add two items to its agendas, one on the impact of climate change on the well-being and stability of the international community [...]" (UNSC 2010a: 5). This indicates, at the least, that the common position on this issue in the Arab League is fractured.

33.5 Contextualization and Policy Implications

A closer look at the contextual conditions that might have helped emphasize certain facets while omitting others is the third level of a sociological securitization analysis according to Balzacq (2010), where important framework and background factors can be found. In

38 Micronesia did so in 2009 (UNSC 2009: 43), while the Solomon Islands referred to the topic in the debate in 2010 (UNSC 2010b: 33), and Papua New Guinea called on the SC to take it up on behalf of all SIDS (UNSC 2010b: 45).

39 Pacific Small Island Developing States: "Letter to the member states of the Security Council", 20 May 2010, Permanent Mission of Nauru to the United Nations.

40 Interview with the Permanent Representative of Tuvalu to the United Nations, New York, 9 November 2010.

this case, the institutional context needs to be taken into account as well as the discourse conditions in the United Nations and in the world at large.

The Security Council debate highlighted the focus on conflict prevention and the possibility of including climate-change-induced violence in the perspective put forward by a number of Western states. Since the SC deals with armed conflicts on a daily basis, the debate was skewed in that direction just because of the institutional context. This made it decidedly easier for G77 and NAM to oppose the whole debate as they could rely on the powerful narratives of SC reform and the ‘democratic deficit’ of the Council vis-à-vis the General Assembly. For this reason the switch to the forum of the GA by the SIDS did not just provide the greatest audience possible, it also diminished the possibility conditions for an opposing argumentation by sceptical states. Sceptical states could no longer refer to narratives solely related to the Security Council, as the draft resolution only mentioned “relevant organs of the United Nations” and focused on the substantial issue of possible security implications of climate change for human security, especially in small island states.

The SIDS’ flexibility in agreeing to a compromise text brokered by Indonesia and their ability to find important allies among all regional groups as co-sponsors had the further consequence that any common sceptical position by the largest groupings, G77 and NAM, could no longer be arranged, as too many of their members had already endorsed the resolution as co-sponsors.⁴¹ The SIDS, on the other hand, had to accept the qualification of the link between climate change and security as a mere possibility and in a sufficiently vague language concerning the role of relevant UN organs; this could not be read as a clear mandate for the SC. However, the language chosen does not exclude a possible role for the SC since “within their respective mandates” can be interpreted differently, depending on one’s understanding of the limits of the SC’s mandate, a hotly contested issue in the past decade (Talmon 2005). Therefore, the SIDS’ reference to the security implications of climate change at many different opportunities at open debates of the Security Council should be seen as attempts to win the struggle for the interpretation of this phrase in the resolution. In the light of Germany’s intention to bring the issue to the SC’s agenda during its current term as part of its campaign promises, this strat-

egy seems to have paid off.⁴² In the same vein, the SIDS arguably rely on a strategy of *rhetorical entrapment* as the successive steps of the SC debate, the GA resolution, the report of the Secretary-General, and the new debate in the SC show vividly. As the topic becomes more and more streamlined within the United Nations system, it becomes increasingly difficult to oppose it not just on procedural grounds but also substantially.

As securitizing actors, the SIDS are particularly credible since it is hard to imagine any hidden agenda beyond the threat to their very survival and statehood posed by the extreme consequences of climate change. The change from a focus on conflict prevention and an ‘environmental conflict’ narrative frequently employed in the SC debate to a focus on an ‘environmental security’ narrative has also added to the success of the SIDS’ securitization move. As their security practices are therefore in line with their securitization move, this can be labelled a “referent object benefiting securitization” (Floyd 2010: 56). This also confirms the utility of a revised securitization theory that does not rely on a fixed, traditional understanding of (national) security, but one that is open to the dynamic generation of the meaning of security depending on the context and the dominant narratives.

Some of the rhetoric used, however, also poses risks to the credibility accorded to small island states. When states like Palau refer to emission targets enforceable by the SC, they act well outside the possibility conditions of climate politics.

The debate on climate change and security reflects, after all, the main cleavages of ‘ordinary’ climate politics. As developed states bring up notions about ‘shared responsibilities’, the major developing states are acutely aware of the mitigation burden they are supposed to bear. For these reasons, the debate about the security implications of climate change reaches the same limits as the overall debate on a comprehensive post-Kyoto agreement on mitigation and adaptation. The deliberate employment of certain discursive strategies such as forum-switching or rhetorical entrapment provides the most vulnerable actors of the climate change debate with important and, as discussed, effective discursive strategies in the UN forums. Future meetings will show if the SIDS can also rely on them to transform debates and reports into feasible action.

41 In the end, there were around 100 sponsors of the draft resolution.

42 The open debate on security implications of climate change took place in July 2011 under the German presidency of the SC.

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34 Climate Change, Peacekeeping, and Perspectives for UN Reform

Bo Kjellén and Peter Wallensteen

34.1 A Planet Under Pressure

Ever since the Club of Rome published its report *Limits to Growth* (Meadows/Meadows/Randers et al. 1972) the question of the human impact on the global environment and the scarcity of the planet's resources have come to play an ever-increasing role in international politics. In the report, the researchers built a model to investigate five major trends of global concern: accelerating industrialization, rapid population growth, widespread malnutrition, depletion of non-renewable resources, and a deteriorating environment. At the time, this report was given considerable attention, but as its predictions about natural resources did not seem to materialize, the value of the findings began to be questioned. But it is noteworthy that the report saw developments over a hundred-year perspective, and that recent research seems to confirm that the global environment is even more vulnerable than the *Limits to Growth* report predicted.

The notion of global change to the immensely large natural systems caused by the impact of humans is now the subject of considerable attention by the research community. A seminal contribution to this reflection came with the publication of *Global Change and the Earth System: a Planet under Pressure* (Steffen/Sanderson/Tyson et al. 2004). More recently, in September 2009, a group of researchers led by Johan Rockström of the Stockholm Environment Institute published an article in *Nature* (Rockström/Steffen/Noone et al. 2009), which identified nine areas where there are risks of “crossing thresholds that will trigger non-linear, abrupt environmental change within continental to planetary systems”. The authors concluded that humanity had already transgressed the planetary boundaries for climate change, biodiversity loss, and changes to the global nitrogen cycle, and is nearing the limits for ocean acidification, the phosphorus cycle, global freshwater use, chemical pollution, and atmospheric aerosol loading. As for stratospheric ozone, the situation is still critical, but loss of ozone is

under reasonable control because of the impact of the Montreal Protocol.

These are sobering facts. Paul Crutzen, Nobel laureate in chemistry in 1995 for his research on the ozone layer, has described our time as the ‘Anthropocene Era’, indicating that humans are now in fact influencing the global system to an extent that the planet is being pushed outside the Holocene range of variability for key processes (Crutzen/Stoermer 2000; Crutzen 2002, 2006, 2011). This also means that the earth system is now operating in a no-analogue state: as a species, humans have never been in this situation before.

This means that humankind has itself become a force of nature, because of the tremendous increase in population and technological capacity. But as individuals we are still small and vulnerable in the face of disturbances to global natural systems. One striking example is the forced migration of vulnerable groups caused by environmental change or environmentally induced disasters. Therefore, the security concerns of nations are changing: whereas traditional security policy has been crafted to face threats from other nations or coalitions of nations, the Anthropocene has created a new kind of threat. Traditional theories of conflict saw war as the continuation of diplomacy by other means. But now we must realize that we cannot negotiate *with* climate change. There is no one on the other side of the table and no room for bargaining. All nations are on the same side, and our negotiation is between world governments facing a common though diffuse and partly long-term threat.

34.2 A New Diplomacy for Sustainable Development

International climate politics are therefore part of what can be called a new diplomacy for sustainable development (Kjellén 2008), primarily characterized by a new perception of the nature of the threats we

are facing. Many of them are clearly global, such as climate change. Emissions of greenhouse gases all end up in the same shared atmosphere. But there are also a number of serious threats of a regional nature: transboundary air pollution is a typical example. Problems of this kind, like the effects of desertification and drought, increasingly tend to take on global significance, since they appear in many different parts of the world simultaneously.

There are, however, also a number of other elements which distinguish this new diplomacy from traditional relations between states.

First, there is the need for an extremely long-term perspective in evaluating the situation and considering the options for action. The scientific models make predictions for hundreds of years into the future. In setting long-term objectives for climate negotiations the pre-industrial period is the point of departure and the perspective for the future looks toward the second half of this century. The short-term target for emission reductions is 2020, whereas a quantified common vision of a global reduction of 50 per cent refers to 2050. This is really quite extraordinary, since the time span is far beyond not only the mandate period of governments but also beyond the lifespan of the majority of negotiators and politicians. The sense of responsibility for future generations and the notion of inter-generational equity give a particular dimension to the negotiations.

Second, there is a need for a broad approach to the societal implications of decisions taken in the international arena. Once again, climate change is a typical example: emissions of CO₂ are to a large extent related to energy and transport, two sectors that are at the very heart of our industrial civilization and more than anything have contributed to improvements in the living conditions of a large part of the planet's population. In order to reach ambitious targets of greenhouse gas reduction there are inevitably many powerful interests that are being challenged, and many governments will have to face opposition to important structural changes in their societies. At the same time, global negotiations have to recognize that developing countries have only a limited responsibility for the present concentrations of carbon dioxide in the atmosphere and that developed countries therefore have to bear the main burden of global action. This has been recognized in the relevant texts as the notion of *common but differentiated responsibility*. In the present negotiations, many developing countries are also insisting on the recognition of a historical debt of the north, due to the greenhouse gases

which have accumulated since the beginning of industrialization. These examples demonstrate that the new diplomacy goes well beyond the environmental problems. We are in fact considering international negotiations which have a bearing on broad societal issues, in a different setting from traditional foreign policy.

Third, since the results of international negotiations are dependent on the instructions of negotiators, national *enabling conditions* need to be well understood, in particular the very broad range of interests that are involved. To formulate instructions for the climate negotiations is to strike a delicate balance between a number of political, economic, and social considerations; the effectiveness of the negotiations and impact of the results are to a large extent determined by the way in which different countries really understand the enabling conditions of other parties, within the framework of a negotiation dealing with non-negotiable threats of a new kind. In this context we also have to realize that sustainability is not just about the environment, but involves economic and social sustainability as well.

The point of departure for this new diplomacy was the UN Conference on the Human Environment in Stockholm in 1972, which among other things led to the adoption of a Declaration containing a set of principles, and later to the establishment of the *United Nations Environment Programme* (UNEP). Twenty years later, the *UN Conference on Environment and Development* (UNCED) in Rio de Janeiro revised the Stockholm principles and adopted Agenda 21, a detailed programme of action for the 21st century. In this way, the United Nations has played an important normative role in creating the conditions for the development of the new diplomacy.

However, as the global threats such as climate change, depletion of the stratospheric ozone layer, loss of biological diversity, water stress, and desertification linked to soil degradation became more precise and better documented by science, it became clear that the world needed legally binding instruments, going beyond mere declarations and action programmes. Today, many global conventions exist and have an impact on international policies that cover a wide range of subjects. At the same time, it has to be recognized that efficient implementation and sufficient financial resources are often lacking. Nevertheless, since we are dealing with global problems, it is clear that this new diplomacy is becoming a central part of the responsibility of the United Nations.

34.3 The Framework Convention on Climate Change

Among these conventions, the *Framework Convention on Climate Change* (UNFCCC) occupies a special place. The Convention was negotiated in parallel with the preparations for the Rio Conference, and after very difficult negotiations it was signed in Rio de Janeiro in June 1992. The developed countries accepted that they should make an effort to stabilize greenhouse gas emissions between 1990 and 2000, but the language was weak and not very effective. More important was the agreement on an objective, and an article listing fundamental principles such as the notion of “common but differentiated responsibilities” already mentioned. The convention also contained procedural and institutional provisions which have provided a basic framework for further negotiations. The Secretariat of the Convention is located in Bonn.

The first Conference of Parties of the UNFCCC in Berlin 1995 (COP 1) considered the adequacy of commitments and found that the Convention needed to be supplemented with a special protocol with quantified emission targets for developed (Annexe I) countries. This led to the adoption of the Kyoto Protocol in 1997. There were differentiated targets, ranging from -8 per cent for the EU as a group to +10 per cent for Iceland for the period 1990 to 2012. On average, the developed countries’ reduction commitments would amount to around -5 per cent.

In order to create conditions for ratification, the Protocol required some additional agreements on specific points, and these could only be finally reached at COP 7 in Marrakech in 2001. However, by that time, the incoming Bush administration in the United States had already announced that the US would not ratify the Protocol. The EU took the lead in the defence of the agreement, and was reasonably successful in convincing countries like Japan to ratify; but the rules for entry into force also required ratification by Russia. It took until the autumn of 2004 for Russia to announce a positive decision, finally permitting the Kyoto Protocol to enter into force in February 2005.

As the first commitment period will end in 2012, it soon became clear that negotiations for the next phase would have to be concluded by 2009/2010 in order to give sufficient time for ratification before the next agreement would have to enter into force. Therefore, COP 13 in Indonesia adopted a “Bali Action Plan”, establishing a road map for negotiations to be finalized at COP 15 in Copenhagen in December

2009. The negotiations have been very complicated, and progress was slow.

The outcome of Copenhagen was disappointing, given the high expectations and the presence of a large number of heads of state and government. However, the problems of climate change will not go away, and it is necessary to build on what has already been achieved in the technical negotiations, exploring to the maximum the terms of the political document that was elaborated at the highest level during the final phase of the meeting, the Copenhagen Accord. It is not helpful to play a blame game, but we have to recognize that the prospects for major progress over the next few years remain dim. At the same time it is essential for governments to provide a stable global framework of cooperation to maintain the confidence of investors in new energy and transport systems as well as infrastructure.

At the same time, the developed countries have to recognize that the question of equity has to be faced up front, with increased efforts to transfer new technology and with new financial resources moving from north to south. None of this is easy under the present global economic conditions, but it has to be done.

The scientific basis for the climate negotiations has been established by the *Intergovernmental Panel on Climate Change* (IPCC), which was formed in 1988 and has produced four assessment reports, the latest one published in 2007. IPCC engages more than 2000 scientists and generally has high credibility. However, critical voices have also been heard, questioning the data of the IPCC: it is to be expected that the scientific debate will continue and that it will lead to a deepening of the understanding of the complexities of the global climate system. It is unlikely though that this debate will affect the international efforts in the political arena: there is sufficient evidence for a human impact on climate and there is sufficient political support for moving the negotiation process further.

Nevertheless, COP 15 in Copenhagen demonstrated very clearly the interface between the ‘new’ diplomacy and more traditional foreign policy concerns. Many observers felt that the difficulties of the negotiations reflected emerging change in the big power relations, in particular between the United States and China. This makes the linkages between geopolitics and climate politics more visible, providing a background for future discussions on the relationship between climate, security, and conflict. Potential problems might arise in the Arctic, where the reduction of ice due to the rapid warming of the region has already started a scramble for resources of all kinds. Similarly,

new sources of conflict might appear in Africa, both with regard to oil and to valuable minerals, to mention just a few examples.

34.4 The Role of the United Nations

Looking beyond Copenhagen, two aspects of global sustainability impose themselves, and involve the future of the United Nations as the central truly global organization. There is no substitute for the UN as a venue for negotiations on global threats. Other institutions or structures would not meet the criteria of global participation, legitimacy, and accountability. For instance, lately G20 has taken prominence in the discussions on the global financial crisis and it has also considered the problems of climate. The acceptance of G20 as a venue for discussions on the status of the world economy is welcome, since it includes all the major economies, including those in the South. Thus it can provide guidance for the climate negotiations and facilitate agreements; but it cannot replace the UNFCCC as the institution where legally binding commitments are agreed.

Therefore, the UN system has a special role in the new diplomacy; furthermore the United Nations is irreplaceable when the international community is facing more traditional conflicts that might have their origin in climate change or other global environmental threats.

In all these respects the ultimate challenge is the survival of the human species. The threat of uncontrollable environmental change on a global scale and the threat of regional or global conflicts that might lead to the use of nuclear weapons have to be faced. An efficient United Nations system is necessary to build structures which will strengthen peacemaking and peacekeeping and improve the capacity of the system to tackle emergency situations and natural disasters in a warmer world. But can it be done? In the next section these questions will be discussed in more detail.

There is a fear that environmental issues will result in increased security concerns and thus lead to armed conflict. So far the evidence for this is limited. Recent data on conflict trends do not point to a global increase in armed conflict, for instance (Harbom/Wallensteen 2009). Trends may change, however, and insightful writers mention several possible connections that require analysis (e.g. Nordås/Gleditsch 2007; Salehyan 2008)). Let us point to four particular dangers. One is that areas become inhospitable thus lead-

ing to out-migration, potentially creating conflicts with the inhabitants of the area the migrants are entering. Recent data demonstrate that many would actually already like to leave their countries to move to more affluent and stable regions. A typical example is the case of Bangladesh and India. Hundreds of thousands of people have already moved from Bangladesh, so far without creating conflicts. But if the numbers rise, and if Indian authorities should intervene to stop migration, the potential for conflict would rise significantly (Ahmed 2009).

A second risk relates to the control of fresh water resources, which not only relates to conflicts over its uses inside a country, but also to potential disputes over internationally divided waterways. The scenarios for climate change serve to increase such dangers.

A third, more traditional type of potentially serious dispute is that relating to access to material resources, that is, competition for particular minerals (including petroleum), forests, land areas, or strategic points to control such resources. Again, climate change may exacerbate such tensions.

Finally, and more novel, is the argument that such disputes are many and common, and thus normally handled through existing state institutions. Today's experiences of weakened governments ('failed' or 'fragile' states) may make local management (however preferable it is) less resolute or even more unlikely. In the case of Darfur, attention is paid to the importance of the neglect of the area by a distant capital in sparking conflict (Kevane/Gray 2008). A larger study comes to similar conclusions (Theisen 2008).

Together, these four dangers provide convincing reasons for early action. Many studies demonstrate that countries can find solutions to common problems through negotiation. For instance, in transboundary water disputes, regimes and arrangements have been made possible through negotiations. At the same time, when issues become connected to very narrow security concerns, the difficulties of finding solutions increase (Jägerskog 2003). Therefore, it is important to act now, before environmental problems take on a security dimension. There are already signs of military planners incorporating climate change into their future security scenarios (National Intelligence Council 2008; Dyer 2008).

Thus, for UN peace actions there are reasons to be concerned about climate change and consider how it can be incorporated into regular action. When a peacekeeping operation is located in an area of climate challenge, it might be important not only to consider the immediate security concerns but also long-

term dimensions. In the case of Darfur, the UN/AU mission may have benefited from including environmental expertise, preparing for post-conflict activities that would involve long-term action. Not only would this contribute to giving the parties added incentives for ending the conflict, it may also promise credible and tangible peace dividends. For instance, geologists estimate that there are vast reserves of water below the desert. A jointly agreed, responsible use of these resources would provide common interest in a solution. It would be a tool in mediation.

An additional example is that the scenarios for climate change provide new early warning signs. For instance, there are reports of how the uses of water in Yemen make this country even more vulnerable to drought, with the possibility of economic crisis and emigration as well as weakened institutions.¹ An early warning strategy would be to consider the situation in Yemen at this moment as a crisis of regional and global concern before it turns into a security arena, attracting actors and actions with entirely different agendas.

Many of the fragile states find themselves in an exposed post-conflict situation. The way international peace-building action is designed may need to incorporate the climate dimension in order to avoid a recurrence of conflict. The benefits of peace should not just bring about an attempt to aim at a quick reconstruction, for instance, but the long-term consequences should be taken into account. Thus, resources are to be maintained, used with care, and left for future generations.

These arguments together point to the centrality of global institutions. Governments are weak, and may, understandably, not have the perspectives that incorporate regional and global concerns. Global institutions that are responsive and concerned about local needs would work both as instruments for managing the planet and as a resource of support and assistance to governments struggling to cope with the day-to-day issues. Indeed, it is in the global interest that exposed countries are environmentally in balance with the trends of climate change. This presents an added challenge to the UN system. In this context, the financing problems of UN operations play a significant role. The linkage between environmental and security concerns requires more willingness on the part of UN member states to provide additional funds.

34.5 The Need for UN Reform

The responsibility of the United Nations system is daunting. We note here that global action will be necessary on a grand scale if disasters relating to environmental threats or threats arising out of a combination of environmental factors and traditional causes of conflict are to be avoided. At the same time we have to realize that major changes of the UN Charter seem impossible for major political reasons. Successive Secretary-Generals have tried to build support for the action needed, with limited results.

However, the present situation, and the risks of making the UN lose relevance at a time when it is more needed than ever, for the reasons given here and elsewhere, warrant renewed efforts. This chapter briefly reviews some possible reforms, expecting that further discussion could lead to new proposals being formulated which would stimulate the discussion about the role and structure of UN in a new and rapidly changing world. The Climate Convention will serve as the background and focus of these suggestions.

The UNFCCC is the most complex of all the Rio Conventions, and its scope is very wide. In many respects it has become a universe of its own, with rather limited links to the United Nations system. Nevertheless, on an issue like the appointment of the Executive Secretary, the formal decision is taken by the Secretary-General of the United Nations. As we begin to realize the very broad character of the climate change problem, and its linkages to traditional international relations, it becomes more obvious that common action in this field will need to be supported by measures and decisions taken in other parts of the UN system; and that conversely, the success or failure of the Climate Convention will have an impact on the general standing of the UN. Therefore, efforts to improve the operation of the UN system in the broad field of sustainable development, but also beyond, are important for the capacity of the international community to deal with climate change.

We will mainly comment on three aspects of this problematic: (1) institutional frameworks and structures for decision-making; (2) the role of science and research; and (3) priorities and structures for early action in emergencies.

¹ Author, "title", in: *The Times* (London), 21 October 2009; here: *TimesOnline*; at: <<http://www.>>. [full reference IS NEEDED]

34.5.1 Changed Structures for Decision-making: Institutional Frameworks

At the central UN level, issues related to the environment and sustainable development have been anchored in ECOSOC and in the Second and Third Committees of the General Assembly. This has led to a fair amount of duplication, and various suggestions have been made to improve the situation, ranging from a winding up of ECOSOC to a strengthening of its role. The Rio Conference in 1992 led to the creation of the *Commission on Sustainable Development* (CSD), which meets once a year and has had some success in attracting high-level participation and providing a forum for many interesting discussions. However, it has never really become a policy-making institution, and its impact on the climate issue has been rather non-existent. Furthermore, from the beginning there has been some uncertainty with regard to the role of the CSD in relation to UNEP and its Council meetings.

The Commission on Global Governance (known as the Carlsson-Ramphal Commission) in its 1995 report *Our Global Neighbourhood* proposed that the *Trusteeship Council* as one of the principal organs of the United Nations should be given a new role as a trustee for the global commons. Given the inter-generational character of the new threats facing us, such as climate change, it could also be seen as a trustee for future generations.

This proposal, like many others in the Carlsson-Ramphal report, did not lead to any action at the UN level, one reason being the general difficulty of envisaging revisions of the UN Charter. In the World Summit Outcome of 2005 the world leaders agreed to abolish the Council, but that did not happen either.² Thus, it remains an institution in search of a mandate. We also realize that later reform proposals, such as those of former Secretary-General Kofi Annan, have had very limited success. However, we would suggest that such a change of mandate for the Trusteeship Council be seriously considered now. This would be a spectacular action, focusing constant political attention at the highest level of the United Nations on the new survival issues facing mankind. And with such issues as climate change or loss of biodiversity now causing world-wide attention and concern, it seems that the prospects for success would be better than in the 1990s. For climate negotiations, it would mean a

more constant focus on climate change at the UN central level and a support for solving many issues which have an impact on climate change. It would also mean that an important new linkage would be established between the Trusteeship Council and the Security Council.

We realize that the prospects for far-reaching UN reform are not good at the present time. But it is essential that serious proposals are on the table if and when opportunities appear.

The Rio Conference opened new avenues for the participation of *civil society* in UN meetings. New rules made it possible for a broader group of NGOs to be part of the Conference and of subsequent meetings on sustainable development. Against this background, the Carlson-Ramphal report went further in suggesting that an annual UN Forum of Civil Society be established, and that a new "Right of Petition" be available to civil society. The latter proposal was based on the experience of the Special Committee of the Implementation of Decolonization, which was established in 1961 and provided an opportunity for causes to be heard and grievances voiced beyond government level. In the present situation the Commission felt that "there must be a place within the UN system for individuals and organizations to petition for action to redress wrongs that could imperil people's security if they remain unaddressed". This proposal should be seen against the background of the report's general view of the changed nature of global security, and to set the security of people and the security of the planet in the centre of attention. Furthermore, in recent years the emergence of social media, such as blogs, has created new possibilities for the general public to be well informed, and to influence decision-making processes.

Proposals of this kind have so far been blocked by the many political and administrative interests that defend the status quo. However, with the new insights into the nature of the human predicament in view of emerging threats, there should be an increased understanding in the international community of the need for new approaches. There are many ideas circulating relating to the role of the *United Nations Environment Programme* (UNEP), the need for improved coordination between the different Rio Conventions, and above all to the ways in which a better implementation of agreed decisions and commitments can be achieved. Furthermore, climate change and mitigation of climate change are closely related to all aspects of the sustainable development agenda: it is not just the environmental aspects that are discussed, but also

2 UN General Assembly, 2005: *World Summit Outcome*, New York, UN GA (A/Res/60/1): paragraph 178.

economic and social sustainability. Thus, the relationship between climate negotiations and the present economic crisis, as well as the links between the UN-FCCC and the World Trade Organization, are highly topical. A former Swedish Environment Ambassador, Lars-Göran Engfeldt, has covered these various aspects in some detail in a recent book (Engfeldt 2009).

Behind all this is also the difficult problem of control of compliance and the potential for sanctions in a still rather weak multilateral framework. However, it is our conviction that events will show that the system will need to be strengthened: the combination of absolute global threats of a new kind, the impact of the quest for fairness and justice at both global and national levels, and the increasing security concerns linked to global change require a new approach to the institutional and structural issues.

Indeed, many of the instruments for achieving compliance already exist, and no other global system has the same legal standing as the UN. Chapter VII of the Charter gives the Security Council the authority to invoke sanctions (or even military action!) in situations that constitute threats to international peace and security. Thus, binding agreements have to relate to the UN charter, giving more clout to the international community to actually act in case of non-compliance. If the Trusteeship Council is given the mandate we suggest, it could also be a matter for this Council to alert the Security Council in cases of non-compliance, thus bringing the climate change issues to the highest authority of the international community. It would mean ultimately connecting climate issues to security, but security at the global level, not at the level of particular (national or sub-national) actors or interests. The global process has already been initiated, as demonstrated by the UN Security Council addressing the issue in April 2007 (Detraz/Betsill 2009).

The purpose of this section has been to underline the fact that reform of the UN system is necessary to face the challenges inherent in the environment/security nexus. This is natural, since the present structures reflect the realities of the immediate post-World War Two period. At the same time we must recognize the difficulties of change when central political interests of countries are at stake.

34.5.2 The Role of Science and Research

All the major environmental negotiations over the last decades have been driven to a large extent by the natural sciences. For climate change negotiations, the establishment of the *Intergovernmental Panel on Cli-*

mate Change (IPCC) in 1988 was of great significance. The first assessment report of the Panel came in 1990, and it had a considerable impact on the negotiations which started in 1991. Here was an assessment by a large number of specialized scientists which showed that 'business as usual' was not a sustainable course of action if serious global warming was to be avoided. The basic numbers of the expected consequences of continued increases of emissions were already in the range of 1.5 to 6 °C by 2100. The assessment reports that followed in 1995-96, 2001, and 2007 became more precise, but they have basically confirmed the warming projections established from the beginning. A debate has opened on the accuracy of certain IPCC findings. However, they have not shaken the basic trust in the methods of work, nor the fundamental conclusions drawn so far. The most important statement in the second assessment report may well have been the following conclusion: "Our ability to quantify the human influence on global climate is currently limited. ... Nevertheless, the balance of evidence suggests that there is a discernible human influence on global climate." This statement should also be seen in the perspective of other global effects of human activities on natural systems, such as biological diversity, the water cycle, the nitrogen cycle or, more generally, ecosystem services (Rockström/Steffen/Noone et al. 2009).

For a closer description of the work of the IPCC and its role in climate negotiations, the Panel's first Chairman, the Swedish scientist Bert Bolin (Bolin 2007), offered many insights. The experience of the IPCC has inspired suggestions that other global problems, such as biological diversity or water stress, would benefit from the establishment of similar structures. Moving towards action with consequences for national or international politics, there seems to be a strong case for a closer involvement of the social sciences, and this will be one of the important issues to be considered as the discussion of international security related to climate change becomes more intense. Research aimed at linking the consequences of climate change for international relations in a more systematic way will be needed, and such research will be of significance for the manner in which the United Nations will be able to deal with the new global threats in a world which is still to a large extent operating within traditional security policy parameters. One particular aspect of this which is seldom discussed is the general drain on the world's resources because of the expenses of military activities. When the cold war was over there was considerable discus-

sion of the concept of a 'peace dividend' which could be used for combating poverty and improving the global environment. However, that discussion is not on the agenda any longer.

34.5.3 Priorities and Structures for Early UN Action in Emergencies

The UN and its various agencies and programmes play a central role in providing practical and humanitarian assistance, and they perform admirable work. But even if climate experts are still very careful in directly linking climate change to single events, they admit that a warmer atmosphere and warmer oceans are likely to lead to stronger tropical storms and other disturbances to a very sensitive global system. With such prospects, the international system of relief operations will be facing severe tests. Furthermore, the likelihood of other disasters, such as earthquakes along the planet's many fault lines where continental plates meet, underlines the weaknesses in the present international system for preparedness and management of relief operations. A particular weakness seems to be the lack of coordination and control during the first three or four days of a major disaster, which are also the most lethal. The terrible earthquake that hit Haiti in January 2010 underlines the importance of coordination and readiness.

The unbearable images of scared and suffering children, women, and men waiting for relief were shown on TV and followed by the waves of solidarity that accompany this situation, the funding, the voluntary helpers, the deliveries of food and other needed provisions. But there have also been confusion and uncertainties: lack of leadership, weak national and local administrations frantically trying to cope, and international organizations scrambling to help without sufficient coordination.

At the UN level, it is difficult to imagine a more forceful image of the world organization than the existence of a global disaster coordinator with the capacity to mobilize within hours an international support action that would serve as the immediate focus for everything that follows, helping national governments to coordinate aid flows and taking on whatever tasks that are necessary in the first critical days. Of course, the UN already has mechanisms for disaster relief, but it would be different if stable, structured and well-prepared machinery could be set in motion whenever a major disaster occurred.

Many political and practical problems can be foreseen in establishing such a system. At the same time

we note examples that are promising, e.g. the recently established UN *Global Impact and Vulnerability Alert System* (GIVAS).³ Furthermore, in the globalized world of to-day, and facing the effects of climate change, it would demonstrate that we are all on the same side in tackling global threats of a new kind. The consequence could also be greater support for other UN activities, such as peacekeeping operations, combating poverty, or long-term development cooperation.

Along the same lines, practical and concrete action to prepare for emergencies (or for that matter climate change adaptation at a more general level), based on national and regional institutions, should be given more attention. Since financing is of central importance, new avenues should be explored, involving more international sources of funds, such as revenues from air travel taxes, or proceeds from the auctioning of emission allowances.

34.5.4 A Major Conference on Global Change, Development, and Security?

It is widely accepted that big conferences rarely lead to concrete and lasting results. Therefore it is necessary to be very cautious in making proposals with this aim. At the same time, there is general recognition that the Rio Conference in 1992 has had a significant bearing on policy developments, and that the Climate Convention has become a major instrument for international cooperation. The symbolic value of Rio was considerable, and it is now realized that whereas climate change in the early 1990s was seen as just another issue for researchers, NGOs and diplomats, the subject is now on the agenda for most summit meetings of political leaders all around the world.

As the new global threats to natural earth systems on the one hand create a need for a new kind of diplomacy, and on the other hand risk deepening traditional security problems, this challenge to global diplomatic inventiveness must be faced. One way could be to try to bring all these various elements together in a UN Conference on Global Change, Development, and Security.

In 2009, the United Nations General Assembly decided to mark the 20th anniversary of the Rio Conference with a Conference on Sustainable Development, to be held in Rio de Janeiro in 2012. This is a welcome initiative, with its stated aim of reviewing, at the highest level, the implementation of commitments

3 See for details, at: <givas@un.org>.

made by the international community, the contribution of the 'green economy' to sustainable development and elimination of poverty, and the question of international governance in the area of sustainable development. A preparatory committee will be established within the existing Commission on Sustainable Development, but the UN resolution only foresees three sessions totalling a period of eight days for its work. This seems to indicate that the result of the Conference will mainly be in the form of a political declaration.

We should recall that one of the main reasons for the impact of Rio was the path-breaking contribution of the Brundtland Commission Report (1987) that actually paved the way for the work of the Conference Secretariat and the adoption of the major Rio document, Agenda 21.

A major Conference of the kind envisaged here would need a different kind of focus from the one now prepared for 2012: the truly global threats that are approaching planetary boundaries in areas such as climate change, biological diversity, the phosphorus cycle or the nitrogen cycle, water, the productivity of land and soil, linked to the operation of the global economy and particularly, the new security issues. This global focus at the same time must recognize that local and national conditions are instrumental in framing the regional and global problems that need to be addressed. The preparation would have to be very thorough and include a new Brundtland-type Commission, with a strong secretariat and the full participation of scientific expertise. A Conference of this kind could therefore not be held before 2017 or 25 years after Rio.

A legitimate question is whether humankind can wait that long. Once again, these authors wish to underline the need for the preparatory process to take its time. At the same time the very process has a value of its own; it would also occur in parallel with the final years of the review of the Millennium Development Goals⁴ by 2015 and be in step with the continued efforts on climate with focus on the 2020 target. The concentration on global issues, including the security questions, requires constructive thinking and

scholarly reflection which needs time to mature in order to lead to a diplomatic effort with prospects of success.

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4 The Millennium Development Goals were adopted at a special high-level session of the United Nations General Assembly in 2000. They contain objectives for reducing poverty, improving water and sanitation, tackling environmental concerns etc. The prospects for attaining the goals are still uncertain, and it is obvious that failure would affect the credibility of the United Nations.

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35 International Climate Change Policies: The Potential Relevance of REDD+ For Peace and Stability

Dennis Tänzler and Felix Ries

35.1 Introduction

The debate on climate change as a threat to peace and stability has gained some momentum in recent years. In particular, the fourth assessment report published by the *Intergovernmental Panel on Climate Change* (IPCC) triggered a surge of interest in the potential security implications of climate change. The scientific findings on climate change paint a dramatic picture of the regional impacts of climate change (IPCC 2007). Since then, numerous studies and reports have been published focusing on the potential security implications of climate change (e.g. CNA 2007; WBGU 2007; Campbell/Gulledge/McNeill et al. 2007; Carius/ Tänzler/Maas 2008; Mabey 2008). Much of this interest focused on the ways in which climate change might amplify factors conducive to violent conflict – weakening state institutions, increasing competition for natural resources such as water and land, and displacing people into areas where they are not welcome. In September 2009, a report by the Secretary-General of the United Nations summarized the major findings of these studies and outlined five channels through which climate change could affect security (UN General Assembly 2009):

1. *Vulnerability*: Climate change threatens food security and human health, and increases human exposure to extreme events.
2. *Development*: By slowing down or reversing the development process, climate change can exacerbate vulnerability and undermine the capacity of states to maintain stability.
3. *Coping and security*: Migration, competition over natural resources, and other coping responses of households and communities faced with climate-related threats could increase the risk of domestic conflict as well as have international repercussions.

4. *Statelessness*: There are implications for rights, security, and sovereignty (or the loss of statehood) because of the disappearance of territory.
5. *International conflict*: There may be implications for international cooperation from the impact of climate change on shared or undemarcated international resources.

The forecast of this UN report and the various studies is clear: countries with low adaptation capacities will be hit hardest. Weak and fragile states are considered particularly vulnerable because they are unlikely to be able to bear the strain of climate change due to their already limited capacities. Further weakening of the public sector in these countries can lead to national and regional destabilization, with societal and political tensions potentially developing into violent conflict or even war. This is all the more true for countries in conflict or post-conflict situations.

If climate change can increase the frequency, intensity, or duration of violent conflict, then it is important to investigate the extent to which tools such as peacebuilding activities available for managing climate risk can be integrated into efforts to stabilize the overall political situation of a country. However, little attention has so far been paid to substantiate the impacts of climate change and climate change policies on conflict-prone countries. Mitigation as well as adaptation measures are likely to affect the overall situation of countries. Ideally, they can support transformation processes towards more sustainable, peaceful, and stable relationships and structures of governance. As contributions to capacity building, they can help avoid a relapse into conflict. However, due to the complex situation, above all in peacebuilding situations, it is also possible that they yield unintended side-effects, further fuelling existing conflict constellations.

This chapter aims to address this lack of reflection on the linkages between the challenges of climate

change and peacebuilding by analysing one key aspect of the mitigation debate, namely reducing deforestation, and how it may impact potential (post-)conflict constellations. To this end, the major linkages between the relevant security implications of climate change on one hand and the major challenges for peacebuilding on the other are outlined (35.2). Against this backdrop the potential of policies aimed at mitigating climate change through the reduction of deforestation in the context of the (de-)stabilization of conflict-prone areas are discussed (35.3). The chances and risks associated with these policies are explored, along with the conditions under which they are likely to achieve their goals through the strengthening of capacities and sound engagement with the international climate change process (35.4).

35.2 Climate Change: Threat Multiplier and Minimizer

The increasingly bleak assessments of the IPCC have led some analysts to ask a further question: how could changes in water distribution and other climate change phenomena affect human and national security (e.g. Campbell/Gullede/McNeill et al. 2007; CNA 2007; Carius/ Tänzler/Maas 2008 2008)? The *German Advisory Council on Global Change* (WBGU)'s report on *World in Transition: Climate Change as a Security Risk* captures the tone of much of the analysis of the past three years: "Climate change," the authors argue, "will overstretch many societies' adaptive capacities within the coming decades" (WBGU 2007: 1). The report suggests that the inability of countries to adapt to environmental stresses such as water scarcity will increase opportunities for "destabilization and violence"; climate-related food scarcities will produce "regional food crises and further undermine the economic performance of weak and unstable states, thereby encouraging or exacerbating destabilization, the collapse of social systems, and violent conflicts"; an increase in severe weather events will deplete crisis management systems and amplify emigration; and large numbers of people will try to cope with drought by moving - often into areas where they are not wanted (WBGU 2007: 2-3). The following four conflict constellations that may be triggered by climate change were identified by the WBGU:

1. *Climate-induced degradation of freshwater resources*: Climate change gives rise to a reduction in the regional availability of water, leading to a

water crisis; the ensuing destabilization may lead to conflicts involving the use of violence.

2. *Climate-induced decline in food production*: Climate change gives rise to a massive decline in agricultural production; food crises ensue, which may spill over into violent conflict through societal destabilization.
3. *Climate-induced increase in storm and flood disasters*: The intensity and duration of storm and flood disasters increase on account of climate change. As a consequence there may be a collapse of public order and/or an intensification of intrastate conflicts, which may lead to growing violence.
4. Notable rise in *environmentally-induced migration*: Climate change intensifies both the gradual degradation of water and land and the impacts of disasters. The decision to migrate may lead to destabilization and violent conflict in the regions of origin, transit, or destination.

A number of other reports outline similar concerns. For example, the *Center for Naval Analysis* (CNA)'s report on *National Security and the Threat of Climate Change* describes a near future in which "climate change acts as a threat multiplier for instability in some of the most volatile regions of the world" and adds "[for] tensions even in stable regions of the world" (CNA 2007: 6-7). These reports tend to agree with the IPCC argument that to avoid social turbulence and breakdown, the world must quickly mobilize significant support around climate change mitigation and adaptation.

However, it should be mentioned that especially within the field of peace and security research, sceptical perspectives on the linkages between climate and conflict remain. The critics refer, for example, to a lack of empirical basis for the 'climate war' theory (Brzoska 2008; Gleditsch/Nordås 2009). Furthermore, some believe it is important to avoid one-dimensional causal explanations when assessing whether there will be an increase in violent conflicts related to the distribution of natural resources such as water and land. Possible conflicts will not be caused by climate change alone; rather, climate change is seen as a factor which multiplies the menacing effects of deficits such as social and economic injustice, little or no rule of law, and so on. A worsening of conflict situations as a result of climate change is only one possible scenario: the peaceful avoidance of new conflict situations is another, and a possible contrary effect triggered by emergency aid is that the boundaries of a conflict are transcended.

This notion is also part of the UN report on climate change and security published in September 2009 based on the comprehensive compilation of thirty-five contributions from member states and relevant regional and international organizations, e.g. the *United Nations Department of Economic and Social Affairs* (UNDESA). Apart from the outline of potential security-relevant impacts of climate change, the report puts a strong focus on potential threat minimizers such as climate mitigation and adaptation, economic development, democratic governance and strong institutions, international cooperation, preventive diplomacy, and mediation. In addition, the timely availability of information and increased support for research and analysis were regarded as important in order to improve the understanding of linkages between climate change and security and to build up early warning capacities.

35.3 The Peacebuilding Challenge in the Light of the Environmental Change

If the linkages between climate change and security are as tight as outlined above, then climate change policies are of crucial importance for successful conflict prevention in general and peacebuilding approaches in particular. But even if these forecasts prove largely false, integration may offer a cost-effective opportunity for introducing climate change responses into a fragile state or post-conflict country.

To define the specific nature of peacebuilding processes, however, has turned out to be challenging. The *Organization for Economic Cooperation and Development* (OECD) has defined peacebuilding using the concept outlined by the so-called Utstein study of peacebuilding (Royal Norwegian Ministry of Foreign Affairs 2004) in 2005, by describing it as mutually-reinforcing activities within the three dimensions of security, governance, and social, economic, and environmental development (OECD 2008). In the light of the potential security implications outlined above, sufficient governance capacities on the one hand as well as the quality of development on the other can significantly help to consolidate peace under changing climate conditions. According to the OECD, the legitimacy, capacity, and effectiveness of key institutions in a country need to be strengthened in post-conflict situations. To this end, measures to reconstruct and strengthen political authority as well as administrative capacity should be applied. Such capacities may serve

as key resources for avoiding a reoccurrence of conflicts. In addition, climate change impacts may negatively affect social, economic, and environmental development by fuelling socio-economic drivers of conflict, such as wealth asymmetries, marginalization of particular social groups or geographic areas, environmental degradation, and competition over natural resources. Losses due to decreasing agricultural productivity or devastating extreme weather events, such as storms and floods, may deepen wealth asymmetries and further contribute to the marginalization of the poor. Water and food scarcity is likely to further increase resource competition in post-conflict environments.

In a similar vein, in a 2009 report the *United Nations Environment Programme* (UNEP) outlined the important role of natural resources and the environment for peacebuilding processes (UNEP 2009). In UNEP's understanding, peacebuilding comprises the identification and support of measures needed for a transformation towards more sustainable, peaceful relationships and structures of governance, in order to avoid a relapse into conflict. With respect to the specific contribution of natural resources and the environment to peacebuilding processes, three tasks in particular should be highlighted (UNEP 2009: 13).

The first is the need to *support economic recovery*. Here, it is relevant to make sustainable use of 'high-value' resources such as hydrocarbons, minerals, metals, stones, and export timber for reconstruction and development. Apart from providing for positive economic development, the prospects of employment and budget revenue are of crucial importance. At the same time, in order to avoid a rapid uncontrolled exploitation of such resources at sub-optimal prices, various risks should be considered. These include a lack of attention to environmental sustainability when considering the equitable distribution of revenues. In the case of insufficient benefit sharing or increased environmental degradation in the course of resource exploitation, the risk remains that tensions and conflicts will reoccur.

The second task is the *development of sustainable livelihoods*. According to UNEP, durable peace depends fundamentally on sustainable livelihoods, on the provision of basic services, and on the recovery and sound management of the natural resource base. Finally, the third main aspect when considering the relationship between natural resource use and peacebuilding processes reflects on the crucial role of *dialogue, cooperation, and confidence building*. Seen in this light, the environment can be an effective plat-

form or catalyst for enhancing dialogue, building confidence, exploiting shared interests, and broadening cooperation between divided groups as well as within and between states.

What can be learnt from these peacebuilding concepts in terms of addressing potential climate change impacts that are relevant for regional or national security? Both climate change impacts and climate risk management approaches need to be assessed with regard to their potential:

- a) to support or hinder economic and social recovery;
- b) to develop or destroy sustainable livelihoods; and
- c) to contribute to dialogue, cooperation, and confidence building, or to prevent them.

The priorities and needs for carrying out these tasks vary throughout different societies, hence there is a need to consider specific circumstances at national, provincial, and local levels. However, from a more general perspective, some aspects may have the potential to help formulate and implement conflict-sensitive answers to climate change (Carius/Tänzler/Maas 2008):

- First, the role of strong, legitimate and effective institutions to link processes of peacebuilding and climate risk management.
- Second, the establishment of inclusive procedures of participation when priorities for climate change mitigation and adaptation are considered, in order to avoid further marginalization of the poor or other social groups.
- Finally, an equitable distribution of benefits gained from climate change policies needs to be ensured. This can help to facilitate social recovery in the aftermath of a conflict and is likely to provide ownership during the processes of building resilient communities.

Institution building, participatory processes and a focus on income generation can complement peacebuilding processes in efforts to build conditions of stable peace and sustainable development. Ideally, these elements combine the need for general capacity development with the design and implementation of projects. The remaining part of the chapter will discuss how one key element of the current international climate change discussion, i.e. *reducing emissions from deforestation and forest degradation* (REDD+), may affect conflict-prone countries in demonstrating the importance of a conflict-sensitive design of climate change policies.

35.4 Reducing Emissions from Deforestation and Forest Degradation (REDD+)

35.4.1 REDD+ As a Climate Policy Tool

Land use and forest protection have become increasingly important climate change issues in the past few decades, as deforestation alone contributes to about 20 per cent of global greenhouse gases. The term 'land use, land use change and forestry', as used by the *United Nations Framework Convention on Climate Change* (UNFCCC), includes aggregated emissions of CO₂, CH₄, N₂O from deforestation, biomass and burning, the decay of biomass from logging and deforestation, and peat decomposition and peat fires.

As demand and prices for wood and other natural resources continue to increase, local communities will depend on their land for earning a living. An estimated 60 million people worldwide live in rainforests, and 350 million in developing countries rely on dense forests for their livelihood and income (Dubois 2002). In Indonesia, for example, 36 million people from a total of 206.6 million rely on the forestry sector as their main source of income (Indonesian Ministry of Forestry 2002). In addition, forests play a vital role for communal adaptive capacities by providing livelihoods and reducing the impact of events connected to climate change such as landslides, flooding, and erosion.

The IPCC has outlined the enormous potential for climate change mitigation that exists worldwide, especially in the tropics. The potential size of a global carbon market is significant as far as emission reductions from forests are concerned. Assuming a carbon price of 12 euros per tonne – a level slightly below the current market price at the European Emission Trading System – then, as well as halving global emissions from deforestation, the global forest carbon market could amount to about 30 billion euros per year.

Over the course of the last few years, international climate change negotiations have intensified discussions about how to address deforestation and forest degradation in developing countries. Though forestry projects in developing countries – based on afforestation and reforestation approaches – can qualify for *Clean Development Mechanism* (CDM) credits, such projects have failed to spur further action to address the emissions as a result of land use changes in non-Annex-I parties. The debate has moved on to address how to design policy instruments to reduce such emissions and how such instruments may be integrated

into the post-2012 climate protection architecture. The discussion about deforestation in developing countries was introduced as part of the *Conference of the Parties* (COP) 11 in Montréal in 2005. Two years later, COP 13 in Bali adopted a decision on “Reducing emissions from deforestation in developing countries: approaches to stimulate action” (REDD). The document specifically encourages parties “to explore a range of actions, identify options and undertake efforts, including demonstration activities, to address the drivers of deforestation relevant to their national circumstances, with a view to reducing emissions from deforestation and forest degradation and thus enhancing forest carbon stocks due to sustainable management of forests” (UNFCCC 2007), a part of the decision that has come to be known as REDD plus or REDD+ (Hirsbrunner/Tänzler/Reuster 2011; Peskett/Brockhaus 2009). In response various institutions have launched initiatives to address the issue.

The *Food and Agriculture Organization* (FAO), *United Nations Development Programme* (UNDP), and UNEP launched UN-REDD, which has invested US\$ 42.6 million in nine pilot countries: Bolivia, the Democratic Republic of Congo (DRC), Indonesia, Panama, Papua New Guinea (PNG), Paraguay, the United Republic of Tanzania, Vietnam, and Zambia. The World Bank has set up a number of initiatives addressing forest issues in developing countries. The *Forest Carbon Partnership Facility* (FCPF), launched in Bali in 2007, has the objectives of building capacity for REDD+ in developing countries and testing a programme of performance-based incentive payments in selected pilot countries to set the stage for a much larger system of positive incentives and financing flows in the future. Various governments have set up REDD+ initiatives on a bilateral basis. Norway has committed to two one-billion US\$ agreements with Brazil and Indonesia on REDD+ activities, including its high-profile activities in Indonesia. Australia is active in Papua New Guinea, and GTZ (now named GIZ) is active with REDD+ projects in the Southern Pacific, Indonesia and Laos. This overview indicates that REDD+ will also be relevant for post-conflict countries or those that may be prone to conflict.

35.4.2 Relevance of REDD+ For Conflicts and Conflict Prevention

Against the backdrop of the potential stabilizing impacts of climate change policies on peacebuilding contexts, the REDD+ approach seems to offer some potential for generating new opportunities for in-

come, for building strong institutions for governance, and for fostering dialogue and cooperation.

REDD+ can, in principle, contribute to economic development by generating new sources of income for often marginalized social groups (Scholz/Schmidt 2008/Holopainen/Wit 2008). Depending on the concrete design of benefit-sharing agreements, central governments as well as local communities can receive income and use it, e.g. to rebuild infrastructures. Historical experience with *community forest management* (CFM) can also provide valuable lessons for REDD+ in this regard (e.g. Agrawal/Angelsen 2009). Employment opportunities can thus be created that may be necessary to compensate for lost income from not clearing forests for agricultural purposes. Additional employment opportunities may also be created for forest monitoring and law enforcement. Afforestation under a REDD+ agreement could provide at least temporary employment in nurseries and the planting of seedlings. However, there is currently strong resistance to the opening of the programme to afforestation or reforestation projects since plantations would also qualify under such a framework. If sustainable forest management and extractive logging is compatible with REDD+, regulations will only materialize after an international agreement on REDD+ has been adopted. In addition, countries active in the trading of timber will also need to find compromises between timber and carbon income: felling trees reduces the carbon stock and therefore lowers the value of REDD+.

Implementation of REDD+ requires robust governance. However, optimistic assessments do exist in this regard if it is assumed that there are some REDD+ policies that can easily be implemented, such as hiring additional forest rangers, removing subsidies for biofuel, and reforming environmental impact or the laws for infrastructure projects (Streck 2009). Governments, communities, and project implementers must ensure that there are clear legal arrangements and tenure agreements. The respective entities need to develop sound concepts and implementation capacities concerning how to address the drivers of deforestation. When it comes to compliance with any future international agreement, the countries need to provide enforcement of forest protection (e.g. curb illegal logging) and build up sufficient capacity for *measurement, reporting, and verification* (MRV) regarding their commitments. Last but not least, sophisticated benefit-sharing mechanisms are needed in order to avoid conflicts at the national and local level (see below).

At present, the governance capacities required can scarcely be found in developing nations, let alone conflict-ridden countries. However, an established REDD+ mechanism could provide incentives for improving these capacities as a prerequisite for receiving funds for projects in order to avoid deforestation. Some of the ongoing initiatives to promote REDD+ approaches and pilot projects aim explicitly at the improvement of a country's capacity for participating in a REDD+ programme, or in other words to make them *REDD+ready*. The financial resources and technical assistance provided for *REDD+readiness* support the building of governance capacities and structures which can have a positive effect on peacebuilding. Community committees established for planning the spending of carbon income or transparent mechanisms and monitoring in forestry departments can yield benefits regardless of the climate change mitigation effect.

REDD+ can foster cooperation, dialogue, and confidence building at all levels. Whereas large-scale logging, mining, oil exploitation, and other activities incompatible with REDD+ have often led to conflicts with local communities, REDD+ can serve as an alternative to these types of unsustainable and conflict-prone activities.

If taken as a trigger for tenure reform to provide legal titles to communities, REDD+ may also help to reduce land conflicts that often occur in contexts of unclear tenureship arrangements (Hatcher 2009; USAID 2005). Finally, in countries where high-value timber has financed civil wars, REDD+ can help in drying up warlord income streams. By increasing forest surveillance and providing a national interest in forest protection, REDD+ could make it increasingly difficult to harvest timber illegally.

35.4.2.1 New Risks on the Horizon

Apart from these potential stabilizing effects of climate policies for peacebuilding contexts, there are a number of risks to be taken into account when considering the introduction of REDD+ in post-conflict situations. First, the procedures for measuring and monitoring carbon and the establishment of REDD+ governance systems are expensive tasks. Accordingly, there is a risk that indigenous communities and micro-project enterprises may be excluded from participation in REDD+ projects through a lack of ability to recover transaction costs. One way to address this problem is to foster cooperation among communities in order to cut transaction costs and, at the same time, help to build confidence. Especially as far as divided

or rival communities are concerned, their collaboration in a REDD+ project must be accompanied by measures for ensuring a transparent and fair steering and distribution of benefits. Otherwise, new rifts may emerge as a result of the project.

Second, REDD+ schemes are seen critically by sections of civil society. Not only is the environmental integrity of REDD+ as an instrument for solving the challenge of emission reduction questioned, but also threats to the rights and livelihoods of local and indigenous communities are areas of concern. Badly-designed and badly-implemented REDD+ programmes risk the marginalization of local communities. As previously mentioned, addressing questions of tenureship and use rights is therefore of the utmost importance. If avoiding deforestation is linked to global compliance markets (Loisel 2008; Viana 2009), enormous financial flows can be expected, although this is not very likely to happen within the next few years. Tropical forests will be the centre of interest for international investors looking for cheap emission certificates. The likely increase of the value of forested land will be an incentive for powerful actors and governments to take control of forests in order to reap the profits of REDD+. The rights of forest-dwelling communities – especially without formalized land titles – will be under threat of being ignored and denied. The danger of selling carbon rights to investors without consulting with forest dwellers and users is especially high in about three quarters of the world's forests which are officially owned by governments (White/Martin 2002). Communities with recognized rights can also be pressured into signing deals which limit their access to forest resources while providing only little compensation (Cotula/Mayers 2009). The displacement of forest communities without legal titles (or the means to enforce them) might be seen as a way to reduce deforestation – with severe human rights implications. Income from avoiding deforestation “could be used by the State to equip forest protection agencies with jeeps, walkie talkies, arms, helicopters and GPS in an outdated and anti-people ‘guns and guards’ approach to forest protection” (Griffith/Martone 2009: 24), leading to a violent escalation of resource conflicts.

Third, opaque tenureship rights for forested land are complemented by the largely undefined ownership of carbon. Only a few countries have legislation defining the ownership of carbon stored in trees. The government of New Zealand's measure of declaring forest carbon government property sparked the resistance of private forest owners. After several years of

lawsuits that prevented the inventory of carbon stocks, and after a public campaign, carbon ownership was transferred back to the forest owners (Rights and Resources Initiative 2010: 15). A clear legal situation is therefore a prerequisite of REDD. The establishment of carbon ownership rights is not as straightforward as it sounds. While carbon is stored in trees (and in roots and organic matter in the soil) customary tenure systems often have overlapping and partly conflicting use rights which make the discussion of carbon ownership complex and difficult. Conflicts can also arise when communities or households have different titles (Cotula/Mayers 2009).

Fourth, another set of conflicts can arise from unequal benefit sharing. Local elites and chiefs who often will be the main negotiators on behalf of a community may capture a disproportional share of REDD income while poorer and landless households might miss out. Increased inequality can create conflict on a local level. In many countries the forest sector is known for irregular and corrupt practices e.g. regarding the issuing of logging concessions. REDD+ programmes will have to be designed in such a way that corruption is minimized, otherwise its legitimacy and acceptance will suffer (Tacconi/Downs/Larmour 2009).

Local farmers who would otherwise clear a plot to farm might be threatened by food insecurity if they do not receive compensation from carbon money. On a larger scale, prices for agricultural commodities could rise, especially if the non-forested areas are increasingly used for fodder and biofuel production. As the value of forest carbon rises, provinces with extensive tropical forest cover will try to keep a bigger share of the REDD+ benefits and not distribute them to the rest of the country. Other resources like gas and oil have encouraged secessionist movements – it remains to be seen if REDD+ promises enough money to split a country.

Fifth, setting the right baseline – the assumption of how much deforestation would occur without intervention – is crucial for the integrity of a REDD+ programme. Deforestation rates are heavily influenced by conflict. Conflict can occur through a lack of law enforcement, extraction of timber to finance arms, and as a result of the coping strategies of war-affected and displaced communities. But civil war also disrupts economic activities. The agricultural frontier is likely to be pushed forward and large-scale logging operations may expand when peace returns and formerly dangerous battle grounds become accessible. Setting the right baseline in a post-conflict setting will be challenging in a context of conflict. How much avoidance

of deforestation can be attributed to a specific intervention financed by REDD+ and how much is the result of peace and conflict dynamics?

Finally, REDD+ not only has the potential to create conflict regarding land, but also to create it with respect to values and beliefs. Indigenous rights movements have repeatedly voiced concern against the ‘commodification of nature’ through carbon markets. Transforming a function of the atmosphere or a forest into a tradable permit to pollute goes against the cultural preferences of many indigenous people. Forests are seen mainly as a carbon sink by investors interested in high carbon stocks and high returns, while for forest-dwelling communities a forest may be much more: a garden, the home of spirits, and a kitchen. Various world views may be an underlying cause of tension in a REDD+ project (Griffith/Martone 2009: 38).

35.4.3 Initial Experiences With REDD+

Since most of the REDD+-related activities have only recently started, it is too early to assess to what extent the positive or negative impacts on conflict-prone settings analyzed above have occurred. Currently, the UN-REDD Programme is assisting nine developing countries to prepare and implement national REDD+ strategies and mechanisms.¹ None of them is currently the site of a UN peacebuilding operation. The World Bank set up a *Forest Carbon Partnership Facility* (FCPF) with the objectives of building capacity for REDD+ in developing countries and testing a programme of performance-based incentive payments in selected pilot countries. The initiative is meant to set the stage for a much larger system of positive incentives and financing flows in the future. Among the countries included are the Central African Republic, Liberia, and Nepal (Williams/Larsen/Lupberger et al. 2011). To a certain extent, such activities can be based on ongoing relevant activities in the respective countries. In Nepal, for example, the Swiss Agency for Development and Cooperation has commissioned the Nepal Swiss Community Forestry Project. The intention of the project has been to contribute to economic growth and social development, inter alia, by focusing on gender, social equity, peacebuilding, and the livelihood issues of poor people, under the umbrella of Forest User Groups (Hobley/Baral/Rasaily et al. 2007). The *International Union for Conserva-*

1 Bolivia, Democratic Republic of Congo, Indonesia, Panama, Papua New Guinea, Paraguay, Tanzania, Vietnam, Zambia).

Table 35.1: Potential positive linkages between REDD-promotion and peacebuilding. **Source:** Authors' own compilation on the basis of OECD's peacebuilding concept.

	Socio-economic development	Good governance	Reform of justice and security institutions	Culture of justice, truth and reconciliation
Supporting economic recovery	Income from REDD provides income for reconstruction and stabilization	Transparent and effective governance structures prerequisite for REDD funds – incentive to build good governance	MRV requires monitoring and law enforcement capacities – these can be financed via REDD Reduction in illegal logging reduces income for war-economy based on timber	Cooperation of opposing groups to improve negotiating power during the setting up of REDD projects
Developing sustainable livelihoods	New income for forest dwellers Improving resilience against climate impacts through protection of ecosystems	Clarification of forest and carbon rights necessary – clear tenurship can reduce conflicts	Local benefit-sharing mechanisms established	Improved livelihood security reduces sources of tension between opposing groups
Dialogue, confidence building, and cooperation	Cooperation between communities and provinces to cut transaction costs encouraged	Communication and cooperation between different provinces improved to address leakage	Transparent monitoring capacities developed	Potential for environmental peacebuilding among opposing groups

tion of Nature (IUCN) has been working in the forest sector in Liberia addressing some of the key elements for sustainable peace and stability in a post-conflict situation, as part of forest sector reform and refugee camp restoration. That approach has been expanded into a broader portfolio currently focused on community forest management, climate change, and forest governance. The last of these is focused primarily on Reduced Emissions from Deforestation and Degradation (Pro-poor REDD), and forest sector policy support. The initiative is built on local community forest and natural resources management strategies, and employs such objectives as forests and poverty reduction; rights, tenure, and empowerment of the forest-dependent poor; forest law enforcement and governance; markets and incentives; and forest landscape restoration.

Regarding bilateral approaches to REDD+, the Norwegian approach may also be instructive. The Norwegian government discussed agreements with Liberia and Papua New Guinea but was not convinced by the degree of commitment shown by the respective governments, e.g. to fight corruption. In both cases, actions taken by governments of the two countries that did not show enough commitment to REDD+ was decisive for not entering into an agreement. In particular, both were issuing logging concessions, and PNG did not demonstrate sufficient measures to fight corruption. In-

onesia, on the other hand, showed much stronger political commitment, and an agreement was signed on 26 May 2010 worth one billion US\$. Indonesia then committed to quite extensive reforms (including a two-year ban on natural forest conversion).

35.4.4 Building a Conflict-Sensitive Approach to REDD+

REDD+ has the potential to create conflicts and increase marginalization, but it also provides an opportunity to develop sustainable livelihoods, generate income, and strengthen the position of forest dwellers – including in peacebuilding contexts. The table below summarizes how positive effects such as supporting economic recovery, developing sustainable livelihoods, and fostering dialogues, confidence, and cooperation may be supported through REDD+. It further indicates that REDD+ policies may also yield positive impacts on key security areas such as the reform of justice and security institutions and the culture of justice, truth, and reconciliation.

The impacts of REDD+ depend, first of all, on an elaborated and well-balanced design of REDD+ frameworks and institutions. The following issues need to be considered for a REDD+ design that reduces conflict potentials and plays a positive role in peacebuilding.

- First, tenureship and legal issues need to be clarified. In order to prevent conflict, REDD+ should be used to strengthen the role of communities living in and using the forest, and not to marginalize or displace them. Complex customary tenureship arrangements and the rights of resource users without legal titles must be taken into account when further establishing REDD.
- Second, transparent and fair benefit sharing is a condition for a conflict-sensitive REDD+ scheme. Corruption, which is rife in the forest sector in many countries, has to be tackled to increase legitimacy, secure local benefits, and reduce conflicts.
- Third, international human right standards and conventions such as the United Nations Declaration on the Rights of Indigenous Peoples and ILO-convention 169 (Indigenous and Tribal Peoples Convention) should be applied when REDD+ policies are designed. In particular, the principle of free, prior, and informed consent on the part of affected communities should be considered.
- Fourth, reliable, transparent, and efficient governance structures are fundamental for ensuring the fulfilment of *measurement, reporting, and verification* (MRV) requirements; addressing drivers of deforestation effectively; and building confidence among investors. This will be a demanding task for post-conflict societies, but may also yield benefits for overall stability in conflict-prone countries.
- Fifth, REDD+ should be designed pro-poor: the revenues should be used for socio-economic development and include the marginalized. Apart from reducing the risk of conflict, it has the positive side effect of being more attractive to investors and of reducing the risk of failure. In addition, this may ensure that positive socio-economic development will support the well-being of the entire population – marginalized groups, above all.
- Sixth, capacity building and REDD+-readiness need the support of the international community. Positive employment effects will only materialize if tasks like monitoring and accounting are at least partly carried out by the local population, and not by international consultants. Alternative income opportunities have to be part of a comprehensive REDD+ scheme. Capacity building on the community level should include a focus on community organization and fund management.
- Finally, one must acknowledge the multiple ecological and social functions of forests – reducing a forest merely to its function as a carbon sink will generate problems.

35.5 Conclusions: The Need for Conflict-Sensitive Climate Policies

This chapter has addressed the lack of reflection on the linkages between the challenges of climate change and peacebuilding by analysing the reduction of deforestation as one key aspect of the mitigation debate. It has also outlined how reduction of deforestation may impact on potential (post-) conflict constellations. Discussing the chances and risks of climate change policies for reducing deforestation, namely trying to establish a REDD+ mechanism as part of multilateral negotiations as well as bilateral initiatives, it has outlined the conditions under which policies to reduce deforestation are likely to contribute to the stabilization of conflict-prone areas through the strengthening of capacities and the involvement of different – sometimes opposing – social groups.

The discussion of the linkages between environmental change such as climate change and peacebuilding processes as a crucial stage in a post-conflict setting has revealed the importance of institution building, participatory processes, and a focus on income generation. If REDD+ as a climate policy is to reflect these dimensions during its further conceptualization and implementation, it has the potential to support peacebuilding processes that contribute to conditions of stable peace and sustainable development. Ideally, these elements combine the need for general capacity development with the design and implementation of concrete problem-solving projects.

Creating conflict-sensitive climate policies that also have a positive, transformative effect is an ambitious task. This is true not only for the example of REDD+ but also for the challenge of designing and implementing adaptation measures (Tänzler/Maas/Carius 2010). In order to avoid unintended impacts of climate policies in general, peace and conflict assessments can be used to reduce this danger. ‘Conflict-sensitive’ climate policies must be developed using a multi-dimensional system that incorporates different levels, both administrative and societal. Given the early stage of policy development on reducing deforestation and on adaptation, there is a fair chance of avoiding such policies causing further conflicts in conflict-prone areas. On the contrary, carefully designed, they have the true potential to support peace and stability.

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36 The Role of Information Systems in Improving Resilience and Security through Innovation-Oriented Capacity Building

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36.1 Introduction¹

Climate change and the increase of extreme weather events have exposed the vulnerability of prevailing resource management regimes where climate and water are concerned (Pahl-Wostl 2009; Pahl-Wostl 2007a). The unpredictable global impacts and prospects of global and climate change are affecting both the bases of natural resources and the capacity for adaptation. They are affecting the swing of the pendulum of sustainability and the indicators of water availability and quality in a way that is likely to increase the risk to social and ecological systems. The large-scale nature of climatic changes has increased the need to make dynamic, effective large-scale interventions and paradigm shifts in the management of natural resources that will replace the prevailing mechanistic and technocratic environmental resource management approaches that largely neglect complexity and the human dimension (Pahl-Wostl 2009; Ludwig 2001; Gleick 2003; Pahl-Wostl 2007a, 2007b, 2007c).

Effective urban water management is directly and inexorably linked with water resources management, sustainable development, and human security. While the maintenance of such linkages is usually viewed at the 'abstract' organizational level, a thorough understanding of the functionalities of the urban water management process calls for understanding of the interactions that shape its internal and external environment at both the local and global scale.

Urban water resources have been affected by the intensity of demand-oriented, supply-specific, and spatial considerations that influence the ability of policy-makers to optimize the utility matrix of its urban stakeholders. Demand for water resources is increasing due to socio-economic activities, demographic transformation, industrial developments, and ecosys-

tem preservation requirements. On the other hand, available water supplies are being affected by spatial variability and rainfall rates, pollution, water losses through evaporation, and climate change. The impacts of external factors interacting in the surrounding environment of the overall water system are reflected in humankind's ability to sustainably manage water development projects and provide quality urban water services.

Urban water resources have also been affected by imperfections resulting from extreme events such as climate change. Since it causes higher temperatures, climate changes influences water availability, reliability of direct abstractions, seasonality and intensity of rainfall, run-off status, and water percolation into aquifers (Smith/Levermore 2008). From an urban management point of view, climate changes create peri-urban spaces that can be regarded as a "heterogeneous mosaic of 'natural ecosystems', 'productive' or 'agro-ecosystems' and 'urban ecosystems'" (Eakin/Lerner/Murtinho 2009) and urban heat-islands (Kikegawa/Genchi/Kondo et al. 2006) that significantly affect the functionality and capacity of all urban water resources and related urban management services and processes. The resulting fragmented landscapes, small towns and cities, modified residence and housing patterns and styles, and modified values and assumptions are reshaping the context of urban management. On the other hand, the modified or new spatial and social impacts of climate change on urban centres also influence the capacity of urban water management organizations to address the consequences of growing urbanization growth rates and other shifts and developing trends.

Meeting these challenges faces many lock-ins. Urban water management has continued to be affected by the institutional frameworks and initiatives accustomed to conceptualizing linkages among the sub-systems of the whole water system. Such frameworks tend to follow different paradigms ranging from 'con-

¹ Keywords: urban water, transition, system innovation, sustainability, information systems.

ventional', through 'sustainable' to 'integrated'. Conventional urban water management practices aim at meeting water supply-demand budgets, at providing clean drinking water, at controlling floods, and at protecting public health through wastewater management and the conveyance of storm water away from urban settings. On the other hand, sustainability and integration frameworks emphasize the use of a holistic cause-effect approach to understand internal functions and cross-sector links. The complexity of interactions (and sometimes interdependence) between water sectors (including urban waters) and other systems significantly affects the capacity of organizations and of society at large to adapt. This calls for identifying (i) the interdependence and hierarchy of resource management scales (basin, catchments, tributary, and water use such as urban water and agriculture) and (ii) organizational mainstreaming.

Over the years, the emphasis has continued to be placed on advocating 'nesting' urban water management processes within the context of integrated water management, but little has been done to ensure the existence of relevant change management strategies, tools, and agents. In the absence of comprehensive preparedness pathways, the call for 'nesting' remains a 'useless' exercise. The lack of such a 'preparedness context' in urban water management frames undermines those issues which are moving towards the front-line agenda of policymakers: water governance, decentralization of water management processes and authorities, involvement of stakeholders, development and adoption of an appropriate information platform, and capacity building.

Organizationally, water management authorities have continued to face different challenges. Because the majority are public organizations they are characterized as having inflexible organizational structures, limited community-oriented capabilities, and inefficiency in managing technology-intensive acquisitions. Rigid organizational control mechanisms complicate the process of infrastructure acquisition and management as well as service provision, and accordingly reduce the adaptive capacity of urban water organizations. They may therefore appear as significant barriers to change, as they limit and challenge effective organizational communication, responsiveness, and shared visions. Especially with regard to adaptation to extreme events, improved organizational responsiveness and adaptability looms large in addressing the 'portfolio'-generic and specific barriers. Generic barriers influence the way the adaptation challenge is de-

finied and potential adaptation responses are identified and selected.

On the other hand, specific barriers relate to individual adaptation options and influence the capacity to implement the solution. Whilst some of these barriers are manageable through adaptation mechanisms, others are not (Arnell/Charlton 2009). The intensity of organizational limitations and complexities of procedures threaten the feasibility of vulnerability management strategies and the development of an 'organizational' and a 'population' adaptive capacity to meet environmental change (Eakin/Lerner/Murtinho 2009) in urban water settings.

The complexity exhibited across the overall urban water subsystem (both in scale and magnitude) calls not only for the development of new or modified 'programme sets' but also transformed and enriched 'mindsets'. The intensity, multiplicity, and complexity of such problems require a radical change in the institutional, technological, and social basis of those systems. Most importantly, both the domain and context need to change across the wider socio-technical setting that structures the behaviour and decisions of actors involved in re-structuration, innovation, and transition thinking (Gasmelseid 2000).

For this reason, the adoption of fundamentally new practices, structures, and culture is looming large. Because water systems are conceptualized as socio-technical systems, the problems of unsustainability experienced in different water-related sectors originate from the great complexity, the high level of uncertainty, and the existence of multiple actors with different perspectives and values (Grin 2000; Gasmelseid 2004).

The basic aim of this chapter is to focus on the imperatives of capacity building in urban water management by recognizing the dysfunctional consequences of climate change for the optimization of the utility matrix, the likelihood of violent conflicts among stakeholders, and the probable impacts on human security. The chapter also advocates the use of systems thinking, innovation, and strategic niche management concepts in pursuit of developing relevant capacity-development-oriented frameworks. Such concepts have the potential to improve the capacity of urban management systems to orchestrate their functionalities by using a holistic approach in accordance with the principles of systems innovation and thinking. The basic research questions to be addressed are:

1. What are the main challenges of capacity building in urban water management?

2. What is the rationale for using system innovation in this context?
3. What are the impacts of using information systems when we adopt system innovation concepts to crystallize capacity-building processes in urban water management?

The methodology that is used in this study is generally a descriptive analytical survey with both inductive and deductive methods applied. Due to the nature of the study a number of other methods and empirically-driven theories are used that are capable of dealing with the topic in question, both quantitatively and qualitatively. The use of several research methods and instruments will allow some flexibility in order to capture the specific relations between the main variables and the factors affecting them. To account for the diversity of information across the different managerial landscapes and to ensure the validity of the instruments of research, Anthony's taxonomy of managerial levels is adopted.

This chapter is organized in five parts. The second part presents the concept of capacity development in urban water management, with an emphasis on the challenges and limitations (36.2). The following part is dedicated to the conceptualization of capacity building (36.3). Part four examines sustainable innovations with a view to guiding their investigation in the context of urban water management (36.4), and part five reflects on information systems in this particular context (36.5).

36.2 Capacity Development in Urban Water Management Domains

'Capacity' is defined as the ability of individuals, institutions, and societies to perform functions, solve problems, and set and achieve objectives in a sustainable manner. Capacity building and development describes the processes through which capacity-building projects are obtained, strengthened, adapted, and maintained over time. Such projects provide the 'tools' needed for the effective delivery of programmes or services, and for ensuring the ability of stakeholders to demonstrate accountability for the 'resources' deployed. They also create a learning platform that significantly supports the identification and implementation of capacity-based processes, enhances their strategic viability, and harmonizes the standard operating procedures associated with them. Capacity development incorporates human, social, institutional, and economic dimensions (Robins 2008;

Timmer/Loe/Kreutzwiser 2007; van der Zaag 2005). The human dimension relates to the improvement of knowledge bases, skills, and experience, and the strengthening of managerial systems. The social dimension relates to the advocacy of trust and reciprocity, values, attitudes, behaviour, commitment, motivation, and network relationships. The institutional dimension relates to improved governance, accountability, the involvement of stakeholders, facilitating decision-making processes, and managing upstream-downstream linkages. The economic dimension relates mainly to financing water infrastructure. However, capacity building and development is affected by three conditions that need to be met to ensure its effectiveness (Al-Jayyousi 2001; Vreede/Jones/Mgaya 1998/1999):

1. an enabling environment with appropriate methods, tools, policy, and legal framework;
2. an institutional development that supports community participative development efforts; and
3. human resources development through training and education (Al-Jayyousi 2001; Vreede/Jones/Mgaya 1998/1999).

Within the context of urban water management and the growing inevitable challenges of climate change and the impacts of global warming on agricultural productivity, water availability, and human security (Twomlow/Mugabe/Mwale 2008; Love/ Twomlow/Mupangwa 2006), emphasis should be placed on institutional capacity development. The basic aim of such capacity development is to develop and use decision-support-oriented frameworks that provide a longer-term strategic understanding of the temporal and spatial distribution and impacts of climatic variability. Within this context, three dimensions are to be addressed: knowledge resources, relational resources, and capacity for mobilization (Healey 1998).

Knowledge resources include 'local knowledge' built up through a combination of practical experience and the frames of reference that people use to filter and give meaning to that experience, as well as the knowledge provided by other stakeholders, including professionals. Relational resources refer to the development of networks that facilitate sufficient appreciation, trust, and communicative skill for the involvement of different stakeholders and interactions among them. Such networks improve the social capital of communication, encourage general 'trust-ability', facilitate a smooth flow of knowledge, and contribute to mobilizing the political and economic

resources that are necessary to achieve the objectives of stakeholders.

On the other hand, the application of knowledge and relational resources shapes the capacity to mobilize resources such as funds, equipment, and people in order to make a difference. The importance of institutional capacity building in the water sector stems from a wide range of challenges that significantly affect both ‘problem domains’ and ‘solution spaces’. Inequity and inefficiency in the sectoral allocation of water; inadequate capacity for decentralization; lack of integration; an unsustainable supply-side management bias; and the challenges of sharing international rivers (Mkandawire/ Mulwafu 2006; Beukman 2002) are examples.

Over the years, capacity building in urban water resources management has continued to be challenged by different limitations.

36.2.1 Limited View of Capacity Building

Despite the fact that capacity building is a multi-dimensional process, there has been a tendency to consider it equivalent to ‘training and research’ in a way that has limited its scope to technical training. As a method for implementing institutional capacity development programmes, training (short- or long-term) assists in establishing new urban water management options, implementing new urban water systems, improving water productivity, and enhancing efficient urban water use.

However, technical skills alone strengthen neither an organization’s analytical capacity (i.e. the ability to step back and critically review its work and the changing environment in which it functions) nor its adaptive capacity (i.e. its ability to change behaviour as a result of that learning and reflection).

36.2.2 Lack of Effective Capacity-Building Paradigms

There has been a considerable failure to orchestrate capacity-building processes in accordance with water management approaches and paradigms that significantly shape the context and domain of capacity building. Instead of using an integrated approach, actual practice views capacity building in a conventional way by considering the locations of ‘water entry and exit’ and the partners involved at each point (humans, animals, land cover, biodiversity, etc.). However, viewing capacity development according to water-entry-and-exit locations complicates the process of articulat-

ing actors and their roles. It also results in coordination problems (because roles should be plotted across hydrological and administrative boundaries) and lack of effectiveness with regard to the development of a comprehensive capacity development matrix that reflects the needs for and dictates the suitable set of monitoring and evaluation mechanisms. Within the context of climate change, failure to adopt the principles of coordination, involvement, and benefit sharing significantly threatens the utility matrix of users and escalates conflicts. Because it attempts to understand the environment of water management in general and urban watercourses in particular, the adoption of integrated principles helps towards an understanding of the dynamics of internal and external configurations and the multiplicity of variables that interact to shape the potential solution space. This will ensure the incorporation of information about urban water demand and supply and the consequences (functional and dysfunctional) of water development and use in a complex socio-economic, political, spatial, demographic, and technological context.

36.2.3 Thematic Fragmentation of Capacity Building

The lack of a systematic conceptualization of capacity building has created a serious thematic fragmentation with regard to the articulation of capacity-building processes and activities in urban water domains. The lack of flexible organizational forms, over-emphasis on ‘sub-optimization’, and weak organizational coordination (both within and between water-related organizations) is curtailing the abilities of organizations to develop and prioritize capacity-building processes. Such fragmentation has been reflected in the levels of sustainability and productivity of urban water infrastructures. It also affects the investment attraction of urban water systems and attitudes of donors (who contribute heavily to water infrastructures especially in developing countries) and investors and water companies through its impacts on the *Standard Growth Value Index* (SGVI) and the *Business Leaders Confidence Index* (BLCI) that determine a country’s capacity for attracting investment.

36.3 Sustainable Transitions

A holistic conceptualization of capacity development facilitates migration from ‘conventional’ to ‘integrated’ domains of urban water management. Within

this context, different concepts, tools, and paradigms can be utilized, such as the concepts of transition thinking and system innovation. System innovation addresses sustainability transitions by providing a way of transforming current unsustainable socio-technical systems into more balanced socio-economic and ecological development (Bai/Wieczorek/Kaneko et al. 2009). It investigates macro and micro developments that put pressure on existing socio-technical systems to undergo system innovations.

A transition is the process of changing the system's state to another (new or modified) state via a co-evolution of networks, structures, culture, practices, institutions, technologies, policies, individual behaviour, and autonomous trends (Raven 2006). It is a radical change towards meeting the needs of a stabilizing future world population, while reducing hunger and poverty and maintaining the planet's life support systems (Parris/Kates 2003; Clark/Dickson 2003). Transition processes exhibit some degree of multiplicity in terms of scale, magnitude, level, structure, and domain of the dynamics of social systems. Sustainability transitions represent socio-technical system changes involving major and mutually-reinforcing alterations in the economic, technological, institutional, and socio-cultural domains of systems that fulfil basic societal functions (Elzen/Geels/Green 2004; Elzen/Wieczorek 2005).

They may involve the restructuring and destabilization of the components of environmental systems and/or lead to the emergence of new components with new socio-technical configurations. However, the resulting system innovations and sustainable transitions tend to be radical in character, long-term, multi-actor, and multi-level (Geels 2005, 2005a; Loorbach/Rotmans 2006; Vellinga/Herb 1999; Van de Kerkhof/Wieczorek 2005).

Following a multi-level perspective, transitions and transformative changes can be viewed as originating from interrelated processes at three levels:

- socio-technical regimes dominating one or more sectors or systems;
- radical innovations generated in niches that shape socio-technical environments as application domains; and
- at the level of the socio-technical landscape shaped by external factors dictating the competitive relationships between niches and regime in a way that supports a transition (Geels 2005; Geels/Schot 2007; Hoogma 2000).

Niches represent new and relatively unstable sets of rules and institutions for innovative practices that constitute a series of experimental projects such as demonstration projects, pilot plants, constellation of structures, specific application domains, and special geographical locations. They constitute the context in which more radical configurations of technology, institutions, and behaviour emerge, and allow for the development of transition experiments necessary for improved learning and the development of social and innovation networks. They provide protected spaces where visionary actors can experiment with an innovation and learn about potential benefits and barriers (Schot/Hoogma/Elzen 1994). Through a series of experiments in different niches an innovation may eventually replace dominant regime practice and contribute to a transition towards sustainability.

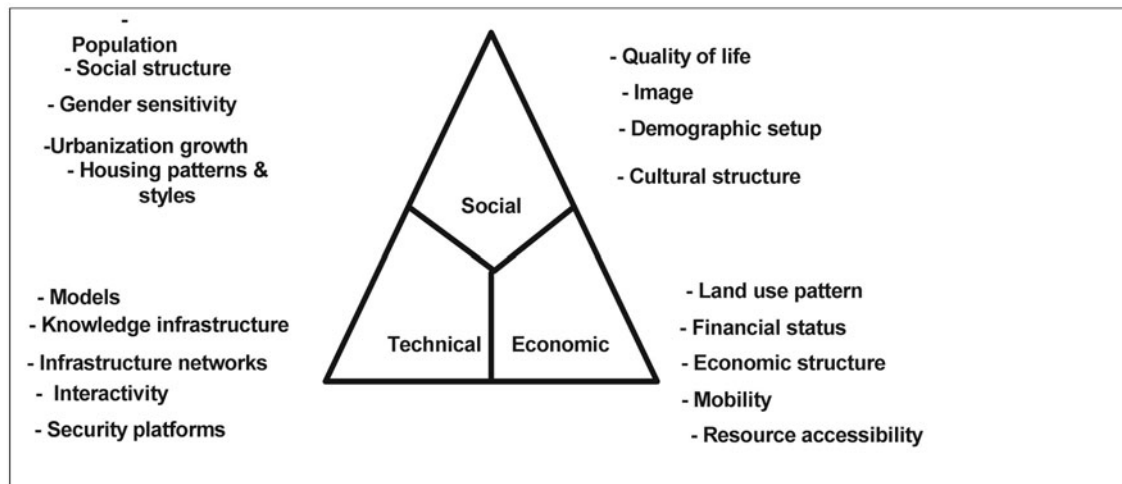
A regime represents a set of cognitive, regulative, and normative rules or institutions that are coherent and guide the choices and behaviour of the actors in that regime (Vleuten/Raven 2006). It consists of three interlinked elements:

- a network of actors and social groups;
- formal, cognitive, and normative rules that guide the activities of actors; and
- material and technical elements as artefacts and infrastructures (Geels 2006).

Dynamics at this level include socio-technical configurations that account for the stability of the whole socio-technical system. Innovations that take place at such a relatively stable stage tend therefore to be incremental and to result in mutually interlinked trajectories in a number of dimensions (Bai/Wieczorek/Kaneko et al. 2009). Interrelations between the elements of a regime provide a direction to change which makes certain transformations more likely than others, and incremental change more likely than radical change.

Furthermore, if changes in certain parts of the regime occur, they may give rise to additional changes in other parts due to interrelations among the elements. The landscape offers a platform for the background setting and developments for the interaction and change in regimes and niches. It represents the source of pressure on the regime and the behaviour and choices of actors to change. The dynamics at this level include broader societal, technological, or ecological developments that may support or weaken the dominance of established socio-technical regimes and open up windows of opportunity for new socio-technical configurations (Geels/Schot 2007). It includes

Figure 36.1: Stock and flow analysis. **Source:** Gasmelseid (2009: 41).



government and international policies, institutional frameworks, power relationships between important societal groups, cultural values, and shared understandings about societal problems and visions of the future (Bai/Wieczorek/ Kaneko et al. 2009).

36.4 Transition Management and Capacity Building in Urban Water Management

Viewed as a socio-technical system, the water system incorporates a wide range of 'stocks' and 'flows', involves complex planning and monitoring activities, and expands across a spectrum of decision-making domains and organizational scales. Decision making is characterized by hierarchical settings and a multiplicity of processes and decision partners. Following hydrological zoning, 'stocks' and 'flows' can be recognized at the level of basins, tributaries, and watercourses. They can be viewed differently by adopting sectoral-function-based conceptualization (urban, irrigation, industrial etc) or a hydro-administrative zoning in terms of administrative boundaries such as countries, cities, and municipalities. Stocks denote collections of physical resources including environmental, managerial, demographic, social, economic, and technological. Flows denote flow of physical objects as well as information and financial flows (figure 36.1).

The dynamics of 'flows' and 'stocks' are dictated by three main factors:

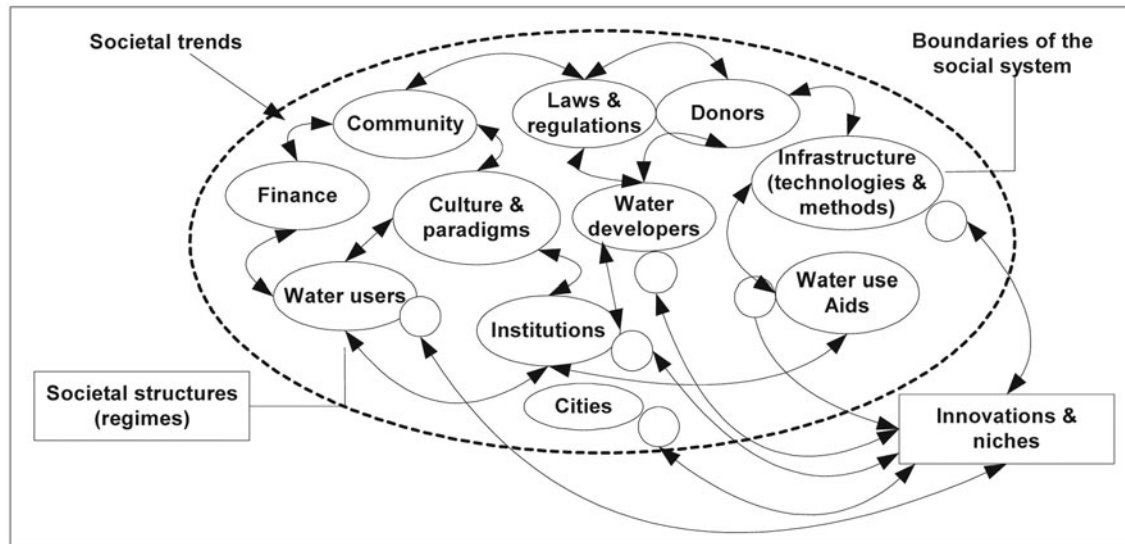
- a) the intensity of processes and complexity of problem domains especially when there is some insta-

bility (variability) in the values of the coefficients of the objective function representing the utility matrix of stakeholders. Such coefficients reflect, for example, the type of water use and productivity;

- b) the possibility of affecting 'flows' and 'stocks' through available intervention mechanisms including demand management and improvement of water development projects;
- c) the existence of a suitable degree of financial sustainability.

Adopting systems thinking and innovation management perspectives, 'flows' and 'stocks' can be reflected in a socio-technical frame spanning the landscape of the overall water system (macro), regime-based functionalities, and niches (micro). As shown in figure 36.2 below, the dynamics and functionalities of regimes (constituting the main socio-technical structures of the water system) significantly affect (either positively or negatively) the capacity of the overall water system to achieve its corporate objectives in a changing environment. Water management institutions (including the institutions responsible for the management of urban water resources), donors, community, water users, water use aids, laws and regulations, culture and paradigms, infrastructure (technologies and methods), are the main socio-technical structures. The approach used for conceptualizing 'stock' and 'flows' (hydrological, administrative, and hydro-administrative zoning) results in different views about the capacity of each regime to affect the fabric, functionality, power structure, and objectives.

Following the principles of general systems theory, the overall water system can be conceptualized as

Figure 36.2: Analysis of water as a socio-technical system. **Source:** Gasmelseid (2009).

a standardized open system. At the level of the landscape there tends to be the interaction of macro change agents governing the interaction of the overall water system with its external environment, including transboundary agencies, economic processes, and demographic forces.

Within the context of the urban water regime, niches drive the efforts of water management interventions and innovations in pursuit of improving regime-based functionalities and reducing the likelihood of conflicts and threats to human security. Despite the intensity of the dysfunctional consequences of climate change and global warming vulnerabilities on urban water regimes, it is only the efficiency of policymakers in strategically managing niches which makes differences. While the impact of vulnerabilities on the landscape may be high, niches dictate new axioms for the optimization of the internal structure of urban water structures and the efficiency of 'nesting' to be accomplished using integrated water management principles. Therefore, the way niches are addressed affects the pattern through which the urban water regime responds to vulnerabilities through systematic innovations and interventions.

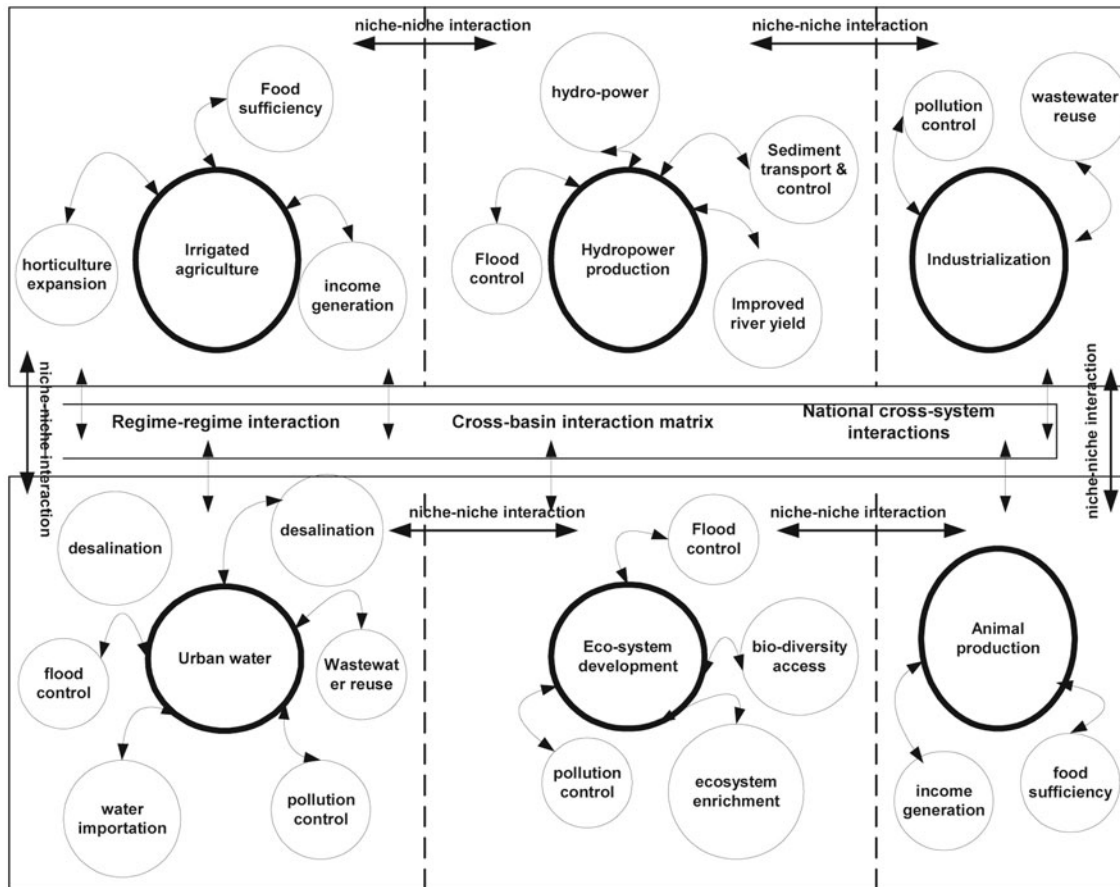
The transformations taking place at the level of regimes as a result of climate changes affect the context of 'flows' and 'stocks' in a way that creates conflicts and threatens human security. While the landscape itself tends to be more vulnerable to the impacts of climate change and global warming, the dysfunctional consequences at the level of regimes tend to have serious dysfunctional consequences. In the case of urban water regimes, the reduction and variability of wa-

ter supplies in peak seasons creates a competition between the urban water regime and other regimes such as irrigation, industry, and ecosystem. The competition takes another form where water authorities need to compete with other public organizations for public funds.

The transformations that take place at the level of the landscape reflect the degree of uncertainty and vulnerability to be taken into account and accordingly the magnitude of innovations to be adopted. Such vulnerabilities tend to be conceptualized in terms of their dysfunctional consequences for the configurations of the water system at large, but in real terms they contribute directly to the context of conflicts and lack of security at the level of regimes such as that of urban water resources. The potential security threats that exist in this regime tend to originate from the fact that urban water management tends to be operated and managed by public institutions whose inefficiency (for any reason including lack of supplies) results directly in political instabilities. Figure 36.3 below reflects such transformations and interactions at the level of niches and regimes, cross-regime interactions, and the impacts of landscape-based transformations.

The characterization of transition management and innovation in urban water management depends on a wide range of capacity-building processes, complex cause-effect relationships, and a context for deploying innovations at the level of landscape, regimes, and niches. Capacity-building-oriented innovations in urban water management processes can be administered and managed at different levels. The basic aim is to enhance the capacity for resilience of urban wa-

Figure 36.3: Niche and regime interoperability. **Source:** Gasmelseid (2010).



ter regimes operating in a corporate niche-regime interaction matrix.

In addition to their role in improving internal functionalities, capacity-oriented innovations at the level of regimes and niches facilitate change management and improve the capacity to manage conflicts, promote reconciliation, and curtail threats to human security. In the light of vulnerabilities and potential security threats, the urban water regime can decide whether to change itself automatically by restructuring its internal goals and resources, or wait for the emergence of change in other interrelated domains of changing or stable regimes. Regime-based shifts include changes to the resource acquisition and allocation matrix, shifts within the utility matrix of stakeholders, and regime-based adaptation capacity. Other shifts may take place at the level of related regimes operating in the overall landscape as well as those existing in its external environment.

36.5 The Role of Information Systems

The adoption of system innovation concepts to develop capacity-building frameworks in urban water resources management depends exclusively on the existence of powerful information systems. The realization of sustained human security and improved resilience capacity through the deployment of innovations cannot be achieved without improved information acquisition, sharing, and utilization. Within this context, information systems can play the following roles to enhance the applicability of system-innovation-based capacity building

36.5.1 Improved Resilience Capacity through Improved Information Availability and Accessibility

Information systems improve the availability and accessibility of information about the internal dynamics of urban water management (functionality-oriented) and the interactions at the level of the overall water

system (corporate axiom generators). As a result, water management authorities can gain significant efficiency improvements, enhanced resource management proficiencies, and increased openness with stakeholders. They can take necessary measures to curtail conflicts, encourage negotiation, and maintain human security.

36.5.2 Improved Coordination

Innovations in capacity building reflect, to a large extent, the actual water use potential in the urban sector. They also reflect the extent to which authorities are capable of mainstreaming functionalities, improving resilience, and enhancing security at the level of landscapes through improved coordination and the prioritization of capacity processes in pursuit of creating 'meeting points' and 'win-win' solutions. Such coordination makes capacity building more process-oriented and targeted towards the improvement of resilience, awareness, conflict management, and human security. It also enhances trust, the involvement of stakeholders, and the negotiation of urban water policies. Improved coordination is essential so that capacity-building programmes, processes, and activities reflect the nature of the interventions and re-engineering processes needed in urban water management settings.

The efficiency of innovation-based capacity building depends on the ability of urban water authorities to coordinate their internal regime-oriented activities and control their external interactions with other regimes. Powerful information systems enable the articulation of urban water management niches and the perception of their attributes, and use the resulting cross-referenced structure of socio-technical configurations in a wider cause-effect context.

Information systems play significant roles in the coordination and orchestration of capacity-building processes at the level of regimes while preserving the principles of integrated water management. The enhancement provided by information in this regard tends to be reflected across both the regimes and the landscape and enables the avoidance of duplication of capacity-building processes, the sharing of scarce resources, and the maintenance of sustained harmonization of processes.

36.5.3 Improved Organizational Ability to Manage Knowledge Assets and Technological Acquisitions

The emphasis on mainstreaming capacity-building processes is directly related to the organizational capacity to manage knowledge assets and data-technology-intensive acquisitions. Such capacity is a prerequisite for the improvement of the 'absorptive capacity' of urban water institutions and their ability to improve resilience by enhancing their capacity to recognize the value of new external information, to assimilate it, and to innovatively apply it. Within this context, information systems assist in the acquisition, analysis, and integration of internal knowledge and external intelligence. In addition to conventional information system functionalities, the development of capacity-oriented innovation networks in urban water management and the orchestration of their functionality with the other innovation networks interacting at the landscape level tend to be of high value. The activities carried out by such networks significantly affect the potential of capacity-building processes in conflict management and the promotion of reconciliation.

However, for information systems to play these roles the following enabling requirements need to be in place:

- a) Adopting a holistic stakeholder-oriented approach for the acquisition and utilization of management information in urban water management. Approaching water information systems with community orientations and structural linkage improves the possibilities of 'making a difference' in the water environment (Gasmelseid 2000, 2000a).
- b) The creation of 'organizational sets': the orchestration of capacity-building processes requires an improved organizational capacity for managing the institutional complexities originating from the modified structural relationships, reporting structure, chains of command, and pathways of information flow and use. To achieve such an objective, water-related organizations should be viewed as 'organizational sets', each with a unique learning capacity of information exchange and response tracking. Organizational sets provide a learning platform for vision sharing, flexible negotiations, and adaptation to organizational defensive mechanisms (Evan 1967). The creation of organizational sets significantly affects interventions based on capacity building at the level of the landscape (the dynamics of institutions interacting in a single set)

as well as the regime (the dynamics of institutions dealing with the urban water regime).

The emphasis on capacity-building processes with respect to organizational sets incorporates the dimensions associated with the interactions of the socio-technical configurations of the overall water system and their consequences on the effectiveness of capacity-building processes in urban water. Therefore, the analysis of capacity-building processes can be oriented towards enhancing 'drivers' that positively affect urban water management and 'barriers' that affect it negatively. Moreover, the emphasis on organizational capacity will facilitate the orchestration of objectives at different levels in pursuit of avoiding any symptoms of sub-optimization and conflicts of interests.

36.6 Conclusions

The complexity experienced in the management of urban water resources has been accompanied with the need to 'nest' urban water management principles and frameworks into the 'integrated' context of water resources management. Despite the 'imperativeness' of such a need for nesting, additional efforts are required to maintain overall 'preparedness and improved capacity'.

The challenges facing water management at the landscape level significantly affect the functionalities of the urban water regime. Therefore, urban water management should be cross-referenced with water management processes in different water-related regimes that share water with it. This is because the context of effective management is no longer limited to the optimization of the utility matrix of stakeholders, but a wide range of transformations (and accordingly issues) are moving to the front-line agenda of policy-makers and demanding structural changes and transformations.

To move from the vision of improving urban water management towards an integrated archipelago of water regimes, emphasis on improved capacity and transitions in its context constitutes a priority. The adoption of system innovation approaches and transition thinking allows for the establishment of a wider domain of interaction and enables an in-depth analysis of niches interacting across the components of the urban water management regime and other related regimes.

Experimenting through regimes establishes connections between different stakeholders in a context of multidisciplinary negotiation and discussion and

enables the creation of social learning networks. It is only the confidence felt at the level of niches and stakeholders which ensures confidence about 'resource sustainability' and stability at the landscape level.

System innovation facilitates migration from conventional urban water management to a wider integrated context of interaction. From the perspective of information systems, the use of systems and innovative thinking to address capacity-building issues improves the knowledge base of water-related information systems (mainly management information systems and decision support systems), increases the responsiveness capacity of the overall urban water regime, and orchestrates its functional interaction with other regimes. In addition, capacity-building activities will be related to urban water management processes in accordance with the interaction between and interdependences among all water-related regimes, as well as the impacts of environmental factors.

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37 Policy Responses to Climate Change in the Mediterranean and MENA Region during the Anthropocene

Hans Günter Brauch

37.1 Introduction: Focus, Methods, and Structure of Chapter¹

According to the *Fourth Assessment Report (AR4)* of the *Intergovernmental Panel on Climate Change (IPCC 2007, 2007a)*, the *Middle East and North Africa (MENA)* or the *West Asia and North Africa (WANA)* region² will be severely affected by the physical effects of climate change such as i) high temperature increases, ii) significant decline in precipitation, and iii) projected sea-level rise, especially in the Nile delta and the low-lying coastal regions with high population density. These changes will directly affect agricultural production: rising evapotranspiration will contribute in most cases to falls in crop yields. This means that rapidly declining self-sufficiency in food caused by continued high population growth until 2050 – with a projected demographic transition prior to 2100 – will necessitate a significant increase in food (cereal) imports (Alexandratos 1995, 2003; FAO 2003). In several countries that are rich in fossil fuels, reserves of oil and gas are projected to decline or to be exhausted by 2050 (Brauch 1996, 1997c, 1997d, 1997e, 2001b). This raises basic economic challenges for many Mediterranean and MENA countries: how to pay for the increasing need of ‘virtual water’ (Allan 2003, 2009), and how to employ, house, and feed a rapidly growing population.

These combined climatic, demographic, and economic challenges that many MENA countries will face by 2050 will affect not only the human security and survival of their citizens, but also the national security and stability of many countries; through both

push and pull factors, the pressure on migration from some MENA countries to Europe, the Arab Gulf, North America, and even Australia may increase what many EU countries have considered an increasing internal security challenge (justice and home affairs), and one that has also been perceived as an international security issue. Migration has already been the major driver for European initiatives both within the framework of the *European Mediterranean Partnership (EMP)* of the *Barcelona Process (BP)* and of the new *Union for the Mediterranean (UfM)*.

Three recent policy developments have increased the pressure to move towards a people-oriented sustainable energy policy by converting the increased urgency of change into an opportunity for moving towards a fourth sustainability revolution across the Mediterranean Sea:

- in the so-called ‘jasmine revolution’, ‘Arab spring’, or ‘Arabellion’³ in North Africa and in many Middle East countries, dissatisfied youth has peacefully toppled the dictatorships in Tunisia and in Egypt after a drastic increase in food prices and major dissatisfaction among the people;
- on 11 March 2011, the cascading risks of the major earthquake that triggered a tsunami and that was instrumental in the meltdown of several nuclear reactors in Fukushima stimulated public pressure in Germany, Switzerland, and Italy for moving away from nuclear energy;
- the German decision of June 2011 to move out of nuclear energy for electricity generation by 2022 has increased the need for renewable energy sources and the attractiveness of small- and large-

1 The author is grateful for the useful comments of two anonymous reviewers and of the responsible co-editor. He is especially grateful to Mike Headon for carefully language-editing this chapter.

2 HRH Prince El Hassan bin Talal (2011) suggested the alternative term WANA to emphasize a collective Arab affinity.

3 This term was created by the *Frankfurter Allgemeine Zeitung* as a short description of the revolutionary events in the Arab world since January 2011; at: <http://zenesprachenwiki.de/definition/arabellion/>.

scale operations for importing solar energy from the Sahara sunbelt.

Building on previous contributions,⁴ this chapter starts with a discussion on the geographic focus (37.2) and of the PEISOR model⁵ for the analysis of interactions between nature and human systems (37.3), noting the gap between the projected impact of global climate change and the insufficiency of political awareness, diagnosis, and policy implementation (37.4). It then addresses possible policy responses, as strategies (37.5), policies (37.6), and measures (37.8) for addressing climate change in the MENA region in the Anthropocene era of earth history, and in particular for projections to 2030, 2050, and 2100. In the conclusions, the chapter discusses the need for improving the knowledge base by research that relies on a necessarily fundamental change in scientific paradigms (a new ‘Copernican revolution’; Clark/Crutzen/Schellhuber 2004 on sustainability), in the world views of scientists, and in the mindsets of policymakers to cope with the multiple security challenges that are forecast, whether in a ‘reactive’ or ‘proactive’ mode (37.9).

Although the study is based in the social and policy sciences and relies on the qualitative-sociological methods and approaches used in the research programmes of peace research, security studies, and environmental studies, its goal is multidisciplinary in that it offers a regional case that illustrates the need for a “fourth sustainability revolution” (Oswald Spring/Brauch 2011) in the framework of the suggested new “political geo-ecology for the Anthropocene” (Brauch/Dalby/Oswald Spring 2011).

4 This chapter builds on previous publications by this author that focused primarily on the Mediterranean space and political frameworks (2001, 2001a, 2003), on confidence and security-building measures (1994, 1994a, 2000, 2000a), on natural hazards (2003a, 2003b), on regional environmental challenges (1998), on the socio-political impacts of climate change (2006a, 2007, 2009, 2009a, 2010, 2011), on desertification (2006a), on migration (1997a, 1997b, 2000/2001), and on renewable energy policy (1996, 1997c, 1997d, 1997e, 2000b, 2001b).

5 PEISOR stands for five phases of the interactions between processes of nature and the societal context: *P*: pressure, *E*: environmental effect; *I*: environmental impact; *SO*: societal outcome, and *R*: policy response (Brauch 2009).

37.2 Geography and Policy Institutions: The Mediterranean and the MENA Region

37.2.1 Conflicting Geographic Definitions

Four geographically and politically ‘contested concepts’ have been used in the policy debate and the scientific literature: a) the Mediterranean, b) North Africa, c) the Middle East, and d) the MENA Region – used in many debates and discourses about the EMP in the context of the BP or the UfM. This lack of precision in geographic boundaries is partly due to political reasons, as reflected in the membership of international institutions (e.g. of the League of Arab States or the UfM).

With regard to climate change impacts, this chapter focuses primarily on the ‘medium’ concept of the Mediterranean (37.2.1.1), and on possible policy responses to climate change through strategies, policies, and measures (37.5–37.7) in the MENA region, with however a special focus on the five countries of North Africa (Morocco, Algeria, Tunisia, Libya, and Egypt).

37.2.1.1 Concepts of the Mediterranean and of the Mediterranean Space

There is no accepted definition of the Mediterranean nor are there common criteria for the *Mediterranean Sea*, except that it is a *sea* whose shores connect three continents: Europe, Africa, and Asia.⁶ For millennia, the Mediterranean has been a unique geographical space but it has been a divided region politically, economically, and culturally. The ‘Mediterranean’ is characterized by both *unity* and *diversity*, by periods of cooperation and conflict, of tolerance and violent conflicts, by intensive cultural exchange and cultural clashes, periods of close economic cooperation, by interdependence but also by exploitation, unequal exchange, and dependence. The Mediterranean is a ‘sea’, a ‘space’, and possibly a ‘region’ with narrow, medium, and wider boundaries. Based on this differentiation between the Mediterranean sea, basin, space, and region, three geographic concepts have been generally used:

- a) the *narrow concept* of the administrative units of the Blue Plan with a Mediterranean coastline, of

6 This section draws on Brauch (2000, 2001, 2001a, 2003, 2010, 2011); see also Wagner (2001, 2011).

Table 37.1: State, Economic, and Societal World: Actors, Levels, and Issue Areas of Cooperation in the Mediterranean Space. **Source:** The author.

	Security	Political	Economic	Environmental
State world				
• international organizations	UN, OSCE, NATO	OSCE, EU, Arab League	WB, IMF, EU (ENP), UNDP, OECD, AMU	UNEP, MAP
• functional regime	non-proliferation regime	EMP/UfM	EMP/UfM	Barcelona Convention ^a
• dialogue forums	NATO, Med dialogues	EMP/UfM	EMP/UfM	Mediterranean Committee on Sustainable Development
Economic world	Multinational companies, international chambers of commerce and industry			
Societal world	Civil society and non-governmental (scientific) organizations			

a The Barcelona Convention for the Protection of the Marine Environment and Coastal Region of the Mediterranean was adopted in Barcelona on 16 February 1976 and came into force on 12 February 1978.

- the watershed, or of the cultivation areas of the olive;
- b) the *medium concept* of a Mediterranean perspective that includes all countries with Mediterranean coastlines plus Portugal and Jordan;
- c) the *wide concept* of the Mediterranean that includes the Black Sea, the Red Sea, and the Persian or Arab Gulf region, recognizing the ecological, cultural, and economic similarities.

Major unifying elements are: a) common ecological features (climate, landscape) and a shared environmental responsibility, challenged by the urbanization, demography, and tourism that have contributed to an 'environmental crisis' (Thornes 2001); b) a common history (Braudel 1972); c) a distinct Mediterranean economy; and d) relatively homogeneous cultures. While the geographical space has remained unchanged during the past 5,000 years of human history, the spaces of rule have been permanently in flux.

Empirically, cooperation in the Mediterranean may be analysed for different *actors* (states, economic organizations, societal organizations) at several *levels of analysis* (international, state, sub-state) for *degrees of intensity* (organizations, regimes, dialogues) and *issue areas*: security and military, political, economic, and environmental. The existing institutions of cooperation in the narrow, medium, and wide Mediterranean space point to different institutional boundaries (table 37.1).

37.2.1.2 Definitions of North Africa

There is also no agreement on whether North Africa includes only the Arab region north of the Sahara

Desert as contrasted with the region of sub-Saharan Africa (Austin 2001).⁷ While the *American Heritage Dictionary of the English Language* (42001) identifies North Africa with the modern-day countries of Morocco, Algeria, Tunisia, and Libya that also comprise the Maghreb,⁸ according to the *Collins English Dictionary* (2003) it includes the African "region between the Mediterranean and the Sahara: consists chiefly of Morocco, Algeria, Tunisia, Libya, and Egypt".⁹ The United Nations' definition of Northern Africa includes Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, and Western Sahara. However, NATO in its Euro-Mediterranean Dialogue and the UfM have both included Mauritania but excluded Sudan, though neither has a Mediterranean coast.

37.2.1.3 Concepts of the Middle East

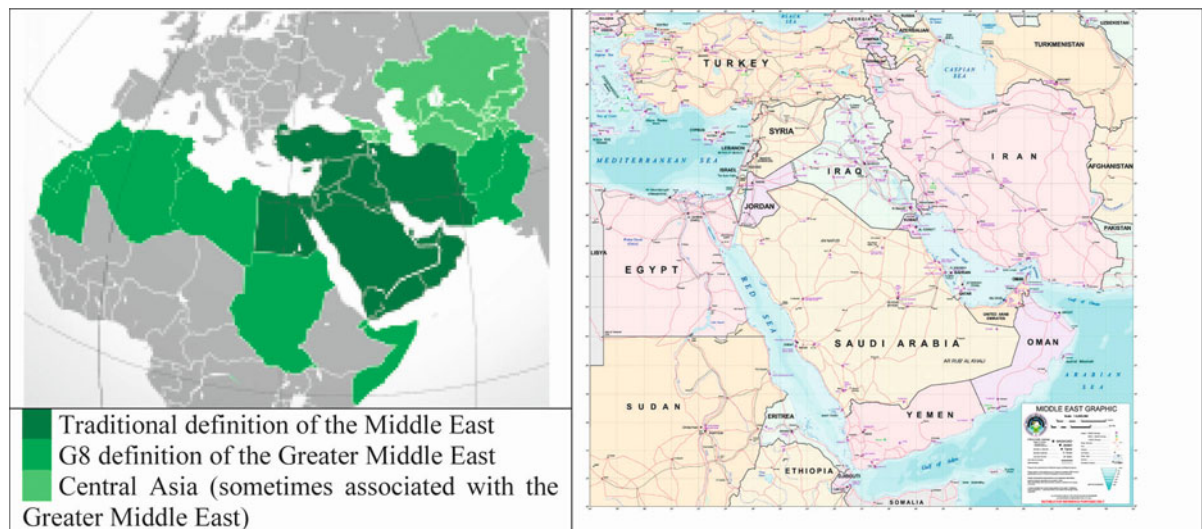
Nor does a consensus exist on the geographic and political scope of the Middle East. The Near East comprises the non-European countries of the eastern Mediterranean, especially Turkey, Israel, and the Arab Mashreq states: Syria, Iraq, Lebanon, Jordan, and the *Occupied Palestinian Territories* (OPT).

7 Austin (2001) noted that according to geographical convention Africa is divided into Mediterranean and sub-Saharan zones, with the former treated as an extension of the Middle East ('Maghreb', the Arabic term for North Africa, means 'West'), while the latter is the 'true' Africa.

8 *The American Heritage Dictionary: Fourth Edition* (New York: Houghton Mifflin Company - Dell, 2001).

9 *Collins English Dictionary* (London: HarperCollins, 2003).

Figure 37.1: Definitions and map of the Middle East. **Source:** Wikipedia maps are in the public domain; at: <http://en.wikipedia.org/wiki/Middle_East> (28 November 2010).



This region is affected by several major international conflicts: a) between Israel and its Arab neighbours; b) over the water resources of the Euphrates, Tigris (Turkey, Syria, Iraq), and Jordan rivers (Israel, OPT, Jordan); c) the war between Iraq and Iran (1980–1988); d) the war between Iraq and Kuwait (1990); e) the two US-led wars against Iraq (1990, 2003-); f) the many wars in Afghanistan (1979-); and g) the wars between Pakistan and India. George W. Bush’s Administration included in the Greater Middle East Afghanistan and Pakistan, the Caucasus, Central Asia, and North Africa (Aydin/Ereker 2009).

37.2.1.4 Concepts of the Middle East and North Africa (MENA)

The MENA region combines two contested geographical regions on whose boundaries no agreements exist. From an Arab perspective, Mohammad El-Sayed Selim (2001) addressed various “Trans-Mediterranean-Arabian Geostrategic Linkages” to counter the division of the Arab world in the context of the Euro-Mediterranean dialogue and cooperation frameworks. To overcome this puzzle of many different geographical and political definitions, this chapter focuses on the medium definition of the Mediterranean, on the five Mediterranean riparian countries of North Africa, and for the MENA on these five countries and on the countries of West Asia (figure 37.2) that have participated in the EMP (since 1995) and in the UfM (since 2008).

37.2.2 Environmental Cooperation in the Mediterranean

In February 2002, the European Commission recommended “strategies for protecting the environment and ensuring sustainability” to be incorporated in an action plan adopted in April 2002 at the sixth meeting of the foreign ministers of the EMP in Valencia. So far within the EU framework, three ministerials on the Mediterranean environment have taken place, in Helsinki on 28 November 1997, in Athens on 9-10 July 2002, and in Cairo on 20 November 2006.

Funding for environmental projects in the Mediterranean has been granted by UN agencies and programmes (UNESCO, ECE, ECA, ESCWA, UNEP, UNDP); by international financial institutions (IFIs): a) the World Bank, b) the *European Investment Bank* (EIB) in Luxembourg, c) the *Global Environment Facility* (GEF); and by the European Commission through the *Short- and Medium-term Priority Environment Action Programme* (SMAP) and through the Life Programme. Since 1995, major funding for joint environmental activities has been provided by the European Union within the EMP of the BP and by the *European Neighbourhood Policy* (ENP). Its geographic scope applies in the Mediterranean to “all non-EU participants” in the EMP (Christensen 2011: 134).¹⁰

37.2.3 Security Dialogues in the Mediterranean

In the realm of security, several security-related dialogues have emerged: a) the Euro-Arab dialogue be-

tween the *European Community* (EC) and Arab League states since 1973; b) since 1975 the Mediterranean partners for cooperation of the *Conference* and since 1994 of the *Organization for Security and Cooperation in Europe* (CSCE/OSCE); c) the French initiative of 1990 for a 5 + 5 dialogue; d) the Egyptian proposal of 1994 for a Mediterranean Forum for Dialogue and Cooperation; e) the *Western European Union* (WEU) Mediterranean Subgroup that has now ended; and f) the NATO Mediterranean Initiative of 1994 (De Santis 2003) and since 2004 the Istanbul Cooperation Initiative (Bin 2008). In 2011, the Euro-Arab Dialogue and the Mediterranean Forum are no longer operational. In early 2011, three Mediterranean security dialogues co-existed without coordination: a) that of the OSCE with its *Mediterranean partners for cooperation* (MPCs);¹¹ b) NATO's *Mediterranean Dialogue* (MD) and its related *Istanbul Cooperation Initiative* (ICI);¹² and c) the *Barcelona Process* aiming at an EMP launched in November 1995 and reinvigorated as the UfM in 2008. After the transfer of the WEU's operational activities to the EU, the WEU Assembly has acted as the interim European Security and Defence Assembly,¹³ providing a forum for political discussion and reflection on the *European Security and Defence Policy* (ESDP).

37.2.4 From the Barcelona Process to the Union for the Mediterranean

The *Barcelona Declaration* of 1995 establishing an EMP and its successor the UfM are the only multi-issue regime in the making covering most Mediterranean riparians and MENA countries. It is the only politically relevant forum for an increasing pan-Mediterranean functional cooperation on the three baskets aiming at a) a security partnership, b) an economic and financial partnership, and c) a partnership in social, cultural, and human affairs.

In the autumn of 2008 the members of the UfM were split on whether the Arab League and its members who do not participate in the UfM could participate as observers in UfM meetings, as they had done in the context of the Barcelona process, but according to the Final Declaration of the UfM Ministerial Conference of 4 November 2008, the Arab League maintained its observer status.¹⁴

Which 'Mediterranean space' may be more appropriate for dealing with non-military environmental challenges? While the environmental 'space' of the *Barcelona Convention* (1976) has focused on the riparian nations in order to protect the Mediterranean Sea ('*environmental space*'), that of the *Barcelona Declaration* (1995) relies on a larger Euro-Mediterranean space as a common area of peace and stability, of shared prosperity, and of understanding between cultures and exchanges between civil societies ('*political space*'). While this environmental space has remained unchanged, the political space has significantly changed due to the enlargement of the EU and the emergence of the UfM. Hence the 'Mediterranean space' used by international organizations, regimes, and dialogues depends on their goals, given the lack of commonly accepted geographical and political criteria.

The Mediterranean environment within the natural boundaries of the Sahara desert, Europe, and the Atlantic does not respect national borders. Within its natural boundaries, the *Mediterranean climate* implies complex interactions between global climate change and regional impacts that will negatively rein-

10 European Commission, 2004: *Communication from the Commission: European Neighbourhood Policy. Strategy Paper*, COM(2004) 373 final (Brussels: European Commission, 12 May); at: <http://www.ec.europa.eu/world/enp/pdf/strategy/strategy_paper_em.pdf>; European Commission, *European Neighbourhood and Partnership Instrument (ENPI) Interregional Programme Strategy Paper 2007-2013 & Indicative Programme 2007-2010* (Brussels: European Commission); at: <http://ec.europa.eu/world/enp/pdf/country/enpi_interregional_en.pdf>. In 2006, within the ENP *Association Agreements* (AAs) were signed with Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, the Palestinian Authority, and Tunisia (an AA has been agreed but not yet signed with Syria).

11 See the website of the OSCE for the most recent developments; at: <<http://www.osce.org/ec/43245>>; see the OSCE conference on 14-15 December 2009 in Cairo on "The Mediterranean Partners and the OSCE: Co-operation toward enhanced security and stability"; at: <<http://www.osce.org/ec/41411>>.

12 See NATO's Mediterranean Dialogue in spring 2011; at: <http://www.nato.int/cps/en/natolive/topics_52927.htm>.

13 See for details at: <<http://www.assembly-weu.org/en/index.php>>.

14 See: Toby Vogel: "Union for the Mediterranean split over the Arab League", in: *European Voice*, 30 October 2008; at: <<http://www.europeanvoice.com/article/imported/union-for-the-mediterranean-split-over-the-arab-league/62856.aspx>> (29 June 2011); Senén Florens: "Union for the Mediterranean: Challenges and Ambitions"; at: <http://www.iemed.org/anuari/2010/aarticles/Florensa_UfM_en.pdf> (29 June 2011).

force the ongoing processes of desertification. Both require an analysis of endogenous and exogenous anthropogenic factors. There are common long-term non-military environmental challenges affecting the whole Mediterranean *space* that will have socio-economic and possibly political or even military consequences for the Euro-Mediterranean *area*.

To analyse *environmental security* issues, an environmental spatialization of the Mediterranean and the MENA region is all that is required; on the other hand, early and joint action by those countries participating in the wider *Euro-Mediterranean space* of the BP and (since 2008) within the UfM is needed in order to develop a policy that avoids those outcomes that might emerge from the medium-term implications of the long-term structural causes of a 'survival dilemma' (Brauch 2008) crossing national borders and environmental boundaries. At present, the European Union has more economic resources for dealing with the future long-term environmental challenges that the southern and eastern shores have experienced since 1950, and that they will be confronted with in the 21st century. To cope with these non-military challenges in the Mediterranean, close political and economic cooperation becomes crucial. The EMP partnership and the UfM offer the only political 'institution' where competence, legitimacy, and resources are present. The Mediterranean eco-region is confronted with a major contradiction: for the common environmental challenges, only highly fragmented institutionalized security, political, and economic spaces are available within pan-Mediterranean political 'spaces':

- the truly Mediterranean environmental regime of the Barcelona Convention (1976), of the *Mediterranean Action Plan* (MAP), and of the Blue Plan, whose functional task is limited; and
- the emerging multi-issue political regime of the *Barcelona Declaration* (1995) and the enlarged space of the UfM that includes most MENA countries.

Between the environmental regimes and the security dialogues there has been little political cooperation. The *Athens Declaration*¹⁵ encouraged closer cooperation between the *Short- and Medium-term Priority Environment Action Programme* (SMAP) and *Medi-*

terranean Action Plan (MAP) and synergies with other organizations, programmes (MAP), and donors such as the *Mediterranean Environment Technical Assistance Programme* (METAP). The Blue Plan secretariat has also analysed many environmental challenges that the *Mediterranean Committee on Sustainable Development* (MCSD) faces in the 21st century. At the *intergovernmental level* and in the *EuroMesco* network¹⁶, there was no conceptual debate on environmental security issues in the Mediterranean until a *Mediterranean Environmental Security Initiative* (MEDSEC) and a *Mediterranean Environmental and Human Security Initiative* (MEHSEC) were proposed (37.5.9).

37.2.5 Towards the Union for the Mediterranean (2008)

The unresolved Middle East conflict meant that a major breakthrough in the Barcelona process remained elusive. The renewed effort by French President Nicolas Sarkozy to relaunch the EMP as a Mediterranean Union failed due to opposition by non-Mediterranean countries who wanted to remain actively involved in Mediterranean politics. During the French EU presidency, the Mediterranean Union was launched in Paris on 13 July 2008, where the participants agreed that the UfM

will build on the Barcelona Declaration of 28 November 1995, promote its goals which were further emphasized in Marseille meeting of Ministers of foreign affairs on 3-4 November 2008, and reinforce the *acquis* of the [Barcelona Process] by upgrading their relations, incorporating more co-ownership in their multilateral cooperation framework, strengthening equal footing governance and translate it into concrete projects, thus delivering concrete benefits for the citizens of the region.¹⁷

During 2008 it was renamed as the UfM. In 2010 it experienced a severe setback with the postponement of the second summit of the heads of state, but functional cooperation continued with the establishment of a UfM secretariat in Barcelona.¹⁸

The new UfM is co-chaired by a European country and a country from the MENA region, and it forms the framework of multilateral relations between the EU and Mediterranean non-EU countries, comple-

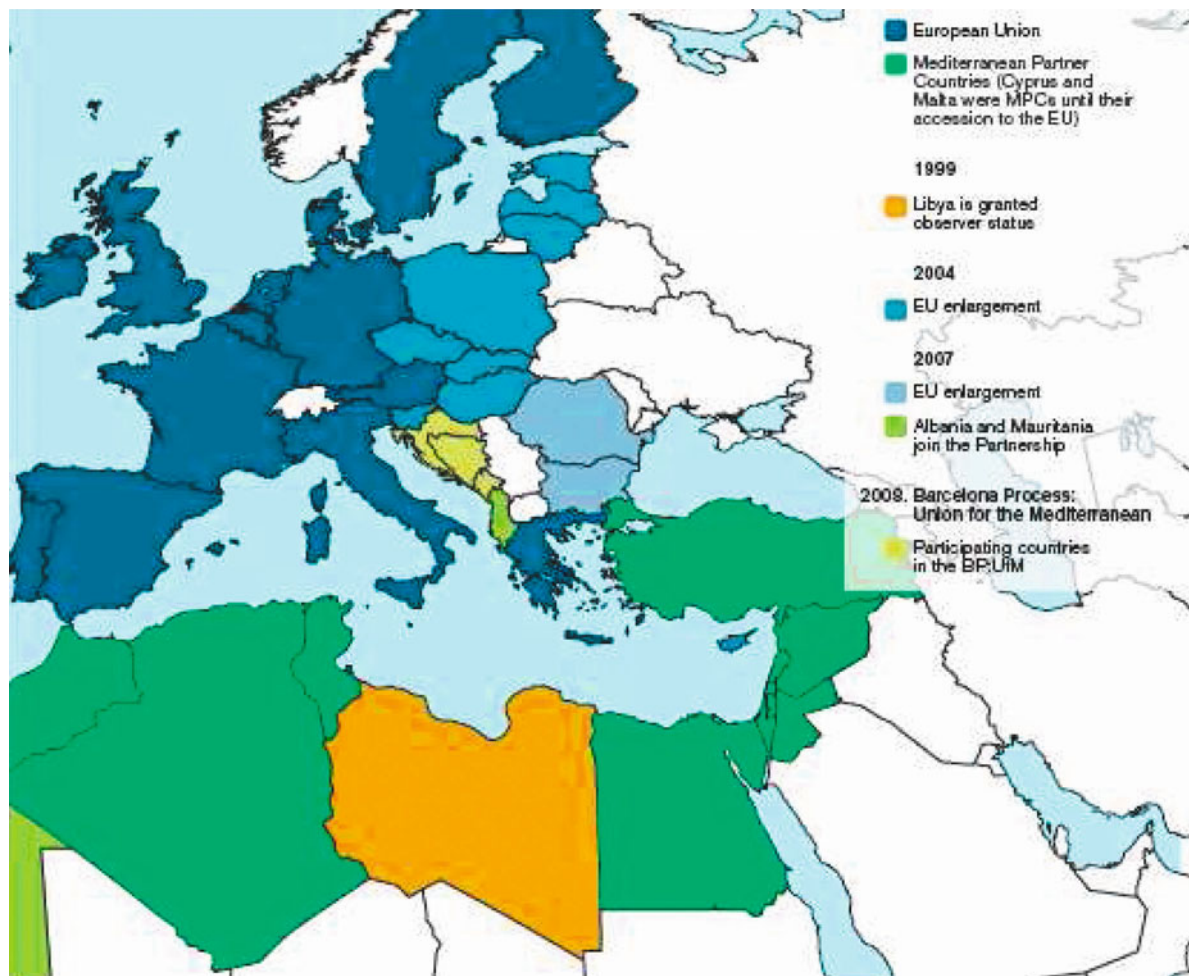
15 See: "Athens Declaration by the Euro-Mediterranean Ministers for the Environment", 10 July 2002 at: <http://ec.europa.eu/environment/archives/smap/pdf/min_dec_en.pdf>.

16 See: <<http://www.euromesco.net/>>.

17 See at: <<http://www.ufmsecretariat.org/en/institutional-documents/>>.

18 See for details and recent developments at: <<http://www.ufmsecretariat.org/en/>>.

Figure 37.2: Member Countries of the Union for the Mediterranean (November 2009). **Source:** Brauch (2010: 21); provided by IEMed in Barcelona.



menting bilateral relations under the *European Neighbourhood Policy* (ENP) and the pre-accession framework. The UfM builds on the achievements of the BP, whose goals and areas of cooperation (political dialogue, economic cooperation and free trade, and human, social, and cultural dialogue) remain valid. The UfM enhances the BP by a) upgrading the political level of the relationship; b) reinforcing co-ownership by a system of co-presidencies, with a Secretariat and a Joint Permanent Committee; and c) making these relations more concrete and visible.

At the Paris Summit, six priority projects were approved: 1) De-pollution of the Mediterranean; 2) Maritime and Land Highways; 3) Civil Protection; 4) Alternative Energies & Mediterranean Solar Plan; 5) Higher Education and Research - Euro-Mediterranean University; and 6) Supporting Business.

According to the European Commission, there are a number of sources of funding: the private sector,

bilateral cooperation between EU Member States, contributions from Mediterranean partners, international financial institutions or regional banks, and the Community budget for the Mediterranean, such as the ENP South regional programmes and the *Neighbourhood Investment Facility* and *Cross-Border Cooperation* instrument, all of them within the *European Neighbourhood and Partnership Instrument* (ENPI).¹⁹

This chapter uses a definition of the Mediterranean (figure 37.2) that includes all the riparian countries of the Mediterranean Sea (plus Portugal and Jordan), all of which cooperate in the UfM/EMP; for the Middle East, it uses the traditional definition (figure 37.1).

37.3 Applying the PEISOR Model to the MENA Region

For the analysis of the linkages between the earth and human systems and their effects, impacts, societal outcomes, and policy response, the author has developed the PEISOR model (Brauch 2009). Stimulated by the *Pressure-State-Response* (PSR) model of the *OECD* (1994; 1998; 1999; 2001; 2001a), the *DSR* (*Driving Force-State-Response*) of the *UN Commission for Sustainable Development* (UN-CSD), and the *DPSIR* (*Driving Force - Pressure - State - Impact - Response*) of the *European Environment Agency* (EEA 1998), the PEISOR model (Brauch 2009) integrates the results of the debate on environmental security (Dalby/Brauch/Oswald Spring 2009) into five stages:

- *P* (*pressure*) refers to eight drivers of global environmental change (*survival hexagon*);
- *E* to the *effects* of the linear, non-linear, or chaotic interactions within the ‘hexagon’ on environmental scarcity, degradation, and stress;
- *I* to extreme or fatal *impacts* of human-induced and climate-related natural hazards (storms, flash floods, flooding, landslides, drought);
- *SO* to *societal outcomes*: internal displacement, migration, urbanization, crises, conflicts, state failure; and
- *R* to *response* by society, the business community, and the state, where both traditional and modern technological knowledge can make a difference.

19 IEMed: *EUROMED Survey of experts and actors Assessment of the Euro-Mediterranean Partnership: Perceptions and Realities* (Barcelona: IEMed); at: <<http://www.iemed.org/activitats/2010/euromedsurvey/aeuromedsurvey.php>>. According to a first annual survey by the *European Institute of the Mediterranean* (IEMed) in Barcelona on the EMP and its perceptions and realities, the programmes on education, culture, youth, and research (72 per cent), as well as business programmes (60-70 per cent), were considered a success while the political and security partnerships were perceived rather negatively and “In the sustainable development area, 80 per cent see no progress or even a regression in reducing the poverty rate, 80 per cent in reducing the prosperity gap and raising GDP growth rates to reduce the prosperity gap (even a larger percentage in Mashreq countries) and 76 per cent see no progress or a regression in the creation of job opportunities for young people.” The respondents believed that there has been no progress or regression on facilitating mobility and managing migration (83 per cent) and on sustainability issues (80 per cent).

While hazards cannot be prevented, their impact in terms of deaths, affected people, and economic and insured damage can be reduced by a combination of policies and measures that link protection with the empowerment of the people so that they become more resilient (CHS 2003).

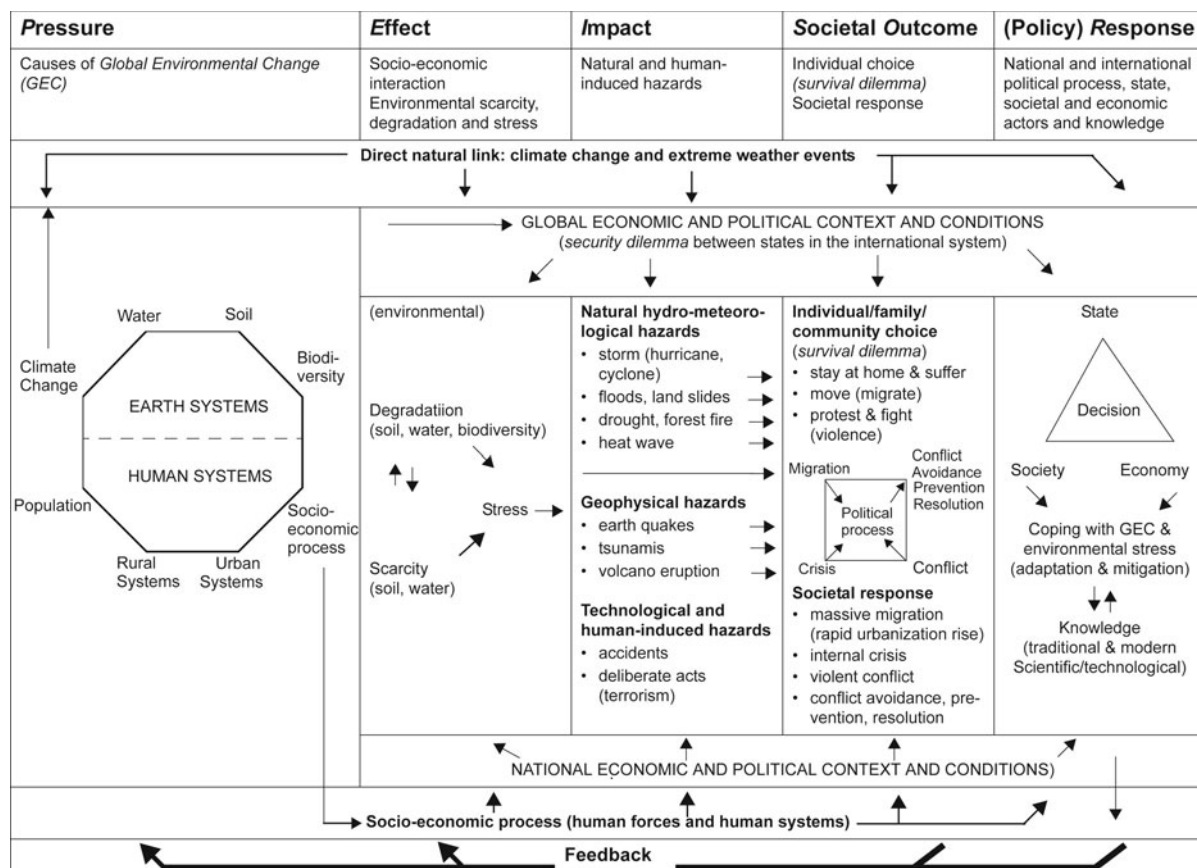
37.3.1 Pressure: Interactions between the Earth and Human Systems

The PEISOR model has gradually evolved as a scientific effort to securitize issues related to *Global Environmental Change* (GEC) and specifically to climate change. The model refers to eight factors contributing to GEC that often interact in a linear, non-linear, or chaotic way, and impact on earth and human systems. The political and societal contexts may affect the socio-economic processes that contribute to anthropogenic environmental degradation or to resource scarcity, both of which may result in environmental stress. Among the four linear or physical effects of anthropogenic climate change impacting on the Mediterranean and the MENA region (37.3.2) are a) temperature rise (37.3.2.1), b) increase in sea level (37.3.2.2), c) changes in precipitation and run-off (37.3.2.3), and d) increase in the number and intensity of climate-related hydro-meteorological hazards, such as storms, floods, and landslides as well as drought, forest fires, and heatwaves or cold spells (37.3.2.4).

Once the climate crosses a certain threshold, there may be non-linear or chaotic consequences that have been referred to as ‘tipping points’²⁰ of the climate system: “In response to anthropogenic climate forcing, a small perturbation at a critical point could qualitatively alter the future fate of the system. Such changes could be triggered this century and would undergo a

20 Lenton, Held, Kriegler, Hall, Lucht, Ramsdorf, and Schellnhuber (2008: 1186) argued that the term ‘tipping point’ has been used in discussions of global change “to describe a variety of phenomena, including the appearance of a positive feedback, reversible phase transitions, phase transitions with hysteresis effects, and bifurcations where the transition is smooth but the future path of the system depends on the noise at a critical point”. They offered “a formal definition, introducing the term ‘tipping element’ to describe subsystems of the Earth system that are at least subcontinental in scale and can be switched – under certain circumstances – into a qualitatively different state by small perturbations. The tipping point is the corresponding critical point – in forcing and a feature of the system – at which the future state of the system is qualitatively altered.”

Figure 37.3: PEISOR-Model. Source: Brauch (2009: 76) and Brauch and Oswald (2009: 11).



qualitative change within this millennium.” Lenton, Held, Kriegler, Hall, Lucht, Ramsdorf, and Schellnhuber (2008: 1186) pointed to the melting of the Arctic sea-ice, rapid changes in the Greenland and West Antarctic ice sheets, a shut-off of the Gulf Stream (Atlantic Thermohaline Circulation), changes in the *El Niño-Southern Oscillation* (ENSO), the Indian summer monsoon, the Sahara/Sahel, and the West African monsoon, drying-up of the Amazon basin, and changes in boreal forests. These possible abrupt climate changes could trigger serious consequences for international and national security (Schwartz/Randall 2003, 2004). Two of these potential ‘tipping points’ may directly affect the MENA region: changes in the Sahara or Sahel, and in the West African monsoon (37.3.3).

37.3.2 Physical Effects of Linear Climate Change

Working Group 2 (WG II) of the fourth IPCC Assessment Report (IPCC 2007) offered, as well as the Synthesis Report, the following assessments of the peer-

reviewed literature pertaining to the Mediterranean region. It has only been analysed in the context of three sub-regions: a) Southern Europe; b) North Africa, and c) West Asia. What physical impacts have been forecast up to 2020, 2050, and 2100? The IPCC Synthesis Report (2007c: 50) concluded that

in southern Europe, climate change is projected to worsen conditions (high temperatures and drought) in a region already vulnerable to climate variability, and to reduce water availability, hydropower potential, summer tourism and, in general, crop productivity. Climate change is also projected to increase the health risks due to heat waves and the frequency of wildfires.

The IPCC Synthesis Report (2007c: 50) noted that Africa will be most severely affected “because of low adaptive capacity and projected climate change impacts” and the IPCC assessment referred to these general projected impacts:

- By 2020, between 75 and 250 million people are projected to be exposed to increased water stress due to climate change.
- By 2020, in some countries, yields from rain-fed agriculture could be reduced by up to 50 per cent.

Agricultural production, including access to food in many African countries is projected to be severely compromised. This would further adversely affect food security and exacerbate malnutrition.

- Towards the end of the 21st century, projected sea level rise will affect low-lying coastal areas with large populations. The cost of adaptation could amount to at least 5 to 10 per cent of GDP.
- By 2080, an increase of 5 to 8 per cent of arid and semi-arid land in Africa is projected under a range of climate scenarios (*high confidence*).

According to the IPCC's assessment, "new studies confirm that Africa is one of the most vulnerable continents because of the range of projected impacts, multiple stresses and low adaptive capacity." With regard to Asia, the IPCC's (2007c: 50) assessed projections are:

- By the 2050s, freshwater availability in Central, South, East and South-East Asia, particularly in large river basins, is projected to decrease.
- Coastal areas, especially heavily-populated mega-delta regions in South, East and South-East Asia, will be at greatest risk due to increased flooding from the sea and, in some mega-deltas, flooding from the rivers.
- Climate change is projected to compound the pressures on natural resources and the environment associated with rapid urbanization, industrialization, and economic development.
- Endemic morbidity and mortality due to diarrhoeal disease primarily associated with floods and droughts are expected to rise in East, South and South-East Asia due to projected changes in the hydrological cycle.

There is so far no systematic and regionally integrated scientific assessment of the physical climate change impacts for the whole Mediterranean, and especially for the MENA or WANA region. However, several research projects, conferences, and publications have covered selected impacts.²¹ A conference report by the Plan Bleu Regional Activity Centre in October 2008 on climate change in the Mediterranean considered it

21 See the RICARME project; see the Report of the Regional Seminar on Climate Change in the Mediterranean, Plan Bleu Regional Activity Centre, Le Pharo, Marseilles (France) 22-23 October 2008; UNEP, MAP *State of the Environment and Development in the Mediterranean* (Athens: UNEP/MAP, 2009): 13-28.

essential to develop a Mediterranean ocean-atmosphere regional climate model, taking into account the change in sea surface temperature ..., the CIRCLE MED research initiative on water management in coastal sectors has allowed farmers to share their experiences and to develop their know-how. ... Similarly, the CIRCE project, which brings together 62 research institutions to evaluate and envisage the physical impacts of climate change on the environment, their implications for society, the economy and the adaptation strategies, should be yielding its preliminary results during the first regional evaluation of Mediterranean climate change within the first half of 2009. ... The SESAME project (Southernmost European Seas: Evaluation and Modelling of Ecosystem Change) seeks to work out the way in which the changes in hydro-climate characteristics have influenced the evolution of the zooplankton over the last 50 years in the northern Mediterranean region.

The conference report further suggested that

priority action should ... be to start ... to conduct work on adaptation and emissions reduction, without awaiting better resolution of the models. At the same time, many scientific and technical challenges would need to be taken up if one were to have reliable regional information on the potential impacts of climate change. To improve current simulations, the Mediterranean countries should continue to develop advanced interdisciplinary research programmes ..., which would help build confidence in the results of the scientific models and arouse the interest of political decision makers.

The consensus among the participating experts was that the

resolution of the models should be in the range of 1 to 2 km within the ten years ... However, these efforts are costly and cannot substitute for political debate. Accordingly, the refining of the models should be accompanied by the production of more qualitative climate change monitoring indicators.

Since the 1990s, scholars²² and national²³, scientific²⁴, and international²⁵ organizations from the Arab world, as well as the World Bank²⁶, have increasingly

22 See among others the work of Mohamad El Raey (1991, 1993, 1994, 2000, 2007, 2009, 2011) and his colleagues from the University of Alexandria (El Raey/Ahmed/Korany 1997; El Raey/Dewidar/El-Hattab 1999, 1999a; El Raey/Fouda/Gal 2000; El Raey/Fouda/Nasr 1997; El Raey/Frihy/Nasr et al. 1998, 1999; El Raey/Nasr/El-Hattab et al. 1995; El Raey/Nasr/Frihy et al. 2005; El Raey/Nasr/Frihy et al. 1995; El Shennawy 2009; El-Atrash/Salem/Jad 2008; Medany (2008); Drine (2011); Salem (2011). See also from a US perspective: Sowers and Weinthal (2010).

23 Many MENA countries from the Arab world have also submitted their national communications to the UNFCCC Secretariat (see [tables 37.11](#) and [37.12](#)).

analysed and assessed the impact of climate change for the MENA or WANA regions using the most recent global and regional scientific evidence. Based on the findings of the IPCC (2007), the 2009 Report of the *Arab Forum for Environment and Development* (AFED) stated

that the Arab countries are in many ways among the most vulnerable in the world to the potential impacts of climate change, the most significant of which are increased average temperatures, less and more erratic precipitation, and sea level rise (SLR), in a region which already suffers from aridity, recurrent drought and water scarcity (Tolba/Saab 2009: vii).

In a working paper for *United Nations' University World Institute for Development Research* (UNU-WIDER), Imed Drine (2011: 1) noted, basing his comments on the IPCC (2007) assessment and on the AFED Report (2009),

that the impacts of climate change on North Africa are likely to be more severe compared to other regions of the world (taking into account biophysical and socio-economic conditions of the region) there remains a considerable effort to understand the magnitude of the challenge facing the region and the region's capacity to cope.²⁷

But Drine (2011: 1) pointed to major knowledge gaps:

...no concerted data gathering and research efforts could be traced regarding the impacts of climate change on health, infrastructure, biodiversity, tourism, water and food production. The economic impact seems to

be totally ignored. Reliable records on climate patterns in the region barely exist (AFED Report 2009).²⁸

Ibrahim Abdel Gelil (2010) of the Arabian Gulf University in Bahrain referred to major political and socio-economic deficits and to the limited scientific efforts in the Arab World addressing climate change and its projected regional and national impacts.²⁹ Abdel Gelil was the scientific consultant for a joint study by the UN's *Economic and Social Commission for Western Asia* (ESCWA) and the League of Arab States on the *Arab Region State of Implementation on Climate Change* (June 2005), that documented major deficits.³⁰

37.3.2.1 Projected Global and Regional Temperature Increase

Depending on the assumptions of the various global circulation models assessed by the IPCC, the level of increase in greenhouse gas emissions and the temperature increase vary widely. There is a consensus among climatologists that a global increase in temperature of 2°C is virtually certain, of up to 4°C is possible, and of up to 6°C cannot be excluded if business as usual continues. As COP 15 in Copenhagen failed to agree on stringent constraints on GHG emissions, the possibility of a “dangerous climate change” (Schellnhuber/Cramer/Nakicenovic et al.) is more likely during this century, and this will create multiple security dangers and concerns.

The UNEP, MAP report of 2009 on the *State of the Environment and Development in the Mediterranean* noted that

over the 20th century and with a clear acceleration since 1970, South-Western Europe (the Iberian Peninsula, South of France) recorded an increase in temperature of almost 2°C. The same increase can also be noticed for

24 See reports by the *Arab Forum on Environment and Development* (AFED) edited by Tolba and Saab (2008, 2009); OSS/UNEP (2010).

25 See the study for the OECD by Agrawala, Moehner, El Raey, Conway, van Aalst, Hagenstad and Smith (2004).

26 See for background studies: “Adaptation to Climate Change in the Middle East and North Africa Region”; at: <<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/MENAEXT/0,,contentMDK:21596766~pagePK:146736~piPK:146830~theSitePK:256299,00.html>>; see also on the World Bank's: “Climate change adaptation and coastal cities of the North African project”; at: <<http://www.egis-bceominternational.com/pbm/>>. This project aims to “assess the climate change and natural disaster vulnerabilities of 4 urban areas in North Africa: Alexandria (Egypt), Tunis (Tunisia), Casablanca and Bouregreg Valley (Morocco)” and to “formulate related action plans to improve their adaptation to climate change and preparedness for natural disasters”. See the project outputs in 2009 and 2010; at: <http://www.egis-bceominternational.com/pbm/Project_outputs_Ang.html> and the extensive library with specialized reports at: <http://www.egis-bceominternational.com/pbm/Library_Ang.html> (1 July 2011).

27 Drine (2011: 1-2) analyses the likely economic impacts of climate change in North Africa by using different indicators to assess regional vulnerability and by considering “that the biophysical conditions, the socioeconomic conditions as well as the state of technology in the region are the main factors behind the extreme vulnerability of the region to climate change.” He used “a statistical crop model to test the sensitivity of agriculture production to higher temperature and lower rainfalls ... [and discussed] potential impacts of climate change on the economies of the region”.

28 See also a background paper for a World Bank Report by Jens Hesselbjerg Christensen on “Ways Forward for Climatology in the Arab Region”, at: <http://siteresources.worldbank.org/MENAEXT/Resources/Ch2_Climate_outline_web.pdf> (2 July 2011).

the North of Africa. ... The rise in temperature is more marked in winter than in summer and for the minimum rather than the maximum figures.

With regard to future trends, the UNEP, MAP report (2009) claimed:

By the end of the century, the average annual temperature increase is likely to be between 2.2°C and 5.1°C for

- 29 Ibrahim Abdel Gelil: "Towards a science-led climate policy in the Arab region" (Beirut: AFED, June 2010); at: <<http://www.afedonline.org/en/inner.aspx?contentID=525>> (2 July 2011). The recently published *Arab Human Development Report 2009: Challenges to Human Security in the Arab Countries* identifies pressure on environmental resources as one of the main factors for achieving human security in the region. The Arab region is among those least responsible for emissions of GHGs. According to the global *Human Development Report 2007/2008* and the *World Development Indicators 2007*, the region's share of carbon dioxide emissions was 4.7% lower than all other regions except sub-Saharan Africa. However, the region is also among those most in danger of becoming a severe victim of climate change. ... This wide gap between different Arab countries in terms of levels of human development made it difficult to formulate a harmonized Arab climate policy. However, the *Council of Arab Ministers Responsible for the Environment (CAMRE)* of the League of Arab States adopted, in 2007, a political declaration that outlines the main elements of an Arab position in the climate negotiations. ... The current weak capacity of science and technology in the Arab region can be attributed to several main factors. One is an overall lack of interest in science by governments. They devote minimal funds to education and science, compared with those set aside for other issues, such as military expenditure. Another crucial factor is the deteriorating education systems. These factors, along with the inadequate infrastructure and support systems, create an environment that is not conducive to R&D. On a global level, the scientific literature originating in the Arab world does not exceed 1.1% of the world production." Abdel Gelil suggested in 2010 that "Arab scientists ... should strive to make their voices heard. Climate change is an issue that reaches out to all aspects of our lives. Research is badly needed in the areas of agriculture, water resources, marine resources, public health, biotechnology and renewable energy, to name just a few. We need to mobilize the fragmented research assets across the Arab region to implement a regional research strategy to determine, as accurately as possible, the future effects of climate change. It is sad that the science community continues to debate whether the Nile Delta in Egypt will be influenced by sea-level rise ... In the ongoing absence of solid science-based evidence, the public and policy makers will continue to receive mixed messages, leading, at best, to inaction." (emphasis added, hgb).

2080-2099, compared with 1980-1999. The probability of temperatures rising by between 3 and 4°C is estimated at 50 per cent. The expected rise in surface temperature varies from one region to the next - in the Sub-Saharan regions it could well be as much as 4°C in summer. On the other hand, on the Northern shores, the rise is likely to be more marked in winter, at around 3°C. Nonetheless, this overall rise in temperature could well hide some local falls in temperature relating to changes in air mass. ... The greatest rises in temperature ... are likely to be recorded in the Mashreq (Palestinian Territories, Jordan, Lebanon, Syria and Iraq). Higher temperatures should thus produce summers with an increasing number of very hot days.

Based on IPCC (2007a) findings, the AFED Report (Abou Hadid 2009: 64) noted that

by the end of the 21st century, the Arab region will face an increase of 2 to 5.5°C in the surface temperature. This increase will be coupled with a projected decrease in precipitation up to 20%. These changes will lead to shorter winters and dryer summers, hotter summers, more frequent heat wave occurrence, and more variability and extreme weather events occurrence.

37.3.2.2 Projected Global and Regional Rise in Sea Level

The population of the coastal cities of the Mediterranean region has grown from 25 to 70 million between 1950 and 2000, and has been projected to rise to 90 million by 2025. In southern Europe, the coastal population doubled from 20 to 40 million between 1950 and 2000, and will probably stabilize at this level by 2030, while the population of the MENA region is projected to rise from 40 to 50 million between 2000 and 2030. This will most seriously affect the deltas of the major rivers, and in particular the Nile delta (BMU 2002; Brauch 2002: 80-83). The UNEP, MAP report (2009: 17) noted, based on satellite monitoring, "between January 1993 and June 2006 ... an obvious east-west differentiation, with a clear trend towards a sea level rise in the Eastern Mediterranean". The forecasts for average sea-level rise have been disputed in the preparation of the IPCC's AR4, where agreement could only be reached on a forecast average increase during the 21st century of 18-59 cm (figures 37.6, 37.7).

Rahmstorf referred to recent studies of an observed average rise in sea level by 1.6 mm/year between 1961 and 2003 and 2.5 mm/year between 2003

30 See at: <http://www.un.org/esa/sustdev/csd/csdtr4/escwa/RIM_bp2.pdf> (2 July 2011); see also UNESCWA (2010).

Figure 37.4: Regional climate model projections for the Middle East of average temperature changes (°C) for the 2020s, 2040s, and 2070s, relative to the 1990s. **Source:** Tolba and Saab (2009: xxii) based on: Hemming, Betts, and Ryall (2007).

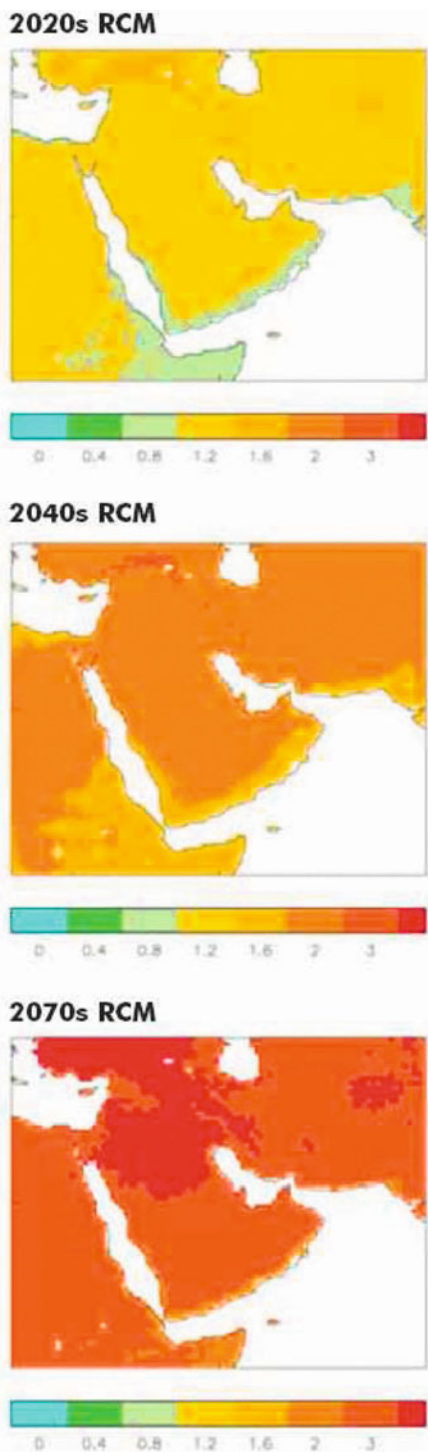


Figure 37.5: Regional climate model projections for the Middle East of precipitation changes (°C) for the 2020s, 2040s, and 2070s, relative to the 1990s. **Source:** Tolba and Saab (2009: xxii) based on: Hemming, Betts, and Ryall (2007).

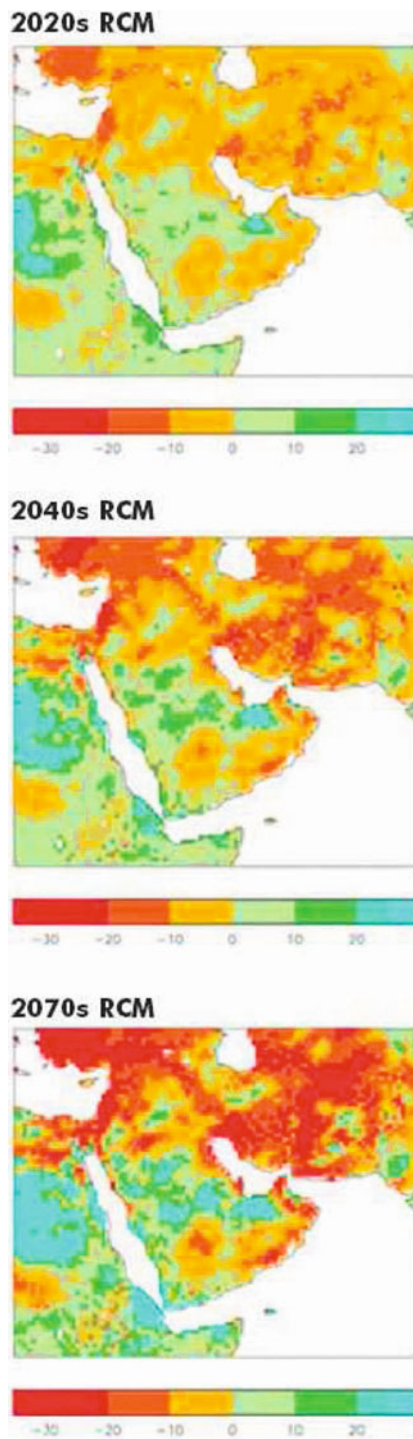


Figure 37.6: Projections of global sea-level rise according to the third (2001) and fourth (2007) assessment reports of the IPCC. **Source:** Designed by Hugo Ahlenius, UNEP/GRID-Arendal; at: <<http://maps.grida.no/go/graphic/projected-sea-level-rise-for-the-21st-century>>.

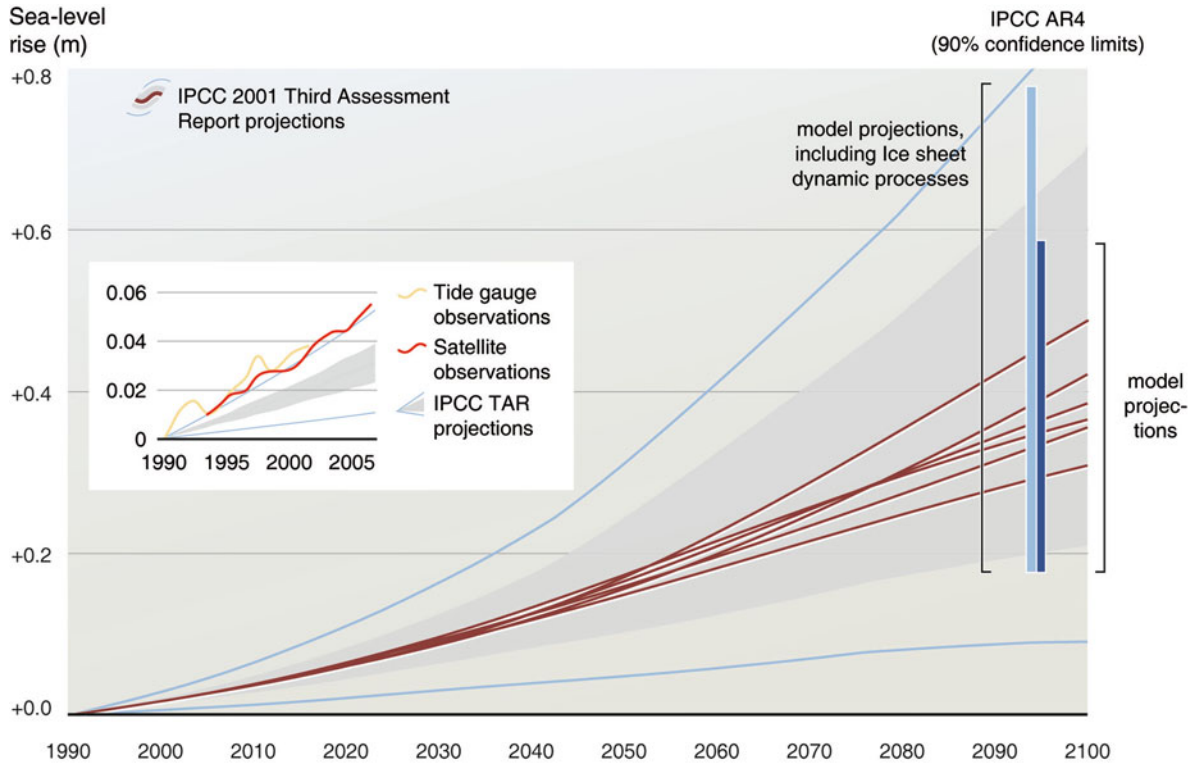
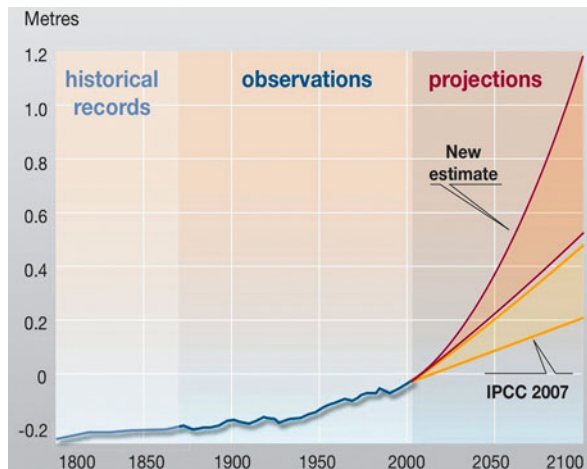


Figure 37.7: Projections of global sea-level rise according to the third (2001) and fourth (2007) assessment reports of the IPCC. **Source:** Designed by Riccardo Pravettoni, UNEP/GRID-Arendal; at: <<http://maps.grida.no/go/graphic/global-sea-level-rise>>.



and 2008.³¹ According to the IPCC chairman Rajendra Pachauri (table 37.2),³² depending on whether the

GHG stabilization level is achieved, and given an increase of the global mean temperature of between 2°C and 4°C, global sea level may rise from thermal expansion between 0.4 and 2.4 metres above pre-industrial levels.

In the Nile delta, according to Sherif and Singh (1999; WBGU 2006: 45), “an increase of 50 cm would imply that the salty water would intrude about 9 km into coastal aquifers”. Without protective countermeasures a sea-level rise of 50 cm would affect about “1.5 million people” in the administrative districts of Alexandria and Port Said (El-Raey 1991; BMU 2002; WBGU 2006: 48).

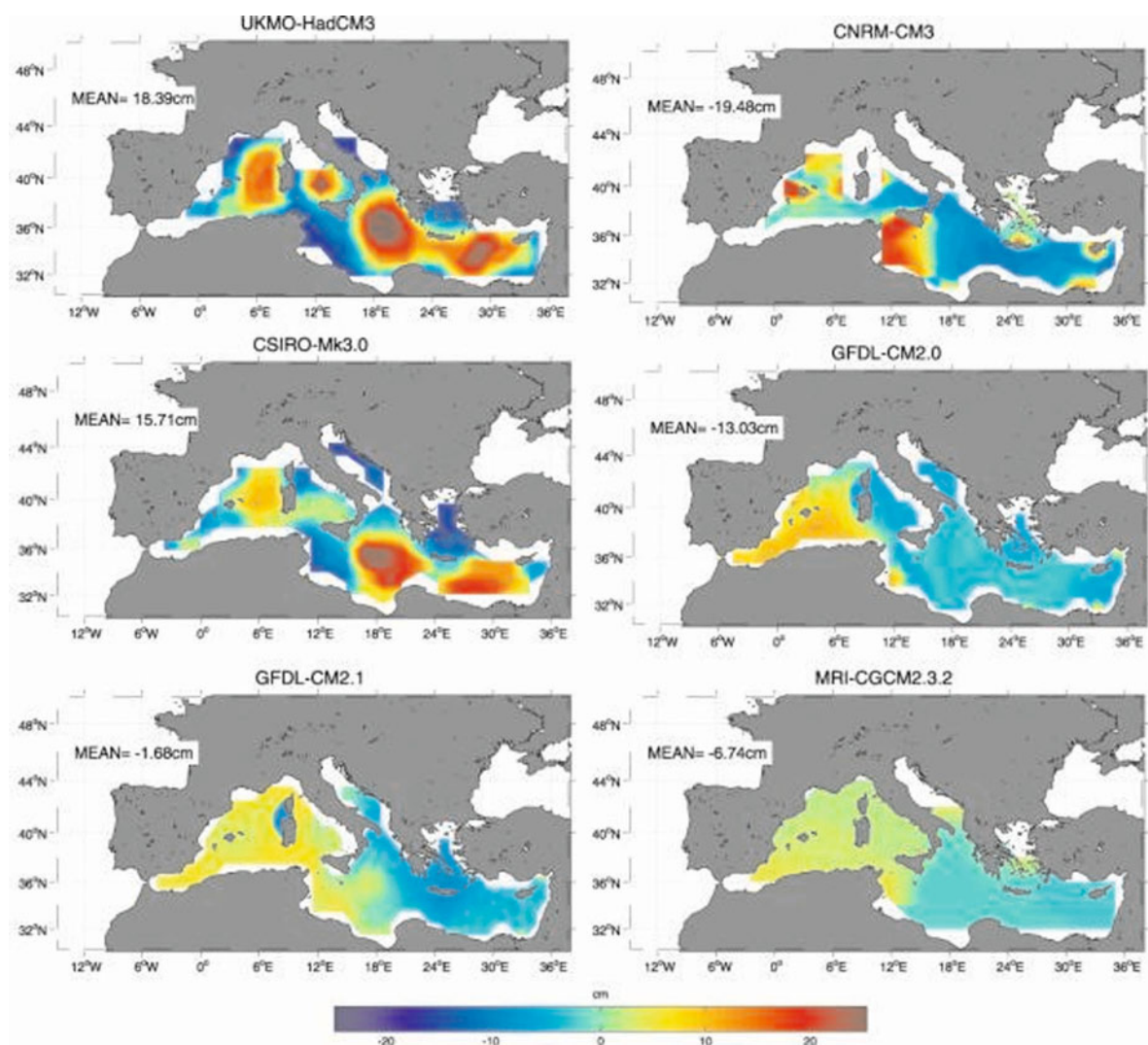
31 Stefan Rahmstorf: “Sea Level Rise”, Copenhagen Scliamte Science Conference, 10-12 March 2009; at: <<http://climatecongress.ku.dk/speakers/stefanrahmstorf-plenaryspeaker-10march2009.pdf>>.

32 R. Pachauri, keynote speech at the conference of German Foreign Ministry in Freiburg, 6-7 November 2008 on “Climate Change as a Security Threat”; at: <<http://www.freiburg-konferenz.de/downloads/R.K.Pachauri.pdf>>.

Table 37.2: Projected Increase in Sea-Level Rise. **Source:** Rajendra K. Pachauri (November 2008).

Stabilization level (ppm CO ₂ -eq)	Global mean temperature increase (°C)	Year CO ₂ needs to peak	Global sea-level rise above pre-industrial levels from thermal expansion (m)
445 – 490	2.0 – 2.4	2000 – 2015	0.4 – 1.4
490 – 535	2.4 – 2.8	2000 – 2020	0.5 – 1.7
535 – 590	2.8 – 3.2	2010 – 2030	0.6 – 1.9
590 – 710	3.2 – 4.0	2020 – 2060	0.6 – 2.4

Figure 37.8: Variations over the 21st century in steric sea levels caused by changes in temperature and salinity for different models of general atmospheric-oceanic circulation against the backdrop of climate change. **Source:** Map: Marta Marcos, SINC (*Servicio de Información y Noticias Científicas*); at: <<http://www.sciencedaily.com/releases/2009/03/090303084057.htm>>.



A Spanish-British research project offered three future scenarios for the effects of climate change on the Mediterranean up to 2100 based on global models from the IPCC, and concluded that ocean tempera-

tures along with sea levels will rise between 3 and 61 cm. But the authors also noted that due to the low spatial resolution of the models understanding of the

impacts of sea-level rise on the coasts is still very limited.³³

However, new models indicate that globally the ocean will rise between 0.9 and 1.3 metres; this is similar to the end of the ice age 11,700 years ago, when sea level rose 11 millimetres per year or about one metre a century.³⁴ In November 2008, Rajendra Pachauri, chairman of the IPCC, foresaw much higher possible increases in sea-level rise during this century, according to different models of the melting of the ice sheets in the Arctic and Antarctic.³⁵

In his chapter for AFED, El-Raey (2009) concluded that “the coastal zones of most of them are highly vulnerable to the potential impacts of sea level rise and the expected increased severity and frequency of extreme events”. El-Raey (2009: 61) noted that no Arab country has established “institutional capabilities for ... adaptation and self protection” and that except for “Tunisia and Morocco, no integrated national strategic action plans have been established for the vulnerable countries”. He proposed “a strategic assessment and risk reduction of climate change impacts ... as a joint effort through the League of Arab States, ... an early warning system of tsunamis for the Mediterranean and the Gulf regions ... [and] ... proactive planning and protection policies and measures should be initiated for vulnerable sectors with particular emphasis on the coastal zone”.

In a study on the projected impacts of sea-level rise for the Nile delta, El Raey (2011: 788) concluded that “the potential impact on water, coastal and agricultural resources is formidable and losses of world cultural heritage cannot be estimated” and his recommendation was “to establish a virtual centre for integrating research activities, carrying out integrated vulnerability assessment, building up a geographic data base of climatic indicators and establishing a regional circulation model”. Furthermore,

an improvement of the resilience of the population should be carried out through upgrading of infrastructure, building capacities for monitoring and assessment and upgrading awareness of decision-makers, civil society and the population at large [and] proactive strategic

plans of development should be identified and enforced for all sectors in view of potential impacts of climate change (El Raey 2011: 788).

According to a project funded by the World Bank, “Alexandria, Casablanca and Tunis face losses of more than \$1 billion each, over the next two decades, as risks of natural disasters intensify with the onset of climate change.” These three city regions, where some 9.5 million people were living in 2010, “could face major risks unless decision-makers employ climate-smart planning. Particularly, as they develop housing and commercial structures in low-lying, vulnerable areas. Climate change, under any scenario intensifies the exposure.”³⁶ According to a Global Arab Network report:

The rapid urbanization also underscores the fact that the region’s coastal cities play an enormously important role—economically, culturally and politically. Disruption and damage from natural disasters would reverberate on a national scale in all the countries. ... The three cities share a number of similar characteristics, but the study shows that each faces a specific set of unique vulnerabilities and risks.

This situation will get worse, with a projected growth of population in Alexandria from 4.1 million (2010) to 6.8 million (2030), in Casablanca from 3.3 million (2010) to 5.1 million (2030), and in Tunis from 2.2 million (2010) to about 3 million by 2030. The study results suggest:

36 See Ammar Shikhani: “Climate change: North African coastal cities face significant risks”, in: *Global Arab Network*, 6 June 2011; at: <<http://www.english.globalarabnetwork.com/2011060611022/Economics/climate-change-north-african-coastal-cities-face-significant-risks.html>>.

The World Bank-led study, ‘Climate Change Adaptation and Natural Disasters Preparedness in the Coastal Cities of North Africa’, was carried out between June 2009 and June 2011 with financial support from the *Global Facility for Disaster Risk Reduction and Recovery* (GFDRR), the *Norwegian Trust Fund Private Sector and Infrastructure* (NTF-PSI), and the *Trust Fund for Environmentally and Socially Sustainable Development* (TFESSD). The Arab Academy for Science, Technology & Maritime Transport in Alexandria and the European Space Agency provided analytical support. The *Marseille Center for Mediterranean Integration* (CMI) has played a key role in the dissemination of the study and the public discussion of its findings and recommendations. The study has been carried out by a consortium of French consulting companies, headed by Egis-BCEOM International and including IAU-RIF and BRGM, in consultation with local partners.

33 Marcos et al.: “Comparison of results of AOGCMs in the Mediterranean Sea during the 21st century”, in: *Journal of Geophysical Research*, 2008; 113 (C12): C12028 DOI: <10.1029/2008JC004820>.

34 Richardson, Steffen, Schellnhuber et al. (2009); at: <<http://climatecongress.ku.dk/pdf/synthesisreport>>.

35 Rajendra Pachauri, presentation in Freiburg; at: <<http://www.freiburg-konferenz.de/downloads/R.K.Pachauri.pdf>>.

for all urban sites ... mitigating the risks requires actions in three overlapping spheres: urban planning, institutional reforms including reinforcing capacity, and strengthening infrastructure. ... Institutions ... will need improved early warning systems, effective communications, and clearer lines of responsibility. Coastal defenses, drainage systems and other urban infrastructures will require upgrading and reinforcement.³⁷

These case studies emphasize the need for proactive action at the city, country, and global level.

37.3.2.3 Projected Changes in Precipitation

According to the *IPCC Synthesis Report* (2007c: 30), from 1900 to 2005 precipitation tended to increase in many large regions “whereas precipitation declined in the Sahel, the Mediterranean, southern Africa and parts of southern Asia”. The IPCC (2007c: 50) said that “in southern Europe, climate change is projected to worsen conditions (high temperatures and drought) in a region already vulnerable to climate variability, and to reduce water availability, hydropower potential, summer tourism and, in general, crop productivity”. Furthermore, changes in precipitation and temperature lead to changes in run-off and water availability that will

decrease by 10 to 30% over some dry regions at mid-latitudes and dry tropics, due to decreases in rainfall and higher rates of evapotranspiration. There is also high confidence that many semi-arid areas (e.g. the Mediterranean Basin, ...) will suffer a decrease in water resources due to climate change. Drought-affected areas are projected to increase in extent, with the potential for adverse impacts on multiple sectors, e.g. agriculture, water supply, energy production and health. Regionally, large increases in irrigation water demand as a result of climate changes are projected (IPCC 2007c: 49).

In addition, climate change will affect “Mediterranean-type ecosystems because of reduction in rainfall; and tropical rainforests where precipitation declines”. The UNEP, MAP (2009: 13) report on the *State of the Environment and Development in the Mediterranean* noted that “rainfall ... has ... diminished in Southern Europe. In the Mediterranean, some regions to the

south have recorded a 20 per cent drop in rainfall. The trend is less even as far as North Africa is concerned.”

According to a precipitation trend analysis by the *Potsdam Institute on Climate Change Impacts* (PIK) for 1975-2004, precipitation fell by between 0 and 20 per cent in southern France and rose by 10 per cent in the mountainous regions of central Italy. But in northern Italy precipitation fell by 20 to 40 per cent, along the Ligurian coast by 20-30 per cent, and in southern Spain by up to 20 per cent.

According to the scenarios of the Acacia project, precipitation in southern Europe will decline by 13-14 per cent in parts of Central Spain and by 10 per cent in the northern part of Greece in summer by 2020. Up to 2050 projected precipitation in summer will fall by 14-20 per cent in Greece, by 13-15 per cent in southern France, and by 21-23 per cent along the Mediterranean coast of Spain. By the year 2080 the decline in summer precipitation in Greece will be 18-27 per cent, in southern France 17-20 per cent, and in Spain 27-42 per cent. The A-2 scenario of the Acacia project foresaw a decline in summer precipitation for Spain amounting to 51-73 per cent and for Greece 41-52 per cent.³⁸ For parts of the Atlas mountain region in North Africa, precipitation may decline by 20-25 per cent in summer by 2020, by 31-49 per cent by 2050, and by 47-75 per cent by 2090. The precipitation trend maps of PIK for 1975-2004 indicated an increase of 0-30 per cent for the Moroccan Atlantic coast and of 10-20 per cent for the north-west of Egypt. However, according to these data, precipitation will have declined along the Moroccan and Algerian coast by 0-30 per cent and in Tunisia and Libya by 20-40 per cent.³⁹ The AFED report 2009 claimed:

Climate change is expected to affect the flow of rivers, which could cause water shortages (in case of decreased rainfall) or flooding (in case of periodic increased rainfall). Water regimes in riparian countries will also affect Arab countries dependent on rivers originating elsewhere, such as Iraq, Syria, Egypt and Sudan (Tolba/Saab 2009).

37 See Shikhani: “Climate change: North African coastal cities ...”, in: *Global Arab Network*, 6 June 2011. The extensive studies in English and French can be accessed at: <http://arabworld.worldbank.org/content/awi/en/home/featured/coastal_cities.html>. The risk assessments and action plans for these three cities and the Boureg region may be downloaded at: <http://arab-world.worldbank.org/content/awi/en/home/research/climate_adaptation.html>.

38 Data are based on a presentation by Martin Parry 2005: “Impacts of Climate Change on Agriculture in Europe”. Informal Meeting of EU Agriculture and Environment Ministers, London, 11 September 2005; at: <<http://www.fco.gov.uk/Files/kfile/Parry.pdf>>.

39 The data by the PIK were made available to the author in summer 2006 as background information for the preparation of an expert study for the WBGU; see Brauch (2006, 2007, 2010).

From a hydrological perspective, El Quosy (2009: 76-78) divided the Arab MENA countries into a) Mashreq countries: Iraq, Syria, Lebanon, Jordan, and Palestine; b) the Maghreb countries: Libya, Tunisia, Algeria, Mauritania, and Morocco; and c) the Nile basin countries: Egypt and Sudan; and he claimed that the “Maghreb countries are the most vulnerable to climate change since they are almost fully dependant on rainfall”, while “the four countries largely dependant on river flows originating outside their boundaries, namely Egypt, Sudan, Iraq and Syria are not only vulnerable to reduced or increased flows caused by climate change, they are also vulnerable to the actions taken by upstream riparian countries which may affect river flows downstream”. According to El Quosy (2009: 79), the Arab region has only very few climatic observation stations, and

there is no local circulation model that has been developed to predict the future situation in the region, predicted to have a greenhouse gas emissions-caused increase in surface temperatures and the consequent effects on spatial and temporal variability of rainfall and runoff. The only model under development at the present time is that prepared by the United Kingdom Meteorological Office for the purpose of predicting Nile flows under different climatic scenarios (Buontempo/Lørup/Sanderson et al. 2011).

Regarding climate change, Lebanon (Assaf 2009, 2009a) is vulnerable to: a) chaotic urbanization; b) air, water, and soil pollution; c) increasing frequency of fires; d) change of water table level due to excessive pumping and quarrying activities; e) overgrazing of rangelands; and f) land fragmentation (El Quosy 2009: 80). In Syria “more than 75 per cent of the cropped area is dependant on rainfall ... Therefore, fluctuation in rainfall affects rain-fed agriculture. Fluctuation of temperature affects crop yields. Increased frequency and duration of droughts affect crop production and food availability”, while in Egypt, “rain-fed agriculture is limited to the north coast and is extended over a distance of 1200 km where modest precipitation of 100-200 mm intensity falls every year. ... If this already limited amount of rain is reduced further, life in these regions will become intolerable.” El Quosy 2009: 80-81) concludes that

almost all Arab countries located on the Mediterranean will be affected by climate change at different levels. Countries which are more dependant on rainfall will certainly be affected most. Other countries ... will be less affected; however, water has to be made available for areas which are going to be indirectly affected due to their dependence on other water sources inside or outside the country. A problem common to all Arab coun-

tries located on the coast of the Mediterranean is the possibility of having coastal aquifers contaminated if the sea level is increased ... because of sea water intrusion. ... Overexploitation of fresh water lenses plus the expected intrusion of sea water in low-elevation areas will certainly affect the use of these aquifers and possibly lead to the pollution of soil as well. If parts of the lands parallel to the sea shore are inundated, then it will not only be groundwater that is going to be affected, the whole landscape will be changed with vast areas of land abandoned and large numbers of citizens displaced.

Based on the IPCC (2007a) findings, the AFED Report stated that

agricultural production in many African countries is projected to be severely compromised by climate variability and change. Yields from rainfed agriculture in Africa could be reduced by up to 50 per cent by 2020, and the projected sea-level rise will affect low-lying coastal areas with large populations, which will require a total cost of adaptation that could amount to at least 5-10% of GDP (Abou Hadid 2009: 68).

However, these general assessments in the AFED Reports and in the emerging Arab climatological literature reflect the difficulties in projecting the impact of both temperature increase and precipitation changes forward to 2100 because of the lack of observation posts and regional circulation models.

According to a study by Abou-Hadid (2006: 6) of climate change impacts on water and food production in North Africa, the

annual rainfall in North Africa is low and it is characterized by the large year to year variability (figure 37.9). Currently, all countries are considered water stressed. At present, the annual per capita share of available water (underground and surface water) is far less than 1000 m³ and is projected to decrease.

During the 20th century, the annual rainfall in North Africa for Egypt, Morocco, and Tunisia has fluctuated greatly, while the available water per person has declined, partly because of population growth and climate change (figure 37.9). In the eastern Mediterranean, the Mashreq or Levant (figure 37.10), the total per capita annual water share of water resources in the early 21st century differed significantly between Israel (1480 m³/yr), Syria (1250 m³/yr), Egypt (980 m³/yr), Lebanon (595 m³/yr), Jordan (250 m³/yr), and Palestine (210 m³/yr), and there again between the West Bank and Gaza. The temperature in the MENA region is projected to grow significantly (figure 37.11) due to climate change during the 21st and 22nd centuries, and water stress will increase due to declining precipitation and the growing demand caused by con-

Figure 37.9: Annual rainfall in Egypt, Morocco, and Tunisia (1901-2000) aggregated at the country level. **Source:** CRU, UEA, cited by Abou-Hadid (2006: 6).

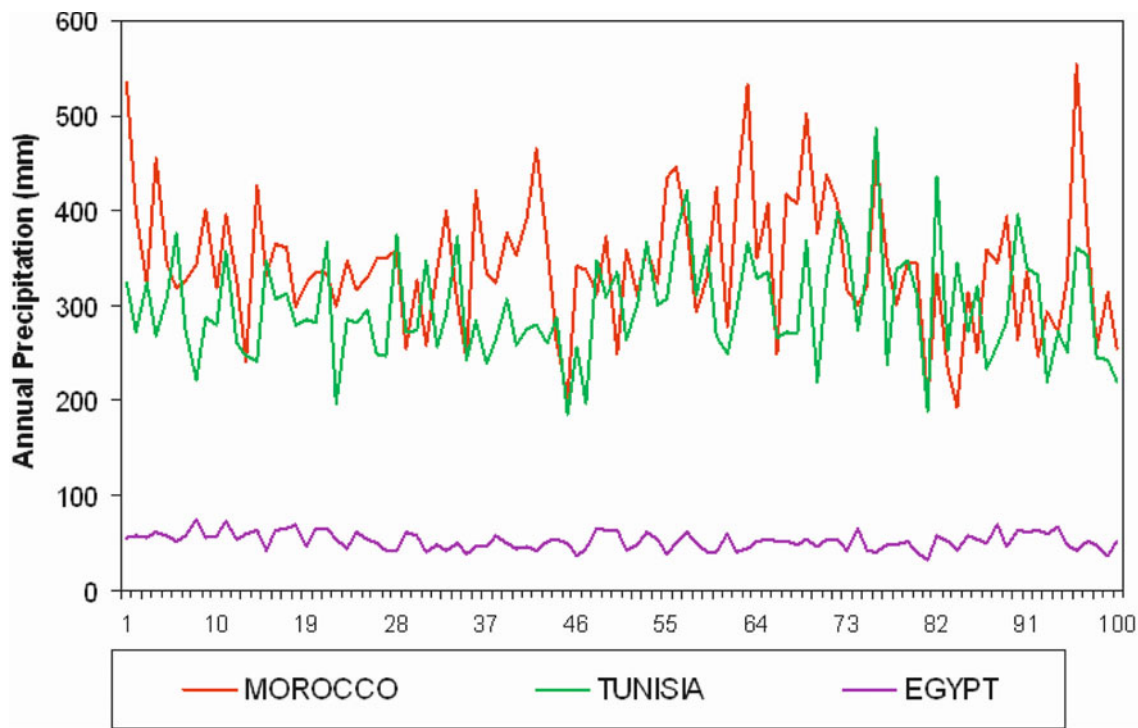
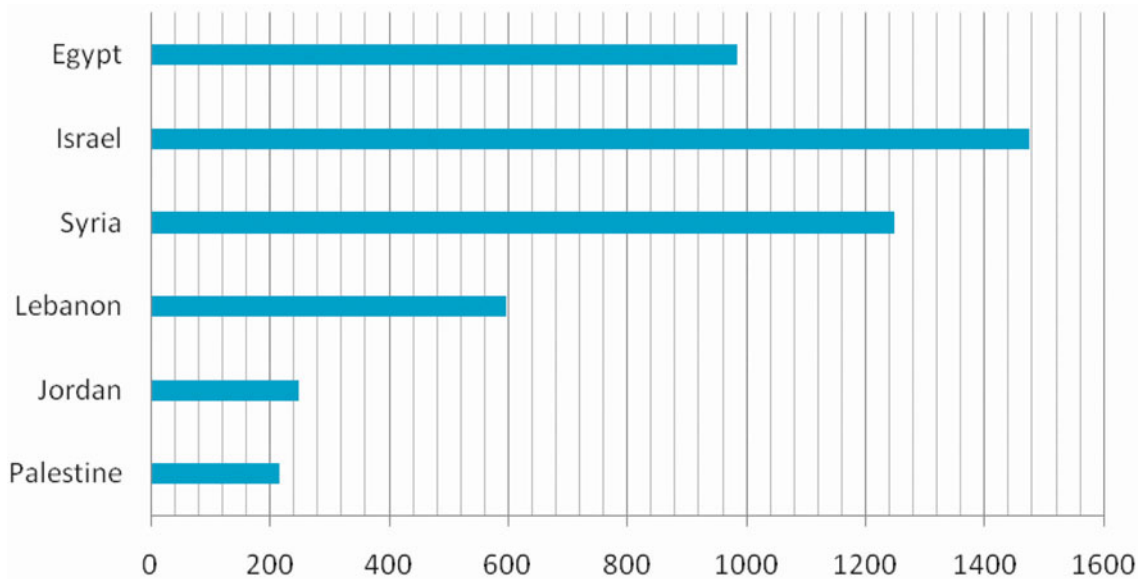


Figure 37.10: Total per capita annual water share of water resources (m³/yr) in Egypt, Israel, Syria, Lebanon, Jordan, and Palestine. **Source:** ESCWA, ESCWA Water Development Report 2 (New York 2007); as cited by: Jubeih, Aljazzar, Piontek et al. (2011: 18).



tinued high population growth (figure 37.12; table 37.4).

This increasing water gap between growing demand and declining supply will be further aggra-

vated by increased evaporation and evapotranspiration and a marked decline in “scarce available renewable water resources such as river runoffs, lake levels

Figure 37.11: Climatic Developments and Predictions for the Middle East for different Global Circulation Models under emission scenario SRESA1B. **Source:** KNMI Climate Explorer, 2010; at: <<http://climexp.knmi.nl/start.cgi?someone@somewhere>> (10 July 2011).

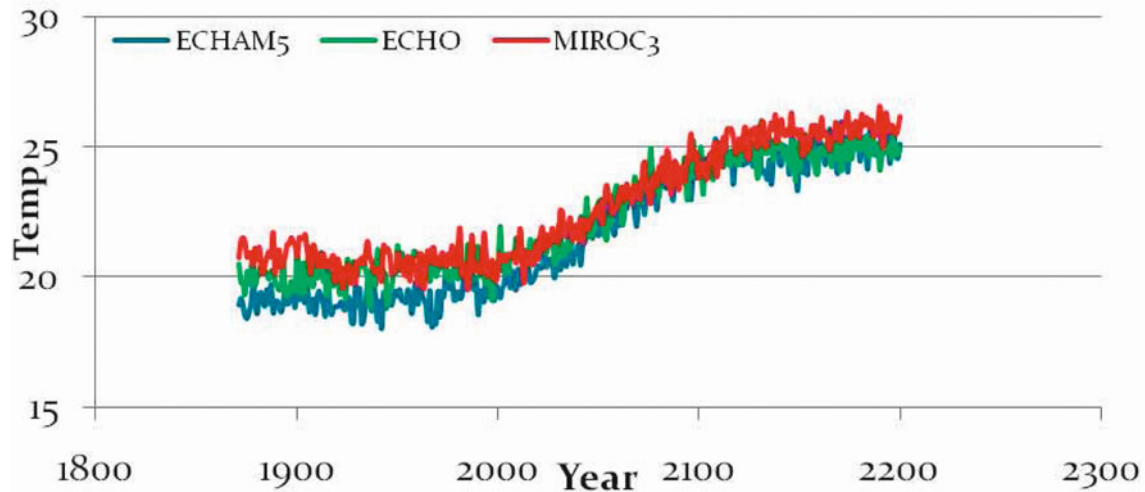
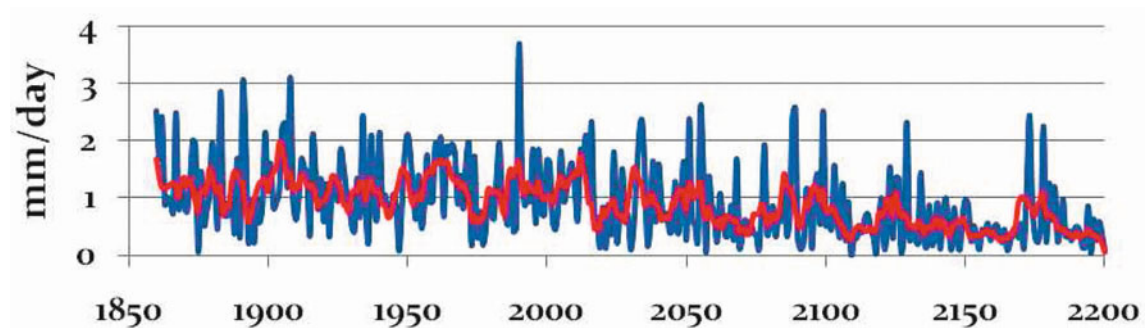


Figure 37.12: Rainfall scenario according to ECHAM5_sresa1b Global Climate Model GCM. **Source:** KNMI Climate Explorer, 2010; at: <<http://climexp.knmi.nl/start.cgi?someone@somewhere>> (10 July 2011).



and ground water levels” (Jubeh/Aljazzar/Piontek et al. 2011: 19).

37.3.2.4 Projected Increase in Climate-Induced Natural Hazards

El Raey (2009: 58-60) stated that the Arab region suffers from various climate-related extreme events, such as droughts, flash floods, dust storms, storm surges, and heatwaves.⁴⁰ He referred to two exceptional floods in Algeria and in Morocco in 2001 and 2002 (Agoumi 2003).

Climate-related disaster in Algeria in November 2001. Extreme rainfall equivalent to an entire month of rain in several hours was recorded, and wind speeds reached 120 kilometres per hour. Most of the damage was concentrated in Algiers where this extreme event claimed

751 victims and caused damage estimated at US\$300 million. There were 24,000 displaced persons and more than 2,700 homes were severely damaged. Between 40,000 and 50,000 persons lost their homes and nearly 109 roads were damaged. Despite being forecast by Algerian and foreign weather services the magnitude of the human and material damage was categorized as one of the most severe in the past 40 years (El Raey 2009: 59).

In November 2002 Morocco experienced its worst flooding with more than

63 dead, 26 missing, and dozens wounded, while 24 houses collapsed and 373 were flooded. Hundreds of hectares of agricultural land were damaged; hundreds of heads of livestock swept away, and industrial plants sustained severe damage. The most important refinery in the kingdom (SAMIR) caught fire, leading to more than US\$300 million in losses (El Raey 2009: 59).

⁴⁰ For detailed documentation for the years 1975-2001 based on CRED data see Brauch (2003, 2003a).

According to the *IPCC Synthesis Report* (2007c: 50), “Climate change is expected to magnify regional dif-

Table 37.3: Climate-related hydro-meteorological hazards in the smaller (Morocco, Algeria, Tunisia, Libya, Egypt) and extended North African region (Mauritania and Sudan), 1995 - June 2011. **Source:** Compiled by the author based on data by EM DAT. The compilations for 1995-2008 rely on Bushby, White, and Smith (2010: 15). The figures for 2009 to June 2011 were added by the author based on EM DAT; at: <<http://www.emdat.be/disaster-list>> (10 July 2011). (f=flood, d=drought, s=storm, hw =heat wave).

Country	Years	No. of hazards	No. of floods	No. of droughts	No. of storms	Max. killed	Max. total affected	Max. home-less
Algeria	1996-2008	32	25	1	3	921 (f)	45,423 (f)	3,000 (f)
Egypt	1996-2008	10	5	0	2	32 (hw)	3,000 (f)	3,000 (f)
	2010-11	3	2		1	58 (f,s)	3,548 (f,s)	?
	Total	13	7		3	80 (hw,f,s)	6,548 (f,s)	?
Libya	1996-2008	1	1	0	0	0	0	0
Morocco	1996-2008	19	15	1	2	739 (f)	3.58 million (d)	46,472 (f)
	2009	2	2			29	9,520	?
	2010-11	2	2			42	77,009 (f)	?
	Total	23	19	1	2	810	3,666,529	?
Tunisia	1996-2008	4	0	4	0	16 (f)	27,000 (f)	0
	2009	1	1			17 (f)	8 (f) (??)	
	Total	5	1	4	0	33	27,008 (f) (??)	
Mauritania	1996-2008	14	11	2	1	25 (f)	1,000,000 (d)	20,000 (f)
	2009	1	1			1 (f)	10,000 (f)	
	2010-11	2	1	1		0	308,750 (d,f)	
	Total	17	13	3	1	26	1,318,750 (d,f)	?
Sudan	1996-2008	25	2	21	1	150 (f)	2,000,000 (d)	200,000 (f)
	2009	2	1	1		20	4,300,000 (d) 111,455 (f)	
	2010-11	2	2			36	138,397	
	Total	29	5	22	1	206	6,549,852	?

ferences in Europe's natural resources and assets. Negative impacts will include increased risk of inland flash floods and more frequent coastal flooding and increased erosion (due to storminess and sea level rise)." By the 2080s, many millions more people than today will experience floods every year due to sea-level rise. The numbers affected will be largest in the densely populated and low-lying mega-deltas of Asia and Africa while small islands are especially vulnerable (*very high confidence*).

The number, intensity and duration of extreme weather events (heatwaves, summer drought, floods in winter) will also increase. Up to 2025 the Blue Plan expects that climate change will lead to an "intensification of extreme weather events". The danger of droughts has increased in this region during the past three decades and it is projected to further rise by

2050 and 2080 (Brauch 2006, 2007; El Raey 2009: 59-60).⁴¹

37.3.3 Impacts of Climate Change on the Human System

On the global level, the first four assessment reports of the IPCC have evaluated the peer-reviewed scientific literature on the multiple impacts of global cli-

41 This author's expert study for the WBGU (Brauch 2006, 2007) refers also in detail to issues of soil erosion, degradation, and desertification (Brauch 2010) as well as of water scarcity and the impact of water scarcity and soil infertility on a decline in agricultural crop yields and a fall in the self-sufficiency of the MENA countries in cereals and consequent impacts on food insecurity in the MENA region.

mate change, most particularly on fresh water resources and their management (IPCC 2007c), on ecosystems, their properties, goods and services, on food, fibre, and forest products, on coastal systems and low-lying areas, on industry, settlement, and society, and on human health. Assessment of the impacts on the Mediterranean is covered from the regional perspective of the continents of North Africa, West Asia, and southern Europe.

At the regional Mediterranean level, various studies by UNEP-MAP, the Blue Plan, and by the *Arab Forum on Environment and Development* (AFED) have often reviewed impacts selectively, rather than following the requirements of IPCC assessments. The report of the Blue Plan regional seminar on climate change in the Mediterranean (2008) addressed impacts on the environment and human health, particularly taking into account the vulnerability of Mediterranean coasts to more drastic sea-level rise, the migration of ecological niches and the movement of invasive species in the Mediterranean, the risks of the spread of infectious diseases, and the health impacts of heat-waves, such as that of August 2003 when between 35,000 and 70,000 people, possibly more, died in central and southern Europe. It also focused on the impact on natural resources, especially on water resources, on natural risks, and on forests, as well as on anthropogenic activities (fisheries, tourism, agriculture, energy needs).

The UNEP, MAP (2009: 17-21) analysis listed among the major climate change impacts “water availability, biodiversity and the economic activities on which they depend” and the implications of these projected changes on fisheries, on risk-prone forests that are also liable to an increase in the number and intensity of forest fires, on tourism, and on human health. But neither recent reports nor the previous extensive studies by the Blue Plan (Grenon/Batiste 1989; Benoit/Comeau 2005) have discussed the implications of climate change for crop yields and food production as well as for the declining self-sufficiency rates in cereals for the MENA region countries (Brauch 2006, 2007; 2010).

A report on the environment and security in the southern Mediterranean region does briefly discuss the “pressures on water, agriculture, desertification”, but it does not meet the systematic requirements of an authoritative IPCC assessment (MEDSEC 2009). Through their effects on the human system, these physical impacts of climate change directly or indirectly present objective security dangers, or else these effects are perceived as subjective security concerns by

the Mediterranean states and by those countries participating in the BP and in the new Union for the Mediterranean.

In the first AFED report (Tolba/Saab 2008), one chapter by Medany (2008) reviews the literature on the “Impact of Climate Change on Arab Countries” due to sea-level rise, on freshwater resources, and on increasing drought. He noted that “only modest efforts and steps are taken in scientific research related to mitigation and adaptation”, and he suggested “improving the scientific capacity in the various fields related to climate change” by

- ensuring political and financial support for the implementation of adaptation strategies,
- applying the bottom-up approach of planning and implementing adaptation and mitigation strategies,
- developing community-based measures by the involvement of stakeholders in adaptation planning, and improving the adaptive capacity of the different sectors of society, and
- increasing public awareness of the impacts of climate change on the environment and human health (Medany 2008: 135).

In the second AFED report (Tolba/Saab 2009), the 12 chapters on the “Impact of Climate Change on Arab Countries” focused on Arab public opinion (Saab 2009), on GHG emissions and mitigation efforts (Abdel Gelil 2009), on a remote sensing study (Ghoneim 2009), on coastal areas (El Raey 2009), on food production (Abou Hadid 2009), on fresh water (El Quosny 2009), on human health (Nuwayhid 2009), on ecosystems and biodiversity (Talhok 2009), on infrastructure (Assaf 2009), on tourism (Khattabi 2009), on international negotiations for a post-Kyoto regime (El-Ashry 2009), and on trade relations (Shahin 2009,) but not on urbanization and energy, nor on the projected regional demographic developments that will severely affect the demand side of climate change.

In the third AFED report (2010), Hamed Assaf (2010) discusses “how climate change may affect water resources in the Arab region and proposes a range of adaptation strategies and measures for consideration by policy-makers” based on the AR4 (IPCC 2007) and its special report on water (IPCC 2008). He claims that

the majority of GCMs project a grim outlook for the northern part of the Arab region in terms of major reduction in precipitation, increase in evaporation, and subsequent reduction in both runoff and soil moisture.

Precipitation is projected to decrease by over 25% which in combination with a 25% increase in evaporation would translate to a drastic 50% drop in runoff by the end of the century. The net effect will be a major reduction in available water resources exacerbating current water scarcity conditions. Some of the reduction in water resources will originate from outside the Arab region in neighbouring countries (Assaf 2010: 26).

Assaf (2010: 26) foresees, based on the scientific literature, that

North African nations will be particularly hit hard by a projected shift in the Westerlies exposing Morocco, Algeria, Libya, and Tunis to the risk of extended droughts and crop failures. The situation will be similar in the Eastern Mediterranean with Lebanon, Jordan, and Palestine reeling from much lower rainfall quantities.

Assaf (2010: 28-29) identified several water-related vulnerabilities to climate change in the Arab region, arguing that

water related vulnerabilities are tied to all aspects of socioeconomic development and environmental wellbeing. Natural water scarcity is a common driver of vulnerability as it restrains urban and industrial development and poses risk to agriculture and food production. Inadequate water services provision is another important determinant driven by several factors including water scarcity, lack of capital, weak accountability, and lack of pricing incentives.

Assaf (2010: 28-29) points to multiple possible negative consequences for security and stability:

Absence of international agreements or cooperation over transboundary water resources poses special risk to regional stability, which could induce armed conflict under extended drought conditions. All these factors can interact in a vicious cycle that could exacerbate adverse conditions leading to political instability, mass migration, malnutrition, and/or community disintegration.

Assaf (2010: 37) argued that “climate change is one of several stressors, along with population growth and land use change, that accentuates water-associated vulnerabilities”. Given the continuing uncertainty in climate change projects, he states that “a vulnerability-based approach provides a more logical framework to select and formulate adaptation strategies based on accumulated knowledge of the strengths and weaknesses of different sectors and systems to given vulnerability determinants”. He further suggested that “by addressing these determinants that include water scarcity, climate variability, demographic factors, land use changes, and deficiencies in water services, it would be possible to enhance the resilience of different sys-

tems to projected climatic change”. In the 21st century high population growth remains a major challenge as it implies a rising demand for water and food, while precipitation and crop yields are forecast to decline.

37.3.3.1 Continued Population Growth

Besides the physical effects of climate change that are foreseen, population growth in the MENA region will be a major factor determining the demand for water, soil, and food during the 21st century. Table 37.4 focuses on the Mediterranean countries from 1850 to 2010 with a projection to 2100. From 1950 to 2010, the population of 11 countries in North Africa and in the eastern Mediterranean grew from 72,512,000 to 280,411,000 (UNPD 2011) and is projected to grow by an additional 111,169,000 million people from 2010 to 2050, reaching about 370,352,000 people by 2100, based on the medium projection of the UN Population Division of May 2011 (table 37.4).

While the population of eight Mediterranean EU countries is projected to increase by 73,205,000 from 1950 to 2050 and by 7,212,000 from 2010 to 2100, for the MENA states an increase of 319,068,000 for the period 1950 to 2050 or of 89,941,000 from 2010 to 2100 has been projected (UNPD 2011). However, the most recent population projection by UNPD (2011) for 2050 to 2100 assumes a decline for all countries in south-eastern Europe and the European Mediterranean countries, except France. In the same time frame, the populations of all the countries of North Africa will decline, and in the eastern Mediterranean only the populations of Israel and of Palestine will continue to grow.

37.3.3.2 Increasing Urbanization

Urbanization trends between 1950 and 2005 in southern Europe and North Africa have differed (table 37.5). While in southern Europe the relative urban population will still grow and the rural population will decline, in North Africa the rural population will stabilize while nearly all projected population growth will be in the cities. This rapid and often chaotic urbanization has resulted in rapidly growing mega-cities where the people are highly vulnerable socially to natural hazards. These trends in population growth (table 37.4) and urbanization (table 37.5) pose different demands for water and food.

Table 37.4: Population growth of eight southern European EU, six south-eastern European, and 11 Mediterranean partner countries (in millions). **Source:** Compiled by the author based on: McEvedy/Jones (1978) for the years 1850 and 1900; for the data for 1950, 1970, 1990, and 2010, and the projections to 2050 and 2100 see: UNPD (2011): *World Population Prospects: The 2010 Revision*; at: <http://esa.un.org/unpd/wpp/unpp/panel_population.htm> (2 July 2011).

	Real population change						Projections med. var.		Changes (in 000)	
	1850	1900	1950	1970	1990	2010	2050	2100	1950-2050	2010-2100
2010 Revision										
Mediterranean Europe (8 of 27 EU countries) in 1 000 persons										
France	36.0	41.0	41 832	50 763	56 708	62 787	72 442	80 288	30 610	17 501
Greece	3.5	4.5	7 566	8 793	10 161	11 359	11 647	11 109	4 081	- 250
Italy	25.0	34.0	46 367	53 325	56 832	60 551	59 158	55 619	12 791	- 4 932
Portugal	3.5	5.5	8 417	8 684	9 925	10 676	9 379	6 754	962	- 3 922
Spain	15.0	18.5	28 070	33 792	38 889	46 077	51 354	45 011	23 284	- 1 066
Cyprus	0.15	0.23	494	614	767	1 104	1 347	1 192	853	88
Malta	0.13	0.19	312	304	368	417	415	394	103	- 23
Slovenia	?	?	1 473	1 670	1 927	2 030	1 994	1 846	521	- 184
Total	83.26	103.92	134 531	157 945	175 577	195 001	207 736	202 313	73 205	+ 7 212
South-eastern European Mediterranean countries (in 1 000 persons)										
[Yugoslavia]	7.25	9.5								
Bosnia and Herzegovina			2 661	3 564	4 308	3 760	2 952	1 877	291	- 1 883
Croatia			3 850	4 169	4 517	4 403	3 859	3 317	9	- 1 086
Montenegro			399	519	609	631	604	499	205	- 132
FYR Macedonia			1 230	1 568	1 909	2 061	1 881	1 391	651	- 670
Serbia			6 732	8 173	9 569	9 856	8 797	6 956	2 065	- 2 900
Albania	0.5	0.8	1 215	2 136	3 289	3 204	2 990	1 863	1 775	- 1 341
Total	7.75	10.3	16 087	20 129	24 201	23 913	21 083	15 903	4 996	- 8 012
Eleven Non-EU-Mediterranean Partners (in 1 000 persons)										
Algeria	3.0	5.0	8 753	13746	25 299	35 468	46 522	39 983	37 769	4 515
Morocco	3.0	5.0	8 953	15310	24 781	31 951	39 200	33 068	30 247	1 117
Tunisia	1.0	1.5	3 530	5127	8 215	10 481	12 649	10 891	9 119	410
Libya	0.6	0.8	1 029	1994	4 334	6 355	8 773	8 073	7 744	1 718
Egypt	5.5	10.0	21 514	35923	56 843	81 121	123 452	123 227	101 938	42 106
North Africa Only	13.1	22.3	43 779	72 100	119 472	165 376	230 596	215 242	186 817	49 866
Jordan	0.25	0.3	449	1 667	3 416	6 187	9 882	9 495	9 433	3 308
Israel			1 258	2 850	4 500	7 418	12 029	15 312	10 771	7 894
Palestine Authority	0.35	0.5	932	1 125	2 081	4 039	9 727	14 868	8 795	10 829
Lebanon	0.35	0.5	1 443	2 464	2 948	4 228	4 678	3 612	3 235	- 616
Syria	1.50	1.75	3 413	6 368	12 324	20 411	33 051	32 623	29 638	12 212
Turkey	10.00	13.0	21 238	35 464	54 130	72 752	91 617	79 200	70 379	6 448
Eastern Med.	12.45	16.05	28 733	49 938	79 399	115 035	160 984	155 110	132 251	40 075
11 Partner countries			72 512	122 038	198 871	280 411	391 580	370 352	319 068	89 941

Table 37.5: Changes in the urbanization rate for North African and the east Mediterranean countries (1950-2050).

Source: For the 2007 Revision (UNPD 2008); at: <<http://esa.un.org/unup>> and for the 2009 Revision (UNPD 2010); at: <http://esa.un.org/unpd/wup/CD-ROM_2009/WUP2009-F02-Proportion_Urban.xls>.

	1950	1960	1970	1980	1990	2005	2010	2020	2030	2040	2050
Algeria	22.2	30.5	39.5	43.5	52.5	63.3	66.5	71.9	76.2	80.1	83.5
Morocco	26.2	29.4	34.5	41.2	48.4	55.0	56.7	61.0	65.9	70.9	75.4
Tunisia	32.3	37.5	43.5	50.6	57.9	65.3	67.3	71.2	75.2	78.8	82.0
Libya	19.5	27.3	49.7	70.1	75.7	77.0	77.9	80.3	82.9	85.2	87.2
Egypt	31.9	37.9	42.2	43.9	43.5	42.6	42.8	45.0	49.9	56.3	62.4
North Africa	24.8	30.4	36.3	40.3	44.7	50.2	52.0	56.2	61.3	66.8	72.0
Turkey	24.8	31.5	38.2	43.8	59.2	67.3	69.6	74.0	77.7	81.1	84.0
Syria	30.6	36.8	43.3	46.7	48.9	53.2	55.9	59.0	64.0	69.2	73.9
Lebanon	32.0	42.3	59.5	73.7	83.1	86.6	87.2	88.6	90.00	91.3	92.4
Jordan	37.0	50.9	56.0	59.9	72.2	78.3	78.5	79.6	82.0	84.3	86.4
Israel	71.0	76.8	84.2	88.6	90.4	91.6	91.7	92.2	93.0	93.9	94.6
Palestine	37.7	44.0	54.3	62.4	67.9	71.6	72.1	74.1	77.2	80.3	83.0
West Asia	28.6	36.0	44.6	51.9	61.0	65.0	66.3	69.1	72.5	76.0	79.2
Southern Europe	45.2	50.4	57.6	62.2	63.8	66.4	67.5	70.5	74.3	77.9	81.2
Total urban population (millions) 1950-2050											
North Africa^{a)}	13.232	20.441	31.208	44.858	64.305	95.189	107.312	134.654	164.519	195.119	223.281
West Asia^{b)}	14.646	24.171	39.221	60.518	93.858	137.940	153.870	188.995	225.909	261.882	294.884
Southern Europe^{c)}	49.252	59.547	73.279	85.703	90.817	99.759	103.170	108.430	113.089	116.833	118.815

According to the UN the following countries belong to the UN regions of North Africa, West Asia, and Southern Europe:

- North Africa includes these countries: Algeria, Egypt, Libya, Morocco, Sudan, Tunisia, and Western Sahara;
- West Asia includes these countries: Armenia, Azerbaijan, Bahrain, Cyprus, Georgia, Iraq, Israel, Jordan, Kuwait, Lebanon, Occupied Palestinian Territories, Oman, Qatar, Saudi Arabia, Syrian Arab Republic, Turkey, United Arab Emirates, and Yemen;
- Southern Europe includes these countries: Albania, Andorra, Bosnia and Herzegovina, Croatia, Gibraltar, Greece, Holy See, Italy, Malta, Montenegro, Portugal, San Marino, Serbia, Slovenia, Spain, and The Former Yugoslav Republic of Macedonia.

37.3.4 Societal Effects

The interactions between the earth and human systems have resulted in environmental scarcity of agricultural land (fertile soils), water, and food. In drylands, the scarcity of land and water has often led to overgrazing and overuse of marginal land. Both have brought about environmental stress, and this has further accelerated the processes of desertification. The linkages between conflicts and environmental scarcity,

degradation, and stress were analysed in the 1990s by two research groups (Homer-Dixon 1991, 1994, 1999; Homer-Dixon/Delingiannis 2009; Bächler/Spillmann 1996, 1996a; Bächler 1999; Mason/Hagmann/Bichsel/Arsano 2009). These environmental security studies applied the concepts of environmental scarcity, degradation, and stress to land degradation and drought, but they did not systematically consider climate change. The approaches of both groups influenced the policy debate, e.g. on the environmental di-

mension of US national security during the Clinton administration (Matthew/McDonald 2009).

On the global level, WG II of the IPCC (2007a) assessed the peer-reviewed literature on the impact of climate change on freshwater resources and their management (chap. 3: 173-210), on ecosystems, their properties, goods, and services (chap. 4: 211-272), on food, fibre, and forest products (chap. 5: 273-314), on coastal systems and low-lying areas (chap. 6: 315-356), on industry, settlement, and society (chap. 7: 357-390), and on human health (chap. 8: 391-432). For the Arab countries, the AFED 2009 Report reviewed the impact on coastal areas (El Raey 2009), on food production (Abou Hadid 2009), on fresh water (ElQuosy 2009), on human health (Nuwayhid 2009), and on ecosystems and biodiversity (Talhok 2009).

After a decade of research, a consensus emerged that environmental stress is rarely considered to be the sole factor in precipitating conflict within and between nations. A major effect of several types of environmental stress is economic decline, and this will affect the poor more than rich groups and countries. Environmental stress and rapid population growth contribute to soil insecurity, internal displacement, socially precarious slum formation, and often larger-scale migration, sometimes in life-threatening conditions. A second pathway from environmental stress to conflict is through forced migration caused by floods, droughts, loss of natural soil fertility, locusts, or famine linked to deteriorated land. Additional related push factors are water and air pollution and deforestation through lack of wood for fuel. All these phenomena trigger urban and rural violence. Direct internal conflicts have occurred due to environmental stress, e.g. in the Sudano-Sahelian region where many nomads have clashed with peasants (see in this volume chap. 24 by Njiru; chap. 25 by Ubhenin, chap. 26 by Mukwaya/Sengendo Lwasa, and chap. 27 by Rowhani/Degomme/Guha-Sapir/ Lambin).

Human-induced environmental stress has a direct impact on the components of the earth and human systems and reinforces the anthropogenic drivers of GEC. With the continuing 'securitization' of climate change, water, and soil, a new policy-focused scientific discourse has emerged that addresses the security implications of climate change from the vantage point of international, national, and human security.

The major human-induced challenge both for the governability of the states and the survivability of the MENA countries will remain projected population growth (table 37.4), urbanization (table 37.5), and the emergence of urban conglomerations for this region

(UNPD 2001a, 2002, 2008; Zlotnik 2011; Brauch 2011: 500).

In North Africa agricultural land is limited by the Sahara: in Egypt to 2.6 per cent, in Libya to 1.2 per cent, in Tunisia to 10.0 per cent, in Algeria to 3 per cent, and in Morocco to 20 per cent. Morocco has about 8.4 million ha of agricultural land, Algeria more than 7.5 million ha, and Tunisia more than 4.6 million ha. The overuse of the land as a consequence of the intensification of agricultural methods has eroded the soils. Salinization and water erosion are partly a result of deforestation and of the change in the use of fertile land (Chourou 2011; Galil 2011).

While the North may adapt more easily to declining precipitation with a slightly growing population, for the countries on the southern and eastern shore declining precipitation will require major efforts that will affect the water available for irrigation and food production (Hayek 2009; Hayek/Al Hmoud 2011; Haddad 2011; Salem 2011; Issar 2011). Self-sufficiency in cereals will drop in MENA countries and the need for food imports or 'virtual water' will rise. In reaction to a region-wide economic crisis in the mid-1980s, Algeria, Morocco, and Tunisia launched agricultural reforms to reduce their food imports and the food subsidies that contributed to increases in foreign debt.

However, with the increasing global and regional demand in the MENA countries for rising food imports, food prices may rise further, as will the financial resources needed to pay for these imports. While the Maghreb region and the Levant have supported their population for millennia, their environment has been transformed by human activities, especially by deforestation, land clearance, and overgrazing. Rapid population growth in the 20th century placed the environment under serious stress. In Morocco, cropland increased from 4.4 to 5.4 million ha between 1987 and 1991, primarily by extending it to marginal rangeland (200 mm rain). This contributed to overgrazing on poorer land, and increased the potential for soil erosion. The same development can also be observed in Algeria. Swearingen (1996: 89) concluded that the "agricultural policies implemented during the 1980s have substantially increased the risk of drought in North Africa". The major reason is the struggle for self-sufficiency in food. It is difficult to imagine any agricultural technology capable of sustaining such a large population, given the region's limited and deteriorating resource base.

The solution to the Maghreb's shortfall in food production ultimately lies in population control (World Bank 1988). In the 21st century, many southern

and eastern Mediterranean countries will be affected by two mutually reinforcing trends: continued high population growth, taking place in an area that cannot produce enough food (Galil 2011). The projected *global* climate change will make the *regional* challenges of population growth, urbanization, pollution, desertification, and water and food scarcity more severe. All MENA countries must spend more on importing cereals and on making potable water available to their people, to tourists, and for irrigation. All countries but Morocco have gained assets to pay for these imports through oil exports. However, this source of foreign income is limited.

37.3.5 Impacts

During the 20th century, and especially from 1975 to 2000, hydro-meteorological natural hazards, such as droughts, floods, and windstorms (Brauch 2003, 2003a), as well as forest fires (Goldammer 2003), have increased in number and intensity. The projected increase in the number and intensity of natural hazards (IPCC 2001, 2007) due to anthropogenic climate change often coincides with an increase in environmental stress caused by the scarcity and degradation of water and soil resulting from rapid population growth and the overuse of these environmental resources. The difference in social vulnerability between southern Europe and the MENA region means that the number of people killed and affected has been much higher in North Africa and in the eastern Mediterranean (Guha-Sapir/Vos 2011).⁴²

In the Mediterranean and MENA region, geophysical natural hazards have killed the highest number of people during the 26 years from 1975 to 2001 (table 37.7). But from 1987 to 2006, of the 10 most deadly extreme temperature disasters – both heatwaves and cold spells – three heatwaves and one cold wave occurred in Europe, causing an estimated 72,210 deaths in 2003, 3,392 deaths in western Europe in 2006, and about 1,000 deaths in Greece in 1987, while a cold wave in 2005 killed 1,330 people in Europe (table 37.6). Thus, the heatwave of 2003 was one of the most deadly natural disasters, causing between 35,000 (Bhattacharya, 2003; MunichRe 2004; Stern 2006; Scheffran 2008) and 72,210 deaths (Guha-Sapir 2007). Compared with other world regions, the Mediterranean or the sub-regions of southern Europe, North Africa and West Asia have not been the most vulnera-

Table 37.6: Heatwave mortality in Europe in 2003. Source: Guha-Sapir (2007: 2). Reproduced with permission.

Country	Number died
Italy	20,089
France	19,490
Spain	15,090
Germany	9,355
Portugal	2,696
Belgium	1,175
Switzerland	1,039
Netherlands	965
Croatia	788
Czech Rep.	418
Austria	345
United Kingdom	301
Slovenia	289
Luxembourg	170

ble to hydro-meteorological hazards during the three decades from 1974 to 2003, but droughts and floods have been relatively significant (figure 37.9). This region has been considered by the WBGU (2007, 2008) and by the European Commission and Council (EU 2008) as one of the major environmental hotspots.

37.3.6 Projected Societal Outcomes and Conflict Constellations

Both the natural climate variability and anthropogenic climate change have had severe societal outcomes in the Mediterranean region, resulting in the collapse of civilizations and in massive migrations in the three continents that share the Mediterranean Sea during the Holocene since the end of the glacial period some 12,000 years ago. Blümel (2009: 103-104) distinguished between ‘climatic optima’ with mostly favourable conditions for human societies and ‘climatic pessimism’ with cooler periods and often precarious living conditions.

The Roman optimum coincided with the Roman Empire while during the following ‘pessimism’ the Roman Empire collapsed and a massive migration of peoples occurred, not only from central Asia to Europe but also from northern Europe to the Mediterranean and even to North Africa. Whether climatic factors were the trigger for this major ‘Völkerwanderung’ when the Roman Empire collapsed⁴³, and during the

42 See above the references under the discussion of extreme events triggered by climate change.

Little Ice Age (Fagan 2002) when the Moghuls moved from Central Asia to Europe, the Levant, India, and even Japan, is disputed in climate and human history (Brown 2001; Issar/Zohar 2004, 2007, 2009).

While the collapse of great civilizations and major movements of people was partly caused by the natural fluctuations of the climate system during the Holocene era of Earth's history, these extreme societal outcomes cannot be projected into the new era of the Anthropocene, where human-induced or anthropogenic climate change may cause, trigger, or intensify (as a force multiplier) extreme societal outcomes such as major migration movements as well as different types of conflicts within and between countries. While structural factors (e.g. demographic trends) can be projected and anthropogenic climate change can be modelled, specific events (conflicts) cannot be predicted, as specific decisions by policymakers and society cannot be foreseen or predicted.⁴⁴

The German Advisory Council on Global Change (WBGU 2008) therefore argued in its report on "Climate Change as a Security Risk" that "climate change will overstretch many societies' adaptive capacities" and that this "could result in destabilization and violence, jeopardizing national and international security". But "climate change could also unite the international community, provided that it recognizes climate change as a threat to humankind and soon sets the course for the avoidance of dangerous anthropogenic climate change by adopting a dynamic and globally coordinated climate policy". If states fail to act early and proactively climate change may trigger "numerous conflicts between and within countries over the distribution of resources, especially water and land, over the management of migration, or over compensation payments between the countries mainly responsible for climate change and those countries most affected by its destructive effects". The report argued that "climate changes amplifies mechanisms which lead to insecurity and violence" affecting specifically countries in transition, those with weak governance structures, and poor countries affected by resource scarcity (land, water, food) and often with high population growth. These local or national conflicts may spill over and

destabilize neighbouring countries "through refugee flows, arms trafficking or combatant withdrawal". The social impacts of climate change can thus transcend borders and expand "the geographical extent of crisis and conflict regions".⁴⁵

To address the possible linkages between climate change and conflict, the WBGU identified "four conflict constellations in which critical developments can be anticipated as a result of climate change and which may occur with similar characteristics in different regions of the world". These 'conflict constellations' were "defined as typical causal linkages at the interface of environment and society, whose dynamic can lead to social destabilization and, in the end, to violence". All four are relevant to the Mediterranean and the MENA region, which the WBGU referred to as one of the major 'environmental hotspots', while a special issue of *Regional Environmental Change* (2011) addressed "Climate hotspots: key vulnerable regions, climate change and limits to warming" (Hare/Cramer/Schaeffer/Battaglini/Jaeger 2011).

37.3.6.1 Conflict Constellation 1: Climate-Induced Degradation of Water

The MENA region is already one of the regions with high water scarcity and severe drought. Due to the projected population growth and the decline in precipitation in the region, access to safe drinking water and to green water for agriculture will worsen further. "This dynamic", the WBGU (2008) argues "triggers distributional conflicts and poses major challenges to water management systems in the countries concerned". Both in the MENA region and in the Nile basin "the countries which will suffer the greatest water stress are generally those which already lack the political and institutional framework necessary for the adaptation of water and crisis management systems. This could overstretch existing conflict resolution mechanisms, ultimately leading to destabilization and violence."

37.3.6.2 Conflict Constellation 2: Climate-Induced Decline in Food Production

In the MENA region, the self-sufficiency rate in food and especially in cereals has been declining rapidly

43 Brown (2001: 84-89, 265-309) discussed the structural explanations for the collapse of the Roman Empire and the role that climatic factors may have contributed to the movement of peoples.

44 Lee (2009) did not distinguish between cases from the Holocene and from the Anthropocene. See the review by Brauch (2011a).

45 WBGU press release: "Report 'Climate Change as a Security Risk' - Climate change threatens international stability and security", Berlin, 6 June 2007; at: <http://www.wbgu.de/wbgu_jg2007_presse_engl.html>. The full report is available for download at: <http://www.wbgu.de/wbgu_jg2007_engl.pdf>.

Table 37.7: People reported killed by hydro-meteorological natural disasters by country, 1975 to 2001 (in 1,000s).**Source:** EMDAT^{a)} compiled by Brauch (2003a). **Legend:** Ev=events; Kill. =killed.

	Total			Drought/famine			Earthquakes			Floods			Windstorms		
	Ev.	Kill.	Affected	Ev.	Kill.	Affected	Ev.	Kill.	Affected	Ev.	Kill.	Affected	Ev.	Kill.	Affected
South Europe (EU)	249	8,888	12,622,055	8	0	6,000,000	33	6,007	1,765,710	71	837	1,238,417	60	469	3,566,519
France	86	524	3,890,759	1	-	-	0	0	0	30	143	372,125	34	239	3,504,918
Greece	43	1,573	944,035	1	-	-	17	335	930,925	8	78	10,150	2	48	-
Italy	57	6,158	921,154	0	-	-	15	5,672	834,765	16	319	67,622	9	67	1,119
Portugal	16	132	46,120	2	-	-	0	0	0	4	99	47,220	2	4	70
Spain	47	501	6,819,987	4	0	6,000,000	1	0	20	13	198	741,300	13	111	60,412
EU Candidates	9	59	4,451	2	0	0	2	2	3,815	0	0	0	0	0	0
Cyprus	8	59	3,751	2	-	-	1	2	3,115	-	-	-	-	-	-
Malta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Slovenia ^{a)}	1	-	700	-	-	-	1	-	700	-	-	-	-	-	-
Balkans	50	562	3,779,928	3	0	3,210,500	11	187	414,405	12	108	145,208	2	0	1,090
Albania	12	187	3,259,756	1	-	3,200,000	4	36	6,045	-	4	46,500	0	0	0
Bosnia Herzeg. ^{b)}	4	6	1,893	1	-	-	-	-	-	-	-	-	1	-	1,090
Croatia ^{b)}	6	41	3,400	-	-	-	1	-	2,000	2	-	1,200	-	-	-
FYR Maced. ^{b)}	4	15	11,500	1	-	10,500	-	-	-	1	-	1,500	-	-	-
Serbia/Mont. ^{b)}	9	15	83,959	-	-	-	-	-	-	5	12	83,008	-	-	-
Yugoslavia ^{c)}	15	98	419,420	-	-	-	6	151	406,360	4	92	13,000	1	-	-
Eastern Mediter.	95	27,613	3,700,060	5	0	988,000	23	26,087	2,377,128	24	505	112,858	8	70	104,688
Israel	11	31	2,029	1	-	-	-	-	-	2	11	1,000	1	3	410
Jordan	11	47	348,956	2	-	330,000	-	-	-	2	17	18,029	3	11	200
Lebanon	4	45	105,575	-	-	-	-	-	-	1	-	1,500	1	25	104,075
Palestinian Auth.	1	-	943	-	-	-	-	-	-	-	-	-	-	-	-
Syria	5	115	662,165	2	-	658,000	-	-	-	2	27	172	-	-	-
Turkey	63	27,375	2,580,392	-	-	-	23	26,087	2,377,128	17	450	92,157	3	31	3
North Africa	82	6,606	2,038,320	10	0	306,400	10	3,452	1,036,210	38	2,924	656,640	6	69	25,188
Algeria	36	4,124	1,154,355	3	-	-	8	2,881	1,001,212	17	1,201	141,765	2	4	10,117
Egypt	14	1,386	280,342	-	-	-	2	571	34,998	5	673	229,868	3	51	15,071
Libya	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-
Morocco	23	919	442,973	5	-	275,000	-	-	-	11	873	155,757	1	14	-
Tunisia	8	177	160,650	2	-	31,400	-	-	-	4	177	129,250	-	-	-
Total	485	43,728	22,144,814	28	0	10,504,900	79	35,735	5,597,268	145	4374	2,153,123	76	608	3,697,485

a) EM-DAT includes events where at least one of these criteria apply: a) 10 or more people reported killed, b) 100 people reported affected, c) a call for international assistance, or d) a declaration of a state of emergency.

b) since independence in 1991, 1992; c) for Yugoslavia (1974-1991).

since the 1960s, and the United Nations *Food and Agriculture Organisation* (FAO) projects it will continue to drop rapidly until 2030 and 2050 (Bruinsma 2003). Climate change and bioenergy development will affect food security in its “four dimensions - availability, accessibility, stability and utilization”. Globally, with

global warming of 2-4 °C, a drop in agricultural productivity is anticipated worldwide. This trend will be substantially reinforced by desertification, soil salinization or water scarcity. In ... North Africa ..., the areas suitable for agriculture are already largely exploited. This may well trigger regional food crises and further undermine the economic performance of weak and unstable states, thereby encouraging or exacerbating destabilization, the collapse of social systems, and violent conflicts.

This situation will become even more dramatic in the 10 countries in the Nile basin that are already severely affected by a vicious circle of repeated droughts, hunger, and famine and that connect the militarily strong downstream country Egypt with the less powerful upstream countries that are already seriously affected (Brauch 2002, 2006/2007). Abou Hadid (2009) reviewed the literature on the available evidence on the multiple impacts of climate change on crop yields and food production in the Arab world.⁴⁶ Abou Hadid (2009: 68) argued that by 2050,

climate change could increase water needs by up to 16% for summer crops but decrease them by up to 2%

for winter crops (Eid/El-Mowelhi 1998). On the other hand, there are additional negative impacts of increased climate variability on plant production due to climate change. ... Furthermore, CO₂-temperature interactions are recognized as a key factor in determining plant damage from pests in future decades, though few quantitative analyses exist to date; CO₂-precipitation interactions will likewise be important (Zvereva/Kozlov 2006). For instance, the impact of climate change on pests and diseases was studied for some important diseases at the national level, such as pear early blight, potato late blight (Fahim/Aly/Mednay et al. 2007), and wheat rust diseases (Abo Elmaaty/Medany/El Hefnawy 2007). Importantly, increased climate extremes may promote plant disease and pest outbreaks (Gan 2004).

Abou Hadid (2009: 68-72) also reviewed the scientific evidence on the impact of climate change on livestock and grazing, on fishing and aquaculture, and on forest productivity, as well as the debate on adaptation of agriculture in the Arab world. With the projected in-

46 See e.g. based on: Eid and El-Marsafawy (2002); Eid, El-Marsafawy, Salib et al. (1997a); Eid, El-Marsafawy, Aineret et al. (1997b); Hassanein and Medany (2007, 2009).

crease in the population of Egypt by 42 million between 2010 and 2100, a reduction of the maize yield by 20 per cent and the wheat yield by 26 to 38 per cent by 2100, food insecurity is projected to grow, and with rapidly growing food prices a political impact can be assumed as with the Arab spring of 2011 (HRH Prince El Hassan bin Talal 2011a).

37.3.6.3 Conflict Constellation 3: Climate-Induced Increase in Drought and Flood

This third conflict constellation has also severely affected the Mediterranean region, confronted with drought throughout history. When precipitation arrives in autumn, it often comes in intensive flash floods that cause a high number of casualties, affect many people, and cause great economic damage in many MENA countries because of their higher degree of social vulnerability (Brauch 2003, 2003a). Both at the global and regional Mediterranean levels, an increase in the number and intensity of natural hazards has been forecast, and this may affect many cities and industrial regions in coastal zones.⁴⁷ However, in the Mediterranean these extreme weather events may be less likely to become a direct trigger of violent conflicts. Increasing food prices since 2008 may have been a major reason for the public protests in the Arab world that contributed to the toppling of the leadership in Tunisia and in Egypt and to the unrest in many other countries.⁴⁸ Johnstone and Mazo (2011: 11) argued that climate change has been a ‘threat multiplier’ and that it “played a necessary role, even if it

47 See the results of the World Bank sponsored studies (2009-2011) on Alexandria, Tunis and Casablanca cited in footnote 36 above.

48 See: IISS: “The Return of High Food Prices” (London: IISS, 3 March 2011); at: http://www.realclearworld.com/articles/2011/03/03/the_return_of_high_food_prices_99421.html: “In January, the...FAO had warned that its food price index had risen past some of the highs that sparked riots in 2008. By the time of its February announcement, there had been a further 3.4% increase, and - although their main focus was on demanding President Hosni Mubarak’s departure - protesters were on the streets of the world’s top wheat importer, Egypt. There are many reasons to link the Arab uprisings to food-price inflation. With little arable land and scarce water supplies, the Middle East and North Africa (MENA) region imports more food per capita than any other, accounting for 25-50% of national consumption. By tonnage it is the world’s largest cereal-importing area, and it is a major customer for Russian grain. Huge population growth and changing diets have contributed to the region’s growing food insecurity.”

was obviously an insufficient trigger on its own” and they concluded that “global warming may not have caused the Arab Spring, but it may have made it come earlier” (Johnstone/Mazo 2011: 16), an assessment that was challenged by Tertrais (2011: 20).

37.3.6.4 Conflict Constellation 4: Climate-Induced Increase in Migration

Migration from the MENA region to the European Union has already become a major issue of domestic or internal security and of the intergovernmental policy coordination on justice and home affairs. In some cases, massive environmentally-induced migration has increased

the likelihood of conflict in transit and target regions. It can be assumed that the number of environmental migrants will substantially rise in future due to the impacts of climate change. ... The increase in drought, soil degradation and growing water scarcity in combination with high population growth, unstable institutions, poverty or a high level of dependency on agriculture means that there is a particularly significant risk of environmental migration occurring and increasing in scale (WBGU 2007, 2008).

Transboundary environmental migration is predominantly south-south migration, but Europe will face increased migratory pressure from Africa and West and South Asia, regions that are most at risk from climate change. Globally, regionally, and in the host countries, there are no reliable international statistics on environmentally- and climate-induced migration, as environmental factors do not entitle a migrant to gain refugee status. Interviews with migrants from source and host countries are too few to permit generalizations. Elsewhere, this author has distinguished between five migration scenarios in the framework of human security (with the migrant as a referent object) and five on the environmental dimension of national security (Brauch 2008a, 2009b).

Besides migration, the physical and societal effects of climate change may pose many other security problems for the Mediterranean region; these may be analysed from the perspective of international and Mediterranean security in the framework of the UfM, and of the national security of riparian Mediterranean countries – source, transition, and host countries, as well as for the human beings affected (human security). Last but not least, the above physical effects and their impacts on human systems also produce various environmental security impacts on the region, the states, and the peoples (Brauch 2006, 2007, 2010, 2011; Brauch/Oswald Spring 2009, 2011).

Which policy response did international policy-makers, e.g. the UN Secretary-General (2009) and the European Commission and Council, as well as individual governments, suggest to deal with the projected physical and societal effects of climate change for the Mediterranean and the MENA or WANA regions in a proactive way? The best countermeasure for avoiding the international, national, and human security effects of climate change would be an active climate change policy aimed at strategies, policies, and measures to stabilize the increase in global average temperature caused by anthropogenic climate change at 2°C by the year 2100, as has been suggested by the G-8 since their meeting in 2007 in Germany when they called for global reductions of GHG of 50 per cent by 2050, which would require an 80 per cent reduction of the GHG emissions of OECD countries by 2050. However, this would require a new sustainability paradigm (Clark/Crutzen/Schellnhuber 2004) and a ‘fourth sustainability revolution’ (Oswald Spring/Brauch 2011).

37.4 Policy Response: Awareness, Diagnosis, and Implementation

In the implementation paper (EU 2008) of the European Security Strategy (EU 2003), the 27 countries of the European Council concluded that “natural disasters, environmental degradation and competition for resources exacerbate conflict, especially in situations of poverty and population growth, with humanitarian, health, political and security consequences, including greater migration”. This decision was based on a report of the High Representative and Commission presented of March 2008 “which described climate change as a ‘threat multiplier’”. The European Council also noted that “climate change can also lead to disputes over trade routes, maritime zones and resources previously inaccessible” (EU 2008, 2008a).

However, these concerns have not yet been mainstreamed into the eight priority projects of the EMP or UfM. During the third Euro-Mediterranean Ministerial Conference on the Environment on 20 November 2006, its ‘Cairo Declaration’ referred only once to climate change. The EU’s environmental policy for the Mediterranean in the framework of Horizon 2020 does not refer even once to climate change among its four key priorities.

The Communication from the Commission to the Council and the European Parliament on: *Establishing an Environment Strategy for the Mediterranean*

Table 37.8: Emission reduction obligations of Mediterranean EU Countries. **Source:** Columns 1-14: UNFCCC, at: <http://unfccc.int/parties_and_observers/items/2704.php> (6 February 2010). Column 15: GHG emissions in tonnes/person (2005) without land-use change, at: <http://en.wikipedia.org/wiki/List_of_countries_by_greenhouse_gas_emissions_per_capita>. Column 16: The greenhouse gas emissions data for 2007 and the changes since 1990 exclude land-use changes and forestry LULUCF). UNFCCC: *National greenhouse gas inventory data for the period 1990-2008*, FCCC/SBI/2010/18 (4 November 2010): 18.

States	UN Climate Change Convention (UNFCCC)			Kyoto Protocol (KP)			National Communications (NC)					Reduction obligations		GHG emissions (without LUCF)	
	Signed	Ratified	Status	Signed	Ratified	Status	1	2	3	4	5	KP (%)	Real (%)	tonnes/person (2005)	1990-2008 in %
Portugal	13.6.92	12.12.93	An. 1	29.4.98	31.5.02	An. B	x	x	x	x	x	-8	+27	7.9	+32.2
Spain	13.6.92	21.12.93	An. 1	29.4.98	31.5.02	An. B	x	x	x	x	x	-8	+15	10.1	+42.3
France	13.6.92	25.3.94	An. 1	29.4.98	31.5.02	An. B	x	x	x	x	x	-8	0	9.0	-6.1
Italy	5.6.92	15.4.94	An. 1	29.4.98	31.5.02	An. B	x	x	x	x	x	-8	-6.5	9.7	+4.7
Greece	12.6.92	4.8.94	An. 1	29.4.98	31.5.02	An. B	x	x	x	x	x	-8	+25	11.5	+23.1
Slovenia	13.6.92	1.12.95	An. 1	21.10.98	2.8.02	An. B	x	x	x	x	x	-8	-8	10.1	+5.2
Malta	12..92	17.3.94	—	17.4.98	11.11.01	—	x	x	—	—	—	—	0	6.5	
Cyprus	16.6.92	15.10.97	—	—	16.7.99	—	—	—	—	—	—	—	0	10.5	

Legend: An. 1: Country listed in Annex 1 to the *UN Framework Convention on Climate Change* (UNFCCC); An. B: Country listed in Annex B to the *Kyoto Protocol* (KP).

(SEC(2006)1082/*COM/2006/0475 final) of 2006 only once referred to climate change in the framework of ongoing and completed research under the 5th and 6th Research Framework Programmes. Furthermore, “global environmental threats such as climate change and biodiversity loss” are identified in this Communication within a thematic programme for the sustainable management of natural resources. A literature synopsis on regional security implications of climate change (Adelphi Consult 2009: 4) reviewed reports on six target regions, among them the MENA region, where “sudden food shortages may trigger violent riots and – if left unaddressed – could destabilize states and increase public support for extremist groups offering viable alternatives”. This synopsis argued that “the two major sources of wealth, income and employment in the MENA region, oil and agriculture, will diminish”, and that “climate change will likely decrease agricultural output due to heat stress and reduced available water”. The review sees a future security challenge “when the combination of converging climate and socio-economic trends will reach critical thresholds, catalysing processes that lead to state fragility”.

Unresolved water disputes (Israel, Palestine; Nile basin) and acute sensitivity to food price rises have resulted in violent conflicts in North Africa since the

1970s and most recently in 2008. In some countries the introduction of nuclear energy as a climate change adaptation measure could result in increasing threats of proliferation (NIC 2008).

While climate change impacts in the Mediterranean have not so far been a major concern of EU environment policy, especially in the framework of the EMP and the UfM, the discussions about the security implications of climate change in the Euro-Mediterranean region have increasingly become a concern of the General Directorate (DG) on External Relations, which has launched the EU roadmap process on the security impacts of climate change.

While the Mediterranean and in particular the MENA region will most likely be very seriously affected by the potential societal impacts of the physical effects of climate change, public awareness and the political will to act, as well as the diagnosis and implementation of the provisions of the UNFCCC and of the Kyoto Protocol (1997), have been much less apparent. While southern and some south-eastern European countries have assumed quantitative reduction obligations as Annex 1 (UNFCCC) and Annex B (KP) countries, no MENA country has undertaken such an obligation. An indicator of their political will to perceive climate change as a challenge to the future well-being, security, and survival of their people is whether

Table 37.9: Emission reduction obligations of south-eastern European countries. **Source:** Columns 1-10: UNFCCC; at: <http://unfccc.int/parties_and_observers/items/2704.php> (4 July 2010); sources for columns 11 and 12 see table 37.8.

States	UN Climate Change Convention (UNFCCC)			Kyoto Protocol (KP)			National Communications (NC)					Reduction obligations		GHG Emissions	
	Signed	Ratified	Status	Signed	Ratified	Status	1	2	3	4	5	KP	Real	tonnes /p (2005)	1990-2008 (%)
Croatia	11.6.92	8.4.96	An. 1	11.3.99	30.05.07	An. B	x	–	–	x	x	-6	-6	6.9	-0,9
Bosnia-Herzegovina	–	7.9.00	–	16.4.07	15.7.07	–	x	–	–	–	–	–	0	4.3	
Montenegro	–	23.10.06	–	–	4.6.07	–	x	–	–	–	–	–	0	4.8	
Albania	–	3.10.94	–	1.4.05	30.5.05	–	x	x	–	–	–	–	0	2.9	
Serbia ^{a)}	8.6.92	12.3.01	8.6.92	19.10.07	17.1.08	–	x	–	–	–	–	–	0	4.8	
FYR Macedonia ^{a)}	–	28.12.98	–	10.11.04	16.2.05	–	x	x	–	–	–	–	0	5.2	

a) In November 2009 Serbia and the Former Yugoslav Republic of Macedonia did not participate in the UfM.

they have submitted their national communications on climate change to the UNFCCC Secretariat.

37.4.1 Southern Europe and EU Mediterranean Countries

Of the eight EU Mediterranean countries, all have ratified the UNFCCC (1992) and the *Kyoto Protocol* (KP), and six have quantitative reduction obligations under the KP. Three of these six countries were permitted, as part of internal EU arrangements, to increase their emissions by 15 per cent (Spain), 25 per cent (Greece), and 27 per cent (Portugal) by 2012, using 1990 as the base year. Among these six countries, only France and Greece fulfilled their obligations, while Spain, Portugal, and Italy failed to achieve their reduction targets (table 37.8; figure 37.13, 37.14). Six Mediterranean EU countries submitted all five national communications required by the UNFCCC secretariat, but Malta has only submitted the first two, and Cyprus has so far submitted none. In 2005, GHG emissions per person ranged from 6.5 tonnes in Malta to 11.5 tonnes in Greece.

37.4.2 South-Eastern European Countries

All south-eastern European countries have ratified the UNFCCC and the KP, but only Croatia, as an Annex I state, has reduction obligations that it failed to meet

by the end of 2007. Croatia submitted the first and fourth national communications only, while Albania and the Former Yugoslav Republic of Macedonia submitted the first two reports. In 2005 GHG emissions ranged from 2.9 tonnes per person in Albania to 6.9 tonnes in Croatia (table 37.9).

37.4.3 North Africa

While all five North African countries have signed and ratified the UNFCCC and the KP, none has reduction obligations. Algeria, Egypt, and Morocco have so far submitted two of five national communications to the UNFCCC Secretariat, Tunisia has submitted only the first, and Libya so far none. Thus, climate change issues seem to have only a low political priority for the governments in North Africa. Here the sub-regional variation in GHG emissions in 2005 ranged from 1.6 tonnes per person in Morocco to 8.3 tonnes in Libya (table 37.10).

37.4.4 Eastern Mediterranean Countries

Of the seven countries in the region, the *Occupied Palestinian Territories* (OPT) are not a sovereign state and therefore cannot be a party to the UNFCCC and to the KP. Of all Mediterranean countries, Turkey performed worst, increasing its GHG emissions by 96.0

Table 37.10: Emission reduction obligations of eastern Mediterranean countries. **Sources:** See [table 37.8](#) (4 July 2011).

States	UN Climate Change Convention (UNFCCC)			Kyoto Protocol (KP)			National Communications (NC)				Reduction obligations		GHG Emissions	
	Signed	Ratified	Status	Signed	Ratified	No obligations	1	2	3	4	KP	Real	tonnes/p (2005)	1990-2008
Morocco	13.6.92	28.12.95	—	25.1.02	16.2.05	—	x	x	—	—	—	—	1.6	?
Algeria	—	3.10.94	—	16.2.05	17.5.05	—	x	x	—	—	—	—	4.2	?
Tunisia	13.6.92	15.7.93	—	22.1.03	16.2.05	—	x	—	—	—	—	—	2.3	?
Libya	29.6.92	14.6.99	—	24.8.06	22.11.06	—	—	—	—	—	—	—	8.3	?
Egypt	9.6.92	5.12.94	—	15.3.99	12.1.05	—	x	x	—	—	—	—	3.0	?

Table 37.11: Emission reduction obligations of eastern Mediterranean countries. **Source:** See [table 37.9](#) (4 July 2011).

States	UN Climate Change Convention (UNFCCC)			Kyoto Protocol (KP)			National Communications (NC)					Reduction obligations		GHG Emissions (2007)	
	Signed	Ratified	Status	Signed	Ratified	Status	1	2	3	4	5	KP	Real	tonnes/p (2005)	1990-2007 (%)
Turkey		24.2.2004	An.1	—	2009	AnB	x	—	—	x	—	—	—	5.5	+96.0
Syria		4.1.96	—	—	27.1.2006	—	x	—	—	—	—	—	—	2.7	—
Lebanon	12.6.1992	15.12.1994	—	—	13.11.2006	—	x	x	—	—	—	—	—	4.4	—
Jordan	11.6.1992	12.11.1993	—	—	17.3.2003	—	x	x	—	—	—	—	—	4.2	—
Israel	4.6.1992	4.6.1996	—	16.12.1998	15.3.2004	—	x	x	—	—	—	—	—	11.5	—
Palestine	Not party to UNFCCC			—	—	—	—	—	—	—	—	—	—	—	—

per cent between 1990 and 2008. GHG emissions varied from 2.7 tonnes/person for Syria to 11.5 for Israel.

The UNFCCC Secretariat has supplied a detailed overview of the changes in the emissions of all Annex I countries under the UNFCCC from 1990 (as the base year) to 2008 (with and without land use changes and forestry) that show slight variations in the performance of state members ([figures 37.13; 37.11](#)).

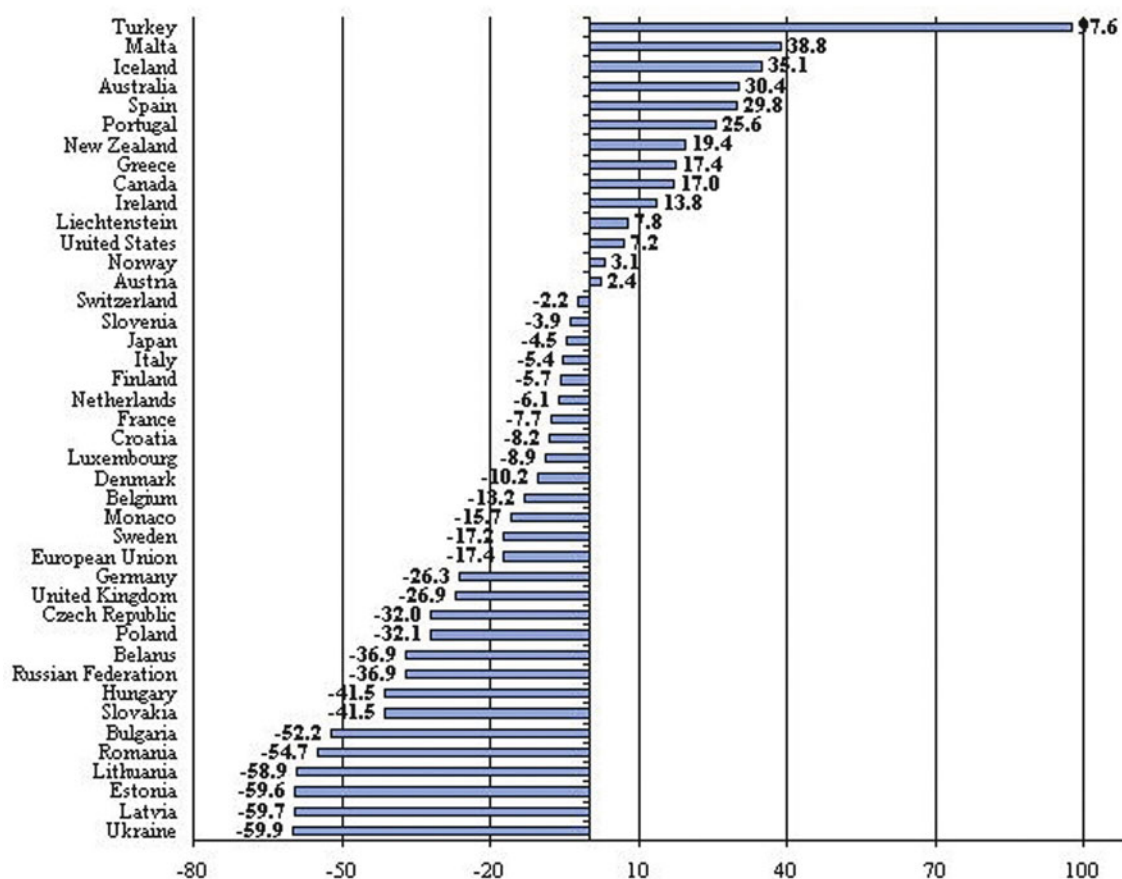
37.4.5 Diagnosis and Implementation Gap: Reduction of GHG

The first four IPCC assessment reports (1990, 1995, 1996a, 1996b, 2001, 2001a, 2001b, 2007, 2007a, 2007b) reviewed the climate change impact research for the Mediterranean in the regional contexts of Africa, Asia, and Europe. There is therefore no integrated research assessment for the whole Mediterranean region that addresses the huge knowledge gaps for many MENA countries, compared with the higher

resolution models and more detailed climate change impact studies for Europe as a whole.

Among the southern European EU member countries, six have so far submitted all five national communications on climate change, Malta has submitted two, and Cyprus alone has so far submitted none ([table 37.8](#)). Among the south-eastern European countries, Croatia, the only Annex I country, has submitted three, Albania and Macedonia have submitted two communications, and Bosnia-Herzegovina, Montenegro, and Serbia only one ([table 37.9](#)). In North Africa during 2010, Algeria, Egypt, and Morocco submitted their second national communication, Tunisia has submitted only one so far, and Libya none ([table 37.10](#)). Of the eastern Mediterranean countries, Jordan, Lebanon, Israel, and Turkey submitted two national communications, and Syria only one ([table 37.11](#)). Obviously for Cyprus and Libya climate change issues had a very low national priority and they may lack the capacity to prepare one.

Of those Mediterranean Annex I countries with quantitative emission reduction obligations for aggre-

Figure 37.13: Total aggregate greenhouse gas emissions of individual Annex I Parties, 1990-2009 (excluding LULUCF).Source: <http://unfccc.int/files/inc/graphics/image/jpeg/changes_excluding_2010.jpg>.

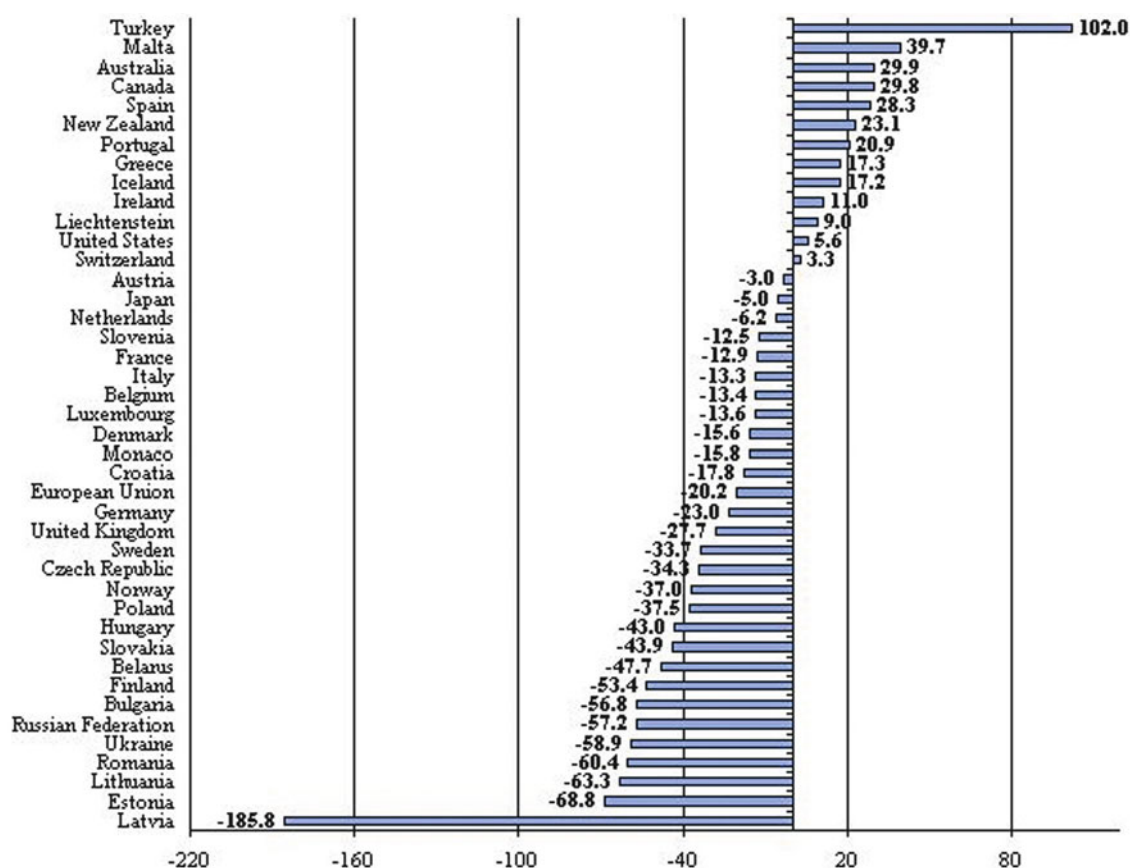
gate anthropogenic emissions of CO₂, CH₄, N₂O, HCF, PCF, and SF for the period from 1990 to 2008, the following countries *missed* their obligations (without/with *land-use changes and forestry* (LULUCF)) in per cent: *Turkey*⁴⁹ (96.0/101.1), *Spain* (42.3/43.7), *Portugal* (32.2/18.3); Greece (23.1/23.0), *Slovenia* (5.2/5.2), *Italy* (4.7/0.4) Croatia (-0.9/-13.7), France (-6.1/-12.6). Only France (0 per cent) and Greece (+25 per cent) met their EU reduction obligations, while Spain (+15 per cent), Portugal (+27 per cent), Italy (-6.5 per cent) and Slovenia (-8 per cent) were far above their EU obligations. Turkey performed worst and it did not ratify the UNFCCC until 2004 and the Kyoto Protocol until 2009 (figures 37.9, 37.10).

Abdel Gelil (2009: 13-30) stated in the second AFED Report (2009) that “apart from the initial national communications, documentations of Arab efforts to reduce GHG emissions are very scarce”. In 2007, the

Council of Arab Ministers Responsible for the Environment (CAMRE) adopted the Arab Ministerial Declaration on Climate Change as the “basis for future action”. Gelil (2009: 16ff.) reviewed the measures undertaken by those Arab governments that had submitted initial national communications on “enhancement of electrical energy efficiency in lighting, cooling, cooking and air conditioning, and implementation of demand-side management programmes”, including efforts “to improve fuel efficiency of vehicles and promotion of public transportation systems” and activities in the industrial and building sectors, including fuel switching and renewables, measures to reduce GHG from the non-energy agricultural sector, and waste management through afforestation and change in land use. Gelil (2009: 29) made many specific recommendations for enhancing public awareness, developing renewable energy resources, using carbon sequestration and storage in the oil-producing *Gulf Cooperation Council* (GCC) countries, adopting national energy efficiency and renewable energy tar-

49 Those countries that have missed their reduction obligations are printed in italics.

Figure 37.14: Total aggregate greenhouse gas emissions of individual Annex I Parties, 1990-2009 (including LULUCF).
Source: <http://unfccc.int/files/inc/graphics/image/jpeg/changes_including_2010.jpg>.



gets and policies of sustainable transport, and promoting 'green building' and "future urban expansions should achieve the highest levels of resources efficiency".

37.5 Policy Response: Initiatives from Knowledge to Action

The countries in the Mediterranean and the MENA region demonstrate a much lower awareness of the urgency of reducing greenhouse gas emissions compared with other EU Annex I countries. Because they lie across three or two continents, the Mediterranean and MENA regions have so far not been jointly assessed by the IPCC. In 28 October 2009 the European Union, alongside its 27 member countries, became an observer at the IPCC, and this permits representatives of the European Commission to introduce proposals. Hence the *European Commission* could propose a special report of the IPCC's three working groups assessing:

- the *physical basis of climate change research* for the three Mediterranean sub-regions;
- the *impacts and vulnerabilities* of different sectors of human activity to climate change;
- national efforts for adaptation and mitigation against short-, medium-, and long-term physical impacts and the societal consequences of climate change.

Such a systematic regional assessment report could become an important policy instrument for addressing knowledge gaps and research needs, thus enhancing European research activities and fostering research cooperation within the EU-MENA region. It would offer an independent scientific assessment of the outcome of many cooperative EU research projects on climate change in the Mediterranean, which should include societal effects and possible security impacts.

An improved knowledge base is a precondition for moving from 'knowledge to action' with regard to regional and national policies and measures on adaptation and mitigation. It is also a prerequisite for progressing from reactive policies - lacking in many

MENA countries so far – to proactive policies and measures to address in a cooperative way both the physical effects of anthropogenic climate change and the possible societal outcomes. To address the causes of anthropogenic climate change and to avoid negative social outcomes necessitates a major reduction in GHG emissions in this century and therefore a shift from fossil to renewable sources of energy such as solar, wind, hydro, biomass, and geothermal energy.

Several stages in the development of solar thermal electricity generation and conceptual and policy debates for a trans-Mediterranean renewable energy partnership may be distinguished. This development has resulted in the evolution of the *Trans-Mediterranean Renewable Energy Cooperation* (TREC) concept to the *DESERTEC* concept. These concepts were taken up in the *Mediterranean Solar Plan* (MSP) in the framework of the UfM and the related *DESERTEC Industrial Initiative* (Dii). Two other initiatives have not so far been taken up: the *Mediterranean Climate Change Initiative* (MCCI), and proposals for a *MEDSEC* or *MEHSEC* Initiative.

37.5.1 Early Developments of Solar Thermal Electricity Generation

The development of solar energy started in 1860, when Auguste Mouchout, a mathematics instructor at the Lycée de Tours, converted “solar radiation into mechanical power” and operated a small, conventional steam engine in 1865.⁵⁰ In 1874 William Adams, a deputy registrar for the English Crown in India, proposed solar thermal energy generation in his book *Solar Heat – A Substitute for Fuel in Tropical Countries*, and in 1878 he began “construction by using 17-by-10-inch flat mirrors calculating that 72 mirrors are needed to generate 1,200°F, necessary to produce high steam pressures to operate 2.5 horsepower conventional engines. It operated successfully”.⁵¹

In the 1870s, John Ericsson built the first parabolic trough in the US, and in 1885 Charles Tellier installed a solar collector on his roof in France to power a water pump. From 1906, Frank Shuman experimented with several designs and after forming his Sun Power Co. in 1911 he built his first solar installation in 1912 outside Cairo, and improved it further until it was

destroyed during World War I. The development of solar collector technology began in the US in the mid 1970s in the aftermath of the first oil shocks, and continued with funding from the US *Department of Energy* (DoE). In 1982, the Los Angeles-based Israeli-American Luz Co. developed a parabolic trough collector, and in 1983 and 1984 Luz Co. negotiated a purchase power agreement with *Southern California Edison* (SCE) that resulted in the construction of two *Solar Electric Generation Systems* (SEGS I, II) in the Mohave Desert with

an 80-megawatt electric power plant using parabolic trough collectors to drive steam-powered turbines. The company had already used similar designs to build nine other solar electric generation facilities, providing a total of 275 megawatts of power. In the process, Luz engineers steadily lowered the initial costs by optimizing construction techniques and taking advantage of economies of buying material in bulk to build ever-larger plants until the price dropped from 24 to 12 cents per kilowatt hour.⁵²

However, due to limited tax credits and falling oil prices, in 1991 Luz Co. filed for bankruptcy.⁵³ This is one of the renewable energy technologies that are crucial for the TREC and Desertec concepts.

37.5.2 Towards a Trans-Mediterranean Renewable Energy Partnership

In Europe, this technology has been further developed since 1981 at the *Plataforma Solar de Almeria* (PSA), as part of a close cooperation between the Spanish CIEMAT (*Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas*) and the Energy Division of the German Aerospace Centre (DLR).⁵⁴ For nearly two decades, energy system specialists from the DLR in Stuttgart (Winter/Nitsch 1988; Nitsch/Staiß 1997) have suggested supplying part of Germany’s electricity demand by importing electricity from solar energy installations from southern Spain and from the Sahara desert via long-distance *high-voltage direct currents* (HVDC).

52 See M. Ragheb: “Historical Perspective”, at: <<https://netfiles.uiuc.edu/mragheb/www/NPRE%20498ES%20Energy%20Storage%20Systems/Historical%20Perspective.pdf>>.

53 See Smith (1995) and: <<http://www.greenway.com.tr/en/html/93>>.

54 For PSA, see at: <<http://www.psa.es/webesp/index.php>>; <<http://www.euro-energy.net/infrastructures/25.html>> and at: <http://www.dlr.de/desktopdefault.aspx/tabid-4550/127_read-3651/>.

50 Charles Smith: “History of Solar Energy: Revisiting Solar Power’s Past”, in: *Technology Review*, July 1995; at: <<http://coronatech.net/History%20of%20Solar%20Power.htm>>.

51 See at: <<http://www.greenway.com.tr/en/html/93>>.

Since November 1993, this author has linked this technical debate with the emerging debates on climate change and on a European-Mediterranean partnership, and has suggested a political framework for a “European-North African Partnership on Renewable Energy Sources in the 21st Century” as a European-Mediterranean “partnership-building project” aimed at a “Euro-Mediterranean energy partnership” (Brauch 1994a, 1997c, 1997d, 2000, 2000b, 2001b).⁵⁵ He suggested that to reduce greenhouse gas emissions in the energy and transport sectors, it would be necessary first to develop a cooperative political framework for a long-term Euro-Mediterranean ‘survival pact’ linking two commodities essential for life and work: sustainable food and energy production, by:

- Relying on the European commitment to reduce its GHG emissions by 2020 by at least 20 per cent and by 2050 by at least 50 and up to 80 per cent.
- Sharing these new technologies with the countries in the EU-MENA region by building up centres of excellence and establishing technical training centres to create local expertise in installing and maintaining renewable energy systems, thus creating an economy of scale (Brauch 1999).
- Initially focusing these activities on those countries that lack fossil fuels (Morocco, Jordan) or whose reserves are rapidly declining (Tunisia, Egypt) but also increasingly on those countries (e.g. Algeria) that rely primarily on fossil exports to assist them in the necessary mid- and long-term transformation of their energy system.
- Taking into account the water scarcity in the Nile basin, which will become more severe due to continued high population growth rates and the impacts of climate change.
- Helping Egypt to reduce its high dependence on the water resources of the River Nile with the gradual build-up of desalination plants based on renewable energy sources, thus reducing one cause of conflict.

In September 1998, the *Hamburg Climate Protection Fund* (HKF) held a workshop on renewable electricity for Europe through long-distance transmission (Knies/Czisch/Brauch 1999). These early conceptual

55 For a comprehensive list of the author’s early conceptual publications see at: <http://www.afes-press.de/html/pdf/DESERTEC_Publikationen_Deutsch> and for his security assessment of Desertec, see at: <http://www.afes-press.de/html/pdf/Brauch_Berlin_DESERTEC_100506.pdf>.

and political ideas were developed further in three research projects funded by the German Federal Ministry on the Environment, Nature Protection, and Nuclear Safety (Trieb/Krewitt/May 2009; Viebahn/Lechon/Trieb 2011).⁵⁶

Several Arab countries (Algeria, Libya, Syria) in the MENA region rely greatly on the export of fossil energy sources (oil and gas), while Tunisia has already shifted from being an oil and gas exporting country to an importing one, and Morocco, Lebanon, Palestine, and Jordan rely on imports of fossil fuels (Brauch 1997c, 1997d). Due to their geographic location in the sunbelt they have very high solar intensity, especially in the deserts. For many decades, visionary natural scientists have suggested using this technical potential for sustainable energy generation in order to reduce emissions from the burning of hydrocarbons (Winter/Nitsch 1988; Nitsch/Staiß 1997; Brauch 2010; Faiman 2009).

However, as long as oil and gas were relatively cheap there was no economic incentive for the coastal regions and sun-intensive drylands to invest in the development of various renewable energy sources, especially wind power and solar energy (thermal, photovoltaic, and solar concentration technologies) for the generation of electricity and hydrogen and for the desalination of brackish and seawater for both ‘blue’ (drinking) and ‘green’ (agricultural) water.

37.5.3 From the TREC to the DESERTEC Concept

These conceptual and technical ideas and developments resulted in the *Trans-Mediterranean Renewable Energy Cooperation* (TREC) concept, endorsed by the Club of Rome under the leadership of HRH Prince Hassan bin Talal (2011).⁵⁷ From 2003, several experts who were involved in the TREC project developed the DESERTEC concept⁵⁸, since 2009 in the framework of the Desertec Foundation that “was established on 20 January 2009 as a non-profit

56 See BMU/DLR: MED-CSP: *Concentrating Solar Power for the Mediterranean Region* (Stuttgart: DLR, 16 April 2005), at: <http://www.dlr.de/tt/desktopdefault.aspx/tabid-2885/4422_read-6575/>; BMU/DLR: TRANS-CSP: *Trans-Mediterranean Interconnections for Concentrating Solar Power* (Stuttgart: DLR, 16 April 2005), at: <http://www.dlr.de/tt/desktopdefault.aspx/tabid-2885/4422_read-6588/>; AQUA-CSP: *Concentrating Solar Power for Seawater Desalination*, at: <http://www.dlr.de/tt/desktopdefault.aspx/tabid-3525/5497_read-6611/>.

foundation. Founding members of DESERTEC Foundation [were] the German Association of the Club of Rome, members of an international network of scientists as well as committed private individuals”.⁵⁹

37.5.4 Commercialization of Solar Thermal Electricity Plants

As a result of 30 years of cooperation between the Spanish research establishment CIEMAT and DLR, solar thermal electricity generating plants are being built in various locations in Andalusia (Sevilla, Granada):⁶⁰

- In December 2008, the first European parabolic trough solar power plant (Andasol I) began to produce electricity, in mid 2009 Andasol II was connected to the grid, and Andasol 3 followed in 2011; each plant will have a capacity of 50 MW.⁶¹
- In May 2011, the world's largest Fresnel solar power plant in Puerto Errada (PR2) had its project financing certified and will supply about 50 million kWh/year upon completion in March 2012.⁶²
- On 27 June 2011, Termosolar Alcazar was chosen to build the first solar tower *concentrating solar power* (CSP) electricity plant in Castilla-La Mancha with a capacity of 50 MW.⁶³

The technology is being introduced into the market and with improvements in technology, an economy of scale is coming into effect, and prices are falling.

57 The *Trans-Mediterranean Renewable Energy Cooperation* (TREC) is an initiative of The Club of Rome, the Hamburg Climate Protection Foundation and the *National Energy Research Center of Jordan* (NERC); see at: <<http://www.iset.uni-kassel.de/abt/w3-w/projekte/TREC.pdf>>; at: <http://www.e5.org/modules.php?op=modload&name=PageEd&file=index&topic_id=0&page_id=52>.

58 See at: <<http://www.desertec.org/en/concept/>> and at: <<http://en.wikipedia.org/wiki/Desertec>>.

59 See for details at: <<http://www.desertec.org/en/organization/>>; for the statutes see at: <http://www.desertec.org/fileadmin/downloads/media/statutes_en.pdf>. Among the founding members were the German Association of the Club of Rome, HRH Prince El Hassan bin Talal of Jordan, Christian Breyer, Michael Düren, Friedrich Führ, Gisela Gallehr, Sebastian Gallehr, Polly Higgins, Tim Hufermann, Gerhard Knies, Wolfgang Knothe, Mouldi Miled, Tobias Morell, Abdel Hamied Moussa, Hani El Nokraschy, Max Schön, Stephan Schoenen, Götz Schuchardt, Oliver Steinmetz, Michael Straub, Stewart Taggart, Gerhard Timm, Gerry Wolff.

These new technologies will gradually become competitive during the next decade.

37.5.5 Union for the Mediterranean (UfM) – Barcelona Process (EMP)

On 13 July 2008, with the establishment of the UfM, the EU Solar Plan was chosen as one of six key projects, and it was developed further during the meeting of the foreign ministers of the 43 participating countries in November 2008.⁶⁴ Among the goals of the EU's *Mediterranean Solar Plan* (MSP) are:

- Expansion of renewable energy systems for electricity generation (CSP, photovoltaic (PV), wind) and grid infrastructure with a perspective of exporting 'green electricity' to Europe;

60 This author's policy proposals for Andalusia (Brauch 1997) became a reality within 10 years; see: "Sustainable Andalusia - where green is number one!", at: <<http://www.andalusia.com/spain/business/renewable-energy.htm>>; "According to information provided by the regional government's 'Andalusian Energy Agency' (Agencia Andaluza de la Energía), this 31.8 per cent of this region's energy will come from renewable energy in 2013. That is equivalent to 90% of home energy consumption in the south of Spain. This is the main objective of the Andalusian Sustainable Energy Plan (Plan Andaluz de Sostenibilidad Energética, Pasener 2007-2013) and it will also translate into more than 100,000 jobs in the renewable energy sector." See also: "The Renewable Energy Sector in Andalusia (April 2010)", at: <<http://www.cres.org.cn/uploads/soft/110422/1-1104221G932.pdf>>; RenRen (Renewable Energy Regions Network); at: <<http://www.renren-project.eu/partners-in-renren/38-partner-andalusia-general-info>>; see videos on the "Ps 20 Solar Power Tower", at: <http://wn.com/PS10_Solar_Power_Tower>.

61 "Andasol I wird jetzt offiziell eingeweiht", 1 July 2009; at: <<http://www.klimaretter.info/content/view/full/3260/70/>>; on Andasol I, 2 and 3, see at: <<http://de.wikipedia.org/wiki/Andasol>>.

62 See: Novatex Solar: "Das weltweit grösste Fresnel-Solarkraftwerk erreicht den Abschluss der Projektfinanzierung", 4 May 2011; at: <<http://www.solarserver.de/solar-magazin/nachrichten/aktuelles/2011/kw18/weltweit-groesstes-fresnel-solarkraftwerk-erreicht-den-abschluss-der-projektfinanzierung.html>>.

63 See: "Solarthermische Kraftwerke in Spanien: Regierung erteilt SolarReserve den Zuschlag für Solarturm-Anlage in Castilla-La Mancha", at: <<http://www.solarserver.de/solar-magazin/nachrichten/aktuelles/2011/kw26/solarthermische-kraftwerke-in-spanien-regierung-erteilt-solarreserve-den-zuschlag-fuer-solarturm-anlage-in-castilla-la-mancha.html>>.

64 See at: <<http://www.desertec.org/de/>>.

- creation of appropriate framework conditions to secure stable investments and sustainable development;
- development of the Master Plan Study and approval of initial projects.

In February 2009, an official of the German Federal Environment Ministry⁶⁵ listed among the most urgent tasks the development of 1) projects (criteria, next steps); 2) a master plan study (terms of reference, responsibilities, realization); 3) a discussion about new elements of the MSP; and 4) the strategy paper (finalizing and distribution). A technical expert distinguished two phases for the development of the MSP. During the first phase (2009-2011), several economic and technological pilot projects are programmed, and during the second phase (2011-2020), the large-scale development is planned.⁶⁶ Work on the *Master Plan Study* started in early 2009. It is to outline “concrete steps for the development of: a) solar thermal power plants, b) solar photovoltaic, c) other renewable energy installations, d) export of electricity to the EU along with local energy needs, e.g. for water desalination”. The study will be a coordinated effort involving relevant administrations from member countries, the European Commission, industry, utilities, transport system operators, potential investors, and financing institutions. The *Master Plan Study* is to develop a roadmap detailing the phases, activities, and precise timeline for the implementation of the Mediterranean Solar Plan. The work is being prepared by an informal working group of experts from the governments of Egypt, France, Germany, Italy, Morocco, Spain, and the European Commission (as an observer).

As an outcome of the first ministerial meeting on sustainable development programmes on 25 June 2009 in Paris it was announced that the following workshops would be organized: a) technical workshops on the environment, transport, energy, and sustainable urban development, and b) an energy workshop about the MSP with participants from 22 UfM member states, representatives of the EC and the US,

65 Ralf Christmann, Division Research and Development in the Field of Renewable Energies, BMU: *Union for the Mediterranean - Mediterranean Solar Plan*; at: <http://www.erec.org/fileadmin/erec_docs/Events_Documents/EUSEW_MSP_13_Feb_2009/MSP_Ralf_Christmann-panel_2.pdf>.

66 Karsten Hoyer-Klick, DLR: *Union for the Mediterranean - Mediterranean Solar Plan*; at: <http://www.eurec.be/files/Oldenburger,%2028th%20July%202008/07_Union%20for%20the%20Mediterranean.pdf>.

and of multilateral and national financial institutions.⁶⁷ According to the *Euro-Mediterranean Energy Market Integration Project* (MED-EMIP), the strategies of the partners differ and the commitment of the *international financial institutions* (IFIs) to invest “€5 billion over ten years ... only represents 8% of the overall cost of €60 billion”. In November 2009 a conference of experts demonstrated that political obstacles add to these strategic and financial challenges.⁶⁸

In February 2010, a strategy paper suggesting two targets was examined by the MSP Expert Group: (i) developing 20 GW of new renewable energy production capacities, and (ii) achieving significant energy savings around the Mediterranean by 2020, thus addressing both supply and demand.⁶⁹ The goal was to develop the MSP by 2011 and to implement it during the planned deployment phase (2011-2020), reaching the 20 GW target by 2020.

The Solar Plan contracted by the EIB should a) address the transmission infrastructures to EU countries, taking stock of existing bilateral agreements and the ongoing involvement of transmission system operators, and proposing ... specific electricity grid infrastructure projects ... for establishing an effective green electricity import-export framework ... in the framework of the *Trans-European Networks* (TEN) initiative; b) [address] relevant conditions for the improvement of energy efficiency in ... buildings, household appliances, industry, and transport ...; c) identify further needs for technical assistance and capacity-building in the fields of renewable energy production, energy efficiency, and technology co-operation and transfer.

In May 2010, the European Commission summarized its activities for the MSP. The development of the

67 Ralf Christmann, BMU: “Mediterranean Solar Plan - Strategy, Governance and Progress”, Paris, 25 June 2009; at: <http://www.ambitalia.org.uk/MSP_conference/Christmann_MSP.pdf>.

68 Manon Malhère: “Mediterranean Solar Plan - Project faces strategic and financial problems”, in: *Europolitics*, 20 October 2009; at: <<http://www.europolitics.info/sectorial-policies/project-faces-strategic-and-financial-problems-art251878-14.html>>.

69 See at: <http://ec.europa.eu/energy/international/international_cooperation/doc/2010_02_10_mediterranean_solar_plan_strategy_paper.pdf> (28 November 2010); see report: Identification Mission for the Mediterranean Solar Plan (Jan 2010); at: <http://ec.europa.eu/energy/international/international_cooperation/doc/2010_01_solar_plan_report.pdf>; Mediterranean Solar Plan experts' group - strategy paper (Feb 2010); at: <http://ec.europa.eu/energy/international/international_cooperation/doc/2010_02_10_mediterranean_solar_plan_strategy_paper.pdf>.

master plan was to take place in close collaboration with a team from the technical assistance project “Paving the Way to the Mediterranean Solar Plan”, as well as with other EU cooperation initiatives, and with the MED-REG Association of Energy Regulators.⁷⁰ The MSP complements the work funded under the *Euro-pean Neighbourhood and Partnership Instrument* (ENPI):

- MED-REG II - Energy regulators: supports the development of a modern and efficient energy regulatory framework in the Mediterranean Partner Countries and strengthens their cooperation with EU energy regulators;
- MED-EMIP - Energy cooperation: a platform for energy policy dialogue and exchange of experiences, leading to enhanced Euro-Med cooperation, integration of the energy markets, and improved security and sustainability;
- MED-ENEC II - Energy efficiency in construction: encourages energy efficiency and the use of solar energy in the construction sector, through capacity-building, fiscal and economic instruments, and pilot projects.

The EIB has also played a key role in implementing the MSP by dedicating more than €3.6 billion to energy projects between October 2002 and 2010 through its *Facility for Euro-Mediterranean Investment and Partnership* (FEMIP), representing almost 40 per cent of its total financing over the period. At the FEMIP Ministerial Meeting in October 2008, the EIB was asked to play a key role in the implementation of the MSP. This assignment was subsequently confirmed by the Euro-Mediterranean Industry Ministers in November 2008, when they called on the EIB to draw up an investment plan for the development of solar energy in the Mediterranean region.

On 2-3 June 2010, the Sixth Euro-Mediterranean Ministerial Conference on Energy & Renewable Energy in Cairo noted the important role of financial institutions, such as

The World Bank through the *Clean Technology Fund* (CTF) approved financing of \$750 million on December 2, 2009, which will mobilize an additional \$4.85 billion from other sources, to accelerate global deployment of *Concentrated Solar Power* (CSP). It will do so by investing in the CSP programs of five countries in the Middle East and North Africa (Algeria, Egypt, Jordan, Morocco, and Tunisia). In addition, The *European*

Investment Bank (EIB), the KfW Development Bank, and the *Agence Française de Développement* (AFD) decided to jointly earmark 5 billion Euros, for the 5 coming years dedicated to renewable energy and energetic efficiency.⁷¹

However, due to the unresolved Israeli-Arab conflict, the UfM, like its predecessor – the BP or EMP –, has remained divided and partly paralyzed three years after its establishment on the initiative of the French President Nicolas Sarkozy. In March 2010, the UfM Secretariat was set up in Barcelona, and on 5 July 2011 Ambassador Youssef Amrani (Morocco) took office as its first Secretary-General, but in 2010 the summit meeting of the heads of state of all 43 UfM countries was postponed.⁷²

While the security dialogue has been blocked by regional conflicts, and NATO has become militarily involved since March 2011 in implementing a ‘no-fly zone’ in Libya based on a UN Security Council resolution, the MSP has so far made slow progress. On 5-6 July 2011, the 1st Joint Committee of National Experts for the MSP of Algeria, Austria, Croatia, Cyprus, Egypt, Finland, France, Germany, Greece, Israel, Italy, Jordan, Malta, Morocco, the Palestinian Authority, Spain, Sweden, Tunisia, Turkey, and the United Kingdom met in Barcelona with representatives of the European Commission, the League of Arab States, the EIB, the KfW, and of the “Paving the Way to the MSP technical assistance project”.

The participants endorsed ... the content structure, time frame, goals and working methods related to the MSP Master Plan. ... The EIB presented proposals for the creation of new financial instruments to support the MSP process. ... The MSP Master Plan ... should be finalized at the technical level by the end of 2012 and submitted to the UfM Energy Ministers by mid-2013.⁷³

While three years after the launching of the UfM and its MSP the UfM has not even appointed a Deputy Secretary-General for Energy, the *DESERTEC Industrial Initiative* (Dii) has been far more ambitious.

70 For an analysis through the prism of external governance, see: Carafa (2011, 2011a).

71 See: Council of the EU, (7 May 2010), Document 9558/10, ENER 141, MED 35; at: <<http://register.consilium.europa.eu/pdf/en/10/st09/st09558.en10.pdf>> (28 November 2010).

72 See the critical analysis by Claire Demesmay und Katrin Sold (DGAP), 13 July 2010; at: <<http://www.euractiv.de/sicherheit-und-verteidigung/artikel/mittelmeer-union-gut-gemeint-schlecht-gemacht-003370>>.

73 See details at: < <http://www.ufmsecretariat.org/en/the-ufm-mediterranean-solar-plan-is-on-its-way/>> (10 July 2011).

37.5.6 DESERTEC Industrial Initiative (Dii)

The Dii was launched on 13 July 2009 in Munich with the goal: “to analyse and develop the technical, economic, political, social and ecological framework for carbon-free power generation in the deserts of North Africa”. Its planning entity includes the DESERTEC Foundation, which is to contribute to the realization of this concept, and which works “for creating a global alliance to ensure security of energy supplies, to promote economic development, and to stabilize the world’s climate”. The MSP could offer a policy framework for the DESERTEC concept that refers to

A close cooperation between EU and MENA for market introduction of renewable energy and interconnection of electricity grids by high-voltage direct-current transmission are keys for economic and physical survival of the whole region. ... The DESERTEC White Book describes a scenario of electricity demand and supply opportunities by renewable energy in the integrated EU-MENA region up to the middle of the century.⁷⁴

Among the Dii’s main goals are the drafting of concrete business plans and associated financing concepts, and the initiating of industrial preparations for building a large number of networked solar thermal power plants distributed throughout the MENA region. The initiative’s clear focus on implementation is set out in the Dii Principles for all future Dii shareholders. Besides the business opportunities for the companies, there are other economic, ecological, and social potentials:

- greater energy security in the EU-MENA countries;
- growth and development opportunities for the MENA region as a result of substantial private investment;
- safeguarding the future water supply in the MENA countries by utilizing excess energy in seawater desalination plants; and
- reducing carbon dioxide emissions and thus making a significant contribution to achieving the climate change targets of the European Union and the German Federal Government.⁷⁵

On 31 October 2009, Desertec GmbH (limited liability company) was established⁷⁶ with the long-term goal “to satisfy a substantial part of the energy needs

of the MENA countries and meet as much as 15 per cent of Europe’s electricity demand by 2050”. By November 2010, Dii had grown to 18 shareholders and 33 associate partners in North Africa and the Middle East, and representing a network of companies in 13 countries worldwide.⁷⁷ Dii’s first Annual Conference on “Energy from the deserts” in Barcelona on 26-27 October 2010 included high-profile stakeholders, among them government representatives from Algeria, Egypt, Libya, Morocco, and Tunisia, and wind and solar energy companies.⁷⁸

On 3 November 2010, the DESERTEC Foundation, together with 18 universities and research facilities, launched the *Desertec University Network* (DUN).⁷⁹ During the first DUN Workshop at the Wuppertal Institute on 28 June 2011, various propos-

76 Among the founding companies were: ABB, Abengoa Solar, Cevital, the DESERTEC Foundation, Deutsche Bank, E.ON, HSH Nordbank, MAN Solar Millennium, Munich Re, M+W Group, RWE, SCHOTT Solar, and Siemens. Its shareholder meeting appointed Paul van Son as CEO of the DII. In April 2010, Rainer Aringhoff joined the Dii board as its Chief Operating Officer; he led the project development of the Andasol power plants in southern Spain, Europe’s first commercial parabolic solar thermal trough plants.

77 See 30 October 2009, Press release, “Joint venture DII established and ready to take up work”; at: <<http://www.desertec.org/en/press/press-releases/091030-01-information-dii-gmbh/>>.

78 Dii’s 2nd Desert Energy Conference was scheduled for 2-3 November 2011 in Cairo. For detailed documentation, see at: <<http://www.dii-eumena.com/conference/>>.

79 Among its founding members are Cairo University; German University in Cairo, New Cairo City; Alexandria University, Alexandria (all Egypt); UDES (Unité de Développement des Equipements Solaires), Algiers; USTO (Université des Sciences et de la Technologie d’Oran), Oran (all Algeria); DESERTEC Foundation, Hamburg (Germany); University of Science and Technology, Irbid; University of Jordan, Amman (all Jordan); Al-Fateh University, Tripoli; Center for Solar Energy Research and Studies (CSERS), Tripoli; National Authority for Scientific Research, Tripoli; Sebha University, Sebha (all Libya); CNRST (Centre National pour la Recherche Scientifique et Technique), Rabat; Ecole Nationale de l’Industrie Minérale, Agdal, Rabat; Ecole Nationale Supérieure d’Electricité et de Mécanique (ENSEM-UH2C), Casablanca (all Morocco); Centre de Recherches et des Technologies de l’Energie, Borj-Cedria; Ecole Nationale d’Ingénieurs de Tunis, Université Tunis-El-Manar; Ecole Nationale d’Ingénieurs de Monastir, Université de Monastir; Université de Gafsa, Gafsa (Tunisia). On 1 July 2011, the Technical University of Dresden was the first public German university to join the Desertec University Network.

74 See summary of the DESERTEC project; at: <<http://www.desertec.org/en/concept/summary/>>.

75 Press release – Munich, 13 July 2009: “12 companies plan establishment of a Desertec Industrial Initiative”; at: <http://www.desertec.org/fileadmin/downloads/press/09-07-13_PM_DII_english.pdf>.

als were made for launching a *DESERTEC employment/industrialization-policy institute* (DEPI), for setting up an *Academic-Industrial Think Tank* (AITT), for initiating an internship programme for expatriate engineers, for introducing a *revenue optimized market introductions strategy* (ROMIS), and for realizing a dry-oasis recovery project.⁸⁰

Dii will not make any investments itself, nor will it build or operate any power plants. During the planning phase (until late 2012) a suitable framework for the long-term development of renewable energies will be set up to invest in a new generation of plants and power grids. Dii will launch several reference projects to demonstrate the fundamental viability of the Desertec vision. In spring 2011, the *Moroccan Agency for Solar Energy* (Masen) and Dii signed a *Memorandum of Understanding* (MoU) about a reference project and they jointly plan:

- installed capacity: 400 MW solar thermal power station, 100 MW photovoltaic plant;
- output: approximately 1.4 - 1.6 TWh of renewable energy;
- export: 80 per cent to Europe, of which approximately 1 TWh of energy to Germany;
- percentage of energy supplied locally: 20 per cent;
- a contribution towards achieving the 2020 environmental protection objectives.⁸¹

The amount of investment required by this project is estimated at between €1.7 billion and €2 billion.⁸² Also in spring 2011, Dii and STEG Energies Renouvelables initiated a feasibility study for solar and wind energy projects in Tunisia.⁸³ In Egypt, an intensive debate is focusing on nuclear vs. solar energy. At an energy seminar on 9 June 2011 in Cairo, analysts argued that

Egypt could generate more power through solar energy than through a multi-billion-dollar nuclear program. Speakers referred to the European Union, members of which were abandoning nuclear reactors in wake of the recent disaster in Japan. ... The analysts said Egypt could exploit winds that blow along the Gulf of Suez to generate 20,000 megawatts of electricity. Egypt's nuclear program has envisioned the acquisition of 1,000 megawatt reactors.⁸⁴

Both initiatives, the MSP of the UfM and the Dii of the private sector could become conceptual components of a far more ambitious *EU-MENA Survival Pact* (Brauch 2002a, 2010) linking two essential commodities: food or 'virtual water' and sustainable solar energy or 'virtual sun' (37.6.9).

37.5.7 Political, Economic, and Security Assessments of a Euro-Mediterranean Energy Partnership through the MSP and Desertec

The Desertec project triggered a policy debate that addressed political, economic, and security considerations, considerations that since spring 2011 had been increasingly influenced by the political changes in North Africa with the ousting of the regimes in Tunisia and in Egypt.

Desertec was heavily criticized by the founder of Eurosolar, Hermann Scheer, who argued that a decentralized expansion of solar and wind power in Germany could be more cost-effective and reliable than importing renewable energy sources from North Africa. He favoured a decentralized energy supply to a large supply and transmission structure controlled by a few huge energy companies.⁸⁵ The Desertec Foundation replied that both international renewable energy networks and small decentralized renewable energy systems could make major contributions to reducing GHG emissions.⁸⁶ Besides cost considerations, centralized vs. decentralized systems, and large vs. small suppliers of renewable energy sources, security considerations also played a major role, i.e. Euro-

80 This is based on a personal communication from Gerhard Knies of mid-July 2011 summarizing the proposals that were made at this workshop.

81 Karl-Eric Stromsta: "Morocco may fold Desertec Flagship into national solar plan", 13 June 2011; see at: <<http://www.rechargenews.com/energy/solar/article/261445.ecce>> (16 July 2011); "Morocco aims to set up concentrated PV supply chain", 17 June 2011; at: <<http://optics.org/news/2/6/19>>.

82 See Dii Newsletter, July 2011, p. 3 of 7; at: <<http://www.dii-eumena.com/index.php?id=186#CI118>>.

83 Markus Balsler: "Desertec in Tunesien: Wüstenstrom nach der Revolution", in: *Die Süddeutsche*, 11 April 2011; at: <<http://www.sueddeutsche.de/wirtschaft/desertec-in-tunesien-wuestenstrom-nach-der-revolution-1.1083604>>.

84 "Energy debate in ... Egypt: nuclear vs. solar", in: *World Tribune*, 16 June 2011; at: <http://www.worldtribune.com/worldtribune/WTARC/2011/me_egypt0742_06_16.asp>.

85 "DESERTEC: Warum in die Ferne schweifen, wenn das Gute liegt so nah", 17 June 2009; at: <http://www.eurosolar.de/de/index.php?option=com_content&task=view&id=11088&Itemid=273>.

86 "Antwort von DESERTEC auf Eurosolar", 14 July 2009; at: <<http://www.sein.de/gesellschaft/nachhaltigkeit/2009/antwort-von-desertec-auf-eurosolar.html>>.

pean energy autarky vs. instability in North Africa, or independence vs. a complex interdependence between Europe and the MENA countries.

According to Mouldi Miled (Tunisia), executive director of the DUN, Europe could “gain 10 to 15 years in the fight against climate change” by importing solar energy from North Africa, as well as meeting its renewable energy commitments. For supporters from the MENA, Desertec is seen “as a boon both for their nations’ development and for their science, engineering and manufacturing communities”. According to the *New York Times*, for many scientists from North Africa, Desertec could help “to build bridges between the north and south” and they argued that the Arab spring “will yield to strong democracies that will better enable projects like Desertec”.⁸⁷ At a conference in Hamburg in mid-June 2011, Egyptian participants argued that the components for these solar energy projects should at least be 80 per cent locally produced and one participant

proposed the development of an EUMENA solar energy center of excellence to exchange research. He recommended developing a blueprint of priorities that benefit both European and North African countries such as Egypt, which boasts the world’s first solar thermal power plant and has attracted billions in solar and wind development in the past decade.

However, according to a World Bank study, “at the moment, all the electronic components would be imported into North Africa”, but with knowledge transfer and training of local manpower “by 2030, the region would see a mix of pure local production and local production with international firms. The region could create about 80,000 jobs in construction services and manufacturing if it can produce between 5 and 7 gigawatts of electricity.” In 1999, a report recommended a set of policy measures in support of a development partnership on renewables in the Mediterranean for NGOs, universities and research institutes, the German federal and the state governments, the European Union, and industry (Brauch 1999). The DUN is creating a framework for developing these suggestions further and for setting up the scientific and technical expertise and training the manpower to

87 This section relies heavily on several reports on a DESY conference in Hamburg, e.g. by Lisa Friedman: “Can North Africa Light Up Europe with Concentrated Solar Power?”, in: *The New York Times*, 20 June 2011; at: <<http://www.nytimes.com/cwire/2011/06/20/20climate-wire-can-north-africa-light-up-europe-with-concen-79708.html?pagewanted=all>>.

be able to produce many of the components needed locally.

Prior to the Arab spring of 2011, several analysts were sceptical about the Desertec scheme, mentioning the authoritarian regimes in MENA countries, the high degree of instability, and the danger of Islamist regimes that could threaten this region with an additional energy dependence in the electricity sector. Others mentioned structural financial and commercial barriers due to the costs of the power plants and the electricity network, and conflicts of interests.

Werenfels and Westphal (2010: 35-36) mentioned among major security risks a lack of legal and investment security, but they also noted that Desertec could contribute to more political stability in the longer term. Despite the difficult context, they argued for a rapid realization of CSP pilot projects in North Africa, balancing the considerable risks with a guaranteed financial return and creating a commercial platform for green electricity prior to exporting solar electricity from North Africa to Europe. Schinke and Klawitter (2010) discussed DESERTEC as a component of a security architecture within the MENA-EU area,⁸⁸ while Klawitter (2010) suggested “a sustainability framework for the DESERTEC concept”.

Since the Arab revolutions in 2011, several analysts have become more favourable, pointing to the potential of sustainable co-development between the EU and MENA regions (Bauer/Hanelt 2011; Achraimer/Bosold 2011), while others called for a Euro-Mediterranean geostrategic interest policy (Grad/Viëtor 2011, 2011a) as part of a strategy of capacity development in the framework of a forward-looking European Neighbourhood Policy (Böttger 2010; Christensen 2011). A special issue of *Energy Policy* (vol. 39, 2011) reviewed the *Energy Futures of North Africa* in detail (Mason/Kumet 2011)⁸⁹, and a Special Report of Working Group III of the IPCC (2011) assessed the *Renewable*

88 Boris Schinke; Jens Klawitter: *DESERTEC – Baustein einer neuen Sicherheitsarchitektur innerhalb des MENA-EU-Raums?* (Bonn: Germanwatch, May 2010); at: <http://www.krium.de/images/stories/hintergrundpapier_desertec.pdf>. For the workshop on this theme on 6 May 2010 in Berlin; at: <http://www.krium.de/index.php?option=com_content&view=article&id=2071%3Aexpertenworkshopdesertec-baustein-einer-neuen-sicherheitsarchitektur-innerhalb-des-mena-eu-raumsq&catid=102&Itemid=164>. See the opening lecture by Brauch, at: <http://www.afes-press.de/html/pdf/Brauch_Berlin_DESERTEC_100506.pdf>. And a conference report at: <http://www.krium.de/index.php?option=com_content&task=view&id=2080&Itemid=158>.

Energy Sources and Climate Change Mitigation (SRREN) while a forthcoming report from Working Group II will assess *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation* (SREX).⁹⁰

37.5.8 IPCC Special Report on Renewable Energy Sources and Climate Change Mitigation

In May 2011 the IPCC released its *Special Report on Renewable Energy Sources and Climate Change Mitigation*⁹¹. This stressed that the demand for energy is rising in order to meet “social and economic development and improve human welfare and health” and “to meet basic human needs”, and that this has resulted in the Anthropocene (since 1850) in a growing “use of fossil fuels (coal, oil and gas)” and a “rapid growth in carbon dioxide (CO₂) emissions”. By the end of 2010,

the concentration of CO₂ in the atmosphere had grown “to over 390 ppm, or 39 per cent above preindustrial levels”. The IPCC Special Report (IPCC 2011: SPM: 3 of 24) pointed to “multiple options for lowering GHG emissions from the energy system while still satisfying the global demand for energy services”, and focused specifically on “the role that the deployment of RE technologies can play within such a portfolio of mitigation options” and “contribute to social and economic development, energy access, a secure energy supply, and reducing negative impacts on the environment and health”. It referred twice to the Desertec project:

- Sun-belt areas such as deserts and the Mediterranean littoral are abundant in direct normal radiation (cloudless skies) and suitable for concentrated solar thermal power plants. Export of solar and wind-generated electricity from the countries rich in these resources could become important in the future (Desertec 2010) [chap. 1, p. 39 of 68].
- Furthermore, very-large-scale PV systems with capacities ranging from several MW to GW are beginning to be planned for deployment (Komoto et al. 2009). In the long term, these systems may play an important role in the worldwide energy network (DESERTEC Foundation 2007), but may demand new transmission infrastructure and new technical and institutional solutions for electricity system interconnection and operational management [chap. 3, p. 60 of 100].

According to the IPCC (2011 [chap. 3: p. 10 of 100]), the total annual technical potential of solar energy for the world would be between a minimum EJ (exajoules) of 1,575 and a maximum EJ of 49,837 (Rogner/Barthel/Cabrera et al. 2000). Western Europe would account only for a minimum of 25 EJ and a maximum of 914 EJ, while the Middle East and North Africa offer a minimum technical potential of 412 EJ and a maximum potential of 11,060 EJ, compared with the global primary energy supply in 2008 of 492 EJ. Thus, the minimum technical solar potential of the MENA region (412 EJ) could have supplied 80 per cent of the global primary energy supply in 2008, while its maximum potential could have supplied 22.5 times the energy supply in 2008. According to the IPCC (2011 [chap. 3: p. 38 of 100]) in 2007

the first major CSP plants came on line with Nevada Solar One (64 MWe, USA) and PS10 (11 MWe, Spain). In Spain, successive Royal Decrees ... have stimulated the CSP industry ... As of November 2009, 2,340 MWe of CSP projects had been preregistered for the tariff provi-

89 This special issue of *Energy Policy* (vol. 39 [2011]: 4407-4519) contains assessments on the resources-based and sustainable development schemes in Egypt's recent energy policy (Suding 2011); on “the renewable energy targets of the Maghreb Countries” (Brand/Zingerle 2011); on the “Integration of renewable energies and nuclear power into North African Energy Systems” (Supersberger/Führer 2011); on the “potential role of concentrated solar power (CSP) in Africa and Europe” up to 2050 (Viebahn/Lechon/Trieb 2011); on “the security of energy infrastructure and supply in North Africa: Hydrocarbons and renewable energies in comparative perspective” (Lacher/Kumetat 2011); on the “international and European market mechanisms in the climate change agenda – An assessment of their potential to trigger investments in the Mediterranean solar plan” (Folkmanis 2011); on “economic and geopolitical dimensions of renewable vs. nuclear energy in North Africa” (Marktanner/Salman 2011), and on “Algerian renewable energy assessment: The challenge of sustainability” (Stambouli 2011).

90 See for details at: <<http://www.ipcc-wg2.gov/AR5/extremes-sr/index.html>>, and for the structure of the report and lead authors; at: <http://www.ipcc-wg2.gov/AR5/extremes-sr/authors/writing_team_pb.html>.

91 This IPCC report assessed the linkages between “renewable energy and climate change” (Chap. 1), specifically on “bioenergy” (chap. 2), “direct solar energy” (chap. 3), “geothermal energy” (chap. 4), “hydropower” (chap. 5), “ocean energy” (chap. 6), “wind energy” (chap. 7), “integration of renewable energy into present and future energy systems” (chap. 8), “renewable energy in the context of sustainable development” (chap. 9), “mitigation potential and costs” (chap. 10), and “policy, financing and implementation” (chap. 11); the report is for download at: <<http://srren.ipcc-wg3.de/>>.

sions of the Royal Decree. In the USA, more than 4,500 MWe of CSP are currently under power purchase agreement contracts. The different contracts specify when the projects must start delivering electricity between 2010 and 2015 (Bloem et al., 2010). More than 10,000 MWe of new CSP plants have been proposed in the USA. More than 50 CSP electricity projects are currently in the planning phase, mainly in North Africa, Spain and the USA.

Since 2010, Spain has become the leading country for the deployment of CSP and is projected to be overtaken by 2015 by the US, with several MENA countries (Israel, Jordan, Egypt, Algeria, Morocco, Tunisia, and Abu Dhabi) in equal third place and China in fourth. If the DESERTEC scheme were to be gradually implemented after 2012 following pilot projects in Morocco, Tunisia, and Egypt, the MENA Region could become the major region for a massive build-up of the new solar thermal and PV (Faiman 2009) CSP systems.

While the MSP and the Desertec Initiative have increasingly dominated the policy debate, the Mediterranean Climate Change Initiative (37.5.9) has received little support, and conceptual proposals for a MEDSEC or MEHSEC Initiative (37.5.10) have not so far been taken up.

37.5.9 Mediterranean Climate Change Initiative

During the Greek presidency of the Human Security Network in 2007/2008, the Greek foreign ministry put climate change as a human security issue on the agenda of the Human Security Network (Fuentes/Brauch 2009).⁹² On 22 October 2010, the Greek Government of Prime Minister Papandreou launched the *Mediterranean Climate Change Initiative* (MCCI)⁹³ in collaboration with leaders from across the Mediterranean and with the support of the European Invest-

92 See details at: <http://www.mfa.gr/www.mfa.gr/Articles/en-US/230508_TC_1203> (28 November 2010) and also the leaflet with the key goals; at: <<http://www.mfa.gr/softlib/LEAFLET.pdf>>.

93 Among the speakers at this one-day launch event were the president of the European Investment Bank, representatives of the World Bank, the chair of the IPCC, and the former Environment Commissioner of the EU Commission, as well as prime ministers from Greece, Libya, Malta, the Palestinian Authority, and Turkey, ministers from Albania, Bulgaria, Croatia, Cyprus, Egypt, FYR Macedonia, Italy, Mauritania, Romania, Serbia, Syria and Turkey, and ambassadors and experts from Mediterranean countries.

ment Bank. Its aims are to accelerate the region's responses to the impacts of climate change and to lead by example the transition to a low carbon development model. This follows its vision note⁹⁴ which refers to the UfM's Solar Plan and to plans to implement specific projects within the UfM framework.

In addition, a Mediterranean Green Development Investors' Forum was held on 23 October 2010 in Athens. The vision note suggested among the proposed priority projects for the *Mediterranean Climate Change Initiative*: a) a Mediterranean Climate Sensitive Development Charter; b) Sustainable Mediterranean Cities; c) a Mediterranean Climate Change Fund; and d) a Mediterranean Climate Change Service Network.

The Joint Declaration that was adopted by the participating government representatives, among them Prime Minister Erdogan of Turkey, pointed to its dual focus "as both an autonomous Mediterranean political initiative ... [and], as a projects-based initiative to be eligible for the UfM branding" with its goal "to strengthen collaboration on convergent challenges and opportunities ... and place a greater focus on the implementation of UfM projects in the Mediterranean region".⁹⁵ During 2011, the planned ministerial-level Working Group in Malta to address specific adaptation policies and challenges was cancelled, and in July 2011 it was unclear whether Turkey, the country with the highest increase in GHG since 1990 among Annex I countries (figures 37.13 and 37.14), would host the Second Annual Meeting of the MCCI in late 2011.

37.5.10 Proposals for a MEDSEC or MEHSEC Initiative

In March 2009, after a workshop in Barcelona, a partnership was formed between the CIDOB Foundation of Barcelona, the *Barcelona International Peace Resource Center* (BIPRC), OSCE, the *Center for Environment and Development for the Arab Region and Europe* (CEDARE), UNU-EHS, GRID-Arendal, a collaborating centre of the *United Nations Environment Programme* (UNEP), and the Zoë environment network. It proposed the launch of a *Mediterranean En-*

94 See the Mediterranean Climate Change Initiative; at: <<http://www.medclimatechangeinitiative.org/node/1335>>.

95 Joint Declaration on the establishment of The Mediterranean Climate Change Initiative adopted in Athens on 22 October 2010. Source: <<http://www.medclimatechangeinitiative.org/sites/default/files/Joint-Declaration.pdf>>.

vironmental Security Initiative (MEDSEC). A report was published and the initiative is gradually moving ahead.⁹⁶

This author has suggested launching a *Mediterranean Environmental and Human Security Initiative* (MEHSEC) within the UfM that would address the manifold challenges posed by global environmental and climate change to the security of the Euro-Mediterranean region (Brauch 2011b). This MEHSEC Initiative would combine the regional soft security approach of the EMP (BP) and of the UfM with ideas of the “human security doctrine for the European Union” (Study Group on Europe’s Security Capabilities 2004; Kaldor 2007; Glasius/Kaldor 2005) and with the environmental security approach of the *Madrid Declaration on Environment and Security* of the OSCE (2007). By July 2011, neither proposal for a MEDSEC or for a MEHSEC initiative had been taken up by policymakers.

This MEHSEC initiative should include, besides the OSCE, UNDP, UNEP, FAO, WMO, and the IPCC, the Secretariat of the UfM, so as to avoid policy competition and guarantee funding. Small-scale functionally-oriented partnership-building projects would provide the scientific knowledge for understanding not only the multiple security dangers presented by the impacts of GEC and climate change but also the potential for proactive functional scientific cooperation.

Within the framework of a MEHSEC initiative, all relevant conceptual activities of the different DGs of the European Commission and the Council dealing with the Mediterranean region and addressing human and environmental security dangers and concerns should be horizontally coordinated. The clear policy goal should be to develop an integrated strategy for addressing the security implications of regional climate change, desertification, and water stress, as well as the direct humanitarian consequences of increased climate-related hazards and the mutual need for an uninterrupted supply of food and sustainable energy.

The MEHSEC Initiative should develop a joint policy agenda that enables proactive policies for coping with *short-term effects* (natural hazards such as drought, heatwaves, forest fires, and flash floods), *medium-term impacts* (on precipitation, water stress, desertification, on agriculture through declining crop yields, and on the climate-induced movement of peo-

ples), and *long-term consequences* (sea-level rise in deltas and coastal regions) of climate change in the Euro-Mediterranean region, through the development of joint adaptation and mitigation capacities.

37.5.11 Climate Change, Migration, and European Security Policy

In December 2008, the European Council adopted a report on the implementation of the European Security Strategy of 2003, noting that “natural disasters, environmental degradation and competition for resources exacerbate conflict, especially in situations of poverty and population growth, with humanitarian, health, political and security consequences, including greater migration”. The EU stressed that “we have enhanced our conflict prevention and crisis management, but need to improve analysis and early warning capabilities”. This requires that “we must step up our work with countries most at risk by strengthening their capacity to cope”.

The trends of projected climate change impacts, hydro-meteorological hazards and their effects on declining crop yields and food supply in the MENA present challenges for international, regional, national, and human security (Brauch 2008, 2009b). The European Council has acknowledged that climate change will severely affect the Middle East, and that climate-induced migration will be an increasingly important and major security issue in the future (EU 2003, 2008, 2008a).

One major trigger for both the EMP and the UfM has been trans-Mediterranean migration from and through the MENA and Balkan countries to the EU. However, since the 1980s migration trends have fundamentally changed. Spain, Italy, Greece, and Turkey have shifted from states of emigration to countries of immigration and transmigration (Brauch 1997, 1997a, 1997b, 1998, 2000/2001, 2002, 2007; Zlotnik 2003; de Wenden 2003). The stream of ‘distress migrants’ across the Sahara and the Mediterranean has increased (Fargues 2005, 2006, 2007, 2009). A number of reactive policy measures could neither turn the tide nor could they address the root causes of why millions of people are on the move. There is a need for a proactive securitization of climate change and migration in the Mediterranean in terms of international, national, and human security.

However, the European response to increasing migration from North Africa in the aftermath of the Arab revolutions in 2011 was both partly inconsistent with its adopted and declared policies and “overly re-

96 See: <<http://medsecnet.org/en/publications.html>> and at: <<http://www.zoinet.org/fileadmin/publications/Medsec.pdf>>.

strictive” (Guild 2011). In spring 2011, the enforcement of “Europe’s borders has meant abandoning some of its principles” and has contributed to “militarizing the Mediterranean” (Bertin/Fontanati 2011).

At the Paris Summit of 13 July 2008 that launched the UfM, the states shared “the conviction that this initiative can play an important role in addressing ... climate change and desertification, with the view of promoting sustainable development”. The representatives of the 43 participating governments stressed: “the importance of strengthening food security, especially taking into account the consequences of climate change on food crops”. They adopted two policy initiatives on civil protection dealing with geophysical and man-made natural disasters and launched the MSP.

The Marseille Meeting of the Euro-Mediterranean Ministers of Foreign Affairs in November 2008 agreed that “climate change could adversely affect the environment and human activities in the Mediterranean”. The ministers “recalled the need to intensify co-operation on climate change through the establishment of a Euro-Mediterranean Climate Change Network to provide the forum for the sharing of information and experience ... to build relationships ... in support of regional efforts to combat climate change”. The Horizon 2020 Steering Group addresses “questions of mitigation/adaptation to climate change, biodiversity protection and conservation of the Mediterranean seabed”. But these policy declarations lacked a sense of urgency.

In 2011, neither the EU and its member countries nor the United States and its intelligence agencies foresaw the fundamental changes in the Arab World. While both had repeatedly called for democratic change, both had preferred stability through massive support for repressive regimes. Since January and March 2011, two series of events, the revolutions in the Arab world and the Fukushima nuclear catastrophe, have placed the MSP and the Desertec concept and initiative into a wider policy context by adding additional incentives and pressures unrelated to climate change impacts.

37.6 Climate Change Impacts for the MENA Region, Cascading Effects: Policy Context for Proactive Sustainable Policies

How did the strategic and scientific literature project the causal relationship between global environmental and climate change and their security implications for

the MENA region prior to the ‘jasmine’ or ‘Arab revolutions’ or ‘Arabellion’ in winter and spring of 2011? Did the emerging literature on climate change and international, national, and human security foresee the fundamental political changes in North Africa and in the Middle East? Did the technical literature and the natural and engineering sciences consider the possibility of the cascading effects of a major earthquake in Japan, triggering a tsunami that resulted in a meltdown of several reactors in the Fukushima nuclear complex? To what extent have the physical and societal effects of GEC become a trigger or intensifying factor for the urgency to pursue strategies for sustainable economic co-development?

37.6.1 Analysis of Climate Change and Security in the MENA Region

37.6.1.1 Climate Change and National Security: US Perspectives

In 2009, the US *National Intelligence Council* (NIC) of the *Central Intelligence Agency* (CIA), published a study and a conference report on *North Africa: The Impact of Climate Change to 2030* as part of a three-phase approach: a) contracted research on the latest scientific findings on the impact of climate change; b) a workshop with experts from outside the *Intelligence Community* (IC) was to “determine whether anticipated changes from the effects of climate change will force inter- and intra-state migrations, cause economic hardship, or result in increased social tensions or state instability within the country/region”, and c) “the NIC’s *Long-Range Analysis Unit* (LRAU) will lead an IC effort to identify and summarize for the policy community the anticipated impact on US national security” (NIC 2009: 1).⁹⁷

In the first phase, the commissioned NIC Study stated that “model projections available for North Africa indicate a clear increase in temperature over the next 20 years that is expected to continue throughout the 21st century, probably at a rate higher than the estimated global average”. The study claimed that *climate change* (CC) “will induce some variations in precipitation patterns, but the trend is not clear, as some models predict slight increases and others predict slight decreases in annual precipitation amounts”. Further, “model simulations also suggest a drying trend in the region, particularly along the Mediterranean coast, driven by large decreases expected in summertime precipitation” and “The *Regional Climate Change Index* (RCCI) identifies the Mediterranean as a very responsive region to climate change (‘Hot-

Spot’).⁹⁸ The NIC Study also noted that “given the ecological and socioeconomic characteristics of the southern Mediterranean countries, the impact of climate change may be more marked than in other regions of the world”, while “most of the predicted impacts in the region are already occurring regardless of climate change (e.g., water stress and desertification). Climate change is expected to exacerbate these trends”. The study reviewed the impacts of climate change on a) water stress, b) agriculture, c) migration, d) natural disasters, e) tourism, and f) energy. With regard to migration, the ‘Executive Summary’ of this study argued:

Thus far, experts have not cited climate change as a driving force for migration in the region; nevertheless, a warmer climate and changing precipitation patterns, which will likely reduce viable cropland and reduce access to water, will increase urbanization and make accommodating the needs of a growing population more difficult. Besides food and water necessities, climate change-related migration may also imply greater demands on infrastructure along the coasts as well as ethnic, racial, or religious clashes.

The NIC’s Study on North Africa forecast that “Morocco and Algeria’s water resources will be reduced by 10-15 per cent by 2020, Tunisia’s water resources will decline by 28 per cent by 2030, and 74.8 per cent of Egyptians will have less than adequate fresh water by the same year”. As a policy impact the NIC study foresaw that “conflicts over water, as have been observed in the past, are likely to surface between African countries”. This study also foresaw that an “increased migration from Sub-Saharan Africa and increased inter-

nal migration to urban areas will place further pressures on water resources, food availability, infrastructure and the ecosystem”, and that “North Africa is one of the regions with the largest predicted impacts from flooding given its close proximity to the Mediterranean Sea and the highly concentrated and poor populations along the coasts”.

In the second phase, the workshop report on climate change impacts for North Africa to 2030 pointed to the ‘geopolitical implications’, where the participants concluded

that systemic state failures attributable solely to climate change to 2030 are not likely. However, climatic stress coupled with socioeconomic crises and ineffective state responses could generate localized social or governmental collapses and humanitarian crises. The effects of climate change in North Africa will exacerbate the region’s existing challenges of insufficient water and food resources, low economic growth, inadequate urban infrastructure, and weak sociopolitical systems. ...

- Climatic stress will add to the already substantial migration from rural areas into cities, exacerbating the region’s urban challenges. Cities will face deteriorating living conditions, high unemployment, and frequent civil unrest.
- The region is likely to face civil conflicts over scarce resources such as water, arable land, food, or employment, which may be expressed in sectarian, ethnic, or anti-regime tensions (NIC 2009a: 3).

The US NIC’s conference report pointed to an increasing conflict potential due to climate change:

North Africa faces increased risks of interstate conflict with southern neighbours over the next 20 years owing to the impacts of climate change. ...

Climate change will likely increase the already substantial emigration of North Africans to Europe. The region will serve as a route for transmigration of Sub-Saharan Africans fleeing severe climatic stress.

- North African states will seek to encourage emigration as a safety valve, relieving demographic, resource, and employment pressures.
- European and North African cooperation to prevent an influx of Sub-Saharan African migrants may result in European states turning a blind eye to North African human rights abuses as long as migration is kept under control.

North Africa’s capacity to adapt to climate change is inhibited by underdeveloped and disempowered civil societies and the dominance of repressive but often ineffectual regimes (NIC 2009a: 3-4).

The NIC’s conference report combined the prevailing enemy image of the threat posed by Islamist groups with its analysis of climate change impacts, arguing

97 See NIC, 2009: *North Africa: the Impact of Climate Change to 2030* (NIC: August 2009-007D): “This assessment identifies and summarizes the latest peer-reviewed research related to the effects of climate change on selected countries in North Africa, drawing on the literature summarized in the latest Intergovernmental Panel on Climate Change (IPCC) assessment reports, National Communications to the United Nations Framework (UNFCCC) on Climate Change, and on other peer-reviewed research literature and relevant reporting. It includes such impacts as sea-level rise, water availability, agricultural shifts, ecological disruptions and species extinctions, infrastructure at risk from extreme weather events (severity and frequency), and disease patterns. This paper addresses the extent to which the countries in the region are vulnerable to climate change impact. The targeted time frame is to 2030, although various studies referenced in this report have diverse time frames.”

98 NIC: *North Africa: the Impact of Climate Change to 2030* (NIC: August 2009-007D): 3.

that the main objective of “a few key decision-makers ... over the next two decades will be to bolster regime security and resilience against climate change-induced instability”, but it also claimed that “longstanding state suppression of civil mobilization and a lack of social capital will significantly constrain the capacity of civil society to address climate change”, while “ineffective state responses and state suppression of civil society allow Islamist groups to fill the void. Climatic stress will create opportunities for both moderate and extremist Islamist groups to expand their influence in North Africa.”

The report further claimed, partly misjudging the events that led to the ‘Arab revolutions’ of early 2011, that “North African states and societies have repeatedly shown the capacity to withstand sustained challenges without overall systemic collapse”, and that

North African states have robust capacity to maintain social control in the face of challenges and destabilization. They are adept at controlling information, deflecting blame, and suppressing opposition. Despite widespread institutional deficiencies, North African states have demonstrated the capacity to marshal considerable national resources and tackle large-scale infrastructure projects. ... Libya and Algeria are less economically vulnerable to challenges that arise from climate change because their economies are supported by exporting fossil fuels and are not dependant upon agriculture or tourism. North African states will actively seek Western assistance in addressing climate change. ... North African states will leverage the threat of unrestrained migration or regional collapse to secure increased Western aid. Europe has a strong interest in preventing spill-over from climate change-induced instability in North Africa and will likely intervene to avert state failures or social collapses. North Africa will absorb an increasing proportion of Europe’s attention and resources.

Thus, the two NIC reports of 2009 on North Africa did not forecast that major political regime change would occur before 2030, because they assumed relatively high regime stability. Tunisia and Egypt were also classified as quite stable in a study for the German Marshall Fund of the US, on *Mapping Climate Change and Security in North Africa*, where Bushby, White, and Smith (2010: iii) combined four sources of vulnerability: “climate-related hazard exposure, population density, household and community resilience, and governance and political violence”. They found that a “medium vulnerability exist[s] along the Mediterranean coastline in Morocco, Algeria, and Egypt”. They argued that the “relatively good governance in ... Tunisia ... drives down their overall vulnerability”. In their rankings of North African governance, Morocco is in the lead, followed by Tunisia, Egypt, Algeria, and

Libya, while in their ranking of political stability, Libya was most stable, followed by Morocco, Tunisia, Egypt, and Algeria. These two examples show the difficulty faced by US national security in predicting political stability while relying on present strategic perceptions. The failures of the intelligence services, of the strategic studies, and of the *International Relations* (IR) community to foresee the political changes of 1989, 2001, and 2011 points to a major methodological problem: structural trends can be forecast, but political events cannot be predicted.

37.6.1.2 Climate Change and International Security: European Perspectives

In its joint study, the Council and the European Commission (EU 2008) considered the Middle East as one of the hotspots and climate-change-induced migration as a major security concern for the EU:

Since the EU’s neighbours include some of the most vulnerable regions to climate change, e.g. North Africa and the Middle East, migratory pressure at the European Union’s borders and political instability and conflicts could increase in the future. This could also have a significant impact on Europe’s energy supply routes (EU 2008: 6).

The EU report claimed that climate change will be a major driver of ‘environmental’ migration and that “some countries that are extremely vulnerable to climate change are already calling for international recognition of such environmentally-induced migration” and indicated that “such migration may increase conflicts in transit and destination areas. Europe must expect substantially increased migratory pressure” (EU 2008: 4). The WBGU (2007, 2008: 3), in a report on *Security Risk Climate Change* that was instrumental for the EU report (2008), pointed to North Africa as an environmental hotspot for international security, where “the potential for political crisis and migratory pressure will intensify as a result of the interaction between increasing drought and water scarcity, high population growth, a drop in agricultural potential and poor political problem-solving capacities”. The WBGU study (2008: 136) also argued that

Southern Europe and North Africa are severely affected by climate change through rising temperatures, precipitation variability and rising sea levels combined with existing environmental problems. However, there are clear differences between the two major regions with regard to their vulnerability and problem-solving capacity. In southern Europe, environmental changes such as droughts and heatwaves are unlikely to lead to outbreaks of violence in the foreseeable future. Relatively high economic and social capability and support from

the EU will mitigate the impact and make long-term adaptation possible (Brauch 2006).

Reflecting the arguments in an expert study the WBGU (2008: 136) stated:

The North African countries, by contrast, are far more vulnerable, because their environmental situation is significantly worse than that of southern Europe and their societies have less problem-solving capacity. The interaction of high population growth, the critical importance of agriculture for the economy and society, weak governance capacities and existing conflicts within society make these states, caught up as they are in political reform processes, particularly vulnerable to the effects of climate change. As usable land and water resources become increasingly scarce and use of non-sustainable methods of agriculture continues, desertification will cause further impoverishment and the risk of water- and land-related conflicts at regional and local level will increase throughout North Africa (Brauch 2006).

The WBGU (2008: 136) and the EU (2008) focused on an international security perspective, where

the risk of destabilization applies not only within these countries; the situation can have consequences for the stability of the entire region. One result of climate change will be further emigration from rural areas to cities and migration via the countries of North Africa to the EU countries. Migration issues will therefore become increasingly sensitive; in southern Europe this could trigger potentially violent conflicts (e.g. the youth riots in France in 2005). In the long term – i.e. after 2025/30 – the possibility of water conflicts between Egypt and individual countries of the Nile basin cannot be excluded if Egypt's water supply is significantly reduced by the actions of countries further upstream, thereby endangering Egypt's viability. In extreme cases, these conflicts might involve violent interstate clashes (Brauch 2006). The consequences of such an escalation in political and security terms might be felt far beyond the region.

So far there have been few integrated assessments of climate change security hotspots in the Mediterranean (chap. 5 by Scheffran/Link/Schilling; Schilling/Scheffran/Link 2010; Link/Piontek/Scheffran/Schilling 2010; Scheffran/Battaglini 2011; Schilling/Freier/Hertig/Scheffran 2011).

37.6.2 Foresight Gap: Victims of Worldviews and Mindset

The strategic studies and intelligence community failed to foresee the global turn of 1989 (Gaddis 1992–1993) with the peaceful implosion of the Socialist world, just as they failed to foresee the 'jasmine revolution'. In both cases, many strategic thinkers and IR

specialists were the victims of their own worldview and their image of the Communist (red) or Islamist (green) enemy. This mindset prevailed in the conference report cited above and sponsored by the US NIC (2009, 2009a). The prevailing Hobbesian or realist mindset of many strategists is somewhat static and projects present enemy images as assumptions into the future. Climate change has been addressed from this prevailing realist mindset in the US debate on impacts on US national security since 2003 (Schwartz/Randall 2003; CNA 2007).

37.6.3 Cascading Processes I: Revolutions in the Arab World in 2011

A "cascading process" (Kominek/Scheffran 2011)⁹⁹ began on 17 December 2011, when Mohammed Bouazizi, a young and desperate fruit and vegetable seller from Sidi Bozid (Tunisia),¹⁰⁰ committed suicide, and this ignited massive protests in Tunisia that spilled over to Algeria on 5 January 2011 and to Egypt on 25 January 2011.¹⁰¹ Within three weeks, the Tunisian President Zine el-Abidine Ben Ali was forced to leave Tunisia (on 14 January 2011) after 23 years of authoritarian rule (jasmine revolution). On 25 January the public unrest spread to Egypt, where President Mubarrak was forced to resign on 11 February 2011 (25 January, freedom, white, or lotus revolution).¹⁰² The public unrest then spilled over to Yemen, Bahrain, Libya, Syria, Jordan, Algeria, and Morocco, resulting in violent confrontations in Yemen, Bahrain, and Syria, and in a UN Security Council resolution to create a 'no-fly zone' in Libya, enforced by NATO since March 2011. Confounding assessments by many social scientists and strategists, this upheaval started in two countries that

99 Kominek and Scheffran (2011: 1) suggested that it is possible, using their theoretical approach, "to study the impact of major events (e.g. natural disasters, mass migrations, social movements) that trigger threshold and spill over effects, tipping points and cascading sequences, including informational cascades and inter-systemic cascades". They illustrated their theoretical approach using the Arab revolutions and the Fukushima nuclear disaster.

100 Prince el Hassan bin Talal, "The Arab spring could be a springboard for economic partnerships", in: *Europe's World* (Summer 2011): 114–117; see: *Survival*, 53,2 (April–May 2011) and: *Internationale Politik*, 66,2 (March–April).

101 See "Tunisian revolution", at: <http://en.wikipedia.org/wiki/Tunisian_revolution>.

102 See for background: "2011 Egyptian Revolution", at: <http://en.wikipedia.org/wiki/2011_Egyptian_revolution>.

were considered highly stable and closely allied with the US (Egypt) and France (Tunisia), and in one with close ties to Italy (Libya).

Analysts of the public discontent have referred to the economic situation of large sections of the society, to high unemployment, especially among the university-trained younger generation, to rapidly rising food and energy prices, and to corrupt governments and repressive regimes that employ censorship. While climate change and environmental factors have not been the major cause, nevertheless the fallout from climate-related hazards elsewhere resulting in rapidly growing food prices has been a significant contributing factor.

37.6.4 Cascading Processes II: Impacts of Fukushima

The second set of cascading processes was initiated by a major earthquake on 11 March 2011 that triggered a tsunami that resulted in the meltdown of several nuclear reactors, so that two related geophysical hazards resulted in a technological catastrophe that cost close to 30,000 lives in Japan. The Fukushima Daiichi nuclear disaster “is a series of equipment failures, nuclear meltdowns, and releases of radioactive materials at the Fukushima I Nuclear Power Plant” that “comprises six separate boiling water reactors maintained by the *Tokyo Electric Power Company* (TEPCO)”.¹⁰³ According to Arnold Gundersen “Fukushima is the biggest industrial catastrophe in the history of mankind”.¹⁰⁴

Kominek and Scheffran (2011) illustrated the second cascading process by the impact of an earthquake that hit Japan and caused a tsunami triggering the meltdown of several nuclear reactors at the Fukushima Daiichi complex, and the effect this had on a state election in the German state of Baden-Württemberg two weeks later, where the first Green prime minister was elected in a traditionally conservative state.

While the first series of cascading processes has initiated a major process of societal transformation within the Arab world, both primarily peaceful (in Tunisia and Egypt, although several hundred people were killed there by the supporters of the old regimes and their repressive police and internal security forces) and bru-

tally violent (Libya, Syria, and Yemen), the second illustrated Ulrich Beck’s ‘world risk society’ (2011) that claims “that modern societies are shaped by new kinds of risks, that their foundations are shaken by the global anticipation of global catastrophes”. According to Beck:

The security dream of first modernity was based on the scientific utopia of making the unsafe consequences and dangers of decisions ever more controllable; accidents could occur, as long and because they were considered compensatable. If the climate has changed irreversibly, if progress in human genetics makes irreversible interventions in human existence possible, if terrorist groups already have weapons of mass destruction available to them, then it’s too late. Given this new quality of ‘threats to humanity’ – argues Francois Ewald (2002: 275) – the logic of compensation breaks down and is replaced by the principle of precaution through prevention. Not only is prevention taking precedence over compensation, we are also trying to anticipate and prevent risks whose existence has not been proven.

The Fukushima nuclear disaster has had global, incalculable, and non-compensable consequences that in some countries have challenged nuclear energy as an ethically acceptable and ‘climate-friendly’ energy source that could help strategies for a decarbonization of the economy. The two cascading chains of events, both political and societal as well as technological and societal, pose closely related policy challenges for decision-makers in the EU and MENA countries.

Kominek and Scheffran (2011: 10-12) suggested applying their concept of “cascading processes” to the possible “risk cascades of climate change”, arguing that “climate change is a macro phenomenon that could simultaneously affect and challenge natural and social systems all over the world, thus containing the risk of multiple cascades connecting these systems”. They argue that

there is a deficit in understanding the social dynamics in response to climate-related events such as floods and droughts and whether there are cascading sequences and tipping points in climate-society interaction. The complex causal chains can be constructed through a network of interconnections based on the sensitivities between key variables and actions (Scheffran 2011; chap. 5 by Scheffran/Link/Schilling).

Kominek and Scheffran (2011: 11) argue that it is possible with their approach “to study the potential for cascading sequences of climate-related events (mass migrations, extreme weather events, food insecurity, social movements, and conflicts)” but also “the collective behavioural changes in a sustainability transition”. But they also note

103 “The Fukushima Daiichi nuclear disaster”, at: <http://en.wikipedia.org/wiki/Fukushima_Daiichi_nuclear_disaster>.

104 “Fukushima: World’s Worst Industrial Disaster Reveals How Nation States Are Powerless to Protect Us from Advanced Technology”, in: *AlterNet*, 27 June 2011.

Whether climate risk cascades will actually happen is hard to predict. It may well be possible that for the time being climate signals affect one layer in the causal chain but may not be strong enough to penetrate to other levels and thus fizzle out in the causal chain. With this analysis it is possible to estimate the probability of future destabilizing events occurring under specified conditions, which has implications for developing an early warning system. Climate change could also lead to 'path creation' in the sense of inducing new pathways that support a sustainability transition (Garud/Karnøe 2001).

For the analysis of the non-linear effects of events triggered by the earth system (e.g. natural hazards) on human and political systems, the analysis of 'cascading processes' in a 'world risk society' may offer innovative scientific insights. The question that will be briefly discussed next is whether in the framework of the projected physical impacts of climate change for the MENA region (37.6.5), of the two cascading processes of the Arab revolutions, and of the Fukushima nuclear disaster, the idea of massively employing the solar energy potential of the desert regions in the global sunbelt (as suggested by the Desertec concept and the MSP) could result in a 'path creation' by "inducing new pathways that support a sustainability transition" (Kominiek/Scheffran 2011: 11; Garud/Karnøe 2001; Grin/Rotmans/Schot 2010).

37.6.5 Climate Change Impacts as a Trigger for MENA Unrest

To what extent did cascading processes of climate change impacts in one part of the world trigger the Arab revolutions that have taken place since January 2011? In March 2011, the *International Institute for Strategic Studies* (IISS) postulated that natural hydro-meteorological or climatological hazards, e.g. heat-waves and forest fires in summer 2010 in Russia, Ukraine, and Kazakhstan, and floods in Canada and Australia resulting in a major decline in food supply and rapidly growing food prices, created one of several major incentives for the rapid spread of public protests throughout the Arab world.

Record food prices have been just one ingredient in the unrest in the Arab world. ... Structural shifts have led to a tightening of the international food-supply system, magnifying the effect of disruptive events such as weather-related crop failures in 2010. ... The cost of wheat has been climbing since summer 2010, when drought and bushfires laid waste to crops in Russia, Ukraine and Kazakhstan, all leading exporters; the prices of sugar, maize (corn), soybeans and vegetable oils have also been rising. ...

The IISS strategic comment of March 2011 further argued

There are many reasons to link the Arab uprisings to food-price inflation. With little arable land and scarce water supplies, the ... [MENA] region imports more food per capita than any other, accounting for 25-50% of national consumption. By tonnage it is the world's largest cereal-importing area, and it is a major customer for Russian grain. Huge population growth and changing diets have contributed to the region's growing food insecurity. ... Experts in Tunisia and Egypt have described food prices as an 'aggravating factor' in the recent turmoil, rather than the principal cause. ... In Egypt, families spend an average 40% of their income on food, overall food-price inflation has been at 20%, and the price of some individual commodities, such as tomatoes, has shot up tenfold. ... Russia, the world's fourth-largest wheat exporter accounting for roughly 14% of the global wheat trade, responded by imposing an export ban on wheat, barley and rye from August. ... Russia's largest customer, Egypt, received only 1.6 m tonnes from Moscow in the last six months of 2010, compared to 2.8 m tonnes in the same 2009 period. Ukraine, another major supplier, stopped overseas grain sales. ...

This thesis of a link between hydro-meteorological hazards resulting in a declining food supply in one part of the world and rising food prices in highly dependent food-importing countries, most particularly in the MENA region, and public unrest, bread riots, and their eruption into a series of rapidly-spreading revolutions,¹⁰⁵ has many historical analogies in the French revolution of 1789 and in the revolutions in Central Europe in 1848 (Stock 1996: 38) and in Mexico in 1910 (Arredondo Moreno/Huber-Sannwald 2011: 875-892).¹⁰⁶

105 An Egyptian scholar argued in August 2011 in a communication to this author that in his opinion "the Egyptian revolution 2011 was mainly against injustice and corruption rather than increasing food prices. It was carried out at the beginning by well off, well-educated middle class young people".

106 Fiona Harvey: "Failures to act on crop shortages fuelling political instability, experts warn. Soaring prices for staples is thought to have been one of the factors contributing to unrest in Egypt and Tunisia", in: *The Guardian*, 7 February 2011; Andrew Lilico: "How the Fed triggered the Arab Spring uprisings in thwo easy graphy", in: *The Telegraph*, 4 May 2011.

37.6.6 Fukushima Aftermath: Challenge to Nuclear Energy

After the nuclear disaster in the Fukushima Daiichi nuclear plant in Japan, many policymakers requested reviews of safety regulations, and several planned construction projects were curtailed. Martin Malin, Executive Director of the 'Project on Managing the Atom', Belfer Center for Science and International Affairs, Harvard Kennedy School, argued that

The politics of nuclear power is likely to be more contentious even in places where public support has been strong (or irrelevant). As a result, in the coming decade, nuclear power may make less of a contribution to the mitigation of carbon emissions than it otherwise might have, (though even before the current crisis its role in overcoming the climate change challenge was a minor one).¹⁰⁷

Europe was divided over nuclear power after the Fukushima disaster.¹⁰⁸ While the UK, France, and the Czech Republic lobbied to have safety checks watered down, in a referendum in May 2011 Italy voted against nuclear energy, Switzerland decided "to phase out its nuclear power plants"¹⁰⁹ by 2034, and the German government announced in June 2011 that it would close down all remaining nuclear reactors by 2022, and within a month both German houses of parliament adopted this goal in a series of laws.¹¹⁰ In Japan, a political discussion began in July 2011 on whether moving out of nuclear energy could be a possible option for Japan after the Fukushima disaster.¹¹¹

107 See at: <<http://belfercenter.ksg.harvard.edu/power/2011/03/16/the-global-future-of-nuclear-power-after-fukushima/>>.

108 See: Leigh Phillips: "Europe divided over nuclear power after the Fukushima disaster", in: *The Guardian*, 25 May 2011.

109 "Schweiz: Parlament stimmt Atomausstieg bis 2034 zu", in: *Focus Online*, 8 June 2011; at: <http://www.focus.de/politik/weitere-meldungen/schweiz-parlament-stimmt-atomausstieg-bis-2034-zu_aid_635313.html>

110 AP: "Germany votes to end nuclear power by 2022 - Fourth largest industrial nation set to replace nuclear with renewable energy", in: *The Guardian*, 30 June 2011; Frédéric Lemaître: "Renewable Energy: Desertec to take over from nuclear power", in: *Le Monde*, 8 June 2011; at: <<http://www.presseurop.eu/en/content/article/701071-desertec-take-over-nuclear-power>>.

111 Jessica Dailey: "Japan's Prime Minister Calls for Complete Phase Out of Nuclear Power", in: *Huffington Post*, 14 July 2011; at: <<http://inhabitat.com/japans-prime-minister-calls-for-complete-phase-out-of-nuclear-power>>.

37.6.7 Addressing the Climate Change and Energy Challenge

After COP-15 in Copenhagen and COP-16 in Cancun failed to achieve a legally binding agreement for a post-Kyoto regime by the end of 2012, it has become more difficult to achieve the goal of a stabilization of the increase of average temperature by 2°C by the year 2100. This would require a 50 per cent global reduction in GHG emissions by 2050 or an 80 per cent reduction in the G-8 countries, a goal they first adopted during the G-8 summit in Germany in 2007 and reconfirmed during the subsequent years.

The *Fukushima Daiichi* nuclear disaster has reduced the political acceptability in many countries of increasing the nuclear percentage of energy production. Because of the decisions by several countries to move out of nuclear energy within the next one to two decades, energy policy is confronted with a climate and energy dilemma:

- either to replace *nuclear energy* with electricity plants relying on fossil energy, which will increase GHG emissions and make achieving the goal of reducing climate change more difficult;
- or to increase *energy efficiency* further, to reduce energy demand and to increase the percentage of renewable energy sources.

With its goal of reducing greenhouse gas emissions by 40 per cent compared with 1990,¹¹² or by an additional 20 per cent by 2020, and of moving out of nuclear energy by 2022, the German Federal government will be forced to increase the proportion of renewables significantly by 2020. This cannot be achieved by a strategy of *business as usual* but requires a fundamental transformation of the energy sector and a progressive decarbonization of the whole economy. Can this energy transformation be achieved solely by an autarkic renewable energy sector or does this require the import of renewables?

112 Ulrike Wachsmann, Christoph Erdmenger, Klaus Müschen, Harry Lehmann: "40% reduction of CO2 emissions by 2020 - Germany's path towards a sustainable energy system", in: *RIO 9 - World Climate & Energy Event*, 17-19 March 2009, Rio de Janeiro, Brazil; at: <http://www.rio9.com/programme/Book_of_Proceedings/35_Mueschen_Neu.pdf>.

37.6.8 Transforming a Dual Challenge into a Dual Opportunity

Are there foreseeable and feasible policy responses to the second option – increasing energy efficiency and expanding renewable – that will directly benefit and support societal and economic transformation in the MENA countries? Gunter Thielen, chairman and CEO of the Bertelsmann Foundation, argued on 17 May 2011 at the Open Forum of the 13th Kronberg Middle East Talks in Rabat:

The search for low-risk and environmentally friendly forms of energy generation will be a key question for the EU in the years and decades that lie ahead. The great energy needs of the north and the hitherto largely untapped sources of solar energy in the south may well turn out to be a stable basis for joint economic development. This would lead to a stable axis capable of promoting joint sustainable development. Such cooperation between Europe and the countries of North Africa would not be aimed at the short-term exploitation of finite resources, but at enduring economic cooperation between north and south. The societies and industries in Europe are looking for a very high level of energy security coupled with a low level of environmental degradation ... For the Mediterranean region this may well constitute the basis for the establishment of future-oriented economic structures of its own.¹¹³

This theme is stressed by addressing the linkages between socio-economic challenges, especially “the lack of employment opportunities and the absence of an economic perspective” and the perspective of ‘green energy’ as suggested by the MSP and Desertec. Bauer and Hanelt argued that “projects such as these have the potential to help people in Europe and North Africa to improve their long-term energy security. And they could help to create urgently needed employment opportunities in North Africa and to strengthen regional cooperation” (Bauer/Hanelt 2011: 7). They called for “developing a shared vision of civic empowerment and sustainable co-development for North Africa and Europe” (Bauer/Hanelt 2011: 20 and 35) concluding that

this should not be construed as a European scheme designed to provide support for the North African economies, but as a programme that can generate common benefits and help the region to develop its full potential. Projects that can help to create permanent employment opportunities in the region and to improve local capacities capable of generating wealth are of particular importance in this context. An immediate step

should be to grant reformist countries in North Africa better access to the Single European Market, which would enable them to make full use of their competitive advantages. This is especially true when it comes to agricultural products. The adoption of better agricultural production methods and a more effective use of water and arable land are areas in which cooperation could flourish. Moreover, the Europeans should also promote the process of economic diversification by helping to develop a local capital goods industry.

These dual challenges of the political unrest, rebellions, or revolutions in the Arab World, and of the consequences of the Fukushima nuclear disaster, as well as the climate paradox of achieving an 80 per cent reduction in GHG by 2050 for G-8 and OECD countries, require a long-term proactive policy strategy to transform these challenges for new opportunities into a sustainable co-development between the EU and MENA countries in the 21st century. The Desertec vision and the industrial initiative may become components of an inter-regional survival pact linking two essential commodities: food and energy (37.6.9).

37.6.9 From Vision to Policy: EU-MENA Sustainable Co-development

A securitization of the dangers presented by GEC, climate change, water stress, and desertification does not imply a militarization of the environment but calls for a demilitarization of security. The solutions for achieving climate, water, and soil security in the 21st century are not offered by the military but by the ingenuity of scientists and the willingness of political elites to establish policy frameworks for coping proactively with projected climate change impacts, thus avoiding potential violent conflicts. The Mediterranean is a fault line of political, economic, societal, and environmental insecurity that pushes or pulls hundreds of thousands of distress migrants to Europe.

A more ambitious, forward-looking strategy for an economic co-development across the Mediterranean is needed in the framework of a ‘survival pact’ that links ‘virtual water’ and ‘virtual sun’. Virtual water refers to the water embedded in food imports with which the food needs of MENA countries have been met. How will a growing population be able to afford these imports once their major source of foreign income, oil and gas, is exhausted?

This may be achieved by an inter-regional strategy of sustainable co-development in the Mediterranean, where the complementarities of food and energy are obvious. The demand for food in the South can be

113 See his preface to Bauer and Hanelt (2011), at: <http://www.cap.lmu.de/download/2011/2011_Kronberg.pdf>.

satisfied by importing food ('virtual water'). In the North, the demand for energy can be satisfied by importing, besides hydrocarbons (oil and gas), renewable energy as electricity and hydrogen ('virtual sun').

This perspective requires a fundamental change in political thinking by overcoming notions of food self-sufficiency in the South and for energy supply security ('autarky') in the North, and a complex interdependence between the agricultural and energy sectors of EU and MENA countries. A 'survival pact' requires a long-term strategy of political and economic cooperation over commodities that are crucial for human and economic survival. This perspective requires mutual trust and confidence among its partners. A North-South strategy of confidence and partnership-building measures and projects is needed to achieve the longer-term goal of an inter-regional Euro-Mediterranean survival pact.

Such a long-term initiative requires a sense of urgency in the mind of policymakers. It needs a strategy that is unlinked from the Middle East conflict. A new MEHSEC initiative could be a policy framework for promoting such a long-term strategy (see above 37.5.10). Climate change as a security challenge for the Mediterranean and MENA region requires not only new strategies and policies but also regional and national policy measures for coping with climate change impacts on the MENA region through adaptation and mitigation.

37.7 Policy Response: Measures for Coping with Climate Change Impacts on the MENA Region: Adaptation & Mitigation

The best mitigation strategy is a legally binding global agreement to implement the commitment of the G-8 countries for a global 50 per cent reduction in *greenhouse gases* (GHG) by the year 2050, which would require an 80 per cent reduction by the highly industrialized countries. After the failure of COP 15 in Copenhagen (2009) and the lack of substantial progress towards these adopted ends at COP 16 in Cancun (2010), it may become less likely that the goal of stabilizing the increase in global average temperature at 2°C by the year 2100 may be met. The possibility may increase that the world and especially the Mediterranean region may be confronted with "dangerous climate change" (Schellhuber/Cramer/Nakicenovic et al. 2006) due to the projected physical effects and the possible societal outcomes that may result in specific conflict constellations.

Besides global measures, a policy debate on binding regional and national measures of adaptation (Pelling 2011) and mitigation is needed that addresses the four specific physical effects (temperature increase, sea level rise, precipitation decline, and increase in number and intensity of extreme weather events).

37.7.1 Policy Measures for Coping with the Physical Effects of Climate Change in the Mediterranean and MENA Region

The projected increase in temperature and the decline in precipitation in the Mediterranean and the MENA region, as well the increase in extreme weather events (drought, forest fires, storms, flash floods), will seriously affect the agricultural sector and tourism due to the projected increase in heatwaves during the summer. However, the wide range of projected rises in sea level poses major challenges for many coastal regions in the Mediterranean and in the delta regions of the Nile and other major rivers (Ebro, Rhone, Po, and the Danube in the Black Sea) as well as for many coastal cities, such as Alexandria and Venice.

37.7.2 Policy Measures for Coping with the Societal Outcomes of Climate Change in the Mediterranean and MENA Region

It is not possible to predict specific political events that result from policy decisions. As a result, policy measures for coping with the societal outcomes of climate change have primarily relied so far on very crude political and security scenarios. These are often based on the projection of given trends interpreted through the specific geopolitical prism of the agency supporting the scenario construction (NIC 2009, 2009a). A major challenge will most likely be a significant increase of migration from and across the MENA region to EU countries, of which only a proportion will be triggered by the physical effects of climate change. Both reactive and proactive policy decisions are difficult to make because of the lack of scientific knowledge about both the physical effects of climate change and the societal outcomes. While the Arab revolutions were welcomed in most EU countries, the migrants who fled North Africa and were trying to reach Europe were not. The European policy response to this illegal immigration of thousands of refugees was negative and the impact varied in EU countries:

Amid fears of immigrant influx fleeing the uprising in North Africa, European countries have suggested that the EU give the Schengen unfettered travel in the continent 'a second thought' and thus help the 26 participat-

ing governments restore border controls. The border-free region ... extends from Portugal to Russia's borders on the Baltic ... The policy shift was pushed by France and Italy, who have been feuding and panicking in recent weeks over a small influx of refugees from Tunisia. ... The European Commission has said it would scrutinize the Schengen rules to see if heightened border controls would be possible.¹¹⁴

Another news item in March 2011 cited a UfM report that

22,000 illegal migrants from North African made it to Italian shores in 2006, while this figure was 19,900 in 2007 and 8,700 in 2008. However, the tide seems to be turning again, as within two days after the Tunisia riots, 5,500 migrants from Tunisia reached Lampedusa, which prompted an overwhelmed Italy to seek help from the European Union. ... Figures show that a large number of migrants who took off from Egyptian ports have already come to Italy, with officials of that country saying that the total number could reach 80,000 over the next few months. The number of illegal migrants landing in Spain had also been steadily falling prior to the riots. In 2006, 39,000 illegal migrants entered the country, which fell to 18,000 people in 2007 and to 13,000 in 2008. France expelled about 27,000 illegal migrants last year, but along with Italy and Spain, France is also facing an influx of illegal migrants.¹¹⁵

This new migration was not triggered or forced by environmental or climatic factors but rather by the chaos after the toppling of the regimes in Tunisia and in Egypt and the violent conflict in Libya. In his expert report for the WBGU, this author discussed five migration scenarios from the perspective of human security and another five from the vantage point of national and international security. Due to projected population growth (2006-2020), Brauch argued (2006: 40-35) that these security scenarios are politically plausible:

1. *Distress and survival scenario*: in periods of severe drought a 'survival dilemma' forces many people from rural areas into the cities or overseas

114 PRESS RV: "Gaddafi uses migrants against Europe", 13 May 2011; at: <<http://arabrevolt.wordpress.com/2011/05/13/gaddafi-uses-migrants-against-europe/>>. Yves Pascouau and Sheena McLoughlin: "Migratory flows from North Africa: challenges for the EU", in: *EPC Commentary*, 7 March 2011; at: <http://www.epc.eu/documents/uploads/pub_1241_migratory_flows_from_north_africa_-_challenges_for_the_eu.pdf>.

115 As cited by Ercan Yavuz: "Riots in Mideast and North Africa prompt wave of illegal migration", in: *Today's Zaman*, 21 March 2011; at: <http://www.todayszaman.com/newsDetail_getNewsById.action?newsId=238763>.

(scenario 2). In the cities mass protests and bread riots ... have often resulted in violent clashes with the state's security forces (scenario 3).

2. *Migration scenario*: a combination of push and pull factors may be influenced by economic and political factors, where ecological push factors may play a causal, influencing, or intensifying role.
3. *Transmigration scenario*: migration from sub-Saharan countries has increased since 1990 and a further significant increase appears probable in the near future; this has resulted in violent clashes in North African countries.
4. *Protest and civil war scenario*: efforts of EU states to counter this migration pressure with the forces of internal security (police, border guards, e.g. Frontex) and external security (army, air force, navy) may increase destabilization in North African states.
5. *Diaspora scenario*: the absence of social, political, and cultural integration of the second and third generation of immigrants has resulted in violent urban unrest in several European countries.

The primary reference object of these five scenarios is the affected human beings and social groups rather than the nation-state and its security instruments. However, due to their involvement, these human security challenges become threats for national and international security in both the countries of emigration and immigration. Brauch (2006, 2007) argued that it is unlikely that these environmentally triggered security challenges will pose a classic Hobbesian 'security dilemma'. To counter the environmental security concerns he suggested five additional proactive international security scenarios:

6. *Scenario for combating desertification*, where the North African states may play a major role as a step towards a 'greening of the military'.
7. *Disaster reduction scenario*, where organs of the state and the armed forces may play an active role as they have an infrastructure and well-trained people.
8. *Scenario for peaceful solutions of local water and soil conflicts*: most of them are of an internal nature in North Africa and concern conflicts over the use and distribution of water between rural and urban areas, where local and regional conflict resolution mechanisms may avoid violent clashes.
9. *Scenario of water conflicts and cooperation in the Nile basin*, where water scarcity may lead to the

only 'hard' environmental conflict between Egypt and its upstream riparians.

10. *Scenario of Euro-Mediterranean migration conflicts*: migration pressure across the Mediterranean is projected to rise until 2020 and 2050 due to projected demographic trends, and the projected environmental changes could intensify this migration pressure.

Five years later, as a result of the Arab revolutions, the illegal migration trends across the Mediterranean have already intensified, and they can be expected to rise further if joint efforts by the new governments and the EU fail to create new professional perspectives and jobs for the young and university-educated people in the MENA region and also in southern Europe. These new and urgent political and societal challenges and the slow-moving structural environmental changes, which Braudel referred to as factors of 'long duration' (*longue durée*), require a comprehensive EU-MENA sustainable co-development strategy, where global, regional, and national adaptation and mitigation measures are linked.

37-7.3 Adaptation Measures to Climate Change in North Africa

Abou-Hadid (2006) of the *Central Laboratory for Agricultural Climate* (CLAC), *Agriculture Research Centre* (ARC) of the Ministry of Agriculture and Land Reclamation in Egypt, suggested several adaptation measures in a report for the *Assessments of Impacts and Adaptations to Climate Change* (AIACC)¹¹⁶ project that analysed the climate change impact, vulnerability, and adaptation of major food crops and irrigation water requirements in Egypt and Tunisia:

The preliminary results show that there is an overall reduction in crop yields under climate change even when adaptation is taken into account. ... Climate is perceived by North African farmers as one of the major risks of agricultural production, but the magnitude of the risk is perceived as higher than the risk derived from empirical knowledge. Changes in crop variety, crop calendar, and irrigation amount and nitrogen fertilization were the main options produced through the analysis

¹¹⁶ AIACC, a project of the *Global Environment Facility* (GEF), is implemented by the *United Nations Environment Program* (UNEP) and managed by the *Global Change System for Analysis, Research and Training* (START) and the *Third World Academy of Sciences* (TWAS). Its concept and proposal was developed in collaboration with the *Intergovernmental Panel on Climate Change* (IPCC).

steps. ... Promoting education programs on water-saving practices and changes in crop choices was the fifth adaptation option resulted from the project investigation. The study concludes that the involvement of the rural population and extension services in capacity building programs is an essential adaptation measure, with information flows among and between these two groups of stakeholders (Abou-Hadid 2006: XIV).

With regard to the rise in sea level in the Nile delta, El-Raey (2011: 787-788) suggested several adaptation options for coastal resources, requiring "strong institutions and systems of supervision ... to enforce environmental laws". He suggested that for the Nile delta region ten adaptation measures should be adopted and strictly enforced, among them the establishment of a National Institute for Climate Change and of "an institutional capability for coastal monitoring, assessment and follow-up of plans. Activation of the national committee on *Integrated Coastal Zone Management* (ICZM), for coastal development and enforcing of *environmental impact assessment* (EIA) that take climate change into account". El Raey (2011: 788) also suggested, based on El Shennawy (2009), several specific adaptation processes and policies, and he argued that for adapting to sea-level rise specific steps must be taken:

1. It is necessary to establish a virtual centre for integrating research activities, carrying out integrated vulnerability assessment, building up a geographic data base of climatic indicators and establishing a regional circulation model.
2. An improvement of the resilience of the population should be carried out through upgrading of infrastructure, building capacities for monitoring and assessment and upgrading awareness of decision-makers, civil society and the population at large.
3. Proactive strategic plans of development should be identified and enforced for all sectors in view of potential impacts of climate change.
4. Introducing policies for adaptation to climate change in various developmental plans, especially in large scale national projects.
5. Recent suggestions of increasing scenarios of sea-level rise will make the situation even worse and call for even faster action.

Many specific adaptation measures for dealing with sea-level rise have also been tabled by a major project sponsored by the World Bank that focuses on Alexandria, Tunis, Casablanca, and the Bouregreg Valley in Morocco. The *Regional Study of Climate Change Adaptation and Natural Disasters Preparedness in the*

Coastal Cities of North Africa released in June 2011 focused on “floods and storm surges, earthquakes and tsunamis, and to the increasingly frequent weather extremes associated with climate change” and “has provided tools for evaluating the risks, costing out potential losses, and moving toward specific reforms and investments designed to adapt the cities to a changing climate and increase their resilience to natural hazards”.¹¹⁷ The study trends confirmed that in the next 20 years “the cities will be increasingly vulnerable to flooding and other natural disasters”.

Rapid urban population growth throughout the Middle East and North Africa raises the stakes by increasing the potential losses from natural disasters and climate-related damages. Some 60 million people inhabited the region’s coastal cities in 2010, but the number is expected to swell to 100 million in 2030, placing more people, livelihoods and structures at risk. Alexandria, Casablanca and Tunis – home to about ten million people in 2010 – can expect a combined population of around 15 million in 2030.

The scientific and political debate on necessary adaptation measures to face and cope with the projected impacts of GEC and climate change is gradually emerging in the Arab World and specifically in the MENA Region, and offers many opportunities for a close scientific, political, and economic cooperation.

37.7.4 Mitigation Measures for the MENA Region

In its programme on Climate Change in the MENA, the World Bank addresses multiple mitigation measures “mainly through cleaner energy generation and by giving countries financial incentives to limit deforestation” aiming at “low-carbon growth” as “a secondary strategy” by mainstreaming “adaptation and mitigation actions within their growth and development strategies”. Besides “supporting adaptation efforts through its pipeline of infrastructure projects (which will average \$1.1 billion per annum over the next three years)”, the World Bank has provided Morocco and Tunisia with “knowledge and technical expertise for

better analysing likely impacts of climate change, and for designing least-cost adaptation interventions to minimize such impacts”.

The Bank is also preparing a regional program for technical assistance on climate change adaptation and mitigation. This knowledge initiative builds on the experience of the *Mediterranean Environmental Technical Assistance Program* (METAP) and will serve as a vehicle to strengthen institutional capacity across the region. Significant progress in adaptation can be achieved by improving the policy and incentive framework of regional governments. Fiscal reforms can encourage more efficient use of land, water, and energy resources, thereby promoting their allocation to more climate-resilient uses, and freeing up valuable public funds which could be used for protecting the most vulnerable social groups. The World Bank will continue to work with its MENA clients to identify, analyse, and implement reform by mobilizing global knowledge and providing targeted financial support.¹¹⁸

The World Bank’s mitigation strategy for the MENA region for coping with climate change impacts assumes that its high urbanization level (over 55 per cent) will increase its emissions and waste:

Bank Mitigation Strategy. To make further progress on the proposed strategy, the Bank will assist in the design and financing of ‘soft’ and ‘hard’ solutions for low-carbon urban management. These could include: i) improving the efficiency of energy use in urban areas; ii) integrating sustainable mobility objectives in the planning of urban and peri-urban areas development; iii) reducing GHG emissions from solid waste....¹¹⁹

With regard to mitigation of climate change impacts in the MENA region, the World Bank conducts studies and “provides technical assistance on environment management” on a) costs of environmental degradation on water quality and coastal zone management; b) reviewing the institutional framework for environment management for Tunisia, Egypt, and Jordan; c) energy-environment reviews in Egypt; d) support to MENA countries for accessing the carbon-trade market of the Kyoto Protocol in Tunisia, Egypt, Syria, and Yemen; e) climate change adaptation for water resources in Morocco, Yemen, Tunisia, and Egypt; and f) studies on climate change impacts:

Some of these studies focus on specific sectors, such as Agriculture and Cities in Morocco, Coastal Zones and Management of Lake Nasser in Egypt, and Water in Yemen. ... In an effort to increase its readiness to assist

¹¹⁷Marseille Center for Mediterranean Integration: *Climate Change Adaptation and Natural Disasters Preparedness in the Coastal Cities of North Africa. Summary of the Regional* (Washington, D.C.: The World Bank – Marseille: Marseille Center for Mediterranean Integration, June 2011); all studies with proposals for adaptation measures can be downloaded at: <http://arab.worldbank.org/content/awi/en/home/research/climate_adaptation.html>.

¹¹⁸ See for details at: <<http://go.worldbank.org/87GRZ8H4Bo>>.

¹¹⁹ See for details at: <<http://go.worldbank.org/HiHATBWHZo>>.

clients on issues of adaptation and mitigation to climate change the Bank has prepared a Regional Business Strategy to Address Climate Change', which proposes to put climate change at the center of the dialogue that the World Bank holds on the overall development agenda with its partners in the region. The Region has organized in that context consultations in a select number of countries of the region (including Tunisia, Egypt and Saudi Arabia) on the MENA Regional Strategy and the overall Strategic Framework on Climate Change and Development.¹²⁰

These recent policy efforts and studies on adaptation to and mitigation against climate change in the MENA region indicate that it is increasingly being perceived as a 'hotspot' for climate change impacts and environmental concerns. This sense of urgency may be further increased by the consequences of the Arab revolutions and an increasing scientific and public awareness of the high regional vulnerability to climate change and its potential impact on migration. Within Europe the concern over growing migration streams across the Mediterranean has been a major driver for both Spain's EMP proposal (1995) and for France's UfM Initiative (2008).

37.8 Improving the Knowledge Base through Research

So far, the knowledge base on climate change effects and their possible regional and national societal outcomes is highly unsatisfactory for launching specific reactive and proactive policies and measures at either regional or national levels. The first policy priority should be to enhance the knowledge base by a joint science assessment following the IPCC approach for the whole Mediterranean region. A policy debate based on an improved knowledge base is needed to enhance public awareness of climate change impacts on the region. This also requires that the governments should submit the requested national communications on climate change to the UNFCCC Secretariat. While Algeria, Egypt, Morocco, and Jordan have submitted their second national communication during 2010, Libya and Cyprus have still to submit their first national communication.

It has been argued elsewhere (Oswald Spring/Brauch 2011) that the implementation of the G-8

GHG reduction targets by the year 2050 requires a fundamental change in scientific paradigms, in the worldview of the researchers, and in the mindset of policymakers towards sustainability in order to be capable of stabilizing temperature increase at a level of 2°C by the year 2010. This would necessitate a "Fourth Sustainable Revolution" and its proactive implementation in the European Union, in close cooperation with the other Mediterranean riparian countries in south-eastern Europe and in the MENA region.

In a recent report, this author addressed various proposals to the Spanish EU presidency, among them the following: a) assessing environmental and climate-induced migration and developing alternative livelihoods for people in drylands (37.8.1); b) civil protection in the Euro-Mediterranean Region (37.8.2); and c) an EU-MENA Survival Pact linking 'virtual water' and 'virtual sun' (37.8.3).

37.8.1 Assessing Environmental and Climate-Induced Migration and Developing Alternative Livelihoods for People in Drylands

There are few research institutes and projects that address migration issues with a regional focus on the Mediterranean but none deals in a systematic way with issues of environmentally- and climate-induced migration within the Euro-Mediterranean region. At the European University Institute in Florence, Philippe Fargue has directed the Euro-Mediterranean *Consortium for Applied Research on International Migration* (CARIM) since 2004.¹²¹ Its Mediterranean migration reports (2005, 2006-2007, 2008-2009) address the demographic, economic, legal, political, and social dimensions of migration, but they do not analyse environmental factors that may cause, trigger, or affect migration. The *Mediterranean Migration Observatory* (MMO) at Panteion University of Athens focuses primarily on Greece.

Two symposia at Almeria (1994, 2006) addressed the linkage between desertification and migration. At the second Almeria Symposium (2006) various proposals were made for establishing an international research centre on the linkages between soil erosion, desertification, and migration in the Euro-Mediterranean context, and for developing alternative livelihoods for people in drylands by using sustainable renewable energies. As desertification and migration

120 See for details at: <<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/MENAEXT/o,,contentMDK:20525954~pagePK:146736~piPK:226340theSitePK:256299,00.html>>.

121 See for details at: <<http://www.carim.org/index.php?callContent=1>>.

had its greatest impact in Spain, it was suggested that such a research body be set up in Almeria to analyse these linkages in cooperation with the *Plataforma Solar de Almeria* (PSA), also in Almeria, a leading research centre on solar thermal technology development in Europe (Brauch 2006b; Garcia Lorca 2011).

37.8.2 Civil Protection in the Euro-Mediterranean Region

On the initiative of Italy, civil protection was added as an area of cooperation among disaster response agencies with its goal “to build the Euro-Mediterranean Area for Civil Protection by progressively integrating the Southern partners into the European Civil Protection Mechanism”. Civil protection has been made a priority area of the UfM, where the *Prevention, Preparedness and Response to Natural and Man-made Disasters Programme* (PPRD) aims to enhance collaboration between civil protection institutions in EU member states and Mediterranean Partner countries in the field of training and on the operational level.¹²²

Within the European Union, civil protection gradually evolved as a new ‘functional security’ area (Ekengren 2008) among the EU member states. It was coordinated by the DG Environment in response to various natural hazards (earthquake in Turkey in 1999; Elbe flood in Germany, 2002; forest fires in Greece and Spain). With the solidarity clause of the Lisbon Treaty, this new task was further upgraded. Various international crises resulted in the creation of new EU agencies, such as the *Centre for Disease Prevention and Control* and the *European Maritime Safety Agency* (EMSA).

Building on present and planned activities and depending on the interest of the partner institutions from MENA countries, cooperation on civil protection in the Euro-Mediterranean region could be gradually expanded to facilitate joint research, capacity building, and training of civil protection officials and practitioners, in order to enhance the monitoring of droughts and the early warning of impending hydro-meteorological hazards.

Gradually the focus should expand from short-term disaster response to disaster preparedness and disaster prevention activities, with a focus on responding to rapid-onset disasters such as earthquakes, volcanic eruptions, tsunamis, and hydro-meteorological

events (storms, floods, forest-fires), as well as to slower-onset extreme events (droughts) and long-term changes (sea-level rise). One goal should be reducing the high social vulnerability of the poorest people in the MENA countries by improved early warning systems and through technical and administrative capabilities and capacities permitting a rapid response.

These civil protection activities might result at a later stage in the establishment of one or more joint training centres in southern Europe, North Africa, and in the Near and Middle East. A research centre could combine the monitoring of droughts, forest fires, and sea-level rise using the most modern methods (e.g. remote sensing, long-term weather forecasts) with the assessment of best practice in rapid response to disasters. This would encourage improvements in the effectiveness of national disaster response forces and would ensure effective cooperation with outside rescue and assistance teams.

To move from disaster preparedness to disaster prevention requires a long-term institutionalization to monitor, analyse, and assess in a systematic way the changes in the number and intensity of natural climate-related hazards in the Euro-Mediterranean region. This requires the active involvement of meteorologists, agricultural specialists who can advise farmers in their adaptation to drought conditions, and landscape and city planners in the development of adaptation and mitigation measures for flash floods, landslides, and the erosion of agricultural land by water and wind.

The number and intensity of hydro-meteorological hazards in the Euro-Mediterranean region has significantly increased since 1950 and most particularly since 1975, and is projected to increase further during this century resulting e.g. in more frequent heatwaves such as that of August 2003, and this requires preparedness on the part of all countries’ medical systems (doctors, hospitals etc.).

In moving from disaster response to disaster prevention in the MENA region, a wide variety of national and international agencies and humanitarian assistance organizations would have to be involved, as well as the research community. This functional cooperation among practitioners, public officials, assistance teams, and experts from many different professions and scientific disciplines might be able to enhance performance to the benefit of the affected people, reducing social vulnerability and the number of people killed or affected, as well as limiting the economic damage.

¹²²See at: <<http://www.ufmsecretariat.org/en/wp-content/uploads/2010/12/Deputy-Secretary-General-Cecilia-Attard-Pirottas-address-for-PPRD-Meeting-Oct-10.pdf>>.

37.8.3 EU-MENA Survival Pact: 'Virtual Water' and 'Virtual Sun'

The concept of a survival pact provides an inter-regional perspective of sustainable co-development by linking these two commodities, where each partner either has a surplus or is in need. Both commodities are indispensable for human survival and for the economy. This proposal suggests an inter-regional framework for a strategy of sustainable co-development for the Mediterranean where the economic gap between North and South has widened. For no other contact region is the complementarity of both commodities as obvious. The growing demand for food (especially for cereals) in the South can be satisfied by importing food as 'virtual water'. In the North, the demand for energy can be satisfied by importing both hydrocarbons (oil and gas) and in the future renewable sources of energy, e.g., electricity and hydrogen or the 'virtual sun', as part of a mutual sustainable development scheme.

However, this perspective requires a fundamental change in political thinking. Notions of food self-sufficiency (in terms of food security) need to be overcome in the South and of energy supply security in the North. It necessitates a complex inter-regional interdependence between the agricultural and energy sectors of the EU (European Union) and of the MENA countries. The concept of a 'survival pact' requires a long-term strategy of political and economic cooperation on commodities crucial for human and economic survival. No such perspective can be realistic without a certain level of mutual trust and confidence among its partners.

'Virtual sun' is the sun embedded in forms of renewable energy that can satisfy the demand for energy (desalination of water) and that can be exported to the North as electricity via long-distance cables (from Morocco to Spain and from Tunisia to Italy) and as hydrogen in existing gas pipelines. The MENA countries have a high potential for solar energy, both solar thermal and photovoltaic. A major constraint in the North has been the way of thinking in terms of energy supply security since the oil shocks of the 1970s and 1980s - the idea that energy could be used as a weapon to 'strangulate' the economies of the North.

Solar electricity for solar home systems, solar village systems, or as part of hybrid energy systems can satisfy the rapidly growing electricity needs of the MENA countries by using their largest renewable source - the sun. It would thus extend the lifespan of available fossil energy reserves that have been pro-

jected to decline during the next 10 to 50 years. These ideas are reflected in the MSP and in the DESERTEC concept and in the Dii.

The MEHSEC initiative suggested above could offer a political mechanism that involves alongside the 43 countries of the UfM relevant UN institutions (e.g. UNEP, UNDP, WMO). The proposal for a Euro-Mediterranean survival pact offers a long-term strategic perspective for coping with the multiple security implications in a proactive way. It would outline a strategy of long-term economic interdependence and make it impossible that either side could use energy or food as a weapon and both sides would jointly move towards a path of sustainable development (37.5.9).

37.8.4 Towards a Fourth Sustainability Revolution

In the Anthropocene era of earth and human history, humankind is confronted with opposing visions of the future:

- *Business-as-usual* in a Hobbesian world where economic and strategic interests and behaviour prevail, leading to a major crisis for humankind in inter-state relations and the destruction of the Earth as a habitat for humans and ecosystems, where the survival of the vulnerable is put at risk.
- The need for a *transformation* of global cultural, environmental, economic (productive and consumptive patterns), and political (with regard to human and interstate) relations (the 'sustainability first' scenario of UNEP 2007).

The two visions refer to totally different strategies for coping with GEC and climate change:

- In the first vision of business-as-usual, *cornucopian perspectives* (Gleditsch 2003) prevail that suggest primarily technical fixes are put in place (such as geo-engineering, increase in energy efficiency or renewables), together with the defence of economic, strategic, and national interests. This would be achieved with adaptation strategies in the interest of and affordable by the 'top billion' of OECD countries in a new geopolitical framework, possibly based on a condominium of a few major countries.
- In the alternative vision of a comprehensive transformation, a *sustainable perspective* has to be developed and implemented into effective new strategies and policies with different goals and means based on global equity and social justice.

The consequences of the two opposite scientific visions and competitive policy perspectives are:

- The vision of *business-as-usual* with minimal reactive adaptation and mitigation strategies will most likely increase the probability of a ‘dangerous climate change’ (Schellnhuber/Cramer/Nakicenovic et al. 2006) or catastrophic GEC with both linear and chaotic changes in the climate system and their sociopolitical consequences. This represents a high-risk approach. Such changes may trigger ‘tipping points’ in the climate system and lead to ‘cascading processes’.
- To avoid these consequences the alternative vision and sustainability perspective requires a change in *culture* (thinking on the human-nature interface), *worldviews* (thinking on the systems of rule, e.g. democracy vs. autocracy and on domestic priorities and policies, as well as on interstate relations in the world), *mindsets* (strategic perspectives of policymakers), and new forms of national and global *governance*.
- This alternative vision refers to the need for a “new paradigm for global sustainability” (Clark/Crutzen/Schellnhuber 2004), for a “transition to [a] much more sustainable global society” (Raskin/Banuri/Gallopin et al. 2002), aimed at peace, freedom, material well-being, and environmental health. Changes in technology and management systems alone will not be sufficient, but “significant changes in governance, institutions and value systems” are needed, resulting in a fourth major transformation after “the stone age, early civilization and the modern era”. These alternative strategies should be “more integrated, more long-term in outlook, more attuned to the natural dynamics of the Earth System and more visionary” (Steffen/Sanderson/Tyson et al. 2004: 291-293). These changes require a ‘fourth sustainability revolution’ (Oswald Spring/Brauch 2011).

37.8.5 Final Remark

- There is a long-term challenge posed by global climate change. There is rhetorical commitment by the heads of states and governments of the G-8 countries, but their lack of will or ability to reach a legally binding post-Kyoto regime that will implement their commitment of an 80 per cent reduction of GHG by the year 2050 makes the achievement of this declared policy goal highly unlikely. This increases the probability that we may enter the phase of ‘dangerous climate change’ leading

natural scientists and climatologists have warned against. To cope with this ‘climate paradox’ requires a ‘fourth sustainability revolution’.

- The first set of cascading processes (Kominek/Scheffran 2011) has resulted in a series of revolutions across the Arab world since January 2011. It has strengthened the insight that major strategic efforts are needed to respond to the societal, political, economic, ecological, and environmental security challenges faced by the MENA region at present and that it will have to cope with during this century. A failure to be proactive now may increase the costs (Stern 2006) and lead to more intensive and potentially violent trans-Mediterranean crises and conflicts.
- The second set of cascading processes triggered by the Fukushima Daiichi nuclear disaster has in many democratic countries reduced public acceptance of nuclear energy as a technical fix for the global climate crisis.

Thus, in the Anthropocene, policy responses to climate change in the Mediterranean and in the MENA region should simultaneously respond to the triple challenge of:

- the ‘climate paradox’ of a major commitment by the G-8 countries and their inability to implement it;
- the different Arab revolutions in the MENA region;
- the consequences of the Fukushima Daiichi nuclear disaster that is leading to a progressive delegitimation of nuclear energy as a technical fix for coping with global climate change.

The TREC concept, the Desertec vision, the MSP of the UfM, and the Dii are all conceptual components of a more far-reaching strategy for sustainable co-development between the EU and MENA countries. This may create building blocks towards developing a ‘survival pact’ that may link sustainable agriculture and energy sectors in Europe and in the MENA region. This political vision and strategy requires a new Copernican Revolution towards sustainability (Clark/Crutzen/Schellnhuber 2011) with a new sustainability paradigm or a ‘fourth sustainability revolution’ that should reflect the proposals for an “earth systems analysis for sustainability” (Schellnhuber/Crutzen/Clark et al. 2004) and for a “political geocology for the Anthropocene” (Brauch/Dalby/Oswald Spring 2010).¹²³ This ‘fourth sustainability revolution’ may also be furthered by *A Social Contract for Sustainability* (WBGU 2011).

The transformation towards a low-carbon society is therefore as much an ethical imperative as the abolition of slavery and the condemnation of child labour. ... The WBGU views this structural transition as the start of a 'Great Transformation' into a sustainable society. ... The nuclear disaster in Japan makes it clear that we must choose the fast lane towards a low-carbon future without nuclear energy. ... In the WBGU's view, a long-term oriented regulatory framework must be developed for this to ensure that prosperity, democracy and security are achieved with the natural boundaries of the Earth system in mind. ... The transformation can only succeed if nation states put global cooperation mechanisms before their own short-term oriented interests, in order to make a trend reversal, particularly as far as the global economy is concerned, towards climate-friendliness and sustainability possible. ... This 'Great Transformation' ... is, in fact, all about a new global social contract for a low-carbon and sustainable global economic system. ... The social contract also encompasses new forms of global political will formation and cooperation (WBGU 2011: 1-2).

The WBGU suggested as "one concrete measure ... the major extension of the Africa-Europe Energy Partnership, and the potential expansion of Desertec further south. The G20 should use the Rio+20 Conference to set a clear signal for this" (WBGU 2011: 13).¹²⁴ The projected impacts of climate change on the environmental and climate hotspot in the Mediterranean and MENA region have demonstrated the potential human security challenges for the people and the international security risks for the EU countries. The MSP and the Desertec concept can initiate a new pathway towards a sustainability transition that can cope proactively with the 'fourth sustainability revolution'.

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123 See also Friedman (2008); Giddens (2009); Gemenne (2010); Piehlke (2010).

124 See WBGU: *World in Transition - A Social Contract for Sustainability* (Berlin: German Advisory Council on Global Change, July 2011); see English summary at: <http://www.wbgu.de/fileadmin/templates/dateien/veroeffentlichungen/hauptgutachten/jg2011/wbgu_jg2011_kurz_en.pdf>.

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Part IX Conclusions and Outlook

Chapter 38 Conclusions and Outlook: Research Results and Research Needs

*Jürgen Scheffran, Michael Brzoska,
Hans Günter Brauch, Peter Michael Link, and
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38 Conclusions and Outlook: Research Results and Research Needs

Jürgen Scheffran, Michael Brzoska, Hans Günter Brauch, P. Michael Link, and Janpeter Schilling

38.1 Key Messages of the Book

The authors of this volume argue that research into the effects of climate change on human security, on societal stability, and on violent conflict is still in its early stages. There is, as yet, little in terms of established knowledge beyond the generally accepted proposition that climate change, if extensive, will have major effects on people, societies, states, and the international system.

One increasingly accepted proposition that is also addressed by the authors of many chapters in this book is that climate change has no automatic effect on human security, on societal stability, or on violent conflict. Rather, there are multiple links in the chain between changes in the natural environment and these phenomena, which mitigate or multiply the effects of climate change. Of particular importance are the many types and forms of institutions, from local town planning to forums for international negotiations. They have in common that they are created by people to deal with problems. If well designed and maintained, institutions can withstand much pressure from changes in environmental conditions. Furthermore, they can be changed by people so that they are better adapted to the effects of climate change.

A second important linking factor is migration. People migrate for many reasons, including fleeing from worsening conditions in their lives and incomes. Their intention is to improve their circumstances through migration, and they often succeed. In research into the effects of climate change, migration has often been seen only as a negative force – a threat to human security, a threat to societal stability, and a generator of armed conflict. The general conclusion of those authors in this volume who address the issue of migration is that this is not necessarily the case. Migration can also be a strategy of adaptation to climate change, though it can indeed also lead to human insecurity. This is particularly likely where migration is

criminalized or inhibited by societies who are afraid of accepting migrants.

An interesting point made in a number of contributions to this book is that research cannot start from the basis that every change from the current social and political status quo is a negative effect of climate change. Such a view obviously supports the current status quo. It legitimizes current injustices and imbalances. While it is likely that climate change in itself will increase injustice and imbalances since it tends to hit poor people and poor countries harder than rich people and rich countries, some ‘victims’ of climate change are privileged. They will most likely be better able to defend their positions, to the detriment of poorer people. It is therefore important, as several chapters show, to base the examination of the effects of climate change on a broader analysis of the causes and dynamics of human insecurity, societal instability, and the danger of armed conflicts.

Another theme running through the chapters of this book is the need for creative and bold policy responses to climate change. Studying the effects of climate change, as most of the chapters do, leads to an emphasis on measures for adapting to climate change, as well as measures to prevent human insecurity, societal instability, and violent conflict. A great number of proposals are made in the chapters, ranging from the particular, for instance on adaptation to rising ground water levels, to the general, for instance on North-South relations. These cannot be repeated here. However, what has been stressed very clearly in the chapters above is policymakers’ responsibility to take climate change more seriously as an urgent issue.

The chapters also widely agree that policymakers in the global North, which after all has been responsible for most historical greenhouse gas emissions, have a particular responsibility to improve the chances of avoiding the often-mentioned grave consequences of climate change, including those emphasized in this volume. However, they need to be prepared to not be

overwhelmed and to prevent shortcuts such as the militarization of the response to climate change. The evidence presented in various chapters in this book is that this has not happened so far, but rather, policy responses have been weak, though generally in the right direction, instead of being strong and in the wrong direction. However, authors agree that this will not suffice in a future marked by major climate change to prevent its effects on human security, societal stability, and violent conflict. Policymakers at many levels will need to become more active on many fronts to prevent climate change from becoming a major cause of trouble.

38.2 Research Results of this Book

38.2.1 Focus and Structure of the Concluding Chapter

The previous 36 chapters have offered many different conceptual, theoretical, and empirical approaches and their results are briefly summarized below, where an attempt is made to place their results in the context of the emerging scientific debate on climate change and security. Given the diversity of these scientific approaches, which emanate from many disciplines, regions, and countries, and address, from the perspective of human security, aspects of the complex linkages between climate change, societal stability, and the possibility of violent conflict, this concluding chapter will provide an overview of the major arguments made, topics addressed, and new insights offered in these chapters.

The volume is divided into nine parts. Part I provides an introduction to four key concepts (climate change, security, conflict, and stability) and covers the policy debate on climate change and security in the UN Security Council. Different snapshots of empirical and theoretical linkages between climate change, human security, societal stability, and violent conflict are provided by the five theoretically oriented chapters of part II. These are followed by eight chapters in part III that review the securitization discourse on climate change. In 23 chapters, parts IV to VIII address possible linkages between climate change and migration (part IV), and offer case studies on climate change and security in the Middle East (part V), in Africa (part VI), and in Asia and the Pacific (part VII), while part VIII examines cross-cutting issues on improving climate security that address cooperative policies at the UN level, as well as looking at capacity

building and providing a conceptual review of possible policy responses for coping with selected climate change impacts in the MENA region.

While chapter 1 section 5 outlined the goals of the 36 chapters, below the scientific and policy-relevant results are reviewed and assessed.

38.2.2 Climate Change, Human Security, Societal Stability, and Violent Conflict: Empirical and Theoretical Linkages

In chapter 2, *Halvard Buhaug* and *Ole Magnus Theisen* pointed to the discrepancies in the literature of the climate-conflict linkage, which suffers from limitations in data, methodology, and research design. Their empirical assessment of short-term rainfall deficiency and civil war in sub-Saharan Africa since 1960 found insignificant or weak signals. One observation suggested that a drought increases the risk of the onset of civil conflict with a time lag of two years. The capability of political institutions in combination with ethnic differences is crucial in explaining why some countries experience civil conflict and others do not. Discriminatory political regimes and high barriers between ethnic groups are argued to be important in making scarce resources more inflammatory. To address the shortcomings a few issues were suggested for future research: level of analysis, type of violence, trigger versus underlying causes, and conditional effects. A high priority should be placed on a systematic collection of data on geographically disaggregated non-state conflicts and low-intensity events such as social unrest, communal violence, and urban riots.

According to chapter 3 by *Peter F. Nardulli* and *Kalev H. Leetaru*, there is no clear empirically-based consensus in the climate change and security field of research. Analyses have employed coarse measures of conflict, and the causal chains between climate change and conflict are long and complex and are affected by a number of mediating factors and contextual differences. To address various concerns and suggestions raised in the literature and to improve understanding of this chain, they developed and applied the *Social, Political, and Economic Event Database* (SPEED). This generates data about spatially and temporally referenced small-bore events, such as demonstrations, riots, political attacks, and state repression. These are more likely to represent human reactions to the incremental destabilizing effects of climate-induced stresses and could serve as precursors or early warning indicators for more extensive events such as refugee crises, regime change, and wars. The

statistical assessment of temporally and spatially concentrated codings from news archives for El Salvador, Nicaragua, Sierra Leone, and the Philippines during the period 1979–2009 led to contradictory findings. For the future, the authors suggested a more systematic empirical analysis that relies on various variables (climate, environment, social stress, triggering mechanisms), including in-depth ‘micro-level’ case studies and analyses of key historical episodes.

Based on their earlier work, *Dan Smith* and *Janani Vivekananda* argued in chapter 4 that the security consequences of climate change are closely related to political instability and violent conflict. In their view, climate change and variability are not climate issues alone. They concluded that the most productive path of inquiry into the effects of climate change is on resilience. Important elements of dealing with the complex interplay of climate change and political instability are conflict-sensitive adaptation, climate-proofed peacebuilding, and governance. None of the current policy fields—development, adaptation, or peacebuilding—is in their view equipped to deal with these interlinked issues. Policy responses must be better integrated while institutional reforms are necessary on all levels.

In chapter 5, *Jürgen Scheffran*, *P. Michael Link*, and *Janpeter Schilling* presented an integrated assessment framework for analysing the causal chain between climate change, natural resources, human security, and societal stability. Within this framework they explored key linkages and sensitivities between major variables and systems, as well as possible pathways of interaction. They introduced a number of theoretical approaches and modelling tools that can better integrate the underlying complex relationships in order to model human interaction. While still at a development stage, the model provides an innovative systematic and integrated assessment of the climate-security link. In the context of climate change, the analysis distinguished different types of conflict, including those shaped by climate risks and uncertainties, and those in the area of selecting and responding to climate policies. In their own model approach, the authors identified the motivations and capabilities of actors as factors that determine the impact of climate change on conflict and cooperation, including the role of resource abundance and scarcity. The macro-level global analysis was exemplified and specified by a micro-level analysis of the water conflict in the Nile River Basin as a climate hot spot in Northern Africa.

In chapter 6, *Jasmin Kominek* used an expanded multi-agent path dependency model to investigate the

links between global climate policies and local conflict. She showed that decisions on climate policy at the global level affect the options for policies at sub-global levels. However, at these levels actors are often not ready or willing to pursue the actions prescribed by global agreements, which could in turn lead to an intensification of national and local conflicts around the world. In particular, the diminishing perception of options could coincide with an increasing radicalization of positions and a reinforced strengthening of existing social hierarchies. If disturbed through climate-change-induced disasters or revolutions, path-dependent structures are likely to re-evolve in a more intense way. Thus, the people involved tend to act even more in ways that are best explained by path dependency.

38.2.3 Climate Change and the Securitization Discourse

Several chapters covered a wide range of issues concerning the climate securitization discourse. In chapter 7, *Julia Trombetta* showed that the conceptualization of environmental security emerged in the aftermath of the Cold War and initially was strongly influenced by Cold War thinking. However, the influence of the realist understanding of security has shaped the initial debate about environmental conflicts. It has contributed to a transformation of security practices in which preventive measures have gained relevance, even if traditional security narratives have reappeared, especially in the recent debate on climate change. First, the academic debate has shown that international environmental conflicts are unlikely and hence there is little need to focus on institutional arrangements. Second, security practices have been shifting from an approach based on dealing with emergencies to one based on precaution and resilience. Third, a human security approach has gained relevance. This process was theorized in two ways: the securitization of climate change and the governmentalization of security. The chapter showed that the transformation of security practices can be conceptualized by adopting a broader understanding of securitization, going beyond the securitization view of the Copenhagen School.

Chapter 8 by *Michael Brzoska* contributed to the analysis of the climate-security discourse by looking at national security strategies and defence planning documents to determine whether climate change is seen as a security issue and which security dimensions are affected. A number of hypotheses addressed the uncertainties of climate change, the power position of

countries, and the use of the climate-security nexus as a tactical argument. While most national security strategies dealt with climate change, substantial differences remained. Although many governments consider climate change as a potential threat, only a few governments, mostly those of major powers, treat it as a major threat or a possible source of violent conflict. There is no consensus on what kind of security is threatened or on the measures that need to be taken. Despite a sense of urgency in many of the documents, the actions in the security sector (with the exception of disaster preparedness) are not regarded as highly urgent. Major powers turn to humanitarian interventions and other activities to strengthen state capacity in countries that are likely to be affected by climate change. A higher degree of consensus on actions, including operations by armed forces, seems unlikely unless more concrete knowledge about the security effects of climate change is established.

In chapter 9, Angela Oels introduced three theoretical perspectives on the policy implications of climate change as a security issue: the Copenhagen School, the human security perspective, and the Paris School, each with an assessment of its strengths and weaknesses. She claimed that the 'securitization' of climate change has failed. The articulation of climate change as a security issue in numerous elite speech acts has not (yet) passed the critical threshold of exceptionality, and there is so far no evidence of 'extraordinary measures'. Despite the fact that a human security framing of climate change has been emerging in science and politics, this has not yet led to ambitious and legally binding emission reductions. If in the future developing countries are overwhelmed by the impacts of climate change, the 'responsibility to protect' might enable interventions in the name of human security. So a human security perspective is not necessarily non-violent and unproblematic. The Paris School has offered a more appropriate framework. 'Climatization' of the security field means that existing security practices are applied to the issue of climate change and that new practices from the field of climate policy are introduced into the security field. For instance, practices of disaster management are emerging in the defence sector while practices of adaptation are featured in migration and development policy. The author argued that while the figure of the 'climate refugee' is mobilized by different and sometimes competing climate-security discourses, sustainable development, adaptation policy, and disaster management would be more suitable means for addressing human vulnerability to climate change.

In chapter 10, *Judith Nora Hardt* deconstructed environmental and human security concepts in the Anthropocene, arguing that only a human-centred security approach can address the root causes of the 'environmental threats' of *global environmental change* (GEC), while state- and eco-centred approaches lack the ability to address the challenges faced by the insecure, the poor, the powerless, and the marginalized. The concept of human security has shifted the discussion towards an *integrative* understanding to be achieved by broadening security narratives and practices, by including dominant actors and structural causes, and by securing the living basis of human existence. While human security is an exclusionary concept, the human-centred concept of environmental security has a broader scope in defining the agents, phenomena, or institutions that are causing GEC. Therefore, a human-centred environmental security approach should play a key role in the Anthropocene, where security cannot be achieved by maintaining order; rather, environmental equity and justice should be a basis for achieving human-centred environmental security.

Focusing on the 'political in nature' in chapter 11, *Linda Wallbott* discussed the conflict-fuelling character of international climate change policies between paternalism and hegemony, arguing that international climate change policies can contribute to conflict prevention if mitigation and context-sensitive adaptation measures are implemented as a consequence. While a reduction of *greenhouse gas* (GHG) emissions is crucial to mitigate climate change, adaptation is necessary to cope with existing environmental changes. Wallbott reviewed various discourses on human-ecological relations for framing adaptive capacity as a feature of human security and for elaborating on the nexus between climate change, natural disasters, and violent conflict. She concluded that the current international climate change policies are paternalistic and hegemonic. Although the climate-security nexus is increasingly debated, climate change and the prevention of natural disasters are often depoliticized. The depoliticizing trend stands in contrast to the urgent need for political solutions to address the root causes and possible consequences of climate change.

In chapter 12, *Detlef Rothe* presented the results of an exploratory case study, using metaphor-based discourse analysis. While empirical knowledge on the security implications of climate change is still limited, the public perception of climate change as a security issue is growing. The picture of a climate-security threat has become influential in political and public

discourses about climate change, but contrary to the assumptions of securitization theory this discursive shift is not accompanied by any political shifts in the climate regime—that is, through the adoption of exceptional measures to challenge the climate threats. In international climate politics very different actors draw upon the climate-security storyline to make causal propositions, put the blame on others, blur their own responsibility, or render certain blueprints for action rational and desirable. The political rhetoric of securitization on the one hand means a politicization of the climate debate and on the other hand fuels a certain trend towards the depoliticization of global climate governance.

Tasos Karafoulidis contributed to the debate on securitization in chapter 13 by identifying the role of the ‘audience’ as the “weak link in the securitization of the environment”. A review of the ‘securitizing actors’ and the ‘speech acts’ used to raise the climate change-security nexus has focused on the responsive ability and will of the audience that must judge these messages and proceed to action in addressing the threat. Exploring the persuasive power of factors resembling ‘speech acts’, the chapter concluded that climate change could neither be effectively securitized through bold language nor by highly expressive visual representations of its consequences. Facilitating conditions concern not only ‘actors’ and ‘speech acts’ but the instrumental role of the audience. The securitization of climate change should balance the three basic pillars by including the audience, in order to move from the process of securitization to a de-securitization of climate change issues.

In chapter 14, *Tore Rørbaek* shifted perspective to a ‘visual securitization’ and examined ‘words, visuals, and the vanished enemy’, basing his argument on the opening film at COP 15, and reflecting the general criticism of the focus of securitization theory on ‘speech acts’ by integrating the abilities and effects of the image into the wider discourse. Climate change has been securitized by various actors with conflicting agendas. The author analysed this film and found that it ‘securitized’ the issue but without identifying a particular ‘other’ as enemy. Climate change pictured this way, as a global problem without the sources of the problem being identified, could compromise the capacity of public opinion and the pressure it could exert.

38.2.4 Climate Change and Migration

As *Frank Biermann* and *Ingrid Boas* argued in chapter 15, climate change will in the coming decades fun-

damentally affect the lives of millions of people who may be forced to leave their villages and cities to seek refuge in other areas. The existing governance mechanisms are not sufficiently equipped to deal with this looming crisis. The protection of climate refugees requires an effective system of multi-level governance, with a strong global framework providing vital support for, and coordination of, national and local efforts. This regime must be tailored to the needs of climate refugees, and be appropriately financed and supported by the international community. Several governing principles were suggested in this context, aiming for planned relocation: resettlement instead of temporary asylum; collective rights for local populations; international burden-sharing and international assistance for domestic measures; and financial support and compensation of climate refugees. A new legal instrument was suggested, a ‘Protocol on Recognition, Protection, and Resettlement of Climate Refugees’ in addition to the *UN Framework Convention on Climate Change* (UNFCCC) – as well the ‘Climate Refugee Protection and Resettlement Fund’ as a separate funding mechanism.

In chapter 16 on “‘Climate Refugees’ as Dawning Catastrophe”, *Cord Jakobeit* and *Chris Methmann* offered “A Critique of the Dominant Quest for Numbers” based on social science research, arguing that the dominant quest for numbers was flawed with conceptual problems on definition, causation, and prediction, and that thorough case studies were to be preferred. Relying on Foucault’s ‘power-knowledge’ nexus, the authors welcomed the maximalists’ will to make their political ambitions explicit, but criticized their lack of awareness that different ways of framing the climate-migration nexus might lead to different political responses. These responses ignore social, economic, political, and institutional structures, and this may have severe political consequences for the populations affected. In particular, climate refugees may bring about the demise of refugee rights if ‘regular’ refugees are pushed into the category of environmental refugees, and high numbers of ‘climate refugees’ could spur anti-immigration discourses. An open debate on ‘climate refugees’ may foster more emancipatory solutions such as an improved global social policy, local autonomy, and a more just migration policy.

In chapter 17, *Úrsula Oswald Spring* analysed environmentally-forced migration from rural areas in Mexico to towns (internal rural-urban migration) and to the USA and Canada (transnational migration). Co-operation between the USA and Mexico should support the weaker country as an ethical compensation

for historical and currently higher levels of GHG emissions, which have affected Mexico more seriously than the USA. These compensation mechanisms should also include the acceptance of a negotiated number of environmentally forced migrants, who are de facto obliged to leave their communities due to the irreversible effects of climate change, setting an important example for peaceful conflict resolution and preventive management of potential complex emergencies. Preventive migration practices and international cooperation must focus more on development, on livelihood improvements, and on environmental services, for example in remote rural areas. This includes the creation of jobs for young people and a strong social and environmental policy in Mexico. A first step towards a combined *human, gender, and environmental* (HUGE) security could be an agreement between Mexico and the USA by which a contingent of low-qualified people are legally accepted annually in order to meet the USA's demand for cheap manual labour. This would reduce the social vulnerability of migrants during the crossing, to some extent diminish illegal and criminal activities, and improve the living conditions of immigrants in the USA. On the Mexican side, environmentally-forced migration could be reduced by the adoption of a rural development policy, by preventive learning, by early warning, and by appropriate adaptation and mitigation mechanisms for coping with the multiple physical and societal effects triggered by anthropogenic climate change during this century.

In chapter 18, "Policing Borders in a Time of Rapid Climate Change", *Steve Wright* argued that the securitization or militarization of the responses to climate change should be monitored, and that climate change and research activists should directly challenge any military and security 'solutions' to climate change. In resisting a possible militarization of climate change impacts, the role of accurate information would be vital. The well-funded internal security markets can reorient their focus to newly defined security threats, including the social consequences of badly managed political responses to climate change. It is important that future debates and decisions about building sustainable futures thoroughly examine and mediate proposed security measures early on. The key is to avoid the worst case scenarios inherent in any last-ditch attempt to technically fix climate change. This dimension is likely to grow very rapidly as the related international crisis deepens.

38.2.5 Climate Change and Security in the Middle East

In chapter 19 on "Climate Change on the Arabian Peninsula - Regional Security, Sustainability Strategies, and Research Needs", *Dennis Kumetat* analysed the potential implications of climate change for the Gulf countries, linked them to the changing security dynamics of the region, discussed selective sustainability strategies, and offered a policy brief on the regional impact of climate change. Future research areas may include the vulnerability of infrastructure, investments, and an incentive for the smaller Gulf States to study the local and regional effects of climate change. Possible patterns of migration and human trafficking into the region in the case of large-scale population movement in North and East Africa will be of key interest to governments. Sustainable and renewable energy policy strategies must be developed to reduce the innovation barriers in the Gulf States. This includes the streamlining of existing sustainability models.

In chapter 20, *Andy Spiess* focused on "Environmental Degradation, Climate Uncertainties, and Human Vulnerabilities: Toward a Shifting Security Paradigm in the Arab Gulf Monarchies". The impacts of climate change can only be successfully countered in the future if preventive measures are applied. Pure reliance on reactive measures is likely to lead to a destabilization of many countries in which adaptive capacities are limited. This may include the Arab Gulf monarchies that have experienced considerable environmental degradation in the past. In conjunction with resource depletion and uncertain climate trends, this makes it necessary for these countries to consider these issues jointly in the regional security discourse. Possible windows of action already appear quite limited as many options are likely to lead to further cascades of detriment, or they take too long to realize, or are unrealistic to put into effect.

In chapter 21, *Achim Maas* and *Kerstin Fritzsche* developed an analytical framework to improve the understanding of the links between climate change and insecurity, in particular violent conflict and political fragility, by incorporating the *Regional Security Complex Theory* (RSCT) developed by Barry Buzan and Ole Wæver (2003). They applied their model to Iraq and its neighbours and showed that climate change carries the danger of the outbreak or continuation of violent conflict. Water in particular, and by extension agriculture and other related sectors, were identified as key issues. The authors developed three scenarios, with parameters that vary in importance for each, that

shape the link between climate change and violent conflict, and also identified policy measures that could alleviate the danger of climate change's becoming a driver for armed conflict in the Middle East.

Chapter 22 by *Clemens Messerschmid* related the current climate change discourse to the Israeli-Palestinian conflict over transboundary, but largely unshared, water resources. In this context, climate change is used to reframe old positions on water distribution. The impacts of climate change are secondary to the main threat, the continuation of the unsustainable status quo. The Palestinian discourse tends to stress the conflict and political impediments while falling, at least partially, for the pragmatic technical solutions promoted by Israel and the donors. Palestinians, essentially, are bereaved of any prospect of mastering or adapting to climate change. They have to carry the double burden of the ongoing occupation and, in addition, the threats posed by the new climate interventions, which constitute an obstacle to Palestinian historic aspirations for hydro-justice. For Israel, climate change is a disruption of the status quo and allows Israel to portray itself as a victim although the projected impacts are marginal rather than existential. Climate change is a possible justification for stabilizing the status quo of asymmetric power distribution, hindering movement towards a sustainable future for all water users in the region.

38.2.6 Climate Change and Security in Africa

In chapter 23, *Joshua W. Busby, Todd G. Smith, Kaiba L. White, and Shawn M. Strange* developed and applied a methodology to assess the vulnerability of locations in Africa to climate change at a sub-national level. The authors used indicators on key socio-economic quantities combined in a *Geographic Information System* (GIS) to identify regions that are particularly at risk from the consequences of climate change. Based on their assessment, the areas with the highest composite vulnerability are Madagascar, the coastal regions of West Africa, coastal Nigeria, Ethiopia, and certain parts of the Democratic Republic of Congo. Different drivers affect vulnerability in the various regions, ranging from cyclones, wildfires, and rising sea level to high population density and weak governance. For each region, the particular combination of drivers was identified that contributes to increasing the vulnerability of the various parts of the continent. The low adaptive capacity of many African states is a product of problems in their economies, health care and education systems, infrastructure, and govern-

ance. Future research areas could focus on improving available data on infrastructure to handle climate-induced emergencies in communities at risk, including services for search and rescue, relief supplies, and reconstruction materials, as well as transport and information networks, and additional data on agriculture, primary commodities (e.g. food supply), and economic diversity. Statistical methods can test the strength of the indicators as predictors of outcomes such as disaster mortality. Maps of vulnerability, based on case studies and fieldwork, provide a precondition for improving understanding of the historical and political dynamics of vulnerable places and how these intersect with exposure to climate change. A more holistic approach could help policymakers tailor adaptation strategies and distribute scarce resources to the places in Africa where the need is greatest.

In chapter 24, *Beth Njeri Njiru* studied the impact of climate change on resource competition and conflict amongst pastoral communities in Kenya. Since increasing global temperatures are producing adverse socio-economic effects, there is an urgent need to find long-lasting solutions so that conflicts related to resource use among these communities can be avoided. The author explores the role of climate change in worsening existing socio-economic trends and looks at possible coping strategies for developing alternative sources of income for the affected people. Such alternatives are geared to decreasing the reliance on animals and increasing sources of water, for example by building dams.

In chapter 25, *Oscar Edoror Ubhenin* investigated the impact of climate change on the increasing number of violent conflicts in Nigeria using theories of human needs and relative deprivation to analyse the emerging 'climate conflict' in Nigeria. Durkheim's relative deprivation theory served as a basis for putting the restiveness among Nigerian youths into context. The situation of the young Nigerian population is shaped by relative deprivation that influences the whole gamut of conflicts, be it a resource war in the south or a religious war in the north. As climate change catalyses the range of conflicts, human rights and the environment are not protected in the Niger Delta, and so "companies can no longer be allowed to self-regulate". Recent political efforts have emphasized human well-being and equal opportunity for all. The huge social, economic, and political inequalities arising from climate change must be addressed. However, the Copenhagen declaration (2009) cannot cushion the effect of climate change.

In chapter 26, *Paul Isolo Mukwaya, Hannington Sengendo, and Shuaib Lwasa* argue that the continued expansion of urban areas in Uganda has increased the threats caused by economic inequality and natural disasters for considerable shares of the population. Flood hazards can have a strong adverse influence on the livelihoods of numerous low-income households. Flood management and planning regimes are two options that can help enhance resilience and security in such low-income areas. As the infrastructure employed is already operating close to its capacity, any extreme events that occur can have massively disruptive effects on the lives of a considerable section of the urban population. In order to identify new management options, it is necessary to better understand urban systems in Uganda and to improve the implementation of urban housing projects.

Focusing on malnutrition and conflict in East Africa in chapter 27, *Pedram Rowhani, Olivier Degomme, Debarati Guha-Sapir, and Eric F. Lambin* have addressed the impacts of resource variability on human security. They found an indirect link between environmental change and conflict in eastern Africa that is masked by a number of political and economic factors. In addition, interannual ecosystem productivity is a quantity that needs to be taken into account when assessing security aspects in this region. The results of a statistical assessment indicate that there is a direct relationship between malnutrition and the occurrence of armed conflict. However, when the different levels of society are looked at, the state of the environment and possible changes are of less importance at the local level and increase in importance at the regional level. As the variability in key climate indicators is going to increase in the future, the complex interactions between these variables, socio-economic developments, and human security need to be better understood if de-escalation measures are to be successful.

38.2.7 Climate Change and Security in Asia and the Pacific

In chapter 28, *Md. Mustafa Saroar and Jayant K. Routray* argued that for coastal people in Bangladesh climate awareness influences their adaptation efficacy against climatic stresses. Physical, cultural, and informational resources each have a similar influence on their adaptation efficacies. The authors explored the impact of socio-economic, political, instructional, psychological, and behavioural factors. Seventeen variables which explain 72 per cent of the variance in the adaptation efficacy of the respondents were selected

and three additional dimensions of climate awareness were used in the multiple regression models to quantify the extent of influence on climate adaptation efficacy. Their findings suggest that only the perception of sea-level rise has a statistically significant influence on the people's adaptation efficacy against its impact, while the other two are insignificant. While in past programmes on natural disasters technical and managerial sciences prevailed, future efforts should incorporate socio-psychological elements to enhance the people's adaptation efficacy.

In chapter 29, *Sujan Saha* identified factors that shape the security of climate refugees in urban slums in Dhaka, Bangladesh. Various reasons were discussed as to why individuals are displaced and migrate to the slums, including climate-change-related causes. Many refugees are internally displaced people from various disaster-prone areas of Bangladesh who are not only adding further hardship to the slum population but are also creating social stresses. Two main areas of concern were identified in this chapter. First, climate refugees aggravate the inhumane conditions in the slums which are growing at an alarming rate in urban areas in Dhaka. Second, climate refugees create stresses in the social order and in existing facilities, and they increase the vulnerability of slums to crime and violence.

In chapter 30, *Ruchi Mudaliar and Parul Rishi* provided a psychological perspective on climate stress in coastal India, which is considered to be particularly vulnerable to the implications of sea-level rise. As a substantial share of the Indian population in the coastal regions is likely to be affected, it is important to assess how the threat of climate change is perceived psychologically in coastal India. Results of a pilot study conducted in the city of Veraval indicated that there is substantial cognitive awareness of climate change and the dangers it poses. A large number of people were also emotionally concerned about climate change. However, it remains unclear how the results would differ in other coastal regions of India. Such assessments in large coastal metropolitan areas are subject to future research.

Analysing and comparing neo-Malthusian and social justice perspectives in chapter 31, *Mohammad Zulfan Tadjoeeddin, Anis Chowdhury, and Syed Mansoob Murshed* showed that population pressure and considerable vertical inequality can have a distinct influence on the occurrence of routine violence on the island of Java, Indonesia. According to their analysis, climate change is likely to worsen the already existing Malthusian conflict potential on Java. The results of a

statistical analysis indicate that vertical inequality can have a violence-inducing effect. This effect is amplified if it coincides with high population pressure. Consequently, it is necessary to develop growth strategies that include redistribution of resources to counter these tendencies to increase the likelihood of conflict.

Chapter 32 by *Achim Maas* and *Alexander Carius* provided a review of the possible security implications of climate change in the Pacific for different sectors, ranging from non-traditional security threats—such as threats to human security, food and energy insecurity, disasters, and others—to traditional security challenges that threaten territorial integrity and sovereignty, with particular reference to sea-level rise. Their study drew on an extensive literature review, on the results of a scenario workshop carried out in Suva (Fiji) with regional stakeholders, and on the perspectives outlined by regional governments on the impact of climate change on security. Because they could be completely submerged, island states become dependent on international solidarity and the goodwill of other states who are prepared to house their populations and governmental structures. Significant amounts of funds may be necessary, and this means that international financial institutions and extra-regional entities need to become involved. Climate adaptation funds may be appropriate for defusing conflict potential. The authors discuss actions to address the challenges and turn them into opportunities, with regional approaches for developing innovative institutions and mechanisms. Migration from the outer islands to the main islands may mean that economies of scale can be achieved.

38.2.8 Improving Climate Security: Cooperative Policies and Capacity Building

Basing his argument on a revised theory of securitization, in chapter 33 *Gerrit Kurtz* proposed that the dominant perception of climate change as a security issue changed substantially after it first became a major issue in 2007. By comparing the arguments used in the Security Council debate on climate change in 2007 and in General Assembly debates and negotiations in 2008 and 2009, he demonstrated the decline of some storylines and the emergence of others. The debate on climate change and security in the main organs of the United Nations provided a practical example of the strategic use of discursive strategies such as rhetorical entrapment and forum-switching in the se-

curitization of non-traditional threats. Kurtz particularly emphasized the rise of the argument made by the small island developing states in the deliberations in the UN General Assembly on climate change as a threat to livelihoods and human security. It was apparently much easier to agree upon than the environmental conflict storyline employed by many European countries in the Security Council in 2007.

Bo Kjellen and *Peter Wallensteen* argued in chapter 34 that diplomacy has failed to successfully deal with climate change. There is a need for what they call new diplomacy. They developed three principles for this new diplomacy. One is the need for an extremely long-term perspective in evaluating the situation and considering the options for action. The second is the need for a broad approach to the societal implications of decisions taken in the international arena. Finally, since the results of international negotiations are dependent on the instructions of negotiators, national *enabling conditions* need to be well understood, in particular the very broad range of interests within the states that are involved. Despite its mixed record, they continued to see the UN as playing a crucial role in dealing with the consequences of climate change. They made suggestions for reform on a number of policy areas including humanitarian assistance, where they expect a rapidly growing demand. But fundamentally, they argued for a new bargain between states, preferably at a global conference on the truly global threats.

In chapter 35, *Dennis Tänzler* and *Felix Ries* argued that climate change as a global challenge has profound implications on peacebuilding but the links between these issues are often somewhat neglected. Successful mitigation measures can influence potential conflict constellations. If implemented correctly, the reduction of deforestation could contribute to the stabilization of conflictive regions by strengthening the adaptive capacities of the social groups involved. In particular, if climate policy is supposed to be not only conflict-sensitive but also positive and transformative, it needs to adequately encompass institution building and participatory processes and provide a focus on income generation. This could only be achieved if different administrative and societal levels are included in policy development.

In chapter 36, *Tagelsir Mohamed Gasmelseid* discussed how information systems can enhance innovation and capacity building as a contribution to resilience and security in the water sector. Capacity is defined as the ability of individuals, institutions, and societies to perform functions, solve problems, and

set and achieve objectives in a sustainable manner. Capacity building and development provide the 'tools' needed for the effective delivery of programmes or services. The human dimension relates to the improvement of knowledge bases, skills, and experience, and the strengthening of managerial systems. The social dimension relates to the advocacy of trust and reciprocity, values, attitudes, behaviour, commitment, motivation, and network relationships. The institutional dimension relates to improved governance, accountability, the involvement of stakeholders, facilitating decision-making processes, and managing upstream-downstream linkages. The economic dimension relates mainly to financing water infrastructure. Capacity building and development are affected by an enabling environment, an institutional framework, and human resources development through training and education. Integrated regimes establish connections between different stakeholders and enable the creation of social learning networks.

Finally, in chapter 37 *Hans Günter Brauch* discussed the policy responses to climate change in the Mediterranean and in the *Middle East and North Africa* (MENA). He referred to the 'climate paradox' of the G8's commitment to reduce GHG emissions by 80% by 2050 together with their lack of will to implement the necessary measures. The MENA region will be a climate change hot spot, where failure to act may cause severe security problems for Europe. To cope with this 'climate paradox', a 'fourth sustainability revolution' is required. The 'cascading processes' of 2011, the Arab rebellions and the Fukushima nuclear disaster, require that policy responses to climate change should simultaneously respond to this triple challenge. The Desertec vision of renewable energies from the Sahara offers a far-reaching strategy for a sustainable co-development between EU and MENA countries as a building block for a 'survival pact' that links sustainable agriculture and energy sectors in the EU-MENA region. This concept may initiate a transition towards the fourth sustainability revolution.

38.3 Future Research Needs and Conceptual Challenges

The various contributions in this book demonstrate that climate change confronts humanity with multiple security risks and major challenges that could push many societies to the edge of their problem-solving capacities. If the adaptive capacities of a considerable number of countries were exceeded and societal sta-

bility were threatened, this could lead to the destabilization of larger regions of the world, possibly resulting in an increased use of violence to secure the political and economic interests of individuals and countries. In order to reduce the likelihood of the occurrence of the adverse societal implications of climate change, it is important to support countries at risk to strengthen their adaptive capacities and enable them to deal with the impacts of climate change when they occur.

In the following, we will assess methodological issues, describe integrative concepts that provide guidance, and develop strategies for addressing this climate challenge to society, stability, and security. Many of these issues can only be briefly touched upon here and deserve a more fundamental treatment and debate.

38.3.1 Methodological Challenges

The nexus between climate change (as the cause) and the impacts on human security, societal instability, and conflict requires a multi- and transdisciplinary approach and the expertise of both the natural and the social sciences, both used in physical and in human geography. This essential multi-, inter-, or transdisciplinary approach poses many methodological challenges, such as epistemic claims to the possibility of the discovery of truth(s) and causality, proper levels of analysis, and the interlinkages between theory and empirical work as well as the treatment of data.

The span of methods used by the authors of this book is extremely wide, including both positivist and post-positivist approaches, theoretical expositions with illustrations, and empirical work with little theoretical background. This diversity not only reflects the current state of research in the field, it is also appropriate given that most of the phenomena we are interested in lie in the future.

Still, in order to advance our knowledge it seems likely that research needs to become more integrative, in terms both of disciplines (see section 38.3.5 below) and methodologies. Simply put, more effort is needed in bringing the various methodological approaches to speak to each other.

This should occur at various levels of analysis. One is that of the local effects of climate change. Currently, as in this volume, quantitative and qualitative case study methods (George 1979) stand side by side. Differences in claims to causality and generalizability but also respect for and knowledge of methods that researchers are not familiar with often prevent cumu-

lative progress in knowledge. While this is not particularly a complaint in this field of study (Laitin/Caporaso/Collier et al. 1995, Sprinz/Wolinsky-Nahmias 2004), the chances for progress are particularly good here as the need for integrative approaches is so obvious.

Another level is that of the region, whether or not it is co-terminous with existing states. Different methods from those used at the local level come into play here on the qualitative side, but the shortcomings, obstacles, and opportunities are similar to those at the local level.

A third level is the global. Here the main methodological challenge is to narrow the currently large gap that exists between models which incorporate physical data on climate change and representations of the interactions of a multitude of the actors in the many fields that are relevant to policy, in ways that are both economical and yield results in line with empirical observations. In order to achieve progress here, models need to become more complex and quantitative analysis needs to become more aware of the possibilities of linking with attempts to model data.

38.3.2 Empirical Research

As several chapters in this volume have shown, the combination of future climate change (cause) and high environmental vulnerability (impact) constitutes a significant potential threat to human security. In the introductory chapter 1, four different social science approaches were distinguished for studying these relationships (determinists, empiricists, sceptics, and deniers).

Changing climatic conditions and extreme weather patterns may severely affect agricultural societies. But highly industrialized and developed urban coastal regions are also at risk. However, as the chapters in this volume have shown, the empirical evidence on the relationship between climatic change and conflict remains inconclusive, partly due to its complexity and inadequate data. Some studies have found significant statistical correlations between a changing average global temperature and the frequency of wars, others doubt such a simple relationship.

Future research can be based on the hypothesis that the intensity of conflict depends on the degree of the physical impacts of climate change and of the unpredictable possible tipping points in the climate system (Lenton/Held/Kriegler et al. 2008). As long as the climate signal is weak, there is no measurable impact on conflict. This raises the question whether there are possible critical thresholds of climate change

that trigger violent conflict. Below the level of armed conflict or interstate war, it is more likely that climate affects small-scale events of societal instability and low-level conflicts. Since data have been insufficient in the past, several efforts have been launched to improve the distinction between different conflict intensities and instability events based on various data sources (including news services, local surveys, interviews, focus groups, and stakeholder dialogues). An additional spatial dimension has been added by a developing geo-referencing of data (e.g. by Nardulli/Leetaru in chapter 3; Busby/Smith/White et al. in chapter 23).

These datasets on environmental, conflict, and socio-economic variables can be combined to provide a comprehensive picture of spatio-temporal security syndromes in regional climate hot spots. Expanded approaches will rely on a more refined set of dependent variables and time-varying factors that affect the vulnerability and adaptability of societies to the effects of climate change. A recent and widely acknowledged attempt has been an article published in *Nature* that relates conflict risk to the *El Nino Southern Oscillation* (ENSO) phenomenon (Hsiang/Meng/Cain 2011).

While large *quantitative* data collections are still insufficient, it is promising to look at individual regional *qualitative* case studies of environmental conflicts, which are important for exploring the relationships between the various factors affecting societal stability in detail. This volume provides insights from a number of case studies in different regions for understanding human responses at the micro-scale.¹

Furthermore, extensive and critical coverage is given to the 'securitization' (Wæver 1995, 1997, 2008, 2008a) discourse on climate change, at both the global and regional levels. While the number of statements in which climate change is perceived as a security threat has grown significantly since 2007, the empirical basis of actual causal linkages and actions has remained limited. This suggests that many 'speech acts' of policymakers have remained rhetorical and have not resulted in 'extraordinary measures' at the governmental level to address the purported security impacts of climate change. For this reason, several au-

1 However, the results of the case studies in this volume rely on different methodological approaches and thus cannot be easily compared and do not necessarily permit 'inductive' theory development. This would have required a common comparative case study method, as has been suggested by Alex George (1979, 1988; George/Bennett 2005) with the method of 'structured and focused comparison'.

thors (Trombetta in chapter 7 and Oels in chapter 9) have challenged the approach of the Copenhagen School.

More research is needed in order to understand the specific conditions under which decision-makers and government agencies are likely to take serious action to address security concerns. As long as the security implications and conflict potentials are hypothetical it is unlikely that states will invest in proactive policies to prevent climate-induced conflicts. Further research and debate is needed to study the contextual conditions that affect the likelihood of security moves, in particular regarding the societal and political context, intermediate variables, and intervening responses that determine whether possible pathways between climate change and conflict are actually taken.²

38.3.3 Theoretical Approaches and Models of the Climate-Society Interaction

While statistical analysis of a large number of cases can provide guidance on possible linkages between the environment and human society, additional theoretical and empirical efforts are required to reconstruct the causal relationships and pathways connecting climate change and conflict. In attempting to identify the conditions under which conflict is triggered or prevented, statistical assessment reaches its limits when it comes to complex, uncertain, and long-term future processes. Because of the circular relationships between many of the variables involved, each pair of variables could be connected through multiple pathways. To support empirical investigations, a systematic assessment of the climate-security link is needed that integrates the causal chain between climate change, natural resources and environmental stress, human values and capabilities, and the societal consequences and instabilities (see chapter 5).

2 Some attempts towards broadening the discourse have been made in 2011 with a series of workshops at the KlimaCampus Hamburg on “Severe atmospheric aerosol events” (August), “Limits to the Anthropocene” (September) and “Geoengineering the Climate” (November). In the same year, several workshops took place in the Climate Security Dialogue Series at the Federal German Foreign Office, which were co-organized by Adelphi Berlin, CLISEC/KlimaCampus and the Institute for Peace Research and Security Policy Hamburg (IFSH). These focused on different world regions (Mediterranean, Central Asia, Latin America, Southern Asia).

Much of the research has focused on vulnerability, which according to the IPCC (2007) is a function of the exposure of systems to climate change and of their sensitivity and adaptive capacity. Several contributions in this volume express concerns that climate change could overwhelm the adaptive capacities of societies and contribute to their destabilization, thus possibly leading to security risks and violent conflicts.

An increase in the average mean temperature above a certain threshold (such as 2°C) with associated changes in the other key constituents of the climate system may result in disproportionately strong impacts and responses in regions of the world that are already economically challenged. It is important to theoretically understand how levels of security and risks of potential conflict are affected by rising temperatures in a particular region, and how societal and human responses further influence that development in their turn.

The analyses in this volume suggest that there is a wide range of possible pathways between environmental changes and conflict-relevant trends. The integration of the potential complex interactions provides a blueprint for further climate-security analysis and points to possible cause-effect relationships as well as to relevant factors for avoiding risks and conflicts. Effects of anthropogenic climate change interact with individual human needs to have an impact on the underlying social dynamics. Depending on how welfare is affected and what the prevalent socio-economic boundary conditions look like in the region considered, such changes can have lasting consequences for the given social structures. If the societal implications are negative, a rise in the risk of armed conflict will then reflect back on the social dynamics and socio-economic boundary conditions as well as on individual human needs, perceptions, and responses.

Besides a lack of theory, there is but little modelling of the link between climate change and conflict, contrasting with the extensive modelling and simulation carried out by the climate research community. To bridge this gap, more research is needed to link empirical and theoretical approaches using modelling tools to analyse the complex relationships. Within the integrated assessment framework introduced in chapter 5, it is possible to explore the key links and sensitivities between these variables and systems, as well as possible pathways of action, reaction, and interaction, with reference to theories and models that are applicable and relevant in this context.

38.3.4 Transdisciplinary Science

While individual disciplines investigate limited sections of reality, each with their specific methodology and terminology, purely disciplinary approaches restrain the solution space and are insufficient to address the complex challenges of climate change. Solutions demand collaboration across scientific disciplines and need to represent reality in a holistic manner. Research that addresses the complex physical and societal impacts of global climate change on security requires a gradual transition to inter-, multi-, and transdisciplinary approaches in education and research (Flinterman/Tecler/mariam-Mesbah/Broerse et al. 2001).

Transdisciplinary issues are relevant in the human lifeworld, including perspectives and forms of knowledge that belong to traditional and everyday experiences. Transdisciplinarity tries to create sustainable structures between science and the living environment and may offer a framework for scientific collaboration beyond disciplinary boundaries. Transdisciplinary sustainability science focuses on the interaction between natural and social systems and the conditions for a sustainable exchange and balance between humans and nature.

A transdisciplinary approach is a scientific construction based on daily practice, which is dynamic, self-regulating, dissipative, and organized with interlinked nodes and clusters (Oswald Spring 1992; 2005). It is dialogic, works simultaneously with experts and decision-makers (top down), and empowers people (bottom up).³ In this context, Wilson's (1998) concept of 'consilience' is relevant; it implies a refocusing of scientific research on the interlocking of causal explanations across disciplines, where the "interfaces between disciplines become as important as the disciplines themselves" and where the research would "touch the borders of the social sciences and humanities".

In a transdisciplinary process (Oswald Spring/Brauch 2008: 952) the participants in a complex interdisciplinary research team first consolidate a research framework capable of dealing with new dangers and inherent uncertainties. Then, a global scientific network should combine the natural and social sciences and the humanities to analyse and interpret the ongoing trends and contradictions in security thinking.

3 Criteria on transdisciplinary sustainability research can be found in Bergmann (2003), Stoll and Pohl (2007), and Scheffran (2007).

This network should be able to advise policymakers and the population at large about potential security dangers and concerns. It starts with an understanding of the multi-causal and deep roots within an intercultural framework in order to produce complex scenarios of possible outcomes and to prevent future ruptures and triggering situations. In this sense it contributes to anticipatory learning processes where knowledge is not only integrated but also structured and merged in such a way that technological and political expertise can be understood and applied for the benefit of the people. It includes analyses of human activities in space and time at the local, meso, and mega levels, where possible conflicts and impacts may be anticipated and mitigated within a complex and dissipative system constellation.

38.3.5 Complexity and Uncertainty

An important aspect that justifies transdisciplinary science is the complexity of the systems and the problems of global environmental change and related security issues. Complexity science offers a rich framework for analysing and handling complex problems and opens the possibility of integrative approaches from the micro to the macro level of the Earth System. In the modelling world this finds its expression in integrated assessment approaches that connect natural and social systems.

In a complex system, the interaction of individual components can lead to new characteristic emerging patterns, which did not exist in the individual units. Related phenomena can be found in many branches in the natural, engineering, and social sciences. They contribute to the ever-growing complexity of today's world by increasing the number and the diversity of interconnections. There are various meanings of the term complexity, yet there is no commonly agreed definition (for an early overview see Scheffran 1983; linkages between complexity and security are analysed in Scheffran 2008 and by Mesjasz 2011). Complex systems tend to generate surprises, react sensitively to parameter variations, and many parameters and interactions are highly uncertain, which makes a validation of theories and models by data and experiments difficult. On the other hand, uncertainties open a wide range of possible futures and offer the freedom of choosing alternative action paths, which challenge the presumption of rational decision making.

Historically, weather and climate have been typical examples of complex and chaotic systems. Although the world's climate has been somewhat stable over re-

cent millennia, a look at palaeoclimatic records shows that abrupt climate changes have occurred. Despite deep uncertainties associated with the climate system, with the emission of greenhouse gases humanity is currently undertaking a risky experiment that may have a lasting impact on the entire planetary system.

Previous research has assembled a huge amount of disciplinary knowledge of the various compartments of the climate system, including rivers, polar ice, solar radiation, various atmospheric components, land cover, GHG emissions, and other anthropogenic factors. However, the climate system cannot be fully described by listing all the equations and measurement data for each of its components. Even if all factors were known individually, it is still not certain how the different relationships and feedback mechanisms interact with each other and how the 'system of systems' works across different temporal and spatial scales. During natural evolution, the various parts and flows have adapted to each other in a long-winded process of trial and error. Interactions which were not compatible have been cancelled out naturally. Human interventions have been destabilizing established relationships in the rather short time period since the beginning of the industrial revolution and the advent of the Anthropocene era of earth history, and this complicates reliable predictions.

Since climate change affects the societal and political environment and is in turn affected by it, analysing this mutual and circular interaction is a major challenge, since many of the tools used in this research field are disciplinary, linear, and monocausal. New approaches in research are needed to address the tremendous complexity of the problems. Considering that the security implications of climate change are very complex and cover highly uncertain future developments, it is imperative to break new ground to find an adequate representation of the complexity of the issues involved. While some contributions in this volume have addressed the causal chains from different viewpoints, a still more systematic approach is needed in order for us to understand and reconstruct the complex tree of potential future pathways and decision points. Using this, we can estimate their plausibility on the basis of an empirical grounding in the links and sensitivities that provide a fair representation of the complexity.

While the complexity of climate change issues is already vast, a new dimension of complexity would be added by including geoengineering measures for deliberate climate intervention. An understanding of the resulting conflict dimensions and peace and security

implications of these intentional efforts to purposefully modify the climate is just emerging.

38.3.6 Actors, Networks, and Conflicts

While developments in global environmental change are affected by systemic factors and interactions that are subject to study by the natural sciences, many of these problems are the result of social developments and human behaviour, which are analysed by the social sciences. An interdisciplinary treatment of these problems would bring systemic and agent-based approaches together to allow for an analysis of the network structures established by their interaction. Human behaviour is guided by values and capabilities which can vary over time. In the climate change debate, value issues play an important role, as expressed by the ultimate goal of Article 2 of the UNFCCC: to avoid dangerous climate change (Ott/Klepper/Lingner et al 2004). As this and other examples show, the normative concepts of security and sustainable development cannot be separated from the different and conflicting interests of society. Thus, understanding the conflicts between the values, goals, and actions of different actors is relevant for an assessment of climate security and sustainability. Conflicts consume considerable resources which are then not available for an efficient and cooperative problem solution. With growing resource conflicts over water, food, fisheries, and biodiversity, in a situation of climate change and energy shortages the conditions for protecting these resources deteriorate. With many natural resources already being exploited, any change in environmental conditions altering the replenishment rates or the accessibility of the resources increases the potential for conflict and societal instability.

The analysis of GEC as a security issue requires an understanding of the linkages between resource scarcity and the degradation of water, soil, and food; between environmental pollution and health security; and between the social problems of urbanization and their respective socio-economic and cultural contexts. Security research should specifically address the extreme scenarios of GEC, among them extreme weather events leading to environmental hazards and disasters, environmentally triggered migration, and the particular conditions and causes that have contributed to an escalation of violence resulting in national and even in a few cases international crises and conflicts. Furthermore, it should assess the interaction between environmental and social vulnerability that contributes to a transformation of natural hazards into

social and political disasters. To overcome the lack of cooperation between disaster research and peace research (Wisner 2009), the insights of both fields may benefit from empirical research and policy-oriented strategies of conflict avoidance (addressing long-term structural factors escalating into violence) as well as conflict prevention and resolution (Brauch 2000; Oswald Spring/Brauch 2011).

Including conflict analysis in environmental research is increasingly important, particularly when the focus is on lasting conflict resolution and peacebuilding. A comprehensive assessment aiming at an integration of societal developments into the analysis of natural cycles can examine the relationship between different frames and concepts of action, including resource conservation and reproduction, fair distribution, participation, efficient resource use, risk minimization, and sufficiency (Scheffran 1998). An integrated strategy seeks to incorporate action-oriented concepts into the societal discourse (stakeholder dialogues, mediation) and solution-oriented concepts into practical rules in the international system. This would be a step towards combining knowledge in systems, goals, and transformation processes.

For existential challenges affecting fundamental human needs, the spectrum of responses may be restrained and possibly increases the temptation to turn to desperate acts, including the use of violence. People may also be forced to leave their home region if their survival is at stake. Similarly, certain mitigation strategies include additional risks, such as nuclear power, biofuels, or geoengineering. On the other hand, innovative strategies could mitigate conflict and facilitate cooperation to improve the common security of all affected parties.

38.3.7 Viability, Adaptation, and Resilience

Every system works within certain limits, and this is true for physical and biological systems as much as for human beings and societies. The term ‘viability’ conveys the meaning that for a system to survive it is essential to stay within the boundaries that support its existence (Aubin/Saint-Pierre 2005, 2007). If changes bring the system close to its boundaries, it is necessary to introduce control and regulation mechanisms that prevent the system from exceeding the boundaries. Systems can also adjust to the new conditions, and this often requires structural changes and adaptive responses. For complex systems the boundaries may be hard to determine, and this depends on the system’s tolerance regarding risks. Regulation can be

based on principles that contribute to stabilization (such as precautionary and safety principles). To survive under continuously changing conditions, ecological and social systems have evolved in a process that improves the ability to learn and adapt. Information flows and communication are essential to create and select between alternative pathways according to performance criteria.

The underlying ecological processes need to be protected against disturbing changes of environmental conditions that could trigger tipping points and cascading breakdowns. To maintain the integrity and adaptive capacity of ecosystems, biodiversity needs to be preserved through the establishment of nature reserves, sustainable land use, limitation of harvest yields, and the preservation of endangered species. This would also protect terrestrial carbon stocks, especially tropical forests, against over-exploitation and deforestation. The adaptation capacities of ecosystems to climate change need to be strengthened, recognizing their services to human societies. Within particular limits, ecosystems can be managed to adapt to and to survive climate change. To be sustainable, consumption of natural resources should not exceed the natural ‘carrying capacity’ for these resources. Viability limits are given by the finiteness of non-renewable resources, by the limited regenerative capacity of renewable resources, and by the limited ability of nature to absorb waste.

Closely related to viability and adaptation is the concept of resilience, which is the ability of a system to cope with or compensate for external shocks and surprises. The resilience concept was first developed for ecological systems (Holling 1973) but has spread to socio-economic systems, in particular with regard to climate change (see the review in Campana 2010; and Brauch/Oswald Spring 2011). Social resilience implies that a community is able “to withstand external shocks and stresses without significant upheaval” (Adger/Kelly/Winkels et al. 2002). Resilient communities involve active agents that anticipate and resist future shocks and stresses and are able to repair or recreate their environment to preserve their self-conceived identities, using strategies of anticipatory learning (Tschakert/Dietrich 2010). What matters for adaptation and social resilience is the capacity of a community to cope with the magnitude of climate change, and this depends on possible alternative action paths and human responses. Some responses could help to diminish harm and to develop new opportunities; others may cause additional problems (maladaptation).

One adaptive response to climate change is human migration (Black/Bennett/Thomas et al. 2011; Foresight 2011). Throughout history, migration has been a possible adaptive response not only to poverty and social deprivation but also to environmental hardship and changing climatic conditions. Migration does not simply pose a threat to the communities who are losing their members, to the migrants themselves, and to their destination areas; it could also create opportunities by allowing the acquisition of new knowledge and income and other resources, as well as the creation of social networks across regions that can be used to pursue new strategies that were previously unavailable. These can help to shape and create community livelihoods under changing environmental conditions and find collective responses to the climate challenge. Three strategies in the migration process can be distinguished (Scheffran/Marmer/Sow 2012):

1. *Adaptation preventing migration*: to avoid forced migration, it is important to strengthen the adaptive capacity and social resilience of communities affected by climate stress through improved capabilities, livelihoods, and institutions.
2. *Migration as adaptation*: where communities are threatened by climate change despite their efforts towards local adaptation and protection, migration is a legitimate adaptive response.
3. *Migration for adaptation*: new opportunities, new resources, and networks of migrants in the host regions can support climate adaptation and social resilience in the regions of origin, e.g. through transfer of know-how, through remittances, and through return migration.

To develop a constructive and sustainable relationship between climate change and migration requires adequate institutional frameworks that strengthen co-development between home and host communities.

38.3.8 Sustainable Development and Sustainable Peace

An essential concept in the prevention and minimization of harmful climate impacts is sustainable development that “meets the needs of the present without compromising the ability of future generations to meet their own needs” (WCED 1987: 43). This definition provides a direct link between the needs and abilities of people across generations which are to be satisfied within their given natural resource limits. Regenerating human capabilities and adaptive capacities in a sustainable manner makes societies more re-

silient to climate change and allows them to invest in low-carbon energy alternatives and the further establishment of societal institutions.

A transdisciplinary sustainability science does not focus only on the biological criteria of ecosystem viability, on the economic requirements of cost-benefit efficiency, or on the analysis of social barriers and solution concepts. An integrated view requires a holistic approach which takes the entire life cycles of goods and services into consideration, from source to final disposal, including recycling. These interactions imply that the change in one variable investigated by one discipline affects other variables studied by other disciplines. An example is the determination of an upper emission limit, which is derived from ecological considerations but at the same time takes into consideration the political and economic context, including the state of development of a country, its human security, and its capacity for conflict resolution.

One focus of future research should be to consider the capabilities and motivations of key actors in pursuing goals that shape the boundaries of opportunities. Natural resources and environmental conditions play a dual role here: on the one hand, (valuable) resources can function as a motivation to take them from others. These resources can thus increase the capability of actors to further engage in (violent) action. On the other hand, resource scarcity can increase the motivation to defend interests against others while it can also diminish the capability to engage in conflict. With declining resources there can be a transition from resource abundance to resource scarcity as a driver of conflict, with a threshold in between. Where the threshold lies depends on the resource type and the actors’ response patterns, which are shaped by cultural and institutional conditions that could transform a conflict situation into cooperation in order to share resources in a mutually sustainable way (Schilling/Akuno/Scheffran et al. 2011).

A challenge of the future is to overcome the current vicious circles of environmental destruction, under-development, and war, and bring the concepts of sustainability, development, security, and peace together in a mutually constructive way so as to establish integrated concepts of sustainable peace (Brauch/Oswald-Spring 2009; Oswald-Spring/Brauch 2011; Scheffran 1998, 2011a). This approach combines the strengthening of economic welfare and human capability with strategies for reducing vulnerabilities and risk. However, even in times of continuous change in environmental conditions it is insufficient to only react to the challenges when actually forced to do so.

Strategies are most successful in fostering cooperation when they are employed in a proactive manner.

38.4 Principles for Proactive Policy

The magnitude of the potential risks of climate change requires new and innovative research approaches and determined policies to manage global change within a new well-designed global governance architecture that combines sustainable environmental policy, development policy, and preventive security policy. Global diplomatic efforts are needed to contain climate-induced conflicts, to develop compensation mechanisms for those affected by climate change, to implement a global policy on migration, and to take measures to stabilize the world economy (WGBU 2008). To avoid climate security risks and mitigate the conflicts induced by climate change, an integrated set of strategies can be designed that addresses the causes as well as the physical and societal impacts of climate change. The methodological and conceptual discussion in the previous sections has laid out the preconditions for the establishment of principles for proactive policies, and these are examined in greater detail below. They involve all aspects of mitigation and adaptation of climate change, ranging from greenhouse gas emission to climate justice, and from risk management to stakeholder involvement (Scheffran 2011a). Obviously, any policies that result from the application of these principles have to be placed in their respective geographic and institutional contexts (e.g. the UN system, the European Union, countries in the South etc.).

38.4.1 Emission Reduction and Improvement of the Efficiency of Natural Resource Use

Since GHG emissions are the main cause of climate change, their reduction remains a predominant strategy when attempting to stabilize the atmospheric carbon concentration at levels that prevent dangerous levels of risk to climate and permit societal stability. To limit temperature change to 2°C requires more efficient and alternative uses of energy and other natural resources in order to create wealth while consuming fewer resources (chapter 37 by Brauch). To strengthen international efforts and agreements, a number of instruments are available for this purpose, including taxes, transfer of capital and technology, tradable emission permits, and other Kyoto instru-

ments (Clean Development Mechanism, Joint Implementation). In each stage of the life cycle of goods and products (resource exploration, exploitation, transport, transformation, use, recycling) efficiency improvements can be achieved, e.g. by innovative technology, economic instruments such as taxes and investment, behavioural changes, and societal reorganization. The transition towards a more efficient and sustainable energy system with lower carbon emissions requires new financial instruments and regulatory schemes. In developing countries, multilateral funds (e.g. Global Environment Facility, Carbon Finance Unit) can make important contributions. Subsidies for fossil fuels need to be reduced and channelled into renewable energy sources.

38.4.2 Fair Distribution and Climate Justice

The resources, benefits, and risks for each social entity are shaped by allocation and distribution mechanisms, market processes, and human rights, as well as by power and interest structures. Equity strategies seek to achieve a fair distribution between those who have the greatest responsibility for climate change and those who are most affected, that is, between North and South, rich and poor, current and future generations. Fair and efficient burden-sharing in a global framework of climate justice would balance responsibilities and impacts among countries, satisfying both the 'polluter pays' principle and the 'ability-to-pay' principle. With the formula of 'common but different responsibilities', the UNFCCC has assigned different roles to industrialized and developing countries in climate policy. The challenge is to agree on collective emission targets that avoid dangerous climate change and will not be exceeded by humankind. Several proposals have been made to balance emissions, including the *Triptych* approach to share emission allowances among a group of countries, the *Contraction & Convergence* concept with a joint target of per capita emissions, and the *Common but Differentiated Convergence* proposal, in which countries are free to select the emission path appropriate to their development (Höhne/Phylipsen/Ullrich et al. 2005).

As the largest emitters of greenhouse gases since the industrial revolution, the developed countries have a particular responsibility as well as the power to reach an agreement to reduce GHG emissions to a non-dangerous level. Less wealthy countries could benefit from adaptation capabilities in wealthy countries which would be liable for the compensation of losses in the most affected regions. A global diplo-

macy could help to contain climate-induced distributional conflicts and to develop compensation mechanisms for the victims of climate change.

However, many developing and threshold states, especially the so-called BASIC countries (Brazil, South Africa, India, China), are projected to increase their emissions to more than half of global GHG emissions by 2030 (Stern 2006; IEA 2007). China has recently overtaken the USA as the largest GHG emitter. Thus, in a post-Kyoto regime for the decades to come the developing countries with very high growth rates may have to accept quantitative GHG reduction obligations themselves. Possible measures to support developing countries in their transition towards more sustainable energy consumption could be development cooperation and supplemental international financial assistance, e.g. expansion of microfinance institutions and instruments or an international environmental migration fund.⁴

38.4.3 Reduction and Management of Risks, Instabilities, and Conflicts

To implement the UNFCCC, the impacts of climate change need to be limited to non-dangerous levels. However, a reasonable and systematic specification of the overall objective with regard to key parameters is still missing. To specify the standards of 'danger' based on ethical norms would serve as a guideline for orientation in order to build the legitimacy and acceptability of negotiation results. Lack of scientific certainty is not a sufficient reason to postpone precautionary measures "to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects" (as required by Art. 3.3 UNFCCC), in particular if they are irreversible and cannot be compensated for. Concrete mitigation measures include disaster relief, protection of refugees, and conflict management. Resources from the military, the police, and the emergency services could be used to protect against the worst effects of disasters, e.g. by using troops to contain wildfires or floods, to control crime and looting, to evacuate refugees, and for crisis man-

agement (UNDDA 1991; Scheffran 1992). It is important to understand the conditions under which climate-related changes will translate into destabilization and conflict, and find factors that make societies more robustly able to resist destabilization and to adapt to changing environmental conditions.

- Societies need to develop and collaborate on mechanisms for handling conflict and for developing the capability to manage disasters, including emergency planning and the establishment of clear decision-making structures and procedures.
- Global information systems for early warning could help with timely responses to extreme events and crises. Databases could collate information from different sources and from the UN institutions and thus address all the threats to human security.
- Arms control, non-proliferation, and disarmament would reduce the destructive potential of military forces (especially weapons of mass destruction) that could be used in conflicts. Preventive arms control restrains advanced technical weapons development, for instance of miniaturized vehicles that could be used in terror attacks. Forces need to be restructured towards defensive postures.
- Regional security concepts would establish conflict resolution mechanisms and confidence-building measures. A high priority should be given to stabilizing fragile and weak states that are threatened by climate change. For instance, the OECD's Development Assistance Committee has set up a Fragile States Group that has defined Principles for Good International Engagement in Fragile States and Situations.
- The capacity to manage environmental risks must be maintained and reinforced, even under difficult political and economic conditions.
- Emphasis should be given to crisis prevention, which is less costly than crisis management and intervention that often come too late. Strategies that allow human beings and institutions to respond in a constructive and mutually beneficial way and provide alternative venues for grievances and differences are critical.

38.4.4 Stakeholder Participation and Alternative Dispute Resolution

The participation of citizens with their interests and capabilities, knowledge and perceptions, responses and interactions is crucial for dealing with the challenges of climate change and the management of the

4 However, at the Conference of Parties (COP) of the UNFCCC at Copenhagen in 2009 (COP 15), and at Cancun in 2010 (COP 16) no legally binding post-Kyoto climate change regime with quantitative reduction obligations could be adopted. At COP 17 in Durban in 2011 the Kyoto Protocol was extended beyond 2012 and a roadmap for a more comprehensive agreement was established.

associated security risks, instabilities, and conflicts. Renn/Webler/Wiedemann (1995: 3) define public participation as “forums for exchange that are organized for the purpose of facilitating communication between government, citizens, stakeholders and interest groups, and business regarding a specific decision or problem”. In place of conflicting forms of expression it includes “public hearings, public meetings, focus groups, surveys, citizen advisory committees, referendums and initiatives, and negotiation, among other models”. Focus groups have proved successful in various contexts as a mechanism for the group discussion and evaluation of critical societal issues such as climate change (Wibeck/Dahlgren/Öberg 2007). The participation of stakeholders in dialogues is also significant in natural resource management (Stoll-Kleemann/Welp 2006).

Multi-stakeholder sustainability planning is a social learning mechanism based on the vision of partnership between members of society and their environment, involving stakeholders in the formulation, monitoring, and follow-up of sustainable development strategies. It contributes to the formation of social capital and to the democratization and stabilization of societies and can prepare the ground for participatory governance and conflict resolution (Scheffran/Stoll-Kleemann 2003). Regional participatory assessment will include experts and stakeholders from the regions of concern in a discussion of the key links and variables in climate-society interaction (including gender issues), in an evaluation of climate impacts, and in the design of strategies. Alternative dispute resolution and mediation is an interactive process for reconciling divergent interests and settling environmental and natural resource conflicts.

38.4.5 Cooperation, Coalition Formation, and Global Governance

The magnitude of the potential security risks of climate change requires determined policies for managing global change within a new well-designed global governance architecture that will establish rules, regulatory systems, and functioning institutions. To master the global and long-term challenges, global governance would create and reinforce multilateral regimes that involve cooperation between multiple agents from the local to the global level (Lempert/Scheffran/Sprinz 2009). Recognizing that anthropogenic climate change constitutes a common problem for humankind, the international community must establish common solutions and cooperative approaches that

combine sustainable environmental policy, development policy, and preventive security policy. New concepts of adaptive governance are appropriate means of addressing the climate challenge, with its long-term nature and its high levels of uncertainty, since they can influence the many decision points along the causal chain from climate change to societal instability and so avoid cascading risks and prevent the breakup of natural and social systems.

Whether climate-induced pressures upon societies erupt into crisis and conflict depends primarily upon the performance and problem-solving capacity of the countries in question, as well as on the choices and decisions of their policymakers. Cooperative approaches include the international transfer of investments and technologies in order to shift the composition and learning rates of the energy system towards emission reduction. To implement the specific goals referred to in Art. 2 of the UNFCCC, states need binding and verifiable agreements.

The more climate change progresses, the more important will adaptation strategies be in the affected countries. These must be supported by international development policy in agriculture, water, food security, and disaster prevention. Adaptive governance arises from needs at state and local level and “involves the evolution of new governance institutions capable of generating long-term, sustainable policy solutions to wicked problems through coordinated efforts involving previously independent systems of users, knowledge, authorities, and organized interests” (Scholz/Stiftel 2005: 5). Adaptive management is essential to adjust to actions and interactions among multiple factors and actors in the complex environment created by climate change and to find the best combination of global mitigation and local adaptation strategies.

Agent-based approaches allow the representation of adaptive agents who follow decision rules based on incomplete knowledge and updated information within a spatial and temporal window of perception, and thus respond to changing circumstances. They are also appropriate for managing the multilevel decision-making process between local and global agents, and the transition between individual and collective action that leads to the formation and breakup of coalitions. This conceptual and analytical framework for global governance is adequate for analysing the conditions for moving from conflict to cooperation.

To overcome divergent interests, it is important to build coalitions among those with common interests in order to establish a regime for sustainable climate

security. Win-win solutions among industrialized and developing countries will help to avoid an extended North-South conflict. Cooperation becomes feasible if participation is in the developing countries' best interest, e.g. because it supports local environmental goals or provides access to low carbon investments and advanced technology to fulfil both environmental and economic goals.

The expansion of governance capacity is particularly relevant in the context of environmentally-induced migration (Biermann/Pattberg 2008). Migration policy needs to be integrated into development cooperation that strengthens the adaptive capacities of people living in poverty and the rights of environmental migrants. This also applies to cooperation on transboundary water management, which should encourage the regional sharing of water resources to avoid water crises and to facilitate developing countries' access to current scientific data on regional water availability.

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Abbreviations

2SLS	Two Stage Least Square	BISS	Bangladesh Institute of International and Strategic Studies
AandM	Adaptation and Mitigation	BIPRC	Barcelona International Peace Resource Center, Barcelona
AAs	Association Agreements (in the ENP framework of the EU)	BLCI	Business Leaders Confidence Index
ABM	agent-based modelling	BMA	British Medical Association
ACF	Arewa Consultative Forum	BMU	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit [Federal Ministry for the Environment, Nature Conservation and Nuclear Safety]
ACHR	Asian Centre for Human Rights	BNLWRP	Bradford Non-Lethal Weapons Research Project
ACLED	Armed Conflict Location and Events Dataset	BP	Barcelona Process
ADB	African Development Bank	BPS	<i>Badan Pusat Statistik</i> (Central Statistical Agency)
ADH	Académie de Droit International Humanitaire	BRAC	Bangladesh Rural Advancement Committee
AF	Adaptation Fund	BSSRS	British Society for Social Responsibility in Science
AFD	Agence Française de Développement	CA	Israeli military 'Civil Administration' (Palestinian civil affairs) in the oPt (1979 ff)
AFED	Arab Forum for Environment and Development	CAJ	Campaign for the Administration of Justice
AHDP	Arab Human Development Report	CAMRE	Council of Arab Ministers Responsible for Environment (League of Arab States)
AIACC	Assessments of Impacts and Adaptations to Climate Change	CARIM	Consortium for Applied Research on International Migration
AIC	Akaike's Information Criterion	CAST	Centre for Advanced Security Theory
AIDS	Acquired Immunodeficiency Syndrome	CC	climate change
AIT	Asian Institute of Technology	CCAPS	Climate Change and African Political Stability Programme
AITT	Academic-Industrial Think Tank	CCPI	Climate Change Perception Inventory
AMU	Arab Maghreb Union	CCS	Carbon Capture and Storage
An.1	Annex I country (UNFCCC)	CC-SLR	Climate change induced sea level rise
An.B	Annex B country (Kyoto Protocol)	CDI	Commitment to Development Index
ANHRI	Arabic Network for Human Rights Information	CDIAC	Carbon Dioxide Information Analysis Center
AOSIS	Alliance of Small Island States	CDM	Clean Development Mechanism
AQUA-CSP	Concentrating Solar Power for Seawater Desalination (BMU project)	CEDARE	Center for Environment and Development for the Arab Region and Europe
AR	Assessment Report (IPCC)	CE-DAT	Complex Emergency Database
AR4	Fourth Assessment Report of the Intergovernmental Panel on Climate Change (2007)	CER	Certified Emissions Reduction
AR5	Fifth Assessment Report of the Intergovernmental Panel on Climate Change (2014)	CFM	community forest management
Arab League	League of Arab Countries	CH ₄	methane
ARC	Agriculture Research Centre, Ministry of Agriculture and Land Reclamation, Egypt	CHS	Commission on Human Security (of UN)
Area A	West Bank areas under Palestinian security and civil affairs control, according to the Oslo Agreement	CIA	Central Intelligence Agency
Area C	West Bank areas under full Israeli security and civil affairs control, according to the Oslo Agreement	CIDOB	Foundation in Barcelona
ASALS	Arid and semi-arid lands	CIEMAT	Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (Spain) [Centre for Energy, Environment, and Technology Research]
ASEAN	Association of Southeast Asian Nations	CIESIN	Center for International Earth Science Information Network (New York)
AU	African Union	CIM	climate-induced migration
BDT	<i>Bangladesh Taka</i> (Currency)		

CIRCE	Climate Change and Impact Research: the Mediterranean Environment	CWC	Chemical Weapons Convention
CIRCLE MED	Coping with Climate Change in the Mediterranean: Integrated coastal zone management and water management	DCDC	Development, Concepts and Doctrine Centre
CISEN	Centro de Investigación y Seguridad Nacional [Research Centre and National Security]	DEM	Digital elevation model
CLAC	Central Laboratory for Agricultural Climate, Agriculture Research Centre (ARC), Ministry of Agriculture and Land Reclamation, Egypt	DEPI	DESERTEC employment/industrialization-policy institute
ClisAP	Integrated Climate System Analysis and Prediction	DES	demographic and environmental stress
CLISEC	Research Group Climate Change and Security	DESY	Deutsches Elektronen Synchrotron
CMA	Commissionerate of Municipal Administration	DF	Degree of freedom
CMI	Marseille Center for Mediterranean Integration	DFID	Department for International Development (UK)
CNA	Center for Naval Analysis (USA)	DII	Desertec Industrial Initiative
CNAS	Center for a New American Security	DLR	German Aerospace Centre
CNG	Compressed natural gas	dn	dunum (also: 'dunam') Arabic surface measure, equivalent to 1000 m ²
CNRST	Centre National pour la Recherche Scientifique et Technique, Rabat; ENSEM-UH2C Ecole Nationale Supérieure d'Electricité et de Mécanique, Casablanca	dn/c	dunum per capita (unit area per inhabitant)
CO ₂	carbon dioxide	DoD	Department of Defense (USA)
CO _{2e}	carbon dioxide equivalents	DOE	Designated operational entities
CONAGUA	National Commission of Water (Mexico)	DoE	US Department of Energy
COP	Conference of the Parties	DPSIR	Driving Force - Pressure - State - Impact - Response
COP 15	15 th Conference of the Parties of the United Nations Framework Convention on Climate Change (Copenhagen, 2009)	DRC	Democratic Republic of Congo
COP 16	16 th COP of the UNFCCC (Cancun, 2010)	DRR	Disaster risk reduction
CoS	Copenhagen School	DSR	Driving Force-State-Response (of UN-CSD)
CRED	Centre for Research on the Epidemiology of Disasters (Université Catholique de Louvain, Belgium)	DUN	Desertec University Network
CRIM	Regional Multidisciplinary Research Center (of UNAM, Mexico)	EACH-FOR	Environmental Change and Forced Migration Scenarios (EU sponsored research project)
CRU	Climate Research Unit (University of East Anglia)	EAT	event annotation tool
CS	Copenhagen School	EB	Executive Board
CSCE	Conference on Security and Cooperation in Europe	EC	Environmental conflict
CSCW	Centre for the Study of Civil War (at PRIO, Oslo, Norway)	EC	European Commission
CSD	UN Commission on Sustainable Development	ECA	Economic Commission for Africa
CSERS	Center for Solar Energy Research and Studies (Tripoli, Libya)	ECE	Economic Commission for Europe
CSIS	Center for Strategic and International Studies	ECOSOC	Economic and Social Council
CSP	Concentrated Solar Power	EEA	European Environment Agency
CSS	Copenhagen School of Security Studies	EEC	European Economic Community
CSS	Critical Security Studies	EEZ	Exclusive Economic Zone
CSS	Council for Science and Society	EF	Ecological Footprint
CTF	Clean Technology Fund	EFM	environmentally-forced migration
		EIA	environmental impact assessment
		EIB	European Investment Bank
		EIT	Economies in transition
		EJ	exajoule
		Em-DAT/	Emergency Disasters Database (of the
		EMDAT	Centre for the Epidemiology of Disasters of Catholic University of Lovain, Brussels)
		EMDT	Electro-Muscular Disruption Technology
		EMP	European Mediterranean Partnership
		EMSA	European Maritime Safety Agency
		ENCOP	Environment and Conflicts Project
		ENIGH	Encuesta Nacional de Ingresos y Gastos de los Hogares (National Survey of Household Income and Expenditure)
		ENP	European Neighbourhood Policy
		ENPI	European Neighbourhood and Partnership Instrument

ENSO	El Niño-Southern Oscillation	GeoEPR	Ethnic Power Relations
ENVSEC	Environment and Security Initiative (OSCE, UNEP, UNDP, NATO)	GFDRR	Global Facility for Disaster Risk Reduction and Recovery
EOLSS	Encyclopaedia for Life Support System (UNESCO)	GFN	Global Footprint Network
EPR	Ethnic Power Relations	GHF	Global Humanitarian Forum
EQA	Palestinian Environmental Quality Authority	GHG	greenhouse gas(es)
ERDA	US Energy and Research Development Administration	GIS	Geographic information systems
ES	Environmental security	GIVAS	UN Global and Vulnerability Alert System
ESCWA	Economic and Social Commission for Western Asia	GIZ	German Gesellschaft für Internationale Zusammenarbeit
ESDP	European Security and Defence Policy	GKMA	Greater Kampala Metropolitan Area
ESS	European Security Strategy (of 2003)	GLADA	Global Assessment of Land Degradation and Improvement
ET	Environmental threat	GLASOD	The Global Assessment of Human Induced Soil Degradation
EU	European Union	GLOWA	Global Water - Jordan River Project (coordinated in Tübingen, Germany)
EUMENA	European Union, Middle East and North Africa	GNI	Gross National Income
EuroMesco	Euro-Mediterranean Study Commission	GOB	Government of Bangladesh
EVI	Enhanced Vegetation Index	GPCC	Global Precipitation Climatology Centre
FAO	United Nations Food and Agriculture Organisation	GRID-Arendal	collaborating centre of the United Nations Environment Programme (UNEP)
FBIS	Foreign Broadcast Information Service	GTZ	German Technical Cooperation, Eschborn, Germany
FCO	Foreign and Commonwealth Office	GW	gigawatt
FCPF	Forest Carbon Partnership Facility	Haifa U	Haifa University
FDI	Foreign Direct Investments	HCF	Chlorodifluoromethane or difluoromonochloromethane is a hydrochlorofluorocarbon
FEMIP	Facility for Euro-Mediterranean Investment and Partnership	HCF	Hamburg Climate Foundation
FENB	Fixed Effects Negative Binomial	HDI	Human Development Index
FoEME	Friends of the Earth, Middle East (NGO in Israel, Jordan, Palestinian Territories)	HESP	Human and Environmental Security and Peace
FOI	Totalförsvarets forskningsinstitut (Swedish Defense Research Agency)	HIK	Heidelberg Institute for International Conflict Research
FPP	Forest Project Protocol	HIV/AIDS	Human Immunodeficiency Virus - Acquired Immunodeficiency Syndrome
FRSC	Forum Region Security Committee	HKF	Hamburg Climate Protection Fund
FSC	Forest Stewardship Council	HRA	High risk area
FSI	Floor Space Index	HRH	His Royal Highness
FSM	Federated States of Micronesia	HRW	Human Rights Watch
G5	Group of 5 (five largest emerging economies: Brazil, China, India, Mexico, South Africa)	HSI	Hydrological Service of Israel
G8	Group of eight (major industrialized countries: Canada, France, Germany, Italy, Japan, Russia, UK, US)	HSN	Human Security Network
G20	Group of the world's largest economies	HUGE	human, gender, and environmental security
G77	Group of 77 (and China)	HVDC	high-voltage direct currents
GA	General Assembly	HWE	House of Water and Environment (Palestinian Water NGO, Ramallah)
GAM	Global Acute Malnutrition	IA	International Alert
GCC	Gulf Cooperation Council	IACP	International Association of Chiefs of Police
GCP	Gross Cell Product	IARU	International Alliance of Research Universities
GDP	gross domestic product	IASC	Inter-Agency Standing Committee
GEC	global environmental change	IBRD	International Bank for Reconstruction and Development or World Bank
GECHS	Global Environmental Change and Human Security	ICE	Inventory of Conflict & Environment
GEF	Global Environment Facility	ICI	Istanbul Cooperation Initiative
GEO	Global Environmental Outlook		

ICISS	International Commission on Intervention and State Sovereignty	JWC	Israeli/Palestinian 'Joint Water Committee' ('Council') under Oslo-II
ICJ	International Court of Justice	KAUST	King Abdullah University of Science and Technology
ICRAC	International Committee for Armed Robots Control	KCC	Kampala City Council
ICRC	International Committee of the Red Cross	KEDS	Kansas Event Data System
ICZM	Integrated Coastal Zone Management	KEPCO	Korea Electric Power Corporation
IDF	Israeli Defence Forces	KfW	Kreditanstalt für Wiederaufbau (German Reconstruction Bank)
IDNDR	International Decade for Natural Disaster Reduction	KIIDP	Kampala Institutional and Infrastructure Development Project KOSIMODatabase of the Heidelberg Institute for International Conflict Research
IDP	internally displaced people	KNMI	Koninklijk Nederlands Meteorologisch Instituut [Royal Dutch Meteorological Institute, The Netherlands]
IEA	International Energy Agency	KP	Kyoto Protocol
IEMed	European Institute of the Mediterranean (Barcelona)	KW	kilowatt
iEVI	integrated EVI	KWh	kilowatt-hour
IFAD	International Fund for Agriculture and Development	l/c/d	litres per capita per day (daily per capita rate)
IFIs	international financial institutions	l/d	litres per day (daily rate)
IHDP	International Human Dimensions Programme	LBJ	Lyndon B. Johnson, former US President
IIED	International Institute for the Environment and Development	LDCF	Least Developed Countries Fund
IISS	International Institute for Strategic Studies	LRAU	Long-Range Analysis Unit (of NIC, CIA in the USA)
IMF	International Monetary Fund	LUCF, LULUCF	land-use changes and forestry
IMR	infant mortality rate	m/yr	metres per year
INC	Israel's 2 nd National Communication on Climate Change	m ³ /c/yr	cubic metres per capita per year (annual per capita rate)
INE	Instituto Nacional de Ecología [National Institute of Ecology, Mexico]	MA	Millennium Ecosystem Assessment
INEGI	Instituto Nacional de Estadísticas y Geografía e Informática [National Institute for Statistics and Geography, Mexico]	M-Aff	Mean of Affective Items
IOM	International Organization for Migration	MAP	Mediterranean Action Plan
IPCC	Intergovernmental Panel on Climate Change	MARISS	Maritime Security Service Project
IPCC WG II	Intergovernmental Panel on Climate Change, Working Group II	Masen	Moroccan Agency for Solar Energy
IPCRI	Israel/Palestine Centre for Research and Information (NGO, Jerusalem)	MCCI	Mediterranean Climate Change Initiative
IR	International Relations	mcm	million cubic metres
IRENA	International Renewable Energy Agency	mcm/yr	million cubic metres per year, annual rate
IRIN	Integrated Regional Information Network	M-Cog	Mean of Cognitive Items
ISDR	United Nations International Strategy for Disaster Reduction	M-Con	Mean of Conative Items
ISODARCO	International School on Disarmament and Research on Conflicts	MCSD	Mediterranean Committee on Sustainable Development
Isr	Israel	MD	NATO's Mediterranean Dialogue
IWA	Israeli Water Authority	ME	Middle East
IWC	Water Commission of Israel, State of Israel, Ministry of National Infrastructures - now: IWA	MED-CSP	Concentrating Solar Power for the Mediterranean Region (BMU project)
IWRM	Integrated Water Resources Management	MED-EMIP	Euro-Mediterranean Energy Market Integration Project
JHU	Johns Hopkins University	MED-ENEC II	Energy efficiency in construction
JI	Joint Implementation	MED-REG II	Energy regulators
JNF	Jewish National Fund	MEDSEC	Mediterranean Environmental Security Initiative
JNLWD	Joint Non-Lethal Weapons Directorate	MEHSEC	Mediterranean Environmental and Human Security Initiative
JPost	'Jerusalem Post' - Israeli English-language daily newspaper		

MEMR	Ministry of the Environment and Natural Resource of Kenya	OPT	Occupied Palestinian Territories
MENA	Middle East and North Africa	oPt	occupied Palestinian territories (West Bank and Gaza Strip, 1967 ff.)
MER	Market Exchange Rate	OSCE	Organization for Security and Co-operation in Europe
METAP	Mediterranean Environment Technical Assistance Programme	Oslo	Oslo-II: The Israeli-Palestinian Interim Agreement on the West Bank and Gaza Strip (Washington, 1995)
mm	millimetres	Pal	Palestinian
mm/yr	millimetres per year; annual rate of precipitation (mm/a)	PAN	Party of National Action (Mexico)
MMO	Mediterranean Migration Observatory	PC RGDP	Per capita Regional Gross Domestic Product
MO	Military Order - Decree, issued by the Israeli occupation forces such as the IDF	PCA	Principal Component Analysis
MoD	Ministry of Defence	PCF	chlorofluorocarbon
MODIS	Moderate resolution Imaging Spectroradiometer	PEISOR	pressure, effect, impact, societal outcome, and response model
MoU	Memorandum of understanding	PHG	Palestinian Hydrology Group (NGO in the West Bank and Gaza)
MPCs	Mediterranean partners for cooperation	PIK	Potsdam Institute on Climate Change Impacts
MRV	measure report verify; or: Measurement, Reporting and Verification standards	PMT	protection motivation theory
MSL	Mean sea level	PNG	Papua New Guinea
MSP	Mediterranean Solar Plan	PNNL	Pacific Northwest National Laboratory
MW	megawatt	PODES	<i>Survei Potensi Desa</i> (Village Potential Survey)
MWe	megawatt (electricity)	PPP	Purchasing Power Parity
N ₂ O	nitrous oxide	PPRD	Prevention, Preparedness and Response to Natural and Man-made Disasters Programme
NA	North Africa	PRB	Population Reference Bureau
NAFTA	North American Free Trade Agreement	PRI	Party of the Institutionalized Revolution (Mexico)
NAM	Non-Aligned Movement	PRIO	International Peace Research Institute, Oslo
NAPA	National Adaptation Programme of Action	PSA	Plataforma Solar de Almeria (Solar Test Station in Almeria, Spain)
NATO	North Atlantic Treaty Organization	PSIDS	Pacific Small Island Development States
NBAR	Nadir Bi-directionally Adjusted Reflectance	PSR	Pressure-State-Response model of OECD
NC	National Communication (UNFCCC)	PV	photovoltaic
NDI	Northern Defence Industries	PWA	Palestinian Water Authority, Ramallah, West Bank, oPt (since 1996)
NDRD	GCC Network for Drylands Research and Development	R&D	research and development
NEMA	National Environment Management Authority	RBAS	Regional Bureau for Arab States
NGO	non-governmental organization	RCM	Regional Climate Model
NIC	US National Intelligence Council	RCM	Regional Circulation Model
NLP	natural language processing	RE	renewable energy
NSS	National Solar Systems	REDD+	Reducing Emissions from Deforestation and Forest Degradation
NTF-PSI	Norwegian Trust Fund Private Sector and Infrastructure	RENB	Random Effects Negative Binomial
NWC	National Water Carrier (basin transfer of the Upper Jordan to the coast in Israel)	RESC	Regional Environmental Security Complex
NWP	Nairobi Work Programme	RICARME	Research on Global Change in the Mediterranean
OAU	Organization of African Unity	ROC	Receiver Operating Characteristic
ODA	Official Development Assistance	ROMIS	revenue optimized market introductions strategy
ODI	Overseas Development Institute, UK	ROW	right-of-way
ODUSD-ES	Office of Deputy Under-Secretary of Defense for Environmental Security	RSC	Regional Security Complex
OECD	Organization for Economic Co-operation and Development	RSCT	Regional Security Complex Theory
OLS	Ordinary least square		
OPCW	Organization for the Prevention of Chemical Warfare		
OPEC	Organization of Petroleum Exporting Countries		

RUSI	Royal United Services Institute (UK)	SRREN	Renewable Energy Sources and Climate Change Mitigation (IPCC Special Report, 2011)
RVCC	Reducing vulnerability to climate change	SSP	Societal Stability Protocol
RZ	Risk zone	SST	sea surface temperature
SAKERNAS	Survei Angkatan Kerja Nasional [National Labour Force Survey] (Indonesia)	START	Global Change System for Analysis, Research and Training
SAR	Second Assessment Report of the Intergovernmental Panel on Climate Change	STEG	Energies Renouvelables (Tunisia)
SC	Security Council	SUSENAS	Survei Sosial Ekonomi Nasional [National Socio-economic Survey]
SCAD	Social Conflict in Africa Database	SWB	Summary of World Broadcasts
SCCF	Special Climate Change Fund UN - United Nations	SWB	Subjective well-being
SCE	Southern California Edison	SWF	Sovereign Wealth Fund
SCV	variability in land surface attributes	TAR	Third Assessment Report (of IPCC, 2001)
SEED	Sustainability Education and Economic Development Center, LBJ School of Public Affairs	TEN	Trans-European Networks
SEGOB	Secretaría de Gobernación (Ministry of the Interior, Mexico)	TEPCO	Tokyo Electric Power Company
SEGS	Solar Electric Generation Systems	TERI	The Energy and Resources Institute
SEI	Stockholm Environment Institute	TFESSD	Trust Fund for Environmentally and Socially Sustainable Development
SEMARNAT	Secretaría de Medio Ambiente Recursos Naturales (Ministry of the Environment and Natural Resources, Mexico)	TFG	Transitional Federal Government
SESAME	Southernmost European Seas: Evaluation and Modelling of Ecosystem Change	TIA	total impervious area
SF	Sulphur hexafluoride	TRANS-CSP	Trans-Mediterranean Interconnections for Concentrating Solar Power (BMU project)
SFM	Sustainable Forest Management	TREC	Trans-Mediterranean Renewable Energy Cooperation
SG	Secretary-General	TWAS	Third World Academy of Sciences
SGVI	Standard Growth Value Index	UAE	United Arab Emirates
SID	Societal Infrastructures and Development Project	UCDP	Uppsala Conflict Data Programme
SIDA	Swedish International Development Cooperation Agency	UDES	Unité de Développement des Equipements Solaires [Unit for the Development of Solar Equipment]
SIDS	Small Island Development States	UEA	University of East Anglia (UK)
SINC	Servicio de Información y Noticias Científicas [Information Service and Scientific News]	UfM	Union for the Mediterranean
SIRuS	Superfluous Injury or Unnecessary Suffering Project	UK	United Kingdom
SLR	Sea-level rise	UN	United Nations
SMAP	Short- and Medium-term Priority Environment Action Programme	UNAM	National Autonomous University of Mexico
SMOM	Sovereign Order of the Military Hospitaller Order of St John of Jerusalem, of Rhodes and of Malta	UNCED	United Nations Conference on Environment and Development
SNA	social network analysis	UNCHE	United Nations Conference on the Human Environment
SOM	climate model simulation	UNCLOS	United Nations Convention on the Law of the Sea
SPEED	Social, Political, and Economic Event Database Project	UN-CSD	United Nations Commission on Sustainable Development
SPI	Standardized Precipitation Index	UNDDA	United Nations Department of Disarmament Affairs
SPLA	Sudan People's Liberation Army	UNDESA	United Nations Department of Economic and Social Affairs
SPM	Summary for Policymakers (IPCC reports)	UNDP	United Nations Development Programme
SREX	Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (IPCC Special Report, 2011)	UNEP	United Nations Environment Programme
		UNESCO	United Nations Educational, Scientific and Cultural Organization
		UNFCCC	United Nations Framework Convention on Climate Change
		UNGA	United Nations General Assembly
		UNHCR	United Nations High Commissioner for Refugees

UNISDR	United Nations International Strategy for Disaster Reduction	VCX	value-cost-system
UNODC	United Nations Office on Drugs and Crime	VIF	Variance inflation factor
UNPD	United Nations Population Division	VRIM	Vulnerability-Resilience Indicator Model
UNSC	United Nations Security Council	VU	Free University Amsterdam
UNSFIR	United Nations Support Facility for Indonesian Recovery	WANA	West Asia and North Africa
UNSG	United Nations Secretary-General	WB	World Bank
UNU-EHS	United Nations University, Institute for Environment and Human Security in Bonn	WBGU	Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen [German Advisory Council on Global Change]
UNU-WIDER	World Institute for Development Research of the United Nations University (Helsinki, Finland)	WCC	World Council of Churches
UNWFP	United Nations World Food Programme	WCED	World Commission on Environment and Development
UP	<i>Union Parishad</i> (lowest tier of local government in Bangladesh)	WDI	World Development Indicators
US NSS	United States National Security Strategy	WEU	Western European Union
US	United States of America	WG	Working Group (of IPCC)
USA	United States of America	WGI	Worldwide Governance Indicators
USAID	United States Agency for International Development	WHO	World Health Organization
USD (US\$)	United States Dollar	WMO	World Meteorological Organization
USTO	Université des Sciences et de la Technologie d'Oran, Oran [Scientific and Technical University of Oran] (Algeria)	WP	Nairobi Work Programme ODA - Official Development Assistance
VCAPS	Values and Capabilities of Action paths and Priorities in System Environments	WSTA	Water Science and Technology Association
		WTO	World Trade Organization
		ww	wastewater
		yr	year

Biographies of Authors of Forewords

Olusegun Obasanjo (Nigeria); Chief Promoter, Centre for Human Security, Olusegun Obasanjo Presidential Library. He served as Nigeria's military Head of State (1976-1979) and President (1999-2007). He recently concluded service as Special Envoy to the Secretary General of the United Nations to the Great Lakes Region of Africa (2008-2009). He is a focal point of consultation by world leaders on matters affecting the African continent. He was Co-Chairman of the Commonwealth Eminent Persons Group on South Africa (1986); Chairperson-in-Office, Commonwealth of Nations (2003-2005); Chairperson, African Union Assembly of Heads of States and Governments (2004-2006). He also chaired the Group of 77. He is a founding member of the Inter-Action Council, a coalition of former heads of states and presidents. He is a member of the African Progress Panel and a regular participant of the Clinton Global Summit. He is also a member of the Club of Madrid. President Obasanjo played a pivotal role in the regeneration and re-positioning of the African Union - with the *African Peer Review Mechanism* (APRM) designed to engender and promote the ideals of democracy and good governance, and the *New Partnership for Africa's Development* (NEPAD). He has consistently supported the deepening and widening of regional cooperation through the *Economic Community of West African States* (ECOWAS) and the Co-prosperity Alliance Zone incorporating Benin, Ghana, Nigeria, and Togo. He chaired the African Heads of State and Government Implementation Committee on the New Partnership for Africa's Development (NEPAD) and recently led the Africa Union delegation to monitor the Togolese general elections as Head of Delegation (2010). President Obasanjo was also involved in international mediation efforts in Namibia, Angola, South Africa, Mozambique and Burundi. He founded the Africa Leadership Forum in 1988 and the Centre for Human Security in 2009.

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Connie Hedegaard (Denmark) had already been working with climate issues for several years by the time she began her appointment as the EU's first ever Commissioner for Climate Action in February 2010. In August 2004 she was appointed as Danish Minister for the Environment. In 2007 she was in charge of setting up the Danish Ministry of Climate and Energy, where one of the main tasks was to prepare the UN Climate Conference in Copenhagen in De-

cember 2009. Connie Hedegaard began her political career as a student at the University of Copenhagen. There she studied literature and history while at the same time pursuing a political career that encompassed both Danish and international politics. In 1984, at the age of 23, she was elected to the Danish Parliament as a member for the Conservative People's Party, thereby becoming the youngest Danish MP ever at that time, and in 1985 she became Chair of the Atlantic Association of Young Political Leaders. In 1989, Connie Hedegaard became first spokesperson for the Conservative People's Party, but chose to leave politics for journalism in 1990. Besides her political career, Connie Hedegaard has had a long career in journalism. In 1990, she began working as a journalist on the Danish national newspaper *Berlingske Tidende*. In 1998 she became head of the news bulletin service *Radioavisen* at the Danish Broadcasting Corporation, after which she hosted the current affairs programme *Deadline* on the television channel DR2. Between 1998 and 2004 she also wrote for the Danish national daily newspaper *Politiken*. Apart from working as a politician and journalist, Connie Hedegaard has sat on a number of committees and boards, including chairing the *Centre for Cultural Cooperation with Developing Countries* (CKU) and as a member of the board of the Danish Parliament's Democracy Foundation. Lastly, she has received various prizes for her involvement in and contributions to social debate, due in great part to her wide-ranging activities as a lecturer and author. Her publications include *Da klimaet blev hot* [When the climate got hot], published in Denmark in 2008, as well as contributions to several anthologies and topical books. Connie Hedegaard lives in Brussels and in Hellerup, Denmark with her husband, Jacob, and their two sons.

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Christiana Figueres (Costa Rica) was appointed as the new Executive Secretary of the *United Nations Framework Convention on Climate Change* (UNFCCC) by UN Secretary-General Ban Ki-moon on 17 May 2010. The appointment was endorsed by the Bureau of the Convention. Ms Figueres has been involved in climate change negotiations since 1995. She was a member of the Costa Rican negotiating team and represented Latin America and the Caribbean on the Executive Board of the *Clean Development Mechanism* (CDM) in 2007, before being elected Vice-President

of the Bureau of the Conference of the Parties 2008–2009. In 1995 she founded the *Center for Sustainable Development of the Americas* (CSDA), a non-profit think tank for climate change policy and capacity-building, which she directed until 2003. From 1994 to 1996, she served as Director of the Technical Secretariat *Renewable Energy in the Americas* (REIA). Ms Figueres began her life of public service in 1982 as Minister Counsellor at the Embassy of Costa Rica in Bonn, Germany. She served as Director of International Cooperation in the Ministry of Planning in Costa Rica (1987–1988), and was then named Chief of Staff to the Minister of Agriculture (1988–1990). Ms Figueres has served on the boards of several non-governmental organizations involved in climate change issues, including the Voluntary Carbon Standard. She is also a widely published author on the design of climate solutions, and has been a frequent adviser to the private sector on how to play a leadership role in mitigation. Ms Figueres holds a master's degree in Anthropology from the London School of Economics, and a certificate in Organizational Development from Georgetown University. She was born in San José, Costa Rica in 1956, and is married with two children.

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Dr. R.K. Pachauri has been the Chief Executive of TERI since 1981, designated initially as Director and since April 2001 as Director-General. In April 2002 he was elected as Chairman of the *Intergovernmental Panel on Climate Change* (IPCC), which was established by the World Meteorological Organization and the United Nations Environment Programme in 1988. IPCC along with former Vice President Al Gore has been awarded the Nobel Peace Prize

for the year 2007. Dr. Pachauri has a PhD in Industrial Engineering and a PhD in Economics. He has served on several international and national committees including membership of the Economic Advisory Council to the Prime Minister of India, the *Advisory Board on Energy* (ABE) which reports directly to the Prime Minister of India, and has been a Senior Advisor to the Administrator of the United Nations Development Programme and several others. He has been President (1988) and Chairman (1989–90) of the *International Association for Energy Economics* (IAEE). He has been President of the Asian Energy Institute since 1992. In April 1999, he was appointed Member of the Board of Directors of the Institute for Global Environmental Strategies, Japan and continues to hold this appointment. Dr. Pachauri was awarded the 'Padma Bhushan' in 2001 by the President of India and he was also bestowed the 'Officier De La Légion D'Honneur' by the Government of France in 2006. He has been active in several international forums dealing with the subject of climate change and its policy dimensions. He was conferred with the 'Padma Vibhushan', the second highest civilian award, for his services in the field of science and engineering in January 2008 by the President of India. He has been appointed as Director, Yale Climate and Energy Institute from July 2009. He has been conferred with the 'Commander of the Order of Leopold II' by the King of the Belgians in July 2009; the 'Commander of the Order of the White Rose of Finland' by the Prime Minister of Finland in February 2010 and 'The Order of the Rising Sun, Gold and Silver Star' by His Majesty Akihito, Emperor of Japan, in April 2010.

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