Heike Greschke
Julia Tischler *Editors*

Grounding Global Climate Change

Contributions from the Social and Cultural Sciences

Springer

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ZMI Centre for Media and Interactivity

ZiF Zentrum für Interdisziplinäre Forschung
Center for Interdisciplinary Research
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Contents

Abbreviations

ACIA	Arctic Climate Impact Assessment
ANSD	Agence Nationale de la Statistique et de la Démographie
ASA	Association of Social Anthropologists
CFC	Chlorofluorocarbons
COP	Conference of the Parties
CO_2	Carbon dioxide
CRU	Climate Research Unit
CWB	Canadian Wheat Board
DPS	Direction de la Prévision et de la Statistique
EIC	East India Company
ELOKA	Exchange for Local Observations and Knowledge of the Arctic
ENSO	El Niño-Southern Oscillation
ERC	European Research Council
ESLC	Eastern Shore Land Conservancy
EU	European Union
FAD	Food availability decline
FED	Food entitlement decline
GMT	Global mean temperature
GPCC	Global Precipitation Climatology Centre
GPS	Global Positioning System
IGBP	International Geosphere-Biosphere Programme
IHDP	International Human Dimension Programme on Global Environmental Change
INSTAT	Institut National de la Statistique
IOM	International Organization for Migration
IPCC	Intergovernmental Panel on Climate Change
IPY	International Polar Year
IUCN	International Union for Conservation of Nature
JRG	Junior Research Group
MEA	Ministère de l'Environnement et de l'Assainissement
NGO	Non-governmental organisation

NSF	National Science Foundation
PBI	Polar Bears International
PHENARC	Understanding Climate-Driven Phenological Change: Observations, Adaptations and Cultural Implications in Northeastern Siberia and Labrador/Nunatsiavut
PIK	Potsdam Institute for Climate Impact Research (Potsdam-Institut für Klimafolgenforschung)
PR	Public relations
REDD	Reducing emissions from deforestation and degradation
SLR	Sea-level rise
TRMM	Tropical Rainfall Measuring Mission
UMCES	University of Maryland Center for Environmental Sciences
UN	United Nations
UNCED	United Nations Conference on Environment and Development (Rio Summit)
UNCSD	United Nations Conference on Sustainable Development (Rio + 20)
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WBGU	German Environmental Advisory Council (Wissenschaftlicher Beirat der Bundesregierung Globale Umweltveränderungen)
WCRP	World Conference of Religions for Peace
WFP	World Food Programme
WWF	World Wide Fund for Nature
ZiF	Center for Interdisciplinary Research Bielefeld (Zentrum für interdisziplinäre Forschung)

Chapter 1
Introduction: Grounding Global Climate Change

Heike Greschke and Julia Tischler

Abstract Global climate change research has seen an increasing involvement of the social sciences and humanities. The introduction charts the changing role of the social and cultural sciences in this field, delineating different research strands that have emerged over the past few years. Studies differ significantly according to the role assigned to the respective discipline, both within and beyond academia, as well as how they deal with the problem of uncertainty. While some studies are directly connected with a call for cultural or even system change, others take into account that people from different cultures conceptualise human-environmental relations in different ways. We move on to discuss several epistemological and methodological challenges arising out of the inherently interdisciplinary research subject of climate change and the attempt to reconcile locally-grounded approaches with global models. All of these problems are reflected in the different contributions of this volume, which are grouped into three parts. The first foregrounds questions of interdisciplinarity and the role of the social sciences in climate research, the second presents ethnographic case studies, while the third part provides insight into collaborative and comparative approaches.

1.1 Social Climate Change Research: Past and Current Developments

> We are facing a period when society must make decisions on a planetary scale. (Mead 1976: xxiii et sqq.)

Margaret Mead may well have been the first anthropologist who convened a conference on anthropogenic global climate change (Rayner 2003). In 1975, she and the meteorologist William Kellog brought together scientists from a wide range of

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disciplines, attempting not only to "arrive at some overview of what is presently known about hazards to the atmosphere from manmade intervention" (see p. xx in Mead 1976), but also to advise the international political community about how such hazards could be prevented. Consequently, they understood the conference as "part of a dialogue between scientists and policy makers, a dialogue that must eventually involve the entire world" (see p. xviii in Leavitt 1976). This was a strong call for the involved scientists or science in general to leave the ivory tower, assume responsibility for the future of the planet and its inhabitants and produce a type of scientific knowledge that could be translated into political decision-making. However, the discussions during the conference were rather caught up in self-reflexion and controversy, dominated by questions of how to deal with uncertainty and frame the role of science in such a political debate.

Since the 1975 conference, our knowledge about the drivers and consequences of global climate change has grown enormously, as has the topic's presence in all kinds of discourses around the world (with important limitations, as we shall see). This in turn has increased pressure on scientists—under which we subsume scholars from both natural and social and cultural sciences—to make unambiguous statements about how to prevent or adapt to global warming. Mead's hopes for a strong scientific-political alliance as a motor for globally shared interpretations seem to have eventually materialised through what has been a singular collaboration between academia and politics, as embodied in the *Intergovernmental Panel on Climate Change* (*IPCC*). With both research and attempts at political regulation intensifying, dissent about the physical facts of climate change has diminished over the last decades. The latest *IPCC* assessment report states that

> warming of the climate system is unequivocal, and since the 1950s, many of the observed changes are unprecedented over decades to millennia. The atmosphere and ocean have warmed, the amounts of snow and ice have diminished, sea level has risen, and the concentrations of greenhouse gases have increased. (see p. 3 in IPCC 2013)

In addition to making definite statements about the existence of climate change and its core physical manifestations, the *IPCC* is equally clear about the underlying anthropogenic causes: "Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system" (see p. 10 in IPCC 2013).

Nevertheless, the problem of uncertainty remains, putting a spanner in the works of the scientific-political alliance, although it has shifted to the human factor, as we can reason from the increasingly unsuccessful negotiations towards a global climate agreement. Now the question of how human culture and society have to be transformed to prevent negative changes in the global climate system or at least handle their consequences has moved into the spotlight. With the human factor becoming the most uncertain variable in climate models, the humanities have pushed into climate research. Indeed, there has been an impressive upsurge in studies from the part of social and cultural sciences in recent years. Such research has been motivated by the criticism of social *and* natural scientists stating that the social implications of climate change cannot easily be derived from computerised climate models. Climate

change, as has been pointed out, is "simply both: a phenomenon 'out there' which can be measured and reconstructed as well as a social construct" (see p. 75 in Reusswig 2010, *our own translation*), although "the social and cultural studies have been paying astonishingly scant attention to the matter" (see p. 32 in Leggewie and Welzer 2010 [2009], *our own translation*; compare also p. 3 in Szerszynski and Urry 2010). Geographer and climatologist Mike Hulme argues in a similar vein, albeit from within climate science, when he points to the significance of "the rich cultural knowledge" (2011, p. 177) of humans around the world in dealing with environmental changes. He criticises climate change research, and specifically the *IPCC*, for continuing to one-sidedly rely on positivist approaches and thus he demands that more weight is given to interpretative approaches of the humanities (see p. 177 in Hulme 2011). An impressive number of studies focusing on the human factor of climate change have been published in the last couple of years,[1] reflecting the fact that the social sciences increasingly regard the environment as being within their thematic domain (see p. 2 in Lockie et al. 2014). These studies can be roughly classified into three strands of research, according to the role they assign to the social and cultural sciences vis-à-vis climate change, both within and beyond academia, as well as how they deal with the problem of uncertainty.

Socio-critical approaches directly connect climate change to a call for cultural or even system change. This is often associated with criticism regarding capitalist production and consumption patterns (Baer 2007, 2008) or, more specifically, modern society's heavy reliance on carbon resources (Urry 2011) and the way in which this has been ignored by social theory. Other scholars highlight the democratic potentials of changing cultural values from property- to behaviour-oriented ones. They presume that ecology-minded patterns of behaviour generate new collective identities of 'sustainability-friendly' we-groups (Leggewie and Welzer 2010 [2009]) or even transnational "cosmopolitan communities of climate risk" (Beck 2008; Beck et al. 2013). Climate change raises new issues regarding a range of basic sociological concepts such as social inequality and power. It is argued that even if everyone is facing climate change, its repercussions and the ability to deal with them varies from society to society and country to country. Climate change, in brief, is presumed to globalise and intensify social inequalities (Beck 2010). Several studies emphasise that global power relations shape discourses and imaginations about the social consequences of climate change, thereby reinforcing existing political asymmetries (Barnett and Campbell 2010; Crump 2008; Crate and Nuttall 2009; Demeritt 2001). Moreover, the issue of global climate change has led to a range of discussions on basic methodological and theoretical principles (Urry 2011; Beck 2010; Heinrichs and Gross 2010; Hastrup 2013).

Many empirical case studies have investigated the resources and requirements of particular socio-cultural groups in terms of mitigating climate change or adapting to its local consequences. Studies in the *mitigation and adaption research strand* often take the physical reality of climate change as a starting point and seek to inform policy (Adger et al. 2009) or focus on the concerns of climate change-affected

[1] For a more comprehensive overview of social scientific contributions to environmental change research, see ISSC/UNESCO (2013).

communities and their participation in political action. As far as indigenous people are concerned, such studies highlight the strong imbalance between these groups' negligible contribution to the causes of climate change and their scarce participation in its political regulation on the one hand, and their high degree of affectedness on the other (Nilsson and Nuttall 2008). It is agreed that it is particularly those people whose livelihoods are deeply intertwined with environmental practices, as opposed to urban-industrial lifestyles, who will bear the brunt of the repercussions of global warming, encountering various kinds of risks, including threats to their cultural survival. Cases range from northern Canada (Baer and Singer 2008; Ford et al. 2009), to Tuvalu (Stratford et al. 2013) and eastern Africa (Little et al. 2001), among others, where living conditions are seen to be particularly endangered by environmental alterations. Scholars criticise that forced relocation as well as inadequate governance mechanisms and budgets for mitigation or adaptation strategies might cause a loss of community and culture. In some cases, research is not limited to investigation, but also aims at adopting a more active role in response to climate change (Crate and Nuttall 2009).

Finally, a considerable number of investigations are dedicated to exploring the relationships between nature and human societies in the face of global change while starting off from a local perspective. Rather than taking climate change as a given social reality, these studies take into account the fact that people from different cultures conceptualise human-environmental relations in different ways. Thus, highlighting the role of local knowledge(s), they take "climate as a site for anthropological investigation of the relationship between ideas of nature and moral and political life" (see p. 279 in Rayner 2003). What environment and climate conditions mean to people (and vice versa) is likely to differ widely from place to place (Strauss and Orlove 2003), and might be altered by both individual perceptions and larger discourses about changes in the environment (Hoeppe 2008; Engels 2008). As has been pointed out, climate change from this perspective cannot be treated "as a single preformed 'problem.' Rather, different climate knowledges appear as products of particular networks and agencies" (see p. 227 in Diemberger et al. 2012). Conceptualising their research subjects from a bottom-up approach, studies in this *culture-sensitive strand of research* are most likely to encounter difficulties in reconciling their findings with global climate change models. While globally aggregated data might be suitable for analysing large-scale meteorological processes, as Cornell (2010, p. 124) argues, "a global average that hides the presence of too much water in one locality and too little in another […] is meaningless."

1.2 Grounding Global Climate Change: Epistemological and Methodological Challenges

Social climate research deals with a research subject that is 'interdisciplinary' in itself, given that climate change cuts across the established disciplinary divide between the study of 'nature' and the study of 'culture.' It thus comprises

interdisciplinary projects, in various regards and to various degrees, some contributing social scientific findings to an originally 'natural science' terrain, while others also integrate data and even methods from the natural sciences in their analyses. The above-mentioned studies seek to complement the 'hard physical facts' of climate change by providing alternative concepts of society from which future scenarios might profit, or by contributing empirical data concerning the socio-cultural implications, different perceptions, interpretations and coping strategies in connection with environmental changes. Other strands—prominently in the field of social-ecological systems research—rather aim at a holistic approach and a full-scale integration of social and natural sciences, combining methodologies as diverse as remote sensing, soil sampling, interviews or participant observation (cf. for instance, Moran 2010; Berkes et al. 2003; Bohle and Glade 2008; see also Collet, Chap. 3, in this volume).

Regardless of its degree of interdisciplinarity, the study of climate change from a social science perspective poses some epistemological and methodological riddles. Indeed, they become particularly apparent in bottom-up approaches that depart from local patterns of perceiving and handling the environment. During our joint supervision of the research group *Climate Worlds* at Bielefeld University,[2] we frequently stumbled upon questions that were not adequately answered in the available literature. How do we approach the subject of climate change in a certain locality? Should we ask explicit questions or content ourselves with observing changing human-environment relations? Does climate change 'exist' for an ethnographer if people do not talk about it? If a researcher comes across significant changes in social-environmental relations in his or her field site, yet these changes turn out to be non-attributable to climate change, is he or she suddenly looking at a different subject? These were some of the questions motivating the conference "Climate Change: Global Scenarios and Local Experiences," held at the *Center for Interdisciplinary Research* (*ZiF*) *Bielefeld* in November 2011, upon which this collection is based. Given the enormous response to the call for papers, the *Climate Worlds* team was not alone in facing these fundamental challenges.

While we appreciate the need for social scientists to go out there and inform political action, this does not mean there is no time for self-reflection or that researchers should be allowed to tacitly pass over the conditions (and pitfalls) of their own knowledge production. Asking questions must not be seen as antagonistic to delivering answers. Much rather, the topic of climate change in particular demands a self-reflexive notion of 'science.' Following Mike Hulme, the sciences' responsibility not only lies with "the quest to establish 'facts'—to formulate what is known," but also with naming and communicating the unknown and the uncertain, as well as reflecting upon sciences' underlying values and biases (see pp. 78–9 in Hulme 2009). By clinging to an image of scientific authority based upon unquestionable facts and academic consensus, climate scientists risk losing public

[2] Heike Greschke coordinated the group from 2009 to 2012 and Julia Tischler joined in from 2011 to 2012 (see Greschke, Chap. 7, in this volume).

confidence whenever a case of controversy arises.[3] Pretending that climate science is aloof from politics only increases its vulnerability (see pp. 308–9 in Demeritt 2001; see also Krauss, Chap. 4, in this volume).

'Climate change' cannot simply be used as a neutral analytical term. The concept is time-dependent and culturally specific. It is laden with a range of presuppositions and already contains in itself an interpretation; one that might not be reflected at the local level, in different societies or distant time periods. Therefore, the majority of the chapters assembled in this volume withdraw into the ivory tower to some extent, reflecting on their own practices of knowledge production and epistemological presuppositions. Apart from the question of how people deal with the effects of environmental stresses and possible ways of adaptation, this volume foregrounds the question: how do we study climate change? Despite the growing involvement of social science in climate research as described above, the subject of research and the role of anthropology, sociology, history and social geography in this regard remain far from clear—apart from the tasks established that climate research has, implicitly or explicitly, set aside for them, such as public communication, "social engineering" or political "mobilisation" (see p. 125 in Cornell 2010; cf. also Krauss, Chap. 4, in this volume). For this reason, most of the contributions critically engage with the research subject 'climate change' itself and reflect on the role that our respective discipline could and should play in producing knowledge about climate change. Addressing these rather fundamental questions, the volume seeks to carve out a specific profile of 'social climate research.'

1.3 Structure of the Book

Cutting across the different sections of the volume, the contributions address three sets of shared problems. Firstly, how do we conceptualise our *research subject*(*s*)? Whereas the natural sciences study climate change as an assemblage of physical facts, the social and cultural sciences primarily focus on the discourses and practices through which climate change becomes a social fact. This basic difference points to some of the challenges inherent in the interdisciplinary dialogue in climate research. Do the natural and the social sciences talk about the same thing or do they confront different research objects? Social scientists in the field of climate change examine second-order constructs based upon first-order constructs produced by natural scientists, whose theories and methods they are usually not familiar with (Schütz 1953; cf. also Greschke, Chap. 7, in this volume). While this 'division of labour' is not unique, given that all scientists, in whatever discipline, rely on findings produced by previous researchers, it is particularly stark when it comes to

[3] As for instance in the case of the 2009 'Climategate' scandal, when the *IPCC* came under siege (cf. Beck 2010; Ravetz 2011).

climate models (cf. p. 309 in Demeritt 2001).[4] The authors in this volume incorporate first-order constructs in different ways, by either integrating hard data such as rainfall patterns systematically into their approach or taking environmental changes that have been scientifically described as a starting point for anthropological research in a particular field site.

Moreover, there are not merely discrepancies between but also within the different disciplines. 'Climate change' is a wide-ranging perspective and—in terms of the social sciences—it can involve extremely diverse research questions, from how international treaties are negotiated, to how climate-related policies are implemented on the ground, to how climate change is constructed in the media, or how people in a specific location deal with environmental changes. Climate change is an extremely elusive research subject. Being an abstraction, that is, the "average weather, or […] the statistical description in terms of the mean and variability of relevant quantities [like temperature, precipitation, wind] over a period of time" (IPCC 2007), it escapes direct sensual perception. While people might experience extreme weather events or observe longer-term changes, these only *become* 'climate change' when they—or we as researchers—make that connection: "Climate change as a positive fact independent from human beings […] does not exist from the perspective of the social sciences" (see p. 26 in Voss 2010, *our own translation*). Studying responses or adaptations in a local community that does not use 'climate change' as a frame of reference means to some extent transgressing the constructivist approaches that inform most qualitative research.

Secondly, the subject of climate change raises *questions of context*, in terms of causes and drivers of change. Ecologists struggle with the fact that climate change is only one among many parallel physical, chemical and biological changes affecting ecosystems (compare Kueffer, Chap. 2, in this volume). Scholars from the humanities also face the problem that climate change is not easy to disentangle from all the other changes occurring in one's field of study. How much does climate change explain in current or past situations? To what extent is it a driving force? What is therefore new or specific about social climate research compared to previous studies on transformations, such as the impact of capitalism or industrialisation? When studying responses or adaptations to climate change in a present or past community, sociologists, anthropologists and historians should be prepared to ask and respond to such questions, rather than simply presupposing that climate change is a major driver and one-size-fits-all explanation for any current transformation in one's field. As several contributions in this volume show, climate change—or changes in ecology and weather more broadly—is always just one of many issues that communities find themselves confronted with and often not even the most pressing one from local perceptions. Hence, a too-narrow focus on climate change as a research subject might conceal more than it reveals.

[4] Apart from these epistemological questions, there are also some very real obstacles to interdisciplinary cooperation. From our experience, including the compilation of this volume, publication logics and career trajectories differ in a way that seriously undermines interdisciplinary cooperation in climate science.

Thirdly, social climate research involves *problems of scale*. Climate change denotes a global phenomenon defined by abstractions and averages but is perceived and dealt with by concrete people in concrete places. Similarly, ecological processes are often primarily driven by short-term variability and climatic extremes—something about which long-term models of average changes in the climate system tell us very little. How do we conceive of these interrelations? When studying climate change on the ground, we soon come to a limit with our conventional vocabulary: What is 'global' and what is 'local' and how do we describe the in-between? How far do terms like 'emic' or 'local,' 'global' or 'scientific' knowledge take us? Moreover, even if we rid ourselves of these problematic terms, how else can we conceptualise the interplay of knowledges of a different scope and scale, which climate change research apparently always entails?

Various case studies have demonstrated the enormous potential of qualitative fieldwork in drawing out how people are responding to environmental stresses, and the shift in questions from mitigation to adaptation has increased the significance of small-scale perspectives. While attributing environmental change to human agency seems plausible in societies that make a clear distinction between 'nature' and 'society,' there are cosmologies that do not differentiate along these lines (cf. p. 8 in Casimir 2008). Hence, it is paramount to carefully contextualise climate change in the specific understandings of environment in a given site and draw out the ways in which these understandings—which are always dynamic and hybrid—have changed in the course of time. At the same time, acknowledging the importance of local ecological knowledge must not mean that everything social scientists can contribute to climate research are micro-analyses, whose explanatory powers do not reach beyond the particular field site. Several contributions in this volume take up the challenge of 'globalising' ethnographic research, showing possibilities (as well as problems) of linking or comparing 'local knowledges.' Drawn together by these central concerns and mostly based on empirical case studies, the different contributions in the volume ask 'what is climate change from the perspective of social sciences?' and 'how do social scientists research climate change?'

1.3.1 Interdisciplinarity, Climate Research and the Role of the Social Sciences

The volume starts by offering some insights into possible 'bridges' connecting different disciplinary modes of knowledge production. From his viewpoint as a plant ecologist, Christoph Kueffer opens up several avenues for an interdisciplinary understanding of ecological change in the Anthropocene—a rather recent term to describe mankind's unprecedented and enduring impact on the Earth's ecosystems, which some regard as so significant that it constitutes a novel geological epoch (compare Crutzen 2006). Providing some insight into how ecological research deals with environmental change in the Anthropocene as a first-order construct, that is, as an assemblage of physical facts, his chapter shows how the problems of a natural

scientist can be quite similar to those encountered by an anthropologist, for instance. Plant ecologists also deal with small-scale situations and have to integrate local data and global models. Moreover, climate change cannot simply be 'found' in a particular ecological system; rather, it interacts with or is even superimposed by other environmental or non-environmental changes. Accordingly, Kueffer proposes speaking of "ecological novelty" rather than climate change. New ecosystems arise through the interaction of various entangled physical, chemical, biological and social factors, making it difficult to pin down cause and effect in a linear manner. It is not change itself, he argues, but its current scope, speed, spatial reach and uncertainty—the 'unknown unknowns'—that challenge established scientific practices and human-environment relationships. More than ever before, separating ecological facts from social constructions is problematic, with the distinction between the production of facts and their representation, interpretation and use becoming increasingly blurred. Since environmental systems are increasingly shaped by both social and biological processes, ecology—which was traditionally the study of 'wild' nature—is becoming a science of hybrid social and ecological systems. Ecology and social sciences or humanities hence increasingly share the same study subject, while their "epistemological and methodological challenges converge" (p. 21).

Like Kueffer, Dominik Collet addresses the question of interdisciplinarity, in his case providing us with specific suggestions and demonstrations of how first- and second-order data can be fruitfully combined, both conceptually and analytically, from the perspective of early modern history. Commenting on the lack of collaboration between climatologists and historians, Collet argues that integrative climate research not only requires the 'little interdisciplinarity' of related disciplines, but also the 'big interdisciplinarity' across the two-culture divide of natural and cultural sciences, which is itself a result of the secular understanding of nature that emerged in the nineteenth century. Historical climate research often includes societal factors merely as an "afterthought" (p. 39), which makes history appear deterministic, with societal developments following those in the natural sphere. On the other hand, social historians have been reluctant to use 'natural data.' Collet proceeds to discuss "vulnerability" as a concept at the threshold between disciplines. Coming from the field of famine studies and having recently entered climate change research, the concept has been continuously refined and rendered more integrative, encompassing geophysical, biological and social factors from a processural and historical perspective. At the same time, "vulnerability" is not a closed theoretical framework or a distinct set of methodologies, but rather a "boundary object" both flexible and plastic enough to be adaptable to different disciplines and methodologies. On a broader level, Collet invites us to reconsider our notion and use of concepts, which might have to be loosened somewhat to make interdisciplinary collaboration possible.

Addressing some of the political implications of social sciences' involvement in climate change research, Werner Krauss brings us back to the question of interdisciplinarity, this time from the viewpoint of an anthropologist. The 'Anthropocene' increases the demand for interdisciplinary studies, although the current experiences are a "mixed bag" for anthropologists, Krauss argues. Whereas there are many new research opportunities and greater political relevance is attached to the

resulting findings, "science and politics have established a dangerous relationship" (p. 60). In the current situation, science—including social sciences and humanities—often becomes instrumental in depoliticising political agendas and legitimating top-down approaches. Against this background, he argues that interdisciplinarity must go beyond adding more disciplines and data types to the existing agenda; rather, knowledge production itself must come under scrutiny—including its underlying hierarchies, epistemological and institutional divisions and, above all, its political dimensions. On this charged terrain, Krauss sees anthropology's task in complicating existing research programmes rather than yielding to already established rules, bringing in "a reflexive and self-critical approach" (p. 60). To illustrate his points, Krauss presents some examples of his own participant observation, namely his experiences with environment-related research at different sites, including several large climate conferences, local implementations of conservation programmes and observations on the "tribe of climate scientists" (p. 72). He thereby carves out a particular profile for anthropology in the study of climate change. Being multi-sited, acknowledging uncertainty and unearthing different viewpoints and interests, anthropology can inform negotiations and inclusive decision-making processes and thus make the 'politics of nature' more democratic, as Krauss concludes his chapter.

1.3.2 Searching for the Social Facts of Global Climate Change: Ethnographic Perspectives

Both the second and third sections discuss the interrelations between the scientific concept of 'climate change' and life-world specific knowledge, thereby reflecting anthropology's contribution in translating local everyday-knowledge and scientific concepts. From an ethnographic perspective, the second section shows that local experiences and interpretations might significantly depart from what is suggested by meteorological data, for instance. All empirical findings presented in this section caution against drawing simple causal relations between climate change and the manifold processes of social change taking place in the field (*problem of context*). Arguing that many studies on the nexus of climate and migration tend to replicate push-pull frameworks and oversimplify causalities, Clemens Romankiewicz and Martin Doevenspeck question the notion of climate-induced migration by providing a more nuanced analysis of mobility in the West African Sahel, a region characterised by both the great mobility of its inhabitants and environmental changes, predominantly a rise in annual temperatures and increasing rainfall variability.

While global discourse portrays their study areas in Mali and Senegal as "hotspots of climate change impacts" (p. 82), the authors adopt an ethnographic and local perspective, bringing out people's perceptions of environmental change and existing patterns of migration. Moreover, they conducted research on the topic of migration on the one hand and weather change on the other independently from each

other and avoided making explicit connections between the two in their interviews, in order to avoid preconceived causal relations. Through long-term, multi-sited fieldwork and narrative and semi-structured interviews, the authors traced people's assessments of changes in temperature, rainfall, crop yields and soil fertility. Confronting results from ethnographic fieldwork with scientific figures on climate and vegetation, the chapter provides a practical example of how macro- and micro- as well as first- and second-order data can be combined. Rather than accepting 'hard data' at face value, they focus on the social construction of issues such as droughts and soil degradation, drawing out how perceptions of environmental stresses might greatly differ from what scientific data suggests and are profoundly shaped by the individual's personal circumstances. Moreover, particular types of aggregated scientific data are not very meaningful at a local level. For instance, in terms of rainfall, people deemed the total annual amount much less significant than its distribution, given that the latter is much more decisive for agricultural production. Turning to the issue of local migration dynamics, the authors argue that there is a multitude of motivations for migration, including education or initiation into adulthood. While mobility constitutes an adaptation strategy in their study areas, it is one that responds to many other challenges besides climate variability, and one among many other strategies to offset hardship. Moreover, interviewees did not necessarily cast temporary and internal migration as a problem, but rather as a facet of their 'normal,' highly mobile lifestyle. These findings show that the explanatory power of climate change is a research question, rather than being self-evident.

Sharing this ethnographic perspective, Claudia Grill highlights the disparity between broader discourses on climate change and local viewpoints. At the same time, she argues against a clear-cut distinction between the two levels, showing instead how actors in the field shift across the different scales, at times envisaging themselves as part of a larger global public, and at others as part of a narrowly defined local community. Using the lens of human-animal interactions, Grill studies the "climate culture" (p. 101) of Churchill, a small town at the edge of the Canadian Arctic that lays claims to being the "polar bear capital of the world" (p. 101). Climate change has 'globalised' this small community due to the thousands of tourists, environmentalists and scientists that arrive every year to see the polar bears, the iconic 'victims' of global warming. While Churchillians perform their role in meeting the guests' expectations, climate change vanishes from local discourse as soon as the bear season is over. At this point, other animal-related practices such as hunting and trapping come to the fore, which are restricted to insiders and integral to specific notions of a 'northern' lifestyle. They blend in with local narratives that cast climate change as an intrusive and threatening concept from outside, and construct nature instead as circular and independent from human influence. Grill shows that even when environmental changes are acknowledged, they are not necessarily perceived as threatening. Rather, the prospect of melting ice raises hopes for new economic opportunities that might restore Churchill to former levels of prosperity and significance. It is the discourse about climate change rather than its physical consequences that is considered to be jeopardising existing lifestyles and patterns of identification.

1.3.3 Spinning Global Webs of Local Knowledges: Collaborative and Comparative Ethnographies

We move on to ask how findings from different local case studies can be combined in a way that does justice to the global scope of climate change. The third section thus deals with collaborative projects that face the challenge of coordinating research and combining diverse data from different locally-based cases. Heike Greschke queries the notion of the 'global,' pointing out how climate change discourse constructs a unitary 'we,' obscuring the fact that some of its basic presuppositions—particularly regarding humans' capacity to manipulate climate—are specific to particular, mostly urban-industrial lifestyles. In this regard, climate change research resembles previous studies under the modernisation paradigm, which also declared a culturally-specific phenomenon as an objective benchmark against which other contexts were measured. Based on her experiences with the collaborative project of *Climate Worlds*, which has studied the social consequences of rising temperatures in various coastal contexts, she highlights the disparity between narratives about a particular region as opposed to those emerging from it. In the different study sites, environmental change was often not discussed locally, or was not linked to human impact. Such findings pinpoint the "very different layers of reality" (p. 129) from which natural sciences and anthropology depart when researching climate change. Arguing against "nostrification" (p. 124), of appropriating other people's perspectives into one's own, Greschke details the methodology of *Climate Worlds* as an alternative approach. In a search for a 'third' for comparison that is not a universalisation of one particular worldview, the researchers refrained from asking explicit questions about climate change but observed local weather talk and human-environment relations more broadly. One result of this cross-cultural comparative ethnography was that climate cultures were much less determined by geographic location than by people's livelihood, professional culture or social position, which made climate change a platform for notions of global solidarity for some, and an exterior threat to local norms for others. Hence, Greschke highlights ethnography's potential in examining the social reality of climate change in a way that does not presuppose a unified 'we,' but acknowledges the diverging and sometimes competing communities of interest on the ground.

From a similar perspective, Kirsten Hastrup focuses on the question of comparison regarding climate-related 'knowledge-making,' hence addressing the crucial question of how ethnography, with its focus on the particular, can respond to more general questions. Drawing upon examples from the collaborative anthropological project *Waterworlds*, she proposes using the notion of "knowledge space" as a conceptual and methodological vehicle, adding to it Thomas Kuhn's notion of "exemplars," that is, particular "puzzle solutions" (p. 139) that are shared among the members of a knowledge community. Hastrup proposes comparing the social work involved in constructing this knowledge and argues that these constructions are never purely "local" but "located" (p. 139), as actors always interweave what they perceive in their environment with 'foreign' or scientific knowledge. Accordingly,

the question of scale in climate change-related ethnography is less an issue of relative distance than one of perspective. Since climate change is an unbounded object, connecting a particular phenomenon such as melting glaciers to a far greater horizon, the anthropologist's field site is not a fixed geographic entity but rather a "field of concerns" (p. 145). Having sketched the ups and downs of climate as a topic for anthropological research, Hastrup criticises that the discipline's recent return to the issue has revived problematic notions of culturally-bounded 'wholes' as study objects. Many studies depict climate change as an exterior shock to 'traditional' cultures; from this dichotomous perspective, communities in the field are entrenched in the role of the victim. By contrast, comparison in this regard should not mean comparing containerised worldviews. While the act of comparing establishes analogies and generalisations, Hastrup argues that it is possible to arrive at some more general findings without casting the latter as universal. Comparison can even imply acknowledging equality between different knowledge spaces, rather than essentialising them and conceiving of them as being incompatible. Anthropology thereby helps to shed light on people's integration of diverse forms of knowledge and the way in which they are not merely victims (or causes) of cultural loss but create new possibilities.

In the final chapter of this section, Susan Crate describes a role for social climate science that goes beyond observation and analysis in seeking to promote multi-perspectivism, including outside academia. The main question of her chapter is how different forms of knowledge related to climate change—namely 'local knowledge' and 'climate science'—can be integrated to add the necessary detail to climate models on the one hand and bolster people's adaptive capacities on the other. Her focus lies on the expertise of people whose livelihoods depend on their immediate natural environment and who are hence severely affected by environmental changes. Local knowledge is conceptualised here not as an opposite to science, but rather a "different and complimentary way of knowing" (p. 157) that is rooted in day-to-day experience and spatially bound. Summarising the methods and findings of 'knowledge exchanges' conducted in northeastern Siberia, Crate engages with the *problem of scale* in a very practical dimension. In a 3-year effort, such knowledge exchanges between local communities, regional scientists and the author were set up to enable the inhabitants to link their individual experiences with changing environmental conditions to the broader framework of climate change, followed by various efforts to disseminate and anchor this integrated knowledge in the region. In a second step, Crate discusses how the framework derived from the Siberian case could be applied to two other regional contexts, namely Labrador, Canada, and coastal Maryland. She draws out the similarities and differences between the three regions regarding the locally-perceived ecological changes, people's interaction with and dependence on the environment, the varying degrees of informedness about climate change, as well as other social and economic concerns that might even loom larger than environmental stress. On this basis, Crate sketches possible avenues for future knowledge exchanges, hence illustrating how a reflexive, bottom-up approach to climate change can make a meaningful contribution beyond the 'ivory tower.'

This volume ends with Frank Uekötter's reflections on the likely prospects of the climate debate. Comparing the discourse on climate change with previous environmental debates, Uekötter finds the former to be unique in the way in which the issue has mobilised politicians, scientists and public activists, albeit without offering much hope for success. While other environmental issues have usually undergone a development from scientific discovery, increasing public awareness, rising political pressure and, finally, a set of measures to solve the problem, climate change seems to be in a deadlock of fruitless debate and ever-rising temperatures. Uekötter uses Luhmann's systems theory to explain the emergence of a "climate community" as a new subsystem next to and cutting across science, politics and the media. On these grounds, the author refers to the climate community as an "autopoietic" system that is increasingly self-referential and decoupled from the rest of society. Following Uekötter, bringing the climate change community back in touch with society is one of the paramount responsibilities of the social sciences and humanities.

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Part I
Interdisciplinarity, Climate Research and the Role of the Social Sciences

Chapter 2
Ecological Novelty: Towards an Interdisciplinary Understanding of Ecological Change in the Anthropocene

Christoph Kueffer

Abstract This chapter presents a broad view of an ecological science in search of new paradigms for tackling the ecological challenges of the Anthropocene. In a first part, I introduce the concept of 'ecological novelty' to characterise ongoing environmental change. The environmental change that brings about ecological novelty can be characterised by at least six attributes: it is (1) man-made, (2) large, (3) very fast, (4) multi-dimensional, (5) variable, unknown and unpredictable and (6) of global extent and even affecting remote wilderness areas. In the second and third parts, I focus on two fundamental challenges that ecological novelty poses for ecological research: (i) distinguishing between nature and culture as separate realms of scientific investigation becomes obsolete; and (ii) understanding how ecological systems change requires embracing the complexities of ecosystems under real-world conditions (as opposed to controlled experimental settings) resulting from open system boundaries, contingencies and historicity. Ecology has long explored the transition zone between the natural and social sciences, and can significantly contribute to an interdisciplinary understanding of societal adaptation, whether to climate or more generally to environmental change.

2.1 Introduction

Humans are transforming the abiotic and biotic conditions on Earth so profoundly that many scientists claim our planet is entering a new geological epoch, dubbed the Anthropocene (Crutzen and Stoermer 2000). While climate change is one aspect of ongoing anthropogenic environmental change, other factors are equally important; for instance, biogeochemical cycles are being changed, biodiversity is vanishing, and the last remnants of wild land are being transformed through human

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land use (Turner and Clark 1990; Steffen et al. 2004; Millennium Ecosystem Assessment 2005).

In this chapter, I am interested in how ecological research addresses environmental change in the Anthropocene as a first-order construct, namely how it studies physical facts as opposed to social constructions and representations of these physical facts ('second-order construct') (cf. Greschke and Tischler, Chap. 1, this volume). Put differently, I discuss how ecologists study cause and effect relationships among physical, biological and social factors as a basis for explaining and predicting (socio)ecological patterns and processes in the Anthropocene. However, as will become apparent in several instances in the text, separating ecological facts from the social constructions and representations of this empirical knowledge can be problematic when dealing with environmental change, given that several issues blur the distinction between the production of facts and their representation, interpretation and use. Much ecological knowledge is uncertain and incomplete ('unknown unknowns') and several alternative interpretations of empirical information may be valid (e.g. Larson et al. 2013). Furthermore, knowledge production and use are often entangled (e.g. Kueffer and Hirsch Hadorn 2008), rendering it difficult for ecologists to navigate their dual role as scientists and advocates of social change and interventions in nature (e.g. Lach et al. 2003). In such cases, the researcher loses his or her status as an objective observer and becomes embedded within networks of social interpretation and acting (e.g. Taylor 2005). Finally, as environmental systems are increasingly shaped by social as well as biological processes, ecology is being transformed into a science of hybrid social and ecological systems.

This chapter comprises three parts that together present a broad view of an ecological science in search of new paradigms for tackling the challenges of the Anthropocene. The first part sets the stage, whereby I introduce a conceptual framing of environmental change in the Anthropocene, which I call 'ecological novelty' (Kueffer et al. 2011a). For an ecologist, 'ecological novelty' better captures the emerging dynamics than notions of 'climate change' or 'global change.' Changes happen at different spatial scales, and patterns and processes at local scales are particularly difficult to understand and manage. Novel ecosystems usually arise, not due to changes in isolated factors such as rising temperatures, but through the interactions of many entangled physical, chemical, biological and social factors. Moreover, it is not change *per se*, but rather the magnitude, rapidity, unfamiliarity and uncertainties of these changes—the novelty—that challenge traditional science and human-nature relationships.

In the second and third parts, I focus on two fundamental challenges that ecological novelty poses for research: (i) distinguishing between nature and culture as separate realms of scientific investigation becomes obsolete; and (ii) understanding how ecological systems change requires embracing the complexities of ecosystems under real-world conditions (as opposed to controlled experimental settings) resulting from open system boundaries, contingencies and historicity.

Ecology has long explored the transition zone between the natural and social sciences, which makes ecology an interesting partner for the social sciences in understanding societal adaptation to both climate change and environmental change more

generally. My aim here is to show that ecology not only increasingly shares the same study object with environmental social sciences and humanities—namely, adaptation to rapidly changing socio-ecological systems—but also that the epistemological and methodological challenges converge. I hope that this chapter helps to build bridges between environmental research in ecology and the human sciences and enriches the vision of a locally-grounded and interdisciplinary science of societal adaptation to environmental change.

2.2 What Is Ecological Novelty?

Humans are fundamentally transforming the abiotic and biotic conditions on Earth (Turner and Clark 1990; Steffen et al. 2004; Millennium Ecosystem Assessment 2005). These changes affect all levels of biological organisation—genomes, populations, communities, ecosystems, landscapes—and result in patterns and processes with which we are not familiar at local, regional, and global scales (Kueffer et al. 2011a). Thus, future ecological systems will be very different from those we know from the past or present. Current environmental change, and thus also ecological novelty, has six important characteristics: it is (1) man-made, (2) large, (3) fast, (4) multi-dimensional, (5) variable, unknown and unpredictable and (6) of global extent and even affecting remote wilderness areas. In the following, I explain and illustrate each of these six characteristics and consider how they affect ecological novelty.

2.2.1 A Man-Made Planet

A first characteristic of ecological novelty is that it is man-made (Vitousek et al. 1997; Turner and Clark 1990). Seventy-five percent of Earth's ice-free land has been altered as a result of human settlements and land use (Ellis et al. 2010), with most remaining wild land found in unproductive places such as at high latitudes and in deserts. Within the next few decades, humans might consume the total global annual terrestrial biomass production (net primary production) that is accessible to them (Running 2012). Climate change primarily results from human activities (IPCC 2007), most biogeochemical cycles (e.g. water, CO_2, nitrogen, phosphorus) have been fundamentally transformed by humans (Vitousek et al. 1997; Steffen et al. 2004), and humans are also the main cause of species extinctions and reshuffle biotas by transporting thousands of species to new places where they were not naturally present (Millennium Ecosystem Assessment 2005). Chemicals (e.g. DDT, endocrine disruptors), engineered organisms (genetically modified organisms, synthetic biology), and other artefacts (e.g. nanotechnology products) are increasingly released into the environment. Accordingly, there are few places on Earth—and few physical, chemical and biological processes—that have not been substantially influenced by humans.

One consequence of the dominant and pervasive role of humans in nature is that feedbacks between ecological change and societal responses have become ever tighter (e.g. Warren 2011). Sometimes, societal adaptation to environmental change results in more fundamental effects on ecological processes than the initial environmental change. For instance, in response to climate change, agriculture might expand into areas that were previously unsuitable, introduce new types of crops or produce biofuels as a new energy source, with ecological consequences for the agricultural land and surrounding landscapes (Sutherland et al. 2012; Warren 2011). People will migrate and land use patterns will shift (Warren 2011). Moreover, geoengineering techniques ranging from reforestation to ocean fertilisation with iron to the release of aerosols to the atmosphere would also have profound consequences for the Earth's ecology if applied on a large scale to moderate global warming (Royal Society 2009).

Such feedbacks between environmental change and human responses might be modulated or accelerated through changing human perceptions of ecological systems due to the loss of experience about past conditions ('shifting cognitive baseline syndrome') (Papworth et al. 2009). For instance, Turvey et al. (2010) recorded how fishing communities along the Yangtze river within decades lost their traditional knowledge about culturally and economically important species such as the extinct Yangtze River dolphin or the possibly extinct Chinese paddlefish. Some conservationists are concerned that ecological research contributes to shifting cognitive baselines by emphasising pervasive human-caused change of ecosystems, thereby characterising the conservation of undisturbed nature as an illusion and acting as "an impetus for accelerated changes in land use" (Caro et al. 2012).

2.2.2 Magnitude of Change

A second characteristic of ecological novelty is the magnitude of current environmental change (Vitousek et al. 1997; Steffen et al. 2004; Fischlin et al. 2007; Millennium Ecosystem Assessment 2005). The anthropogenic component of many biogeochemical cycles (e.g. water, nitrogen, phosphorus) is as large as or larger than all natural fluxes combined. Pools of many chemical substances (e.g. CO_2, methane, nitrous oxide) have at least doubled in the atmosphere, oceans and/or terrestrial ecosystems since pre-industrial times, or will soon do so. The current species extinction rate is estimated to be 100–1,000 times higher than natural. Furthermore, an increase of the global mean temperature (GMT) of at least 2 °C and more likely 3–4 °C (or more) above pre-industrial times is expected before the end of the twenty-first century (New et al. 2011). With an increase of 2–3 °C GMT, the chapter of the 2007 *IPCC* report on the impacts on ecosystems (Fischlin et al. 2007) predicts major losses of some biomes (e.g. coral reefs, Amazonian rainforest, Arctic tundra) and globally one-quarter or more of all species are expected to be committed to extinction. With an increase of 4 °C or more, the report predicts catastrophic ecological impacts, with widespread extinctions around the globe (Fischlin et al. 2007).

In short, most places on Earth will experience physical, chemical and biological conditions in the near future that are very different from those that characterised them in the past.

2.2.3 Rates of Change

The magnitude of changes in itself represents a huge challenge for the adaptation of ecosystems and societies to environmental change. However, it is the speed of these changes that will make adaptation excessively difficult or impossible in many situations. At a local scale, humans have been changing ecosystems for thousands of years, although the dramatic ecological change that characterises the Anthropocene is very recent (Steffen et al. 2004; Millennium Ecosystem Assessment 2005). In some parts of the world, this phase of rapid change began around 250 years ago with the industrial revolution, whereas it is only now beginning in other regions. However, most changes are now very fast and even accelerating, with little evidence that these trends will change in the near future (Steffen et al. 2004; Millennium Ecosystem Assessment 2005). As an example of the rate of change, consider how c. fifty percent of the global Earth surface was still largely wild 300 years ago, while only c. five percent was used intensively (Ellis et al. 2010). Today, less than 25 % of land is in a wild condition, while over 50 % is intensively used, with much of this change occurring in the last few decades. At present, over ten million hectares of forest are converted to agricultural land annually (Koh and Gardner 2010). With a predicted increase in the global mean temperature of 3–4 °C compared to pre-industrial times in the next 50–100 years (New et al. 2011), few ecosystems will be able to adapt to the new climate conditions (Fischlin et al. 2007).

In a few decades to centuries, environmental conditions on Earth will change fundamentally. For geophysical, ecological and evolutionary processes that unfold over thousands to millions of years, this period is extremely short; indeed, so much so that some ecological adjustments will only gradually become evident. Such time lag effects are omnipresent and pose a special challenge for environmental research and management. For instance, even if all anthropogenic CO_2 emission was abruptly stopped, the climate system would still not cool for millennia (Solomon et al. 2009). Time lags also distort observations of biodiversity loss: many rare species are still present in the wild in low numbers despite being doomed to extinction (‘extinction debt’) (Kuussaari et al. 2009).

The rapidity of changes represents a huge challenge for ecological and societal adaptations to ecological novelty. Paleoecological data from past periods of rapid climate change in the Earth’s history indicate that species and ecosystems need time to adapt to new environmental conditions (Warren et al. 2011). Similarly, societies and land use systems only adjust gradually to changing conditions. Indeed, a well-functioning adaptation to a current ecosystem state (or current environmental change) can turn into a dysfunctional adaptation in just a few decades. This problem is further accentuated by the uncertainties and vagaries of the future; for instance,

the adaptation that needs to be in place in a few decades can be very different depending on whether the planet will warm by 2 or 4 °C. Furthermore, trajectories of change might fluctuate; for instance, a place may first get wetter for some decades and thereafter become prone to droughts.

2.2.4 Many Changes Happen at Once

Another characteristic of ecological novelty is that many different physical, chemical, biological and social factors change in parallel. For example, there will not only be changes in temperature and precipitation patterns, but also in biogeochemical cycles, the distribution of biodiversity—through both species extinctions and the invasions of non-native species—and land use. These parallel changes interact and lead through synergies among multiple factors to new patterns and processes. It is often very difficult to understand which changes are responsible for a certain ecological effect, and generally only a combination of different changes can explain emerging ecological realities. Due to these interactions, a given change can result in different or even opposing ecological effects in different places (e.g. Kueffer et al. 2013a). For instance, pollinating insects such as the honeybee are in decline in many areas. The reasons are not well understood, but may include habitat fragmentation, pesticides, pathogens, invasive species, climate change, the small remaining size of pollinator populations, as well as interactions between several of these factors (Potts et al. 2010).

2.2.5 Surprises Become the Normality

While humans are increasingly altering their environment, they do not understand or cannot predict many of the consequences of their actions. Many consequences of anthropogenic environmental change are not foreseeable and perhaps not even detectable until much later. A classic example is the hole in the ozone layer. It was not expected that chlorofluorocarbons (CFC) reaching the stratosphere would react with ozone. Although relevant ecological knowledge concerning a relatively stable ecosystem will accumulate over time, and historical records can elucidate system behaviours under different conditions, neither accumulated experiences nor information from the past might be relevant for understanding fundamentally novel systems.

Ecological systems often respond in a non-linear way to environmental change, with the consequence that abrupt and irreversible change occurs once a threshold has been crossed. Such non-linear responses further add to the difficulty of predicting ecological consequences. Furthermore, in the case of certain environmental variables, not only the mean value changes but also the variability around the mean. For instance, while the average summer temperature of individual years in northern

Switzerland between 1961 and 1990 varied by 4 °C around the mean of 16 °C, with climate change the annual summer temperature of a 30-year period could vary between 17.5 and 24.5 °C (variability of 7 °C) in the future (Schaer et al. 2004). One consequence of such increased variability is that species and ecosystems must be able to adapt not only to a mean summer warming of 4.5 °C, but also to an increase of the temperature of the hottest summers by 6 °C to 24.5 °C, while still experiencing summer temperatures of only 17.5 °C in other years. Besides such changes of inter-annual variability, seasonality will also change, with climate change predicted to unequally affect summer and winter temperature and precipitation patterns in many regions.

2.2.6 Global Extent and Pervasiveness of Changes

The global extent of many environmental changes also has implications for ecological novelty and how we should respond to it. First, there remains little leeway for prevention and reversibility; once a problem has been recognised in one area, it is likely to also be present in many other areas. Second, causes and effects can be interlinked across very large distances; for instance, CO_2 emission in an industrialised country can reflect a cause for a drought in Africa. Finally, much environmental change is difficult to contain, given that climate change, air pollution or invasive species do not stop at the boundaries of protected areas. The implications of this include even remote wilderness areas being increasingly characterised by anthropogenic impacts, establishing protected areas not being sufficient to preserve vulnerable biodiversity, and reference systems of non-anthropogenic nature becoming lost.

2.3 Towards an Ecological Science of Man-Made Nature

In the future, ecological science will deal almost exclusively with ecological systems that are shaped by humans. In ecology, the social sciences and humanities, there is a long history of trying to conceptualise hybrid natural/social systems (e.g. Lorimer 2012; Haila 2000; Latour 1993; Scoones 1999; Davidson-Hunt and Berkes 2002; Turner and Robbins 2008; Taylor 2005, *and citations therein*). However, such ideas have mostly remained at the fringes of mainstream ecology and social sciences. Over the past five decades, a number of subfields have also emerged from ecology that address the impacts of man on nature from different angles. These fields are more tightly linked to mainstream ecology and include conservation biology (Soulé and Wilcox 1980; Sodhi and Ehrlich 2011), invasion biology (Elton 1958; Richardson 2011), restoration ecology (Jordan et al. 1987; SER 2004), ecosystem resilience and adaptive management (Holling 1978, 1973; Chapin et al. 2009) and urban ecology (Sukopp et al. 1990; Pickett et al. 2001, 2011). My

intention in this paragraph is not to review these diverse approaches for dealing with 'socio-nature'; rather, I will highlight three fundamental research problems related to hybrid natural/social systems that require conceptual innovation, and in particular the closer integration of ecology with human sciences.

First, ecological theory generally treats humans as *causal factors* in physical systems, in analogy to any other animal. However, humans are psychological, social and cultural *actors*, and an integration of ecology with human sciences is needed to adequately describe human behaviours in ecological systems. Indeed, mainstream ecology typically addresses hybrids of nature and culture as socio-ecological *systems* by focusing on the distribution and change of biodiversity and energy and material flows, thereby expanding ecological theory developed for wild nature to man-made ecosystems without explicitly conceptualising human agency. Research fields that emerged from the human sciences to address environmental issues such as political, human or social ecology or land-change science (e.g. Latour 1993; Scoones 1999; Davidson-Hunt and Berkes 2002; Turner and Robbins 2008, *and citations therein*) build on theories of human agency, although these ideas have not yet reached the mainstream in ecology.

Second, ecology is a science of wild nature. However, if nature untouched by humans is organised through different ecological laws than anthropogenic nature, ecological theory must be adapted. The constitutive assumption of theory in biology, including ecology, is that the fundamental organising principles governing nature can be understood as a result of long-term processes in the past that were not influenced by humans: natural evolution and the assembly and self-organisation of biological communities and ecosystems. A famous quote by evolutionary biologist Theodosius Dobzhansky states: "nothing in biology makes sense except in the light of evolution" (Dobzhansky 1973). Consequently, ecological research is mostly focused on those ecosystems that are least affected by humans. It is assumed that in 'pure' nature, general ecological laws can be uncovered that will also apply to anthropogenic ecosystems. However, strongly human-influenced ecosystems may function in ways that are fundamentally different from wild nature. For instance, many regions lost all large animals, including large herbivores, frugivores, and top predators such as tigers, sharks or wolves, following the arrival of humans, with profound implications for the functioning of their ecosystems (Hansen and Galetti 2009; Jackson 2001; Estes et al. 2011). Furthermore, humans also substantially change the magnitude of species movement between ecosystems, both by enhancing and restricting it, thereby influencing fundamental ecological processes such as gene flow or community assembly processes. In addition, man-made ecosystems are often characterised by novel disturbance regimes that differ from historic ecosystems in terms of the frequency, type and intensity of disturbances. Therefore, it is not evident whether the functioning of anthropogenic ecosystems can be understood based on the empirical generalisations and theoretical principles derived from wild ecosystems. The functional similarity or dissimilarity between pre-human and human-shaped ecosystems should be explicitly investigated, because in the Anthropocene nothing in nature makes sense except in the light of human action.

Third, prediction is an important goal of ecology, although in human-dominated ecosystems this requires anticipating both biological and social changes. For instance, predicting future species invasions depends upon anticipating the way in which humans move species, manage the land and value nature and non-native species (Kueffer 2010). In urban ecology, a consideration of future urban development is necessary to understand the effects of urbanisation on biodiversity and ecosystem functioning in rapidly urbanising landscapes (Ramalho and Hobbs 2012). The rapid expansion of biofuel plantations, especially oil palms, has fundamentally changed the opportunities for nature conservation in the tropics (Koh et al. 2009). Climate change science has a weak ability to account for feedbacks between climate change and societal adaptation to a changing climate (Warren 2011). All of these examples show that a predictive science of ecological novelty will have to be able to address feedbacks between ecological and social change.

2.4 Understanding Rapidly Changing and Novel Ecological Systems

The rapid and fundamental changes typical of ecological novelty imply that ecological knowledge gained in the past might not be relevant in the future. This requires the generation of continuously new ecological knowledge about the functioning of emerging novel ecosystems. Some ecologists believe that addressing these new demands requires a shift in the boundaries between the experimental/nomothetic and observational/ideographic research approaches (e.g. Sagarin and Pauchard 2012). This relates to alternative views of ecology, as either an experimental and nomothetic science focused on universal laws or an observational and ideographic science focused on rich understandings of particular real-world cases, which have fluctuated in importance throughout the history of ecology (Kohler 2002; Brown 2011; Pickett et al. 2007; McIntosh 1987). For some, ecology is, or should be, a 'hard' science such as physics, which aims at identifying universal laws through experimental testing of hypotheses. By contrast, for others, it is, or should be, a 'soft' science such as most environmental or social sciences, which embraces the openness, multi-scale nature, historicity and contingencies of real-world systems and aims to reconstruct and interpret the past and present of particular real-world systems through the integration of heterogeneous—and mostly observational—data. If observational/ideographic research approaches gain new prominence in ecological research in the near future, reciprocal learning between ecology and (some forms of) research in the social sciences and humanities that face similar methodological and epistemological challenges could help both scientific cultures to work towards a common scientific methodology for understanding man-made real-world systems.

While recent debates concerning the relevance of observational/ideographic research approaches (e.g. Sagarin and Pauchard 2012) resemble older ones

(e.g. McIntosh 1987; Kohler 2002; Shrader-Frechette and McCoy 1993), the rise of a data-intensive ecological science places these debates in a new context. Indeed, ecology is rapidly becoming a globally interconnected and collaborative science with the computer power necessary for sharing and analysing huge amounts of data (e.g. Sagarin and Pauchard 2012; Coleman 2010). In this paragraph, I will review the rise of a data-intensive ecology, discussing how these developments touch upon fundamental questions about the production and use of ecological information, such as: who are the producers of relevant ecological data and who interprets the data? Inputs from research in the social sciences and humanities interested in how sciences work will help ecology to better design the ways in which knowledge is produced, interpreted and shared.

2.4.1 The Emergence of a Data-Intense Ecological Science

The amount and diversity of data available for ecological analysis is rapidly growing (Sagarin and Pauchard 2012). One reason is that new data sources are emerging, especially through developments in remote sensing. Satellites collect data, resulting in global maps of land cover or ecosystem properties such as biomass production at a spatial resolution that is often sufficiently fine for ecological analysis (Aplin 2005), while airborne surveys produce very high resolution information on three-dimensional vegetation structure, the distribution of species and their traits, or the chemical composition of plant canopies (Schimel et al. 2013). A second reason is that long-term ecological research programmes that compile all data collected in their study areas in centralised databases are increasingly being established (e.g. http://www.lternet.edu/). Moreover, monitoring programmes are also run for applied purposes (e.g. forestry inventories, biodiversity monitoring schemes, global Earth observatories). A third reason is that major efforts are invested in collecting, compiling and sharing existing data for secondary analysis (e.g. Kueffer et al. 2011b). It is increasingly expected that data from observational or experimental research is publicly shared after publication, and inaccessible data—for instance, from historic documents, or records in museums and herbaria—is made accessible in electronic form. Finally, holders of local and traditional knowledge are recognised as valuable data providers, with practitioners and citizens encouraged to document and share their observations (Sagarin and Pauchard 2012; Silvertown 2009; Dickinson et al. 2010; Berkes et al. 2000).

As a consequence, huge amounts of ecological data are freely available on the internet. For instance, such datasets cover: climate variables (http://www.worldclim.org/), land cover maps (http://nsidc.org/data/modis/), historic photographs (http://mountainlegacy.ca), vegetation surveys (Dengler et al. 2012), species distributions (http://www.gbif.org/), species traits (http://www.try-db.org/TryWeb/Home.php) or DNA[1] sequences (http://www.ncbi.nlm.nih.gov/genbank/). The growth in

[1] Deoxyribonucleic acid, a molecule containing genetic information.

data availability is paralleled by new possibilities to analyse large datasets. The increasing computing power of desktop computers supports ever more complex calculations, while new statistical and computing technics are being developed and shared through open-source software such as R (http://cran.r-project.org/).

2.4.2 *Data-Driven Pattern Recognition Versus Theory-Based Understanding*

Secondary analysis of large datasets that were originally collected for other purposes opens new possibilities for scientific inquiry. In a data-intensive science, there is more leeway for defining the relationship between data and theory in the process of identifying and testing explanations. At one extreme, data-driven algorithms search large datasets for interesting patterns or make ecological predictions without little or any input of prior knowledge. For instance, *BIOMOD* (Thuiller et al. 2009) is an ensemble forecasting modelling platform that allows aggregating spatial predictions of species distributions derived through different statistical/artificial intelligence techniques and parameterisations. In principle, such techniques require no input of prior knowledge (except for the initial selection of variables and data) and provide no explanation (except for a quantification of the range of 'reasonable' relationships between variables or 'likely' forecasts). At the other extreme, expert systems elucidate and aggregate qualitative and tacit expert knowledge in a systematic way (Perera et al. 2012). Between these extremes lie approaches such as Bayesian statistics, model selection or meta-analysis, which infer explanation from data with some input of expert knowledge and by weighing the evidence in support of alternative explanations (Ellison 2004; Burnham and Anderson 2002; Hobbs and Hilborn 2006).

Thus, the relationships between data-driven pattern recognition and theory- or expert-based understanding are becoming increasingly diverse, which relates to the topic of the next section. Specialised data analysts should not produce final data interpretation but rather help data providers and users to become involved in the procedures of the data analysis.

2.4.3 *Who Are the Producers of Relevant Ecological Data and Who Interprets the Data?*

Traditionally in ecology, the person who collects the data is also the person who analyses and interprets it. However, the emergence of a data-intensive ecology changes this arrangement in two important ways. First, the diversity of data collectors is increasing, with some ecological data no longer collected by academic ecologists. This diversification of data sources results in an increasingly wide range of

people being linked to ecological research, including people with contrasting expertise, stakes, social networks and personal relations with nature and environmental problems. Second, the data collectors and data analysts are often no longer the same people. While an academic ecologist still generally prepares a scientific publication with data that he/she collected, theoretical biologists, physicists, mathematicians, statisticians or computer scientists are increasingly specialising in analysing and interpreting ecological data that was collected by others. At the same time, the growing availability of free ecological data and easy-to-use analysis tools through the internet potentially leads to a democratisation of ecological analysis, whereby everyone can conduct ecological analysis at his/her desktop computer with data that was collected by others.

How data interpretation is shared among data collectors, specialised data analysts and data users has important implications for environmental decision-making. Given that data and knowledge about complex and rapidly changing ecological systems are necessarily highly uncertain and incomplete, there is much leeway for alternative interpretation (e.g. Larson et al. 2013). At present, there is a tendency for data interpretation to be fully handed over to specialised academic data analysts. While such specialised analysis certainly reflects a useful way of analysing ecological data—just like climate models are a useful tool for devising climate adaptation strategies—arrangements of data interpretation that more strongly involve diverse data collectors and users might be fairer and more likely lead to broadly legitimated decisions about human interventions in nature (cf. Kueffer et al. 2012).

2.4.4 Experimental Research in the Real-World

Many ecological processes occur at spatial and temporal scales that are not amenable to experimental manipulation. Nevertheless, scientists have innovated different strategies to extend the spirit of experimentation into the real-world. Natural experiments, gradient analyses and chronosequence studies interpret observed patterns as the result of experiments that took place in nature. Natural experiments are observational studies that exploit differences between sites (or other observational units) in nature as experimental treatments (Diamond 1983; Kueffer et al. 2013a). The trick is to observe how a dependent variable varies between sites that differ in one major factor ("the experimental treatment") yet not others. It is also occasionally possible to compare observations before and after an event at the same site, e.g. before and after a volcanic eruption (Dale et al. 2005). Gradient and chronosequence studies represent a special form of natural experiments. In gradient studies, the variation of a dependent variable is observed along continuous gradients, e.g. an elevational or latitudinal temperature gradient (e.g. Kueffer et al. 2013b). Chronosequence studies compare observation at sites that have experienced a certain ecological process for different time periods and use these observations to reconstruct how an ecological system develops with time, e.g. with ecosystem age (Wardle et al. 2004) or after being invaded by an invasive species (Lankau et al. 2009). Such observation-based

"experiments" allow studying long-term effects of "experimental treatments" that cannot be implemented through a research project for practical reasons, and data can sometimes be gathered from many replicates. The main weakness is that researchers are not in control of experimental manipulation.

Ecologists also perform 'true' experiments in the field, sometimes at a large spatial scale of a whole watershed or lake. Large-scale field experiments correspond to a traditional understanding of experiments insofar as the experimental treatment is manipulated by the researcher, although they have other important weaknesses; namely, they only run for a short time (compared to natural experiments), only some variables can be controlled by the experimenter (compared to laboratory or microcosm experiments) and replication is often low (Diamond 1983; Carpenter et al. 1998). For these reasons, Carpenter et al. (1998) argued that large-scale field experiments should not be used to test hypotheses, but rather to "compare diverse alternative explanations." They advise against replication, at least in certain situations, suggesting that multiple experimental ecosystems should each be manipulated in a different way to explore alternative ecosystem behaviours. Thus, there appears to be an inversion of the roles of experiments and observations in field research. Traditionally considered the exploratory mode of ecological research, observational studies are increasingly used to test hypotheses (e.g. through natural experiments) (Sagarin and Pauchard 2012; Fraser et al. 2013), while experiments—traditional used for hypothesis-testing—are considered exploratory research.

The discussion of different types of experimental approaches in field research gains another important dimension when considering that such research is increasingly undertaken in human-influenced settings, e.g. by comparing ecological parameters along land use gradients, between sites that have been impacted by humans in different ways or at different times, or before and after a management intervention. This means that ecological research is increasingly embedded in real-time in ongoing deliberate (e.g. a management project) or unwanted experiments of human-induced change (e.g. Felson and Pickett 2005; Gross 2010), and, through their daily actions, citizens are not only becoming data collectors for ecology (see above) but also experimental manipulators.

2.4.5 Problems of Scale: Local In-Depth Case Studies Versus Global Comparative Studies

Thanks to an increasingly globally interconnected and collaborative science, coordinated research that conducts the same observational or experimental studies across many sites is becoming increasingly common (Fraser et al. 2013; Kueffer et al. 2013a; Kueffer 2012; Hobbie et al. 2003). This opens new possibilities for performing experiments (Fraser et al. 2013) or in-depth case studies (Kueffer 2012; Hobbie et al. 2003; Kueffer et al. 2013b). Such comparative research across multiple sites helps to circumvent an important trade-off in ecology, between collecting data from a broad range of different locations, species and ecosystems

(Pyšek et al. 2008; Kueffer et al. 2011b) and studying the ecology of particular places in-depth (Billick and Price 2011). Indeed, networking local case studies globally (Kueffer 2012; Kueffer et al. 2013b) represents an alternative bottom-up research approach to global change, compared to the top-down vision of a planetary science of global change (Mooney et al. 2013) that has set the global change research agenda since the 1980s (Kwa 2005).

2.5 Conclusions

The objective of this chapter was to present a broad view of an ecological science in search of new approaches for tackling the scientific challenges of societal adaptation to ecological novelty (rapid and fundamental ecological change in the Anthropocene). I have emphasised the multifaceted nature of ecological novelty, whereby each aspect confronts science and society with difficult problems. For an ecologist, 'ecological novelty' better captures emerging dynamics than the notions of 'climate change' or 'global change.' Changes occur at different spatial scales, and patterns and processes at local scales are particularly difficult to understand and manage. Ecological novelty does not arise through changes in isolated factors such as temperature, but rather from the interactions of many entangled physical, chemical, biological and social factors. Moreover, it is not change *per se*, but rather the magnitude, rapidity, unfamiliarity and uncertainties of these changes—the novelty—that challenge traditional science and human-nature relationships.

Human influences on nature are rapidly and irreversibly expanding. The new challenges for environmental sciences are: (i) to theoretically grasp the essence of 'socio-nature' that is governed by coupled natural and social processes; (ii) to anticipate environmental change that is driven by rapid ecological *and* social change; and (iii) to mediate between an ecological understanding of humans as *causal* forces and a human sciences perspective on humans as self-conscious and cultural *actors*.

Ecological change in the Anthropocene is rapid and fundamental. Consequently, environmental management must be continuously adapted and thereby should particularly consider alternative scenarios of future changes and feedbacks between environmental change and societal adaptations to such change. Ecological science is innovating new ways for embracing the scientific complexities of such rapidly changing real-world systems in order to support societal decision-making, although scientific uncertainty and ignorance remain important and are often irreducible. As a result, separating the study of ecological facts from the social constructions and representations of this empirical knowledge can be problematic when dealing with ecology novelty. The emergence of a data-intensive and collaborative ecological science holds potential for redefining the relationships between collectors, analysts and users of ecological information, and such opportunities should not be missed to account for the unruly relationships between the production, interpretation and use of uncertain and incomplete ecological knowledge. Particularly due to increased global connectivity and collaboration in ecological research, networking multiple

local in-depth case studies is emerging as an alternative bottom-up approach to global change research compared to the top-down vision of a planetary science of global change.

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Chapter 3
Predicting the Past? Integrating Vulnerability, Climate and Culture during Historical Famines

Dominik Collet

Abstract Research on climate change is essentially a study of the past. However, while predicting future developments rests firmly on the analysis of historical changes, cooperation between climatologists and historians is extremely rare. Instead, the field is mired by disciplinary constraints and the resilient dichotomy of 'natural' and 'cultural' factors. Integrative approaches are only just beginning to emerge. Fewer still are empirical case studies that test the interaction of climate impacts and human responses in small-scale, high-resolution analyses. This paper tries to provide examples of both, drawing on the field of famine-studies. It presents the vulnerability-approach as an interdisciplinary *boundary object* for climate research, introducing the global famine of 1770–1772 as a case study. In this way, the paper makes the case for a genuinely historical approach in climate research to replace the current mode of simply 'predicting the past.'

3.1 Archives of Nature, Archives of Man

Integrative climate research is challenging. It not only requires the 'little interdisciplinarity' of related disciplines, but also the 'big interdisciplinarity' across the two-culture divide of natural and cultural sciences. At present, climatologists (working in an already cross-disciplinary field) regularly confine themselves to the biophysical reconstruction of climates, while the societal impact of the observed phenomena is regularly left for others to research. Even large-scale co-operative enterprises rarely include the social sciences and humanities. Recent schemes such as the *pages2k* project have brought together close to a hundred researchers working on historical climates, but did not include a single historian (PAGES 2k Consortium 2013). As a result, when reflections on societal impacts are voiced at all, they are often added as an afterthought (see Fig. 3.1) and remain curiously detached from the meticulously documented climatological data. More often, however, societal implications are

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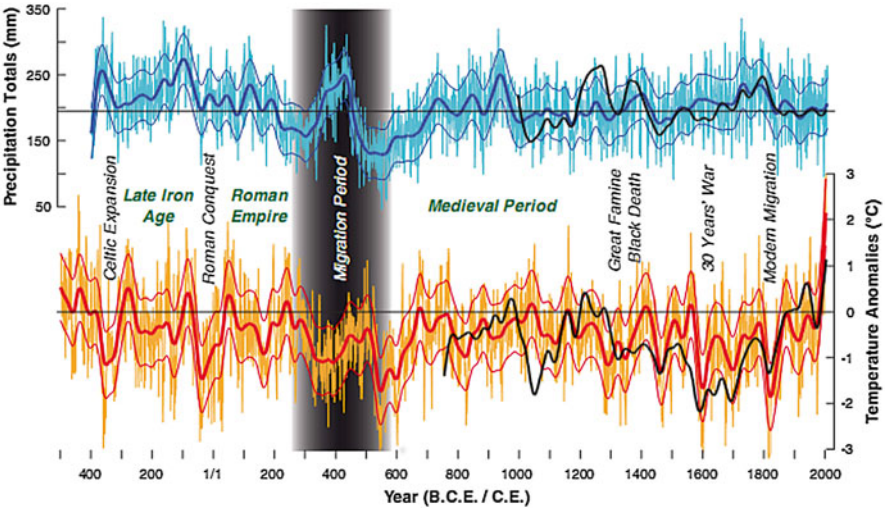

Fig. 3.1 Detailed reconstruction of precipitation (*top*) and temperature (*bottom*) from tree-ring data with a rudimentary overlay of supposed phases of "demographic expansion, economic prosperity, and societal stability" (see p. 581 in Büntgen et al. 2011)

supplemented by non-scientific actors, such as the public relations (PR) departments and journalists, or published in separate formats, such as podcasts or interviews. As a result, they often play on the established narrative of the 'rise and fall' of civilisations and remain, at heart, deterministic.[1]

Historians have similarly sidestepped the challenge of 'natural data.' Even though climatic extremes constituted a formative experience for pre-modern, agrarian societies (Radkau 2008), the most recent major studies on climatic extremes by historians appeared decades ago (Labrousse 1944; Abel 1974). This indifference is partly a reflection on the discipline's genesis: for a long time, historians studied the natural world alongside human societies. When 'human history' finally split from the field of 'natural history' during the nineteenth century, this decoupling resulted in the marginalisation of natural factors and a strong aversion to perceived climate

[1] *Pages2k* (past global changes of the last two millennia) is a multinational working group focusing on climate reconstructions. Its papers and official press releases, for example, focus exclusively on reconstructions, refraining from any interpretation of possible societal impacts. Nonetheless, these gaps encourage journalists to take licence and charge these reconstructions with populist narratives. For example, the leading German news site *Spiegel Online*, featured the paper (PAGES 2k Consortium 2013) with the headline "The fall of civilisations explained" and incorporated sweeping assumptions on the fate of "the Romans" or "the Mayans" (Bojanowski 2013). In another typical move, a "science podcast" (*Science Magazine* 2012) as well as an article on climate and the "collapse of ancient Maya civilization" (*Science Daily* 2012) are the result of PR "material provided by the University of Southern California," to flank a more cautious scientific article on the day of its publication (Kennett et al. 2012). To a certain extent, the same division of labour is present in the separation of working groups I ("the physical science basis") and II ("impacts, adaptations and vulnerability") in the reports of the *Intergovernmental Panel Climate Change (IPCC).*

determinism (Chakrabarty 2009). This tendency has been reinforced by the growing disenchantment with earlier econometric approaches, portraying the relation of environment and society as an interplay of climate and demography, forces beyond the reach of the individual (see p. 975 in Hoyle 2010). Since the 'cultural turn' of the historical disciplines in the 1980s and 1990s, the prospect of such a history disconnected from human agency has held little interest.

This deadlock between natural and cultural sciences is particularly noticeable in the research on famines—events that mark an important contact zone of man and nature. Famine research has remained split into two mutually exclusive approaches since the 1980s. The natural sciences have worked exclusively on the external, biophysical impacts, studying the *archives of nature* (precipitation and temperature data reconstructed through the proxies of speleothems, sediments or tree-rings). In turn, the humanities have focused on internal, societal factors such as poverty and entitlement failure, based on the *archives of man* (records of prices, births and deaths, etc.). These approaches do not just use different data sets and 'archives'; moreover, they also suggest entirely different causalities of famine. The former regards famine as the straightforward result of the decreasing *availability* of food, advocating a strong link to climate anomalies, whereas the latter considers the decline in *access* to food as the root cause of famine, highlighting political famines with no relevant link to climate, particularly in modern times. Indeed, the opposition of interpretations based on either food availability decline (FAD) or food entitlement decline (FED) continues to delineate this research field (Murton 2000).

This rigid dichotomy of 'natural' and 'cultural' factors not only mirrors the two-cultures-tradition of todays scientific set-up or the rise of postcolonial theory during the 1980s, with its strong focus on man-made causes. Furthermore, it also reflects the character of famines as 'slow catastrophes,' developing over many months and providing ample opportunity for human interference. The resulting plurality and variability of human responses is difficult to process with the modelling techniques commonly used by economists and climatologists, given that their models need stable data sets rather than the malleability and contingency of human reactions. Faced with the opaque interplay of factors during a slow catastrophe, the measuring sciences tend to focus on the more manageable data of the natural archives—a confinement that further reinforces disciplinary boundaries.

However, integrative approaches have begun to emerge in recent years, mainly due to the debate on the impacts of the current climate change. New approaches conceptualise the natural environment and human practices as coupled "human-environment-systems" (Turner et al. 2003), "social-ecological-systems" (Oliver-Smith 2004; Bohle and Glade 2008) or "sociospheres" (Mauelshagen 2010). They replace established narratives of man's 'struggle against nature' with an integrated study of climatic impulses on the one hand, and the ways in which these have been interpreted and exploited on the other. These integrated approaches have been pioneered by disaster studies, whose research into earthquakes or floods focuses on the intersection of nature and culture (Johns 1999; Mauch and Pfister 2009). Studies in this field have argued that while hazards are natural, disasters are not (Bankoff 2004a). As a result, they should be classified as "cultural" as well as "natural catastrophes"

(Walter 2008). Disaster studies have revealed historical patterns of interpretation and coping to be unexpectedly dynamic—particularly during the late-eighteenth century—offering a poignant critique to determinist approaches to climate and hunger. One of the most promising interdisciplinary approaches to have emerged from these pioneering studies on disaster and famine is the concept of *vulnerability*.

3.2 Vulnerability as a *Boundary Object*

Vulnerability studies constitute a multidisciplinary approach that traces the dynamic interaction of multiple factors. At its core, the concept is used to capture the interplay of several stressors or perturbances threatening the stability of a system (Turner et al. 2003). In relation to human-environment interaction, vulnerability is conceptualised encompassing "an *external side* of risks, shocks, and stress to which an individual or household is subject; and an *internal side* which is defencelessness, meaning a lack of means to cope with damaging loss" (Chambers 1989). This interaction has often been visualised in diagrams, focusing on multiple and mutually entangled impacts on the level of society, households and individuals (Fig. 3.2). With its emphasis on the dynamic interaction of heterogeneous factors, such an approach is well suited to transcend the dichotomy of natural and societal factors.

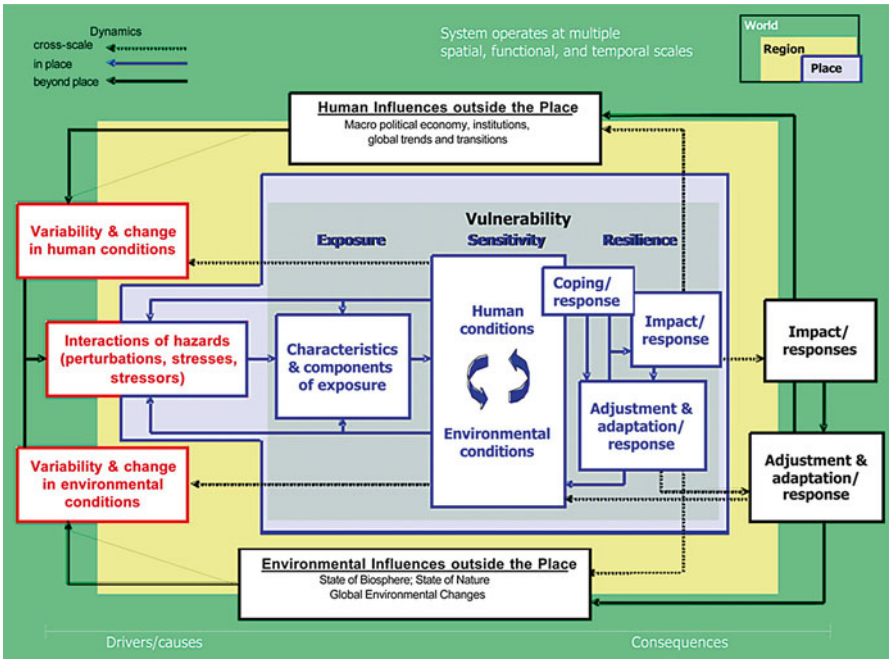

Fig. 3.2 Illustration of a "vulnerability framework" chart (see p. 8076 in Turner et al. 2003, Copyright (2003) National Academy of Sciences, U.S.A.)

However, multifactorial approaches are not a modern invention. Pre-modern societies readily accepted that events such as famines could be simultaneously attributed to human neglect, extreme natural events and divine intervention. While the weighting and relative importance of the three fields—profiteering, real scarcity, punishment by an angry god—were eagerly discussed, all three were conceptualised as being closely interwoven. Only during the nineteenth century did a new, secular understanding of nature become dominant, conceptualising man and nature as fundamentally separate (Walter 2008; Phillips and Fordham 2010). Subsequently, famines were principally attributed to natural factors that originated outside human society. Since then, prevention has largely focused on technical rather than social instruments.

The renaissance of multifactorial approaches is often associated with the rise of postcolonial and development studies during the 1980s. However, the roots of the vulnerability approach reach back even further, resting—surprisingly given its strong focus on civil society—within military research of the 1940s. During this time, large-scale collaborative projects such as the *United States Strategic Bombing Surveys* started to study the impact of new military techniques such as carpet-bombing on the affected population. As the bombing campaigns resulted in not only physical but also psychological devastation, the surveys incorporated social as well as infrastructural data. After the war, the cross-disciplinary collaboration of physicists, geographers, sociologists and psychologists during the *Bombing Surveys* extended to non-military catastrophes. Researchers began to combine external biophysical shocks with internal economic, social or psychological perturbations caused by catastrophic events, in a move that arguably paved the way for civilian research on catastrophes and later interdisciplinary collaboration (see Bankoff 2004a; Dombrowsky 2008).

The programmatic combination of natural and societal factors initially generated little reaction from the academic world. When it was finally picked up by the universities, research on hunger and famines proved pivotal. The continuation of severe famines in Africa and Asia during the 1970s had challenged traditional patterns of interpretation. In the midst of the modern world and all its capacities, it became increasingly difficult to attribute these catastrophes to natural impacts alone. Accordingly, societal factors such as poverty, inequality and exploitation were increasingly put forward. When Amartya Sen published his influential essay on *Poverty and Famines* (1981), asserting that famines frequently developed with little any discernible natural impact, he once again opened the field to multifactorial approaches and a balanced debate on the mix of climatic and societal factors. Robert Chambers later described the entanglement of these two sides with the term "vulnerability" (Chambers 1989), in an integrative concept that was meant to counteract purely climatic or economistic approaches. Chambers and his colleagues drew attention to the notion that popular measures, such as simply raising net income and land ownership, could raise other risks: they diminished mobility in times of crisis, reduced the availability of wild substitute foods and destroyed vital networks of patronage and relief. Rather than replacing older approaches that focused on natural impacts with an equally monocausal concentration on socio-economic factors, they advocated the integration of biophysical and societal aspects.

The initial "double-structure of vulnerability" was later expanded to include ecological approaches, integrating the developing field of ecosystems research (Bohle and Watts 1993). This shifted the focus from short-term relief measures to a systemic perspective. As a result, the term 'vulnerability' has come to specify not just a temporal condition, but also a research programme. Due to this broadened perspective, it has been applied not only to famine research but also in other areas that study human-environment interactions—most notably climate change research. Indeed, the 2007 *Intergovernmental Panel on Climate Change (IPCC)* report included a working group on vulnerability, using the term to describe "the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts of climate change" (IPCC 2007).

Since the new millennium, the concept has become the subject of intense debate and modifications, whereby the initially static concept of vulnerability has increasingly given way to a more procedural approach. Moving away from event-focused 'catastrophism' to a long-term perspective on the historicity of vulnerability has opened the field to the historical sciences (Bankoff 2004a; Oliver-Smith 2004). More recently, the factor of 'culture' has been added into the equation, with the impact of "cultural capital" (P. Bourdieu), the role of cultural memory and practices of neglect (J. Assmann) or the exclusion from hegemonic discourses and practices of communication (A. Gramsci) all having been highlighted as important contributors to patterns of vulnerability (Voss 2008; Swift 2006; Pfister 2011; Bankoff 2004a). As a result, the concept has now gained relevance for the humanities as well as the social and natural sciences.

These extensions and modifications certainly point to the enduring appeal of the concept. The plurality of the included factors (biophysical, social, cultural) and levels (spatial, historical, biological) encourage interdisciplinary exchange. At the same time, they also attract criticism, much of which is common to attempts at 'big interdisciplinarity': the measuring sciences complain that the large number of factors now included impede any sensible modelling. From their perspective, greater realism has been achieved at the expense of practicability (see p. 488 in Thywissen 2006). The hermeneutical disciplines, on the other hand, take issue with the tendency towards abstraction and reduction, which marginalises the contingency of individual cases and studies societies "from the outside" (see p. 48 in Voss 2008). Even advocates of the concept agree that its rapid development poses a challenge for researchers to remain up-to-date. Research overviews now distinguish up to five generations of vulnerability studies (Birkmann 2006) and as many as 20 semiotic dimensions and 30 definitions (Füssel 2007; Thywissen 2006). As a result, many researchers use a rather mechanistic, ahistorical concept of vulnerability. Ignoring the concepts' turn towards processuality and agency, they reduce vulnerability to a simple aggregation of stressors—a tendency particularly prominent in recent works on climate change (see p. 104 in Bohle and Glade 2008; p. 70f. in Ericksen et al. 2010).

Other critics lament that the profound political implications of the concept have been ignored. Labelling a population as 'vulnerable' can be used to stigmatise groups and delegitimise governments of the global south. Indeed, the terminology remains tied to western concepts rather than those of the societies commonly

associated with being at risk (Bankoff 2004b). Crucially the term 'vulnerable' encourages a perspective that frames the affected population or ecosystems as passive victims. It plays on declensionist narratives of ecological deterioration and promotes the disempowerment of local systems of relief and coping. These criticisms highlight that the concept is still missing a self-reflexive perspective—a desideratum that might be meliorated by the growing involvement of the humanities.

The most common critique, however, is the result of a misunderstanding: the complaint that vulnerability studies do not come equipped with a set methodology. In fact, as their proponents argue, as an interdisciplinary tool they do not attempt to do so. Instead, in the context of interdisciplinary cooperation, 'vulnerability' constitutes what Susan Star has termed a "boundary object." Such objects are both plastic enough to organise cooperation and sufficiently robust to maintain a common identity across disciplines: "they have different meanings in different social worlds but their structure is common enough to more than one world to make them recognisable, a means of translation" (Starr 1989). Scholars of science studies and interdisciplinarity have stressed that it is precisely this pliability that encourages cross-disciplinary 'borrowing' without forcing participants to abandon the respective methodological resources of their field (Weingart 2000). As such, vulnerability can be compared to concepts such as 'sustainability' or 'discourse' in the way that, at its core, it merely encourages a specific perspective: multifactorial rather than monocausal approaches, dynamic interdependencies rather than rigid determinisms, a concept of human-environment relations as entangled rather than conflicted.

The vibrant cross-disciplinary use of the vulnerability approach testifies to the attraction of such an open concept. This is particularly relevant to five areas of human-environment relations: agency, historicity, entanglement, scalability and comparability (Collet 2012):

- The vulnerability approach highlights the agency of the people affected. Their practices are not regarded as simple reactions to external stimuli or mere functions of precipitation and temperature. It integrates the multi-faceted and often improvised actions of specific "economies of survival" (V. Shiva).
- The concept opens climate change research to genuine historical approaches: instead of the popular 'catastrophism' that focuses on disasters as mere events, it encourages a long-term perspective. It studies how vulnerability is created over long periods of time and considers the way in which it manifests itself in specific "built environments" (A. Oliver-Smith).
- It enables us to perceive the relation between man and nature as one of entanglement rather than conflict. Instead of rigid schemes of stimulus and response, it studies the mutual interaction and co-development of climatic and anthropogenic impulses that can be appropriated and 'socialised' in various ways.
- The concept is scalable, given that it can be applied to various geographical as well as societal levels, covering individuals as well as households and larger groups. As a result, it is able to trace inequalities in vulnerability according to gender, ethnicity and age that often go unnoticed by traditional state-centred approaches. It also reflects that greater resilience on one level can increase

vulnerability on another (i.e. a state profiting at the expense of its farmers through 'development aggression'). As such, it can contribute to the ongoing debate on micro- and macro-perspectives in climate impact studies and other academic fields.
- It encourages and facilitates comparative studies. Through its analytic framework, it can organise comparisons between historical and modern as well as western and non-western societies. Its embrace of non-standard factors such as imperfect markets, informal strategies of risk or specific cultural modes of perception reveals linkages that have been overlooked or underestimated to date.

Compared to previous approaches, the vulnerability concept supplements biophysical impact with ecological, societal and cultural factors. This turn shifts the focus from measurement and quantification towards weighting and qualification. As a result, the concept breaks with determinist approaches and highlights the dynamic entanglement of multiple impacts—entanglements that create space for the agency of the people affected.

Its multifactorial approach goes beyond what disciplinary methods can achieve; for example, through discourse analysis, climate modelling, "cliometrics" or economic mapping. In terms of research on climate change, vulnerability provides a framework that is able to capture the complexity of human-environment interactions rather than reducing them to manageable yet disconnected particularities. It reminds researchers that extreme climate events cannot be adequately described by drawing on the logic of a particular discipline, but rather constitute fundamental societal experiences that require the crossing of academic boundaries.

3.3 The Global Famine of 1770–1772

Research on the impact of historical climates is often geared towards ancient civilisations. Here, climate data is considered a suitable supplement for completing the patchy human record. However, the scarcity of historical records is usually inadequate to reconstruct human-environment relations in meaningful detail. To fill in such gaps, research often draws on established narratives—particularly in works of popular science, such as Jared Diamond's bestseller *Collapse* (2005). Crucially, these rather sweeping assumptions concerning the rise and fall of civilisations, on mass-starvation and 'climate migration' often serve as *silent referents* in contemporary debates on climate change.[2]

Early modern crises have attracted less attention. Paradoxically, this deficit is at least partly due to the better quality of the data available: because the human record

[2] Dipesh Chakrabarty (1992) used the term "silent referents" to describe narratives that continue to shape our knowledge even when they have slipped from an individual's power of disposal over time. While he refers to colonial discourse, similar historical narratives of decline and ascent shape our understanding of 'climate' and its societal impacts. On the (fragile) historical grounding of modern imaginaries dealing with 'climate refugees' see, for example, Lübken (2012).

is more detailed, it does not yield as easily to the formulation of clear-cut theses.[3] The rich archival sources also require the unusual cooperation of climatologists with historians. However, once these prerequisites are met, the events provide a rich source for an integrative approach to climate impact studies. Historically, they mark a halfway-point: unlike studies on ancient societies, they can draw on rich human as well as natural records, rendering small-scale, high-resolution case studies operable. Nonetheless, this wider source base is not bought at the expense of including later industrial societies, where modern technologies have arguably constrained the impact of climate. Crucially, the precise documentation of human responses allows climatologists to use this period as a test case for the presumed impact that the shifts observed in the natural archives might have had on historical societies.

The case discussed here provides a good example: the global famine of the 1770s occurred during one of the most severe spikes of the 'Little Ice Age' (1350–1850). It can also count as one of the best-documented disasters in the pre-instrumental period, thanks to the proliferation of sources during the high Enlightenment. Unlike the extremes of 1816 ('the year without summer') or 1740 ('the black spring'), its disastrous effects lasted for several years, causing disruption and stress on all levels of society. Due to its global reach, it also offers the rare chance to compare western and non-western ways of coping.[4]

The unfolding of the biophysical event–a multi-annual weather extreme framed by long-term climatic deterioration–is fairly well understood. Reconstructions are able to draw upon a large array of data. To date, tree-rings offer the highest resolution on temperature and precipitation in the natural archives. The (sub-) annual measurements they provide can then be supplemented with more long-term data gained from tracing stable isotopes in speleothems and sediments. More precise proxy data is available from an array of phenological sources (cherry blossom, vine, wheat and rye harvest dates) and qualitative data such as ship-logs, tax-dates, early instrumental measurements and—particularly for India—revenue (diwani) accounts. These show significant correlations and, in aggregated form, can be used to create indices of local climate. In some cases, they even allow the drawing of monthly atmospheric pressure charts (Brázdil et al. 2001).

The climate reconstructions illustrate that while India and Central America faced severe drought, Europe experienced a persistent "cold/wet" complex (Ouweneel 1996; Arnold 1999; Johnson 2005; Le Roy Ladurie 2006). All of central Europe was subject to exceptionally cold winters, with snow cover at low altitudes until June. More damaging still was the persistent heavy rainfall, which prevented airborne insemination and timely sowing, encouraged the proliferation of fungi and stunted growth on virtually all sources of food, while simultaneously shutting down transportation, with most major rivers unnavigable due to flooding for long periods. In India, the general drought was aggravated by the repeated failure of the

[3] However, the supposed impact of climate on the *French Revolution* has remained a popular topic (Fagan 2002; Le Roy Ladurie 2006).

[4] The crises of the 1770s are at the focus of an interdisciplinary research group on eighteenth century famines, uniting palaeoclimatologists, anthropologists and historians at Heidelberg University: http://www.hce.uni-heidelberg.de/jrg/facingfamine.html.

monsoon, causing serious damage to the dominant rice cultivation. However, the causes of these anomalies are less certain. Cursory research has hinted at solar activity or volcanic eruptions (Vasold 2008), while others have suggested fluctuations of the El Niño-Southern Oscillation (ENSO), particularly as it has been demonstrated to explain the wet Europe/dry India constellation (Davis 2002). Nonetheless, at the current level of research, causal explanations must remain speculative.

In comparison, the societal responses to the 1770s famine have attracted substantially less scholarship, even though the severity of the climatic anomaly resulted in a large body of sources. They comprise serial data on births, deaths, prices and revenues, alongside criminal records, both for European bandits and Indian dacoits (robbers) as well as supplications, letters directed by the peasants of both continents to their superiors in search of relief and tax breaks. The crisis inspired large numbers of egodocuments such as diaries and memoirs, as well as sermons, economic records and numerous songs. Additionally, the famine in Europe sparked a learned debate that resulted in several hundred volumes of so-called "Teuerungsliteratur" (dearth literature) (Soden 1828). In central Europe, special 'poor papers' circulated that were sold for the benefit of famine victims and offered a unique mix of political comment, theological advice and meteorological observations. There is also a rich tradition of material culture that comprises memorials, commemorative coins, grave inscriptions and a broad pictorial record.

The archives of man confirm that Europe and northern India certainly experienced dramatic mortality crises. Bohemia and parts of Saxony are thought to have lost 10 % of their population, with a loss of up to ten million (30 %) in Bengal (Post 1990; Arnold 1999). At least in Europe, excess mortality was closely associated with the outbreak of major epidemics. How these large-scale effects were linked to climate, pre-crisis vulnerability or post-crises interventions (or a lack thereof) needs further clarification (Pfister and Brázdil 2006). On an abstract political level, the crisis in India has frequently been associated with the *East India Company's* takeover of direct government in Bengal in 1772 (Ghosh 1944; Chaudhury 1995). In Europe, the governments in France, Sweden and Denmark collapsed. While grain shortages, price hikes of bread, widespread riots and migration undoubtedly had an impact, their relevance—as a catalyst, an inhibitor or a convenient pretext—is equally difficult to assess on such an abstract level. Small-scale case studies give a much better idea of the way in which external impulses can be adapted, used and 'socialised.'

For example, research on a local level suggests a reinterpretation of many precautionary measures. Two of the most common strategies of historical societies—banning grain exports and building granaries—are usually regarded as a straightforward (if ineffective) reaction to the overwhelming impact of weather extremes. In the few cases where these strategies have been studied in more detail, they were blamed as counter-productive impediments to interregional grain exchange and a fatal discouragement of trade (Collet 2013b). Close-up analyses of the practices of early-modern 'hazard policy' paint a rather different picture, illustrating that borders and granaries became foci for a broad spectrum of religious, economic and social practices, conflicts and appropriations.

For example, the closure of borders to secure grain for local consumption constituted a highly symbolic move. As in all pre-modern crises, this policy covered all of Europe (and much of Bengal) during the 1770s, in a close-meshed net of fortified boundaries that quickly reached down to the level of individual villages and communities. However, studies from the Ore Mountains in Saxony and Lake Constance near the Alps or, indeed, the riverine landscapes of Bengal show that these blockades were almost impossible to police (Collet 2013b; Chowdhury-Zilly 1982). Smuggling and trespassing, often under the pretext of pilgrimages and migration, remained common. Additionally, the closures were flanked by propaganda denouncing foreigners and vagrants suspected of trafficking grain out of the country. Particular attention has been paid to the scapegoating of grain traders in Europe that took the form of vicious anti-Semitic propaganda in the Empire. The authorities minted coins denouncing these 'Corn-Jews' alongside images of hoarders hanged from trees or rotting in hell (Gailus 2001). As a result, these ineffective and politically-charged corn bans have been interpreted as "moral economy from above," whereby governments faced with extreme weather managed to appropriate popular resentments, fostering "an attitude of submissive abidance" (Medick 1985). However, the vivid local debates suggest a different perspective. Large groups used the bans as an argument to secure relief and participation in times of crisis. Given that the bans terminated all commercial grain trade, the responsibility for provisions shifted immediately and entirely towards the authorities. In this way, it fell exactly on those people who had drawn the largest profits from grain through taxes and land-ownership in prosperous years. Fencing off the country to the outside created a community on the inside that transcended the usual hierarchies and privileges—a fact vividly illustrated by successful denunciations against noblemen and clerics. The public provisioning that the bans had made obligatory did indeed happen, often with disastrous financial consequences for the authorities (Collet 2013b). The border closures allowed the 'inmates' to activate entitlements and rights to relief that would otherwise have remained out of reach. As the eminent German economist Reimarus sneered, "food handouts are no longer regarded as gifts but rather as a statutory obligation of the government" (see p. 131 in Reimarus 1791; *own translation*).

These practices can be read as "empowering interactions" (A. Holenstein). They counteracted the social vulnerabilities of a highly stratified society, not primarily through physical, but rather through communicative practices. During extreme climate events, new constellations and alliances became possible. Subjects and Sovereigns used the crisis to establish relations of mutuality, irrespective of their diverging interests, marking each other as authoritative partners. In doing so, they managed to expand their rights at the cost of intermediary levels of government, as well as the privileges of nobility and the church (Collet 2013b).

Public granaries constituted another field where the physical practices of facing famine can only be understood when their material and their communicative aspects are integrated. A quick glance at their genesis already hints at some zones of conflict. Most public grain depots did not originate from the need to provide relief, but rather to store tax grain and provisions for the military. Furthermore, they also illustrate

the momentous separation of producers and consumers. As such, granaries mark not only an infrastructure to guard against extreme climate events, but also an intensely contested interface of military, fiscal, economic and humanitarian interests. On a local level, these fault lines quickly become visible. In early modern Prussia, a veritable "granary state" (Collet 2010), the public magazines owed their existence to the 'military revolution' rather than relief. However, during harvest failures, King Frederick II used them as a stage to portray himself as a benevolent sovereign—a strategy he had pursued since his accession to the throne during the 'black spring' of 1740 (see p. 239 in Collet 2010). At the same time, eminent German cameralists drew on the granaries to develop and propagate their theories of economic circulation, arguing for the state depots to be used for price balancing (Justi 1771; see pp. 376–381 in Sonnenfels 1777).

In 1770, however, Prussia's granaries stood half-empty. The military administrators had seen few merits in tending the magazines during peacetime. Local landowners, unwilling to lose control of their stocks, supported this cavalier approach. Therefore, when the subjects took to writing desperate supplications, they directed them not to the local authorities involved in the grain trade, but rather directly to the king. Initially, Frederick II dismissed them, stepping up his anti-Semitic smear campaign against 'Corn-Jews' instead. However, when the persistent rains ruined a second harvest in 1771 and reduced his subjects to eating bark and grasses, Frederick was forced to act. His 'solution' involved moving his troops under a pretext into neighbouring war-torn Poland to requisition large quantities of grain abroad—a campaign that eventually paved the way for Prussian land gains during the First Partition of Poland in the following year (Collet 2013a). Frederick's move exported the famine eastwards, allowing the King to uphold the well-publicised fiction of granaries as sources of food security.

Therefore, granaries performed various societal roles and cannot be interpreted as a simple response to climatic fluctuations. The sovereign used them for power politics, as well as portraying himself as a good shepherd. For the 'economists,' the granaries constituted an important sparring pit that initiated new concepts of an integrated, cyclical economy and prepared the way for new food regimes in the nineteenth century based on free-trade rather than charity (Priddat 2008). The experience also grafted the loose assortment of self-fashioned experts into a coherent group and helped to establish the new scientific field of Nationalökonomie or classical economics. For the common people, the granaries provided an argument to activate new participatory rights. Not just in Prussia, they served as a pretext to circumvent intermediary levels and open up a direct channel of communication to the sovereign. As in the previous case of the border closures, these 'empowering interactions' served to legitimate both parties at the cost of local authorities. In this way, the humble petitioners did not just secure food; rather, they inadvertently modernised the institutional set-up of the early modern state. Again, the vulnerabilities that common people experienced at the hands of external impacts and a highly stratified society were not kept at bay through the physical means of technology alone, but through social norms activated by communicative practices.

Strikingly, comparable strategies can be observed in the Indian arena. Export bans and grain stocks, both local and regional, played a comparable role in securing participatory rights (Chowdhury-Zilly 1982; Curley 1977). While earlier research attributed the Bengal famine of the 1770s exclusively to the *East India Company (EIC)* and colonial rule, more recent studies have re-evaluated role of the native interests, focusing instead on ecological disempowerment (Damodaran 2007). This revision also suggests a new perspective on the effects of the famine: the plight of the 'zamindars,' the local gentry in charge of the intermediary levels of administration, jurisdiction and tax collection, could be equally attributed to the *EIC* government as to the agency of local peasants (see pp. 22–41 in Sen 1988; pp. 43–49 in Chowdhury-Zilly 1982). Ultimately, the famine might have served as a pretext to replace local rulers with the *EIC* as a supposedly weaker outside force—a strategy that hints at an alternative interpretation of early colonialism. In comparison, these new coalitions at the expense of the middle-ranks are reminiscent of the situation in Europe. Moreover, they suggest that 'colonial' food regimes also existed in the Old World. In another transcontinental exchange, the Bengal famine proved instrumental in Europe as well. A London show trial against the *EIC* governors involved provided starving Londoners with the opportunity to voice their plight and secure a reform of the Poor Laws while the British parliament used it to pass the Regulation Act of 1773 that initiated the transfer of the Indian possessions to the English government (Dirks 2006).

The societal responses to the 1770s anomaly seem to mirror the complicated teleconnections and linkages that characterise the climate system. In close-up, 'societies' display a multitude of interconnected groups and interests eager to capitalise on external, biophysical events, with varying degrees of success. As a result, they should certainly be studied with similar precision. Only then does it become possible to map the interactions, co-developments and discrepancies of climates and cultures.

3.4 Pluralities of Responses

The switch from long-term, general reconstructions to small-scale case studies reveals the actual plurality of human responses to climatic impacts and biophysical phenomena. The diverse reactions reflect the manifold social, climatic and cultural causes of 'vulnerability.' During the famine of the 1770s, sovereigns used extreme climate events to disempower intermediary agencies. Self-appointed experts exploited famines to establish themselves and their respective fields of expertise. Common people took advantage of the crises to assume new rights of participation through practices of communication and exclusion. Their actions provide a potent reminder of the longevity of what Karl Polanyi termed as "embedded economies" (Polanyi 1944). The resulting de-legitimisation of intermediary actors can be

interpreted as an unintended form of 'state-building by catastrophe'—an effect discernible in both Europe as well as (colonial) India. Indeed, similarly variegated strategies are observable for other groups. European physicians used the epidemics that accompanied the persistent rains and the famine of the 1770s to discredit and suspend competitors such as midwives, 'quacks' and 'medicasters.'[5] Their vigorous debates established the public doctor as a profession—even though the miasma theory they propagated proved just as ineffective as the older humorism had been.[6] Even theologians settled old disputes on church hierarchies and the literal exegesis of biblical texts on the back of the volatile contemporary debate on "whether all people that died during the famine had been abominable sinners" (Sillig 1772).[7]

The scope of human responses is particularly prominent during the late eighteenth century. The broad range of actions in this period mirrors the many interpretations available at this historical watershed of human-nature relations. Religious, economic and physical explanations of the anomaly coexisted, in a plurality that is obvious even in a source genre that is quite small, such as commemorative medals (see Fig. 3.3). The 1770s mark an exceptional *trading zone* where religious and secular environments met, moral and utilitarian concepts of nature competed and imaginaries of the human-nature relationship as symbiotic or as fundamentally separate coincided. In this 'laboratorium,' secular approaches and exact measurements coexisted with a remarkable resurgence of religious practices such as pilgrimages and prayer days. This overlap of interpretations created the space for human agency and enabled people to make use of climate impacts for their own ends.

Looking back to the eighteenth century not only provides a test case for climate reconstructions and the dynamics of human-environment interaction; moreover, it also takes us back to a time before the current nature-culture divide was established—a separation that still determines the disciplinary setup of modern science. The pluralities of the perceptions, responses and appropriations observable in this case provide a strong reminder that the prevalent rigid models of 'climate versus culture' are often highly selective. Integrative concepts, such as the vulnerability approach presented here, promise a more adequate and operable way to study climate history, offering an empirical alternative to the current determinist mode of simply predicting from 'the past.'

[5] For an account of these conflicts, see, for example, Arand (1773), particularly pp. 143–153, and on the displacement of non-academic physicians during the hygric anomaly, pp. 163–176. A colleague of his used the famine in Bengal to discuss the relation of climate and health for similar ends (see pp. 110–144 in Hecker 1839).

[6] Early modern European medicine rested on the concept of bodily fluids. Extreme climates such as hotness, coldness or humidity could throw them off balance and result in disease. Even though proponents of the competing miasma theory regarded contagion as a more important factor, the communicating agents (bacteria and viruses) were not discovered until much later, resulting in futile and often counter-productive treatments.

[7] For an overview of the heated discussion that prompted a flood of publications, particularly in hard-hit Saxony, where the church was under particular stress, see Wagner (1773).

Fig. 3.3 Three medals commemorating the famine of 1770–1772, focusing on religious, natural and societal causes (divine wroth, extreme rain, ursury by 'Corn-Jews') respectively. From *top* to *bottom*: Anon., Saxony 1772; J. L. Oexlein, Nuremberg 1772 (author's photographs of coins in author's possession); J. C. Reich, Fürth 1772 (see Ben-Arieh 2014)

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Chapter 4
Anthropology in the Anthropocene: Sustainable Development, Climate Change and Interdisciplinary Research

Werner Krauss

Abstract Recent world summits on sustainable development or climate change have been considered as failures, with greenhouse emissions rising and sustainable development much talked about yet hardly seen. In this chapter, I argue that global environmental change programmes and their understanding of interdisciplinary research are part and parcel of this problem, having turned science into an "anti-politics machine" (Ferguson 1994). I illustrate this argument with sketches from two ethnographic case studies in Portugal and northern Germany, comparing them to the globalising approach of international research programmes. Rather than the 'science is settled' approach, I argue that the open dialogue about knowledge production and collaboration based on ethnographic research leads to a shift in perspective and helps to bring issues such as climate change into the world and science back into democracy.

4.1 Introduction

Recent world summits on climate change such as *Conference of the Parties* (*COP*) *15* in Copenhagen or *Rio+20*[1] on sustainable development have not kept their promise. Greenhouse gas emissions are on the rise, while sustainable development is rarely seen. According to so-called Earthsystem scientists, the impact of human activities on planetary ecosystems is comparable to geological forces, with humanity having entered a new geological era, termed the Anthropocene (Crutzen 2002). Concerned scientists argue that more research is needed, which also has to become more interdisciplinary:

[1] The *United Nations Conference on Sustainable Development* (*UNCSD*) was held in Rio de Janeiro in June 2012, twenty years after the first summit in Rio, 1992.

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> The challenges facing a planet under pressure demand a new approach to research that is more integrative, international and solution-oriented. We need to link high-quality focused scientific research to new policy-relevant interdisciplinary efforts for global sustainability (Brito and Stafford Smith 2012).

This call is the latest step in an already long history of scientific research programmes that have been formative for both the organisation of science and the way in which environmental problems are presented to the public and politics. In this article, I will discuss various stages of this global research agenda from the perspective of an anthropologist who conducted research on global change problems and participated in various interdisciplinary settings between the landmark summits in Rio de Janeiro 1992[2] and *Rio+20* in 2012. I will present ethnographic vignettes from my fieldwork on the (failed) implementation of sustainable development in Portugal in the early 1990s, from my participation in an interdisciplinary project on local resistance against a national park at the German North Sea coast, as well as from the performance and sometimes frustrating experiences of anthropologists in the world of global research programmes. In the final part, I present the example of a collaboration with a climate scientist; together we suggested to deal with the challenge of climate change in a way that empowers politics and people.

While there is no doubt that more and better research is needed to understand global change problems, the question remains of why there is such a discrepancy between almost routinely expressed alarmist calls from concerned scientists on the one hand and a lack of effective political management of planetary problems on the other. The current dilemma or even gridlock of climate and sustainability policies cannot only be blamed on "vested interests and fossil fuel lobbies (…), media barons hijacking public opinion or cowardly political 'leaders,'" as the palaeontologist Andrew Glikson (2013) stated in a recent article. Rather, it is also time to discuss both the agenda of scientific global change programmes and the practices and prospects of interdisciplinary research.

In this article, I will argue that science and politics have established a dangerous relationship, with science setting the political agenda in the form of thresholds, tipping points or recently planetary boundaries, thus de-politicising the political agenda. In short, science-based programmes turn into what James Ferguson (1994) calls an "anti-politics machine"; they create their own structures of knowledge and de-politicise deeply political problems such as climate change or sustainable development. Thus, scientific practice and research agendas have to become part and parcel of the field, with disciplines such as anthropology that have newly emerged on the global research panel bringing in a reflexive and self-critical approach.

Global change research has long been the domain of natural sciences, applied social sciences and economists, while disciplines from the humanities have until recently been reluctant to participate in the global research agenda. However, this volume and many other research reviews show that this is changing in an impressive manner, with anthropology, for example, increasingly contributing to research on climate change (Barnes et al. 2013; Crate 2012). With *anthropos* as

[2] *United Nations Conference on Environment and Development* (*UNCED*).

the common denominator, anthropology is an obvious candidate for interdisciplinary research in the Anthropocene. However, for anthropologists and other social scientists, the Anthropocene is more than a scientific (and contested) definition of a new geological era; it is, like the image of planet Earth, also a global icon with political, ecological and cultural dimensions (Jasanoff 2001). Even more so, it is also a common and organisational symbol for interdisciplinary research, with its origin from geology hinting to the dominance of natural sciences in defining the problems at stake, as well as the hierarchy among the disciplines. Nonetheless, the Anthropocene also poses new ontological and epistemological questions in challenging familiar distinctions between nature and culture, as well as between the local and the global. The effects of global changes are local, as are the measures taken for mitigation and adaptation. In short, interdisciplinary research including anthropology means more than simply adding more disciplines to an already existing agenda; instead, the research agenda, its own cultural fabric and the inherent hierarchies have come into focus.

In their typology of interdisciplinary research, Barry et al. (2008) already reflect upon the delicate relationship between disciplines, as well as between the research agenda and politics. The authors identify three different types of interdisciplinary research, two of which easily fit the current global interdisciplinary research agenda. There is the additive model, whereby social sciences are asked to add the social dimension of global change, to deliver data about social and cultural values or indigenous knowledge and to provide a link between the scientific model and reality. There is also the 'submissive' role attributed to social sciences, whereby they are asked to translate scientific findings to the public and sum them up for politics in an understandable way. The third type is the most interesting for the purpose of this article, and is called the "agonistic-antagonistic" model, which I translate here as a relation of tension and critical dialogue between anthropology and other disciplines. This typology also makes clear that interdisciplinary research is not a value per se; it is not sufficient to simply add up increasingly more disciplines in order to achieve more reliable and better results. The Anthropocene not only challenges the dispositions of our survival; rather, it also challenges our understanding of the role of science. The view from anthropology suggests that global environmental problems still happen locally in the Anthropocene, and that it is from here that we have to compose our research agendas and the idea of a common world to be taken care of.

4.2 Anthropology in the Anthropocene: *Rio+20*

How should anthropological fieldwork be conducted on global environmental change, and can the ethnographic particular be connected with the global? In the following two sections, I present two different approaches: one starting from the global, the other from the local. Both approaches are connected to the landmark summits of *Rio 1992* and *Rio+20* and serve to provide a critique of the global sustainable development agenda.

In a recent edition of the *Anthropology News*, David Rojas (2013) from Columbia University presented a stunning example of his multi-sited and interdisciplinary fieldwork. He attended the *Rio+20* world summit in the footsteps of the anthropologist Paul Little, who had observed the legendary *Rio 1992* summit on environment and development. Little (1995) had described the Earth summit as a global ritual, and was already aware of the enormous tensions between developing and developed countries in the negotiation about the globalisation of environmental risks and the urge for sustainable development. Twenty years later, the United Nations (UN) secretary welcomed the delegates with the video "Welcome to the Anthropocene," showing a digital image of planet Earth in the form of lines and networks representing the spread of industrialisation from England all over the world. The video visualises a common planet that has to be managed by humanity for the sake of its own survival; however, for the critical observer, it does so with an inherent western gaze, which generalises a culturally-specific vision of growth and development. In any case, in order to face the challenges of global change, it is still necessary to bridge the inequalities between developing and developed countries, between north and south, on the way to sustainable development. In his report, the anthropologist David Rojas provides an insight into the enormous political tension created through the difference between global discourse and political practice, which is played out on the summit itself. Official delegates and members of environmental organisations or indigenous groups crowded this summit. In the midst of this chaos, David Rojas observed a dramatic discussion between Brazil's Minister of the Environment, Isabella Texeira, and an activist who interrupted a press conference protesting against the official statement that Brazil was successful in implementing sustainable development. Rather than ignoring the activist or calling security, Texeira answered at length, emotionally explaining the restraints imposed on sustainable development when carbon and deforestation are negotiated in a free market. In interviews with her advisers, David Rojas learned that even the anticipation of failure has become an asset in these newly emerging markets. The conflicts between north and south are played out in the south, in developing countries, with climate treaties and sustainable development agendas creating a new reality that more often than not sharply contrasts official declarations and fosters cynicism and frustration on all sides. After having attended *Rio+20*, the next step in his multi-sited fieldwork brought David Rojas back to the frontier line of deforestation in the Amazon, where he studies together with environmental sciences the local effects of global treaties. Anthropology in a world turned into a 'global village' is indeed multi-sited and interdisciplinary in order to connect the lines and dots between the local and the global. While it is impossible to grasp the full picture, it is possible to follow some lines that connect the dots and fill them with thick descriptions. The ethnographic report presents a different picture of how global rituals and global research programmes on the one side and specific environments inhabited by people on the other are connected in the Anthropocene, creating new realities.

4.2.1 Anthropology in the 'Global Village': A Case Study from Portugal

The dilemma between development and nature conservation, as exemplified by David Rojas from the *Rio+20* summit with the example of Brazil, is not a new one; rather, it was there from the beginning, and not only in the American south. During the world summit in Rio 1992, I conducted fieldwork in the southwest of Portugal to study the political ecology of this geographically and economically peripheral region of the *European Union* (*EU*). In a common effort, a coalition of non-governmental organisations (NGO), local politicians and concerned biologists managed to implement a nature park to protect its natural values and the coastal landscape from mushrooming tourism, as well as implementing sustainable development. In short, what was talked about in Rio was being put into practice, turning Portugal's southwest into an exemplary 'global village.'[3]

The prize for singling out the coastal landscape and implementing a sustainable and green agenda was the de-politicisation of the political landscape. After the revolution of 1974, landless workers occupied the *herdades* (estates) of the landowners, working the underused land. In 1986, the post-revolutionary era ended with Portugal's entry into the *European Union*. While the former landowners successfully reclaimed the occupied land and turned it into profitable eucalyptus monocultures, environmentalism was on the rise among Portugal's academic elites, as in the rest of Europe. The *International Union for Conservation of Nature* (*IUCN*), international conservation treaties and scientific *UN* programmes served as the main resources for environmentalists to overcome political polarisation, which was a heritage from the revolution. Non-governmental environmental organisations replaced the revolutionary leftist tradition and started their fight from within the system, as they called it. They heavily relied on the *European Union*, which itself had a strong regional and environmentally friendly impetus to bring development to its peripheral areas. The *European Union* and global environmentalism were seen as a means to end national nepotism and notorious bureaucratic corruption, with science-based management representing the key to a sustainable future.

While this was the theory, in practice, development was not in sight, whether sustainable or otherwise. Instead, during my fieldwork I followed ongoing stories about corruption, scandals and the misuse of European subsidies in plain protected area. While coastal inhabitants' agricultural activities were strictly subject to the laws of the recently implemented nature park, international investors in horticulture easily surpassed the law with protection from 'above' in Lisbon and with subsidies from Brussels. Rather than ending corruption, the nature park proved to be a powerless administration, serving as a fig leaf for the straight transition from pre-revolutionary feudalism to neoliberal capitalism; nature conservation and the promise of sustainable development helped to paint spatial planning and economic

[3] The following paragraphs about sustainable development and nature conservation in Portugal are based on Krauss (2001) and Krauss and Dracklé (2012).

development green. The nature park's main achievement was the identification of endangered species listed on red lists. A handful of engaged biologists thus managed to single out small islands of nature conversation, turning them into symbols for a hopefully emerging eco-tourism, both in permanent danger of being overruled by 'higher interest.' Willingly or not, they helped to de-politicise the coastal landscape; science-based environmentalism and the promise of sustainable development served as an 'anti-politics machine.'

In the 1990s, Portuguese social scientists initiated an interdisciplinary, *EU* funded long-term research programme in order to observe the environment, society and public opinion. As a participant in one of its projects, I was able to closely observe the double nature of these programmes: on the one hand, I helped with my individual expertise in the field of ethnography to fill white spots on the map of knowledge concerning Portugal's and Europe's peripheral regions; on the other hand, I thus contributed to the establishment of a new form of governance. The programme was also educational, reaching out to schools and mass media, creating an 'environmental citizen,' while successfully linking Portuguese (social) sciences to the global research community such as the *International Geosphere-Biosphere Programme* (*IGBP*) and other *UN* programmes.

The dilemma of nature conservation and sustainable development has been the topic of several case studies in environmental anthropology, such as *Misreading the African Landscape* (Fairhead and Leach 1996), *Conservation is our Governance now* (West 2006), *Ecology*, *Alterity and Resistance in Sardinia* (Heatherington 2001) and, more recently, *Transforming the Frontier. Peace Parks and the Politics of Neoliberal Conservation in Southern Africa* (Büscher 2013). These are telling titles of monographs, all of which present with great scrutiny case studies similar to the Portuguese. There is abundant literature on the dynamics of sustainable development strategies; the more they fail, the more research programmes are requested to finally successfully implement ecological governance and better educate the citizens. Anna Tsing's *Friction. An ethnography of global connection* (2005) provided perhaps the most detailed look into the messy world of the Anthropocene, as seen through the lens of local populations. However, the difference between discourse and its practice, as revealed in these ethnographic studies, evidently does not disturb the continuous and uncritical praise of sustainable development, whether in the world summits in Rio 1992 or *Rio+20*, research programmes or project applications.

Twenty years after my Portuguese field experience and while the global community again met at *Rio+20*, nothing has changed. Quite the contrary, the European financial crisis has hit Portugal and the coastal landscape. As one of the results of the austerity politics imposed by the 'Troika,' the nature park's administrative staff was cut down as in many other cases in southern Europe. To overcome the crisis, economic growth is seen as the only solution, whether sustainable or not. People migrate to the European north to find employment, while international investors and tourists enjoy the landscape at the margins of Europe. Sustainable development was much spoken about in the global village between *Rio 1992* and *Rio+20*, yet was hardly seen in Portugal or elsewhere (Krauss and Dracklé 2012).

4.2.2 *Interdisciplinary Perspectives from the Humanities: The Politics of Nature*

Of course, there are many consensual examples of interdisciplinary research concerning global change, at least at first sight. For example, the Swiss historian Christian Pfister recently reconstructed significant changes in past temperatures from proxy data such as wheat prices, thus providing data to correct or calibrate climate models (Wetter and Pfister 2013). In doing so, abstract climate statistics from climate science have regained a social life. This method of careful translation is also relevant concerning the study of natural or ecosystem processes (see Kueffer, Chap. 2, this volume). However, even these widely accepted studies have a political flipside: politics of nature are often based on the scientific identification of endangered natural facts or ecosystems, which in turn are used to legitimate politics by suggesting that there are no alternatives. Nonetheless, this is not necessarily the end of the story. My next example shows how interdisciplinary research can help to change the global environmental anti-politics agenda through a shift of perspective on local resistance (see also Greschke, Chap.7, this volume).

One of the advantages of anthropology is the long-term observation of complex processes. In the global research agenda, nature or ecosystems are mostly portrayed as timeless entities without social history, whereas anthropology and related disciplines focus instead on how people shape, administer and inhabit their environments. According to Bruno Latour (2005), people assemble around things or matters of concern and create "parliaments of things" where questions of belonging, ownership or practices are negotiated. In the following example, I will show that conflict and resistance by local populations are not necessarily to be understood as a lack of environmental education, but rather as a driving force in bringing the politics of nature back into democracy.

At the beginning of the new millennium, I participated in an interdisciplinary project called *Nature in Conflict*, researching the conflicts surrounding a national park along the northern German coastline, the so-called Wadden Sea. It was declared a national park in 1986, and a *UNESCO* (*United Nations Educational*, *Scientific and Cultural Organization*) world heritage site in 2008. The history of this national park was one of embittered protests by the local population against restricted traditional access to the tidal flat area and its declaration as 'nature.' Science played a crucial role in this process: it defined the tidal flat area as a 'unique ecosystem' and thus legitimised the existence of the national park. Locals doubted whether the tidal flat area was natural at all, claiming it part of the cultural heritage in this area, where land reclamation and storm floods permanently challenge the boundaries between land and sea, nature and culture.[4]

[4] See Krauss (2006a) about the conflicts surrounding the national park and the natural and cultural heritage. For more information about this project and interdisciplinary research in general, see Krauss (2006b).

One of the protest slogans directly addressed science, claiming that "the Wadden Sea is not a playground for scientists, but a livelihood for fishermen." This is where our project came in, which was a joint cooperation between a coastal research institute and disciplines from the humanities—history, literary and media studies and anthropology. Our common starting point was to identify different perceptions and 'images' of the coast and to critically question normative terms such as 'nature' or 'ecosystem.' In doing so, we opened up a complex conflict constellation. It was no longer good environmentalists versus backward and greedy modernist locals; instead, we interpreted the conflicts in the context of the political ecology of this landscape.

The case study of the conflicts surrounding the national park at the North Sea coastline and how they were closed serves as a good example. The focus of research was not on how to create 'environmental citizens' who willingly accept the national park; instead, we followed the conflicts, the symbols, the scandals and their plots in time and space. We deconstructed the underlying normative concepts such as nature versus culture, questioned taken-for-granted terminology such as 'ecosystem' or 'local tradition,' and instead followed the networks between people and things, humans and non-humans. This is where interdisciplinary research proves to be productive: not in presenting the tidal flat area as a timeless scientific fact, but rather in relating its elements to coastal protection, fishery or common law. It is necessary to follow migratory birds as well as migratory scientists to understand the conflicts between environmentalism and local farmers (Krauss 2011a). In doing so, it clearly turns out that even geographically and economically peripheral areas are indeed 'global villages'; for example, there are links connecting farmers to the *European Union*, to the *IUCN* or global research programmes from the *IGBP* via subsidies or regional environmental administrations. Each one of these connections warrants its own attention and has to be followed with great scrutiny; each link has to be based on perfect translations from one step to the other, while each sphere has a right of its own to exist. This is true for tourist resorts as much as for scientific communities, as well as fishermen, hunters or farmers.

The ongoing protests eventually forced the national park administration to take the initiative and stage hundreds of public hearings and meetings. Moreover, working groups were set up to manage in consensus areas of traditional use, ensuring that coastal protection has priority over nature conservation and that zones of risk were taken care of, while traditional access to the tidal flat area was acknowledged and the national park area was divided into zones with differing protection status. Common law was at least partly reconciled with the laws of the national park, and finally the conflicts were closed and the national park became part of the political landscape.

Science no longer needs to play the role of an advocate for a global environmental agenda; rather, it can serve as a source of knowledge, as a facilitator and adviser on the road towards sustainable development. In the beginning, the national park was seen as a one-way street, and resistance was interpreted as a lack of education or as backwardness. The protest against nature conservation and science as its advocate opened up a long process of negotiations between the administration of the

nature park and coastal institutions and organisations. With this shift of perspective, the role of interdisciplinary research is to identify pathways as well as to support and to facilitate democratic decisions.

This was one of the results of this interdisciplinary project, at least in my interpretation. However, this project was decidedly different from those executed under the umbrella of global science organisations. Of course, this is true in respect to size and funding, but although the main difference is that global environmental change programmes still tend to advocate a 'science-leads-politics' agenda.

4.3 Science Studies and Interdisciplinary Research: From the Local to the Global

When studying the conflicts at the North Sea coastline, my fieldwork became multi-sited; besides research in a coastal community and the administration of the national park, I became a participant observer in the *Institute for Coastal Research*, which had played a leading role in the ecosystem studies of this tidal flat area.[5] Participant observation among colleagues is a tricky thing, of course. Being interested in the scientific construction and perception of the coast, I attended their workshops and conferences, asking questions; I tried to understand how they collected data in the Wadden Sea and turned them into graphs and scales on their computers. I shared an office in their institute and studied the history of coastal research in northern Germany. How did coastal research deal with the political changes and the respective changing coastal politics? The North Sea coast always was political; in imperial times, it nourished fantasies about Germany as a sea power; during national socialism the tidal flat area was considered as a resource for a "people without land"; and with the rise of environmentalism, century old land reclamation ended and was replaced by nature conservation. On the other hand, coastal research claims to be objective and timeless, despite the shifting context of research. The rise of ecosystem studies coincided with the rise of environmentalism and, in this case, with the implementation of the national park. Most of the ecosystem researchers left the interpretation of their data and the political implications to the staff of the national park administration. While these studies were used to legitimate the existence of the park, scientists claimed to only be interested in the data and not their political use. Nowadays, the institute plays a leading role in climate research, with its director one of the leading climate scientists. At times deeply involved in politics, sometimes even driving the political agenda, scientists mostly claim to be apolitical and only interested in the timeless production of knowledge and truth.

In an interview, one of the directors of the institute suggested not only focusing on the regional dimension; instead, I should see the local conflicts at the North Sea coast in a global dimension. In order to get introduced, he suggested participating in

[5] For more details, see Krauss (2007).

the *Open Science Conference on Global Change*, which was staged in Amsterdam in 2001. A new perspective opened up: indeed, the coast now stood in the context of global change, as did science.

The *Challenges of Changing Earth*: *Global Change Open Science Conference* was organised by global research programmes such as *IGBP*, *IHDP* (*International Human Dimension Programme on Global Environmental Change*), *Diversitas* and *WCRP* (*World Conference of Religions for Peace*). Here, I was first introduced to the 'Anthropocene,' which was a keyword in many keynotes. My presence as an anthropologist was timely, given the urge for an increased participation of social sciences in this already interdisciplinary world. Just notice the capital letters that connect the natural with the social sciences in the self-description of the *IGBP*:

> IGBP was launched in 1987 to coordinate international research on global-scale and regional-scale interactions between Earth's biological, chemical and physical processes and their interactions with human systems. IGBP views the Earth system as the Earth's natural physical, chemical and biological cycles and processes AND the social and economic dimensions (IGBP n.d.).

The conference in Amsterdam was staged right before decisive negotiations about the Kyoto treaty in The Hague and in Bonn, with the keynotes and panels serving to raise alarm and place pressure on politics. Global change meant identifying vulnerabilities and risks concerning land-use, climate, oceans and the atmosphere; the social and economic dimensions mostly consisted in quantifying the human costs of global change. The image of planet Earth was omnipresent in the keynote speeches, with the final "Declaration of Amsterdam" leaving no doubt that "global change is real" and political action is urgent.

Interviews with scientists who attended the conference denounced the keynote speeches as 'politics' rather than science; they considered it 'part of the business,' but also expressed concern for the reputation of science. Other scientists, especially those actively engaged in non-governmental organisations or bureaucratic or administrative institutions, welcomed the political engagement of the keynote speakers. There were special sessions for scientists from developing countries who complained about restricted access to technology and education in their countries and the dominance of Anglo-Saxon countries in the organisation of science.

As my 'admission card,' I had prepared a poster about the conflicts surrounding the national park, with a specific focus on the networks and actors involved. However, I am afraid it looked somehow strange and got lost among hundreds of other posters from natural scientists, presenting their results from remote sensing or modelling. The "social and economic dimensions" suggested by the *IGBP* were not absent, but rather presented in the specific Esperanto of global change research. My individual case study was just this: a case study that did not seem to fit in when the whole Earth has to be saved. To become a member of this global tribe, one needs strong allies in form of established research institutes, and has to comply with a hidden political agenda. At least, this is how I felt in this environment and at many other conferences and workshops related to global research programmes. The local did not yet really fit into the global, and I struggled with how anthropology might fit in global change research.

4.4 Interdisciplinary Research and Earth System Sciences: A Critical Perspective

Coming from a relatively small discipline such as anthropology, entering the world of global change research can come as a culture shock. In order to participate, one has to learn the written and unwritten rules, the common rituals and the specific iconography, as well as finding a place from where it feels safe to speak. In short, participant observation affords a kind of credibility, which to gain in turn is part of the process. The world of so-called Earth system sciences is one of symbolic power and a more-or-less open political agenda; the world is at risk, the science is settled, and it is time for political action—this is the message in a nutshell. It is a message that is accepted uniformly. However, the opening towards disciplines such as anthropology or sociology has brought different perspectives and opened up dialogue inside the scientific community. One such example is the recent debate about planetary boundaries identified by Earth system sciences; critical voices from anthropology and other disciplines interpreted these boundaries as a power grab, as millenarian prophesies and an attempt to suspend democracy in order to save the world.

There is a long discussion in global change research about the limits and boundaries of life support systems. From the limits of growth propagated by the *Club of Rome* in the 1970s to the "Declaration of Amsterdam" in 2001 or the "Planet under Pressure" Declaration from London 2012, the scientific global change community has continuously influenced and set the frameworks for politics, such as the 2 °C goal in climate negotiations. A current example of this process is the debate about so-called 'planetary boundaries,' a concept that goes back to studies by Rockstroem et al. (2009) in cooperation with prominent Earth system scientists such as Hans-Joachim Schellnhuber, who is the scientific advisor of the German government, or the Nobel Prize laureate Paul Crutzen. They identified nine boundaries of life support systems such as climate change, biodiversity loss, land use or freshwater that are essential for human life on planet Earth. This concept differs from previous ones insofar as it goes beyond sectorial politics; planetary boundaries crosscut every aspect of human existence in the Anthropocene. According to leading Earth system scientists, planetary boundaries set the framework and agenda for politics in order to secure human existence. In a nutshell, this is an extreme example of science assuming the role of political authority in a way that raised the critical attention from their colleagues from anthropology and other social scientists.

The anthropologist Steve Rayner (2013) considers the rhetoric employed in the discourse about planetary limits and tipping points as showing the "characteristic features of traditional millenarianism," as evident in religious movements or Marxist splinter groups: catastrophe is near, the Earth is a closed system with no escape, and particularly the weak and poor will suffer. The present is established "as a unique defining moment for the future of humanity requiring urgent action on a global scale which seems slow in coming" (ibid.). The planetary boundaries are presented as scientific facts, ignoring the debate about the validity of the categories and the degree of certainty. Instead, they are considered as a threshold,

which necessarily implies a new hierarchy in the system of competing values. Sustainable development is no longer the balancing of environmental, social and economic values; from now on, environmental values come first.

Roger Pielke Jr. (2013) interprets the promotion of planetary boundaries as a "power grab," reminding him of the idea of 'trusteeship' once suggested by Hans Joachim Schellnhuber and the *German Environmental Advisory Council*, the *WBGU*. They suggested reforming democratic institutions by assigning 10 % of all seats in parliament to ombudsmen who only represent the interest of future generations. To varying degrees, science is assigned authoritative power over democratic institutions once those planetary boundaries are reached. The sociologist Nico Stehr (2013) writes about the political implications for democracy:

> Consensus on facts, it is argued, should motivate consensus on politics. The constitutive social, political and economic uncertainties are treated as minor obstacles that need to be delimited as soon as possible—of course by a top down approach (Stehr 2013).

Consequently,

> (…) the discourse of impatient scientists privileges hegemonic players such as world powers, states, transnational organizations, and multinational corporations. Participatory strategies are only rarely in evidence. Likewise, global mitigation has precedence over local adaptation (ibid.).

This interpretation is surprisingly shared by one of the leading Canadian political activists, Naomi Klein. In a recent interview (Mark 2013), she states that this kind of green agenda has done greater damage to the environmental movement than right-wing activists. She particularly focuses on the political dimension of this agenda, which favours cooperation with big industry and neglects local activities such as during hurricane Sandy in New York. As a result, all measures to reduce greenhouse emissions like the Kyoto treaty and carbon markets have failed miserably.

The anthropologist Melissa Leach, a frequent collaborator in the global change community, felt this power grab on a very personal level. She recently published in the *Huffington Post UK* her experiences as a participant in a *United Nations* meeting of experts, asking:

> When the Economist famously announced 'Welcome to the Anthropocene' a couple of years ago, was it welcoming us to a new geological epoch, or a dangerous new world of undisputed scientific authority and anti-democratic politics? (Leach 2013).

In her report, she describes in detail how her ambitions to represent the results of her fieldwork in Africa during an *UN* session failed miserably. She wanted to argue that choices between pathways are political and have to become a matter of democratic debate; that public and citizen expertise is of value and "that scientists should be bringing plural and conditional advice to decision-making [. . .] and that sustainability is political, as is the knowledge that shapes goal definition and processes" (Leach 2013). However, those statements somehow disappeared in the course of the session. She blames the need to translate her ambitions into '*UN*-speak'; she had to reduce her arguments to four slides, sparing the minimal remaining political content

for the following discussion. In the end, all was about agenda setting and about the implementation of mechanisms, while the option of political pathways had disappeared. This leads her to the question:

> Is there a contradiction between the world of the Anthropocene, and democracy? The Anthropocene, with its associated concepts of planetary boundaries and 'hard' environmental threats and limits, encourages a focus on clear single goals and solutions. It is co-constructed with ideas of scientific authority and incontrovertible evidence; with the closing down of uncertainty or at least its reduction into clear, manageable risks and consensual messages (Leach 2013).

Evidently, the increasing participation of anthropologists and scholars from other disciplines not only add another perspective or serve as translators of scientific findings to the public; instead, they enter into an 'agonistic–antagonistic' relationship. Global change research comes under scrutiny in a moment of a 'power grab' of science on the one hand and increasing frustration about global environmental policies on the other. These discussions also reflect the changes in science policies, career patterns and disciplinary identities. Indeed, the actual experiences of anthropologists in such an interdisciplinary environment are a mixed bag; on the one hand, global change research offers new research possibilities, providing political relevance and new ways of and sources for funding; on the other hand, short field trips increasingly replace extensive fieldwork, and anthropological expertise is often rigorously subordinated to strict solution oriented research agendas. In informal conversations, I often hear of experiences similar to that of Melissa Leach, namely of feeling silenced in a research environment dominated by science.

While the presence of anthropologists and other social scientists becomes increasingly normal, they often express a submissive attitude towards consensus. Many post-docs or adjunct professors hardly feel entitled to challenge the overall assumptions or frameworks such as the Anthropocene, planetary boundaries and the implicit supremacy attributed to scientific knowledge over other forms of knowledge. Seen from this perspective, global change research can indeed be understood as an anti-politics machine, producing its own reality and "depoliticizing everything it touches" (see p. xv in Ferguson 1994).

4.5 Climate Change and the Prospects of Collaborative Research

How to bring climate change into the world? How to connect the local and the global, the North Sea coast and *Rio+20*? How to bring together Earth system science with its totalising approach and anthropology, with its focus on local perspectives and multiple pathways? And how to integrate science into the democratic process rather than suspending it? These are questions for interdisciplinary research in the Anthropocene. Throughout this chapter, I have presented different variations of interdisciplinary research, and will end with a specific anthropological approach

that is based on the long tradition of the relationship between informant and researcher. Particularly in studies on elites or in science studies, informants are interlocutors who have their own social theories concerning their objects of study, their expertise and societal role. They often enter into a dialogue or conversation with the anthropologist in order to better perform their own research or practice. Once both agree upon this conversation, this collaborative effort can lead to framing or understanding current problems in a new way (see Krauss 2011b). In this last section, I wish to outline such an interdisciplinary effort by using the example of my collaboration with a climate scientist. In doing so, I will also close the circle of this article by bringing the global problem of climate change to the North Sea coast in Germany in a new and innovative way.

I started to already gain interest in climate change as an object of study during the interdisciplinary project on the national park conflicts in northern Germany. The only natural scientist in this project was Hans von Storch, one of the directors of a coastal research institute and a well-known climate scientist. Within the project, I added the ethnographic approach for the research on differing representations of nature and started to conduct research on the 'tribe of climate scientists.' I was fascinated by the existence of the 'prophets of doom,' prevalent in both the environmentalist and climate arenas, as well as their role played in the representation of anthropogenic climate change in politics and the public. Hans von Storch was involved in all stages of the current debate on anthropogenic climate change, and is also critical of this prophetic attitude. I followed his activities as a scientist, as a director of an institute and science manager, as an editor of a climate journal, and most of all as a prominent climate scientist in the public arena. For example, he was one of the main actors in the so-called hockey-stick debate, when he challenged the methodology of this iconic climate curve, which serves as a symbol for catastrophic climate change. Furthermore, he was also indirectly involved in the so-called 'Climategate' scandal, when he was mentioned in the emails stolen from the server of a climate institute.[6] In short, the stories, scandals, confrontations and conflicts that he remains a part of provided me as an anthropologist with an insight into climate science as a deeply politicised science, whereby climate scientists act in a political arena with every research result gaining political significance.

My interest in climate science as a cultural activity resulted in a multi-sited ethnography of varying intensities over a decade; here, participant observation meant participating in common projects, organising interdisciplinary workshops, writing articles together, giving lectures on climate conferences and having regular conversations about the heated debates that are so characteristic for climate science.

Coming from different scientific backgrounds, we managed to find a mode of conversation about climate science as a cultural practice. Our common grounds are the questions concerning the adequate representation of man-made climate change and the role of climate science in the public perception and politics of climate. As a working hypothesis, we agreed upon the theory of post-normal science that politics have to make decisions even though the knowledge basis is uncertain, values are in

[6] For more detail, see Krauss (2009).

play and stakes are high (Funtowicz and Ravetz 1991). Together with two other scientists, we established a blog on the internet in order to discuss current climate affairs with climate scientists, experts and interested citizens. The blog was founded during the 'Climategate' scandal, and we especially invited so-called climate sceptics to present their critical arguments. It was a time when there were rumours about 'gatekeepers' who keep sceptical articles out of relevant journals, and the air was full of conspiracy on all sides. At least in these troubled times, some so-called sceptics helped to reintroduce scientific scepticism in a climate science that seemed to be more concerned about acting politically correcte rather than admitting uncertainties and open questions. The blogosphere mirrors the current climate debate and sometimes also drives its agenda.

Climate change is one of the hot topics on global conferences; it is negotiated globally and the agenda is set by science, with the current 2 °C limit reflecting a prominent example of so-called 'planetary boundaries.' This has led to a dangerous relationship between science and politics, as we argue in our recent common project, an essay called "The climate trap" (von Storch and Krauss 2013). In this book, our collaborative effort comprises the double perspective from an insider and outsider. In a certain sense, we wrote an ethnographic case study based on our own experiences and observations as actors in the scene, as observers and commentators. These different yet complementary perspectives and the intention to write a cultural history of climate science is intended to open up new ways of conversation about a topic that is notoriously blocked between 'warners' and 'sceptics,' as well as between science and politics. Once the scientific production of knowledge on climate is put into context and understood as a cultural activity, it becomes evident that science cannot decide political conflicts or set the political agenda. Instead, it is politics and society that have to decide how to deal with the challenges imposed by the production of knowledge on climate change, in each and every place.

The North Sea coast serves as an example to illustrate this different understanding of the relation between science and politics; it is the anthropological case study that helps to put global problems into perspective. The effects of climate change are local, and adaptation and mitigation also need to be embedded in a local context in order to be sustainable. From an ethnographic perspective, climate change does not hit the North Sea coastline like a meteor from outer space; instead, climate change challenges a local society with a century long tradition of coastal protection, and with a social organisation based on the necessity of reclaiming and protecting land from the sea. It was in this area that the first wind turbines were erected during the 1970s, in protest against nuclear energy and an economy dependent on foreign oil; it is often forgotten that the origins of the German 'Energiewende' are to be found in local resistance.[7] Regional climate models downscaled from global climate models have to be linked to this complex history of infrastructures; the information has to find its proper addressees in the web of connections and associations that make up the local or regional sphere. Climate is just one factor

[7] For more information about the regional history of the "Energiewende" and the social life of things such as wind turbines, see Krauss (2010).

among many others of equal importance in the coastal reality; Hans von Storch is just one, albeit an important informant for coastal protection. Climate science cannot tell local or regional administrations and political institutions what to do; rather, it can provide specific information and scenarios to support local decisions concerning a variety of pathways. In order to do so, detailed ethnographic knowledge about local dynamics and social organisation as well as complementary forms of knowledge are indispensable. The conflicts surrounding the national park, as well as the way in which they were solved, served as a template for effective climate politics. In order to bring climate change into the world, it is necessary to situate it carefully in the web of connections that make up the local assemblages. Climate affects all aspects of coastal life, from coastal protection to questions of ownership and belonging; certainly, this will not go without conflicts. All voices will be heard, different pathways have to be identified and decisions have to be taken by the responsible political entities; the task of science is to offer scenarios and provide expertise in order to find the best solutions. In doing so, science becomes a part of the democratic process, rather than trying to substitute it. While this approach does not replace global research programmes or interdisciplinary work on a global level, it is a shift in perspective, bringing those people into the foreground that actually shape, administer and inhabit their environments.

4.6 Conclusion

There is more at stake in the Anthropocene than a simple addition of natural sciences and those concerned with *anthropos*. It is also not sufficient to identify planetary boundaries, tipping points and limits of growth from a scientific perspective in order to successfully implement sustainable development or effective climate politics. We have to take into account the double challenge of global change, which affects our environment as well as our intellectual dispositions. The Anthropocene challenges the familiar distinction between nature and culture, which structured the order of knowledge and disciplines for such a long time. Taking *anthropos* as the driving force means an epistemological and ontological challenge, and Ferguson's warning not to produce an 'anti-politics machine' is to be taken seriously; indeed, recent failures in global climate policies remind the observer of previous development strategies. Science is easily misused as an authoritative measure to implement specific politics and suspend democracy; local populations in geographically and economically peripheral areas have to carry the costs of the failure of carbon markets and misguided sustainable development strategies.

The discussions about the political role of global research programmes are reflected in their influence on the identity of small disciplines, their practices and the respective career patterns. Despite a demand for disciplines such as anthropology, it still has to find its place in global change research. Of course, there is no one-size-fits-all solution; instead, each situation and problem needs its own solution. In this chapter, I have shown the importance of carefully tracing the connections between the local and the

global, between people and things, and between science and politics. Great care and scrutiny is necessary to bring the Anthropocene into the world and science back into democracy, in each and every case. With its focus on the place of *anthropos* in the world, anthropology is well prepared to contribute to achieving this ambitious goal, even though it is sometimes difficult to find a place to speak and not too easily submit to preconceived agendas.

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Part II
Searching for the Social Facts of Global Climate Change: Ethnographic Perspectives

Chapter 5
Climate and Mobility in the West African Sahel: Conceptualising the Local Dimensions of the Environment and Migration Nexus

Clemens Romankiewicz and Martin Doevenspeck

Abstract Despite the theoretical and methodological critique of deterministic and linear explanations of migration under changing climatic conditions, many empirical case studies in this field remain deeply entrenched in static push-pull frameworks and tend to reproduce simplistic causal relationships. Drawing on results from an interdisciplinary research project in Mali and Senegal, the chapter presents a methodological approach that emanates from past analytical shortcomings. By adopting a local perspective on migration, we consider cultural norms, the migration history and people's interpretations of weather and environmental changes. Moreover, we argue for a multilevel, multi-method research that seeks to separate the two research topics of migration and climate/environment; for example, by avoiding explicit questions about possible linkages. Contrasting results from ethnographic fieldwork concerning migration, climate and environment with 'hard' data on climate and vegetation allows us to become more susceptible for the social construction of alleged 'facts' such as droughts and land degradation as drivers for migration. We place a focus upon local meanings of weather and environment by considering how they are being assessed by the people, within a context of not only climatic but rather multiple changes.

5.1 Contextualising the Argument: Introduction

This chapter addresses the potential impacts of climate change on population movement by adopting a local perspective. Two case studies from rural Mali and Senegal serve to reveal the ambiguous relationship between climate change, environmental changes and migration. The relevance of the topic seems to be apparent in relation to the West African Sahel, given that the region's population is one of the most mobile in the world (Ammassari and Black 2001), while mean annual temperatures

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have risen since the 1960s and increased precipitation variability is predicted for the future (Boko et al. 2007). Moreover, the severe droughts of the 1970s and 1980s involved massive changes in vegetation patterns, thus rendering the African Sahel a hotspot of environmental degradation and desertification (Kandji et al. 2006). Assumptions of this kind, embedded in the highly politicised discourse on climate change, perpetuate the belief that there is a growing impact of climate factors on population movements (Piguet et al. 2011), especially in developing countries, leading to estimates of the future magnitude of climate-related population displacements. However, most scholars oppose such estimated numbers and refer to people being at risk of becoming displaced rather than depicting possible migration flows (see p. 8 in Black 2001). The *IPCC*'s 4th assessment report emphasises the importance of migration as one of the key options for adaptation to climate stress, as well as underlining that a variety of other factors may contribute to the decision to migrate (Boko et al. 2007). This complexity of migration points to fundamental shortcomings in much of the scientific and public discourse on the environment-migration nexus. This chapter contributes to the present volume's concern with context regarding the explanatory power of climate for changes within social systems. Accordingly, it seeks to re-contextualise assumed 'natural' drivers of migration processes in order to balance simplified assumptions of the relationship between climate, environment and migration.

In order to identify population movements that are affected by climate change, it is necessary to understand the linkages between environmental changes and migration, considering multiple levels of analysis and different temporal and spatial scales (Kniveton et al. 2008). Moreover, further challenges that arise in understanding the migration-environment nexus include the lack of a clear definition and use of controversially discussed terms such as 'environmental refugees'[1] or 'climate refugees,' the general scarcity of migration data, especially in developing countries (particularly longitudinal data), the lack of detailed knowledge about the impacts of climate change on environmental conditions (e.g. the evolution of local vegetation trends), and the failure to consider adaptive practices other than migration (cf. Adamo 2008; Bates 2002; Black 2001; Castles 2002; Renaud et al. 2007).

The simplified portrayal of environmental changes as root causes of migration has been contested by many scholars, both theoretically and empirically (de Haan et al. 2002; Findley 1994; Van der Geest et al. 2010; Henry et al. 2003; Piguet 2008; Doevenspeck 2011). Argumentation within the static push-pull framework has been further criticised for being too deterministic, since it suggests that migrants are being 'pushed' out of degraded areas, rather than allowing for the various other dimensions of human migration (Jónsson 2010). With the exception

[1] Essam El-Hinnawi (1985, p. 4) defines environmental refugees as "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. By 'environmental disruption' in this definition is meant any physical, chemical, and/or biological changes in the ecosystem (or resource base) that render it, temporarily or permanently, unsuitable to support human life."

of extreme events such as flight after natural disasters, "[it] thus seems analytically impossible to identify a migration stream as principally environmentally-induced" (see p. 51 in Doevenspeck 2011). Therefore, further research faces the challenge of balancing the multitude of factors shaping migratory patterns in the context of environmental change, in order to grasp the internal logics of migration dynamics (cf. p. 420 in Castles 2011). Similarly, changes of climatic conditions are unlikely to directly cause people to move, yet may produce environmental effects and exacerbate current vulnerabilities in a way that may render migration one possible strategy of adaptation.

Any attempt within the vast spectrum of approaches to understand the linkages between climate, environmental changes and migration also faces severe methodological challenges (cf. Piguet 2010). One major and general difficulty is to evaluate an isolated correlation between climate or environmental parameters and migration variables, considering the complexity of other contextual effects on migration processes. Ethnography applying thick description through observation, in-depth and biographical interviews with individual migrants can avoid some of the difficulties of other methods, given that it is a place-sensitive approach and provides an insight into social constructions of alleged 'facts,' such as environmental degradation and droughts, people's perceptions and experiences (see Meze-Hausken 2000; McLeman and Smit 2006; Mortreux and Barnett 2009). However, there are three essential shortcomings related to conceptual flaws in interview techniques of ethnographic and quantitative (large-scale sample surveys) approaches. First, it must be recognised that research results are shaped by the way in which questions are formulated. Interviewees often undergo an intensive 'problem-scanning' with respect to their migration motives, economic situation and environmental changes. Second, it is difficult to avoid general narratives on climate, the environment and migration issues. Third and most fundamentally, a causal linkage between environmental changes and migration is often taken for granted in research designs and reflected in questions that directly ask for these linkages, thus leading to a perpetuation and reification of this narrative. This is problematic, since it is the researcher rather than the respondent who hints at causal connections. Mertz et al. (2009) suggest how 'hinting at problems' and causal linkages can bias research results, having conducted a study in rural Senegal to analyse people's perception of climate change and their coping and adaptation strategies by applying household questionnaires and different types of interviews. To avoid biases, they only posed climate-related questions towards the end of the interviews. Indeed, none of the respondents identified climate factors among the five main positive or challenging aspects of their village life (not even within the category of agriculture). "Only when asked directly about climate issues did the group interviews largely corroborate the impacts identified in the household interviews, and they reiterated that rainfall variability during the rainy season is of major importance" (see p. 810 in Mertz et al. 2009). This example demonstrates that suggestive interviewing considerably influences responses and should thus be avoided when seeking to grasp the relevance of climatic conditions and the environment for rural households.

Given the conceptual shortcomings, this chapter will provide evidence of the complexity of the environment-migration nexus by discussing results from a research project on migration and local assessments of climatic and environmental changes in Mali and Senegal. As the Sahelian drylands are frequently presented as hotspots of climate change impacts (Hulme 2001) and the population is seen as very likely to become displaced by environmental degradation (IOM[2] 2009), two study areas in Senegal and Mali have been selected in order to understand how these assumptions translate at the local level. Macro data on climate is contrasted with findings on local people's assessments of changes in climate conditions and the environment (see also West et al. 2008) and contextualised with the identified patterns, dynamics, motives and people's notion of migration. Through this process, we are not evaluating the effects of climate trends in the study areas as outcomes of global climate change; rather, we argue in favour of assessing the relevance of various trends in climate variability and the importance of its different cultural, social and political dimensions by focusing on local people's representation, perception and interpretation of climate and environmental changes. Considering the conceptual and methodical difficulties of carving out the relevance of climate and environmental factors in migration decisions, this chapter puts forward a methodological approach that attempts to avoid suggestive causality between climate, environment and migration in the research design.

Following a presentation of the study regions and the methodological approach, we offer an analysis of current climate and vegetation trends and how people assess them locally. The second empirical part provides a historically informed analysis of the contemporary migration landscape, including patterns, motives and destinations, before the chapter concludes with some conceptual and methodological reflections on this approach to grasping the local dimensions of environment, climate and migration.

5.2 Study Regions

Research is conducted in the two study areas of Linguère, Senegal, and Bandiagara, Mali (see Fig. 5.1). Both regions belong to the semi-arid Sahel-Sudan region, yet differ in their socio-economic context as well as their cultural and historical migration background. While the Linguère area is part of a traditionally important pastoral zone, the drylands of Bandiagara are mainly farmland, although crop production is important in both study regions. In Linguère, many of the pastoralist families nowadays are sedentary and practise both the cultivation of land and livestock breeding. However, our study focuses on general patterns of people's mobility rather than the specific movements of herders with their cattle. The selection of the study regions was based on the criteria of high population mobility, peculiarity of environmental change and accessibility of the regions.

[2] *International Organization for Migration*.

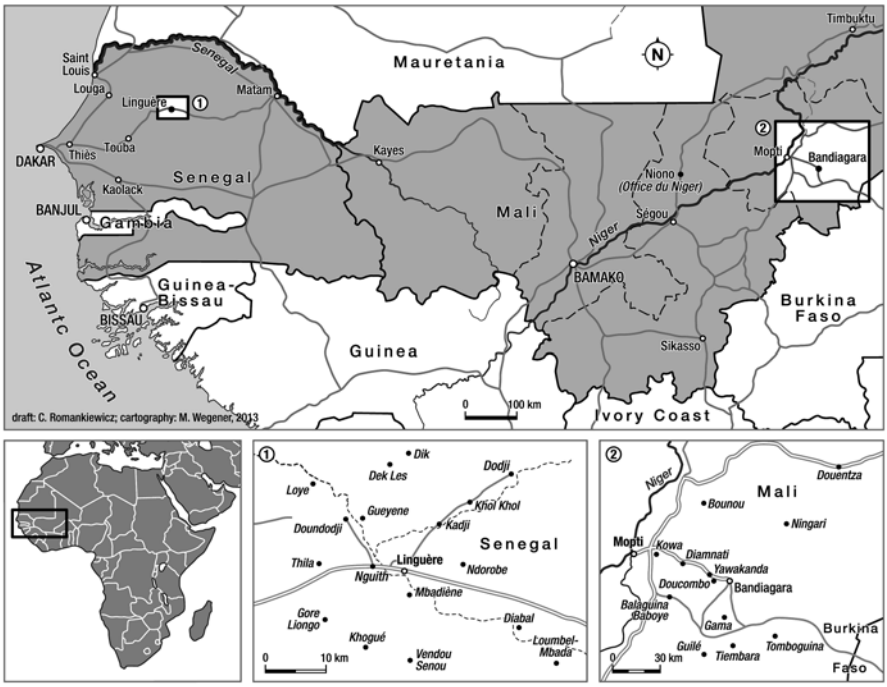

Fig. 5.1 Study regions and surveyed villages

The area around Linguère is situated in the northern part of Senegal in the region of Louga, department of Linguère (also known as the *Ferlo*) (Fig. 5.1). Around 80 % of the population lives in rural areas, with the Fulani and Wolof being the largest ethnic-linguistic groups (ANSD[3] 2007). This agro-sylvo-pastoral area is sparsely populated (14 inhabitants per km^2 [inh./km^2]), characterised by an average annual rainfall of 380 mm and dominated by open shrub and tree savanna and grasslands (Tappan et al. 2004). Economic activities concentrate on livestock breeding and crop production (mainly millet and groundnut). Relying on the most recent migration data available (ANSD 2008), Louga shows an overall migration deficit (ANSD 2007) with 18 % of Senegal's international migrants originating from this region in 2002, making it the third most important region in terms of migrant origins, after Dakar and Thiès (see p. 230 in DPS[4] 2004).

In 2009, the Mopti region in Mali had two million inhabitants and a population density of 25 inh./km^2 (INSTAT[5] 2009). Research concentrates on the Dogon plateau and the Séno plain near the town of Bandiagara, a dryland zone characterised by an annual precipitation of around 600 mm and open shrub and

[3] *Agence Nationale de la Statistique et de la Démographie*.

[4] *Direction de la Prévision et de la Statistique*.

[5] *Institut National de la Statistique*.

tree savanna. Rainfed agriculture and to a certain extent vegetable gardening are the main economic activities (MEA[6] 2009). Dogon and to a much lesser extent Fulani are the predominant ethno-linguistic groups. In the early-1990s, the region's migration deficit for both international and internal movements was among the highest in the country (Bocquier and Diarra 1999). Data from a 2005 survey reveal that 61 % of the interviewed households in the Mopti region mentioned one or more migrating members (WFP[7] 2006), thus indicating a long tradition of labour migration (Sieveking and Fauser 2009). Besides migration to Bamako (31 %) and other African countries (28 %), rural areas and villages (23 %) are also important destinations for migrants from the Mopti region (WFP 2006; Merabet and Gendreau 2007).

5.3 Methodological Approach

Given the flaws of the different approaches described above, we developed a multi-method and multi-level research design without asking respondents explicit questions about the linkages between environment, climate and migration, let alone asking directly whether climatic and environmental changes cause migration. As already pointed out, such direct questions by researchers tend to trigger answers that refer to master narratives of environmental migration and provide the respondents the opportunity to avoid elaborating on the subtle and complex social and political undercurrents that relate to migration. Moreover, we attempted to separate research on climate and vegetation trends from the migration issues by conducting the respective fieldwork at different times. During the conversations, we tried to avoid making direct causal links between environmental and climatic factors and migration motives, allowing only the people themselves to establish such potential links.

While the identification of the study areas essentially followed the idea of ecological inference (high emigration rates and noticeable trends in vegetation cover of a certain area), ethnography helped to identify migration dynamics and motives, as well as grasping assessments of climatic and environmental changes at the local level. Our fieldwork could be best described as a multi-sited ethnography (see p. 106 in Marcus 1995) following migration networks to multiple places in the area of origin and the target regions of migration, which of course have to be understood as potential places of departure for new migration. This approach is motivated by the aim to avoid the sedentary bias inherent in migration research in Africa (see also Verne and Doevenspeck 2012). We conceptualise movement "as constitutive for economic, social and political relations" (see p. 43 in Urry 2007) and mobility as an integral part of human life and not as a problem *per se*, regardless of the place where this life is lived (see also Sheller and Urry 2006; Büscher and Urry 2009).

[6] *Ministère de l'Environnement et de l'Assainissement*.

[7] *World Food Programme*.

We conducted fieldwork during 9 months in 2011 and 2012 and used semi-structured and narrative interviews to understand the village's history, directions and amplitudes of and motives for migration, as well as local meanings of these movements. Additionally, we collected biographies of migrants and identified migration networks. On this basis, contacts with migrating family members at various places were established by telephone or via the internet, leading to interviews in Bamako and Dakar, as well as France and Spain. Working with migrants from the study area at their current residence offered valuable insights into migration networks, given that speaking to migrants outside the social structure of their home village seems to produce less biased and more explicit statements regarding their migration decisions. We used also interviews for the study of the assessment of changes in climate and environmental conditions, addressing both the state of and perceived changes of temperature, rainfall and wind, soil fertility, woody cover, biodiversity, capacities of pasture and crop yields (see Mertz et al. 2010; Roncoli 2006). We conducted the respective interviews with the same people who had already provided insights into migration, or, in case we were unable to encounter them again, referred to members of the same household or family from the same village. Village elders provided valuable information regarding pre-drought conditions and long-term changes in natural resource and farm-management. Additionally, we conducted transect walks and site visits with individual villagers in the surroundings of settlements. Attention was paid to people's interpretations and explanations of already mentioned and visible changes in vegetation cover, the availability and exploitation of woody resources, soil fertility, crop yields and degradation phenomena. Accordingly, we took these impressions and information into account in later interviews in the respective villages. With the help of a village questionnaire, elders identified trends in the tree species composition of the past 50 years (see for example Gonzalez 2001).

5.4 Changes in Climate and Environment: Local Representations of "Facts"

While the Sahelian region has always been characterised by high climate variability, there is much uncertainty in climate trends and forecasts produced by the different climate models on smaller spatial levels for the West African Sahel (Boko et al. 2007; Kandji et al. 2006; Hulme 2001). When looking at environmental changes in terms of vegetation trends, it may be considered that not only climate (rainfall in particular) but also human factors contribute to long-term changes in the natural environment (Herrmann et al. 2005). Nevertheless, what is experienced, assessed and communicated by the population is the variability of weather and changes in vegetation cover at the local level. Depending on the available data, we operationalise climate as temperature and rainfall (cf. Gbetibouo 2009; Mengistu 2011) and examine the environment through the indicators of woody vegetation coverage and diversity, which can be considered as important measures of environmental

degradation (cf. p. 73 in Bilsborrow 2002; p. 113 f. in Massey et al. 2010).[8] In the following section, data on temperature, precipitation and vegetation change in the study regions are contrasted with local people's assessments and explanations. Following Hulme (2008), climate can only be understood and must be re-examined as a manifestation of both nature and culture, which implies that

> its physical dimensions are allowed to be interpreted by their cultural meanings […] [and] that discourses about global climate change have to be re-invented as discourses about local weather and about the relationships between weather and local physical objects and cultural practices (ibid. p. 6).

5.4.1 Temperature

According to data collected from meteorological stations, an increase in the mean annual temperature can be observed for the western Sahel[9] since the 1960s (see Fig. 5.2). Boko et al. (2007) state that there is a rising number of warm spells and a decrease in extremely cold days for the period 1961–2000 in West Africa. Peaks in high mean annual temperatures in the past two decades have been registered for

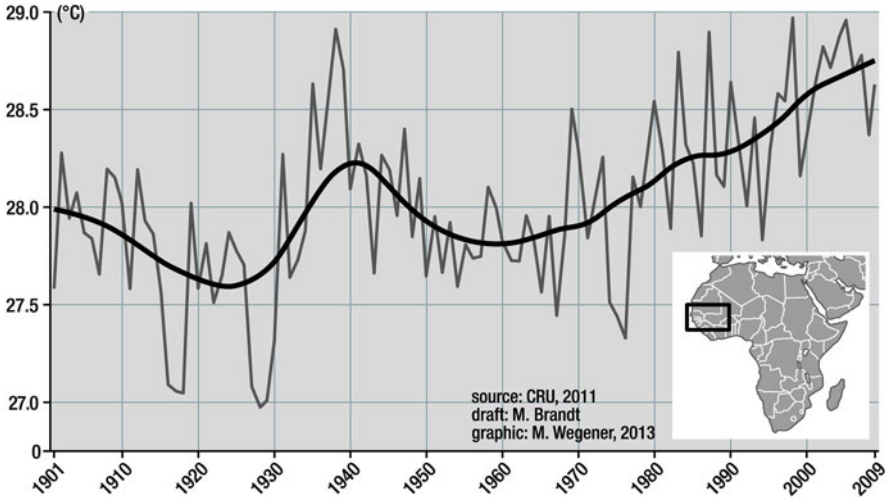

Fig. 5.2 Average annual temperature in Western Sahel (1901–2009) (*CRU* (*Climate Research Unit*), data after Mitchell and Jones (2005))

[8] The development of soil fertility has been considered in ethnographic research yet is not explicitly integrated here because there are no 'hard' data on soil quality that could be compared with people's statements.

[9] Data from *Climate Research Unit (CRU)* 2011 (see Mitchell and Jones 2005). Here, temperatures changes are considered for the Western Sahel and not on the level of the study regions, since available temperature data has been interpolated for larger areas between meteorological stations, and because temperature trends do not show significant differences within the region.

1998 and 2005. Beyond rainfall, rising average temperatures essentially account for reduced soil moisture and tree cover changes (Gonzalez et al. 2012). By determining physiological processes, changes and extremes of temperature may negatively affect crop and livestock production (Stabinsky 2011).

Villagers in both study areas expressed diverse opinions on temperature trends, providing a variety of interpretations. In contrast to the findings from five West African countries of Maddison (2007), stating that significant numbers of farmers perceived increasing temperatures, most of the elders in our study areas agreed that it used to be hotter in the past.[10] A couple of interviewees in Senegal independently recalled a phenomenon in the 1960s when birds, paralysed by the heat and unable to fly, came towards their houses and even into their rooms in search of cooling. Today, some said that suffering from the cold is worse than before, while others claimed that the 'coldness improved' and that it is getting warmer. Only a few people could not identify a general trend in temperature change, suggesting instead that hotter and colder years or periods have always alternated.[11] People's assessment of temperature change is clearly influenced by their personal experience of seasonal heat waves or cold waves; moreover, even the availability of warm clothing and a blanket can have an impact on a person's views. In general, interpretations of temperature variations were directly or indirectly related to rainfall: the more it rained in the past rainy season, the less intense the heat, people explained. Leaf growth, cloudiness, wind direction and the existence of seasonal water bodies were said to affect the intensity of the heat during the dry season. It also seems that the perceived severity of high temperatures in the past has been reduced by the increased availability of water sources such as boreholes, wells, artificial waterholes and dams, compared to the period before the 1970s drought.

Interestingly, few of the interviewees perceived the rise in temperatures that has actually been recorded for the region, with most of them reporting decreasing temperatures. Given that abundant rainfall was said to reduce the heat, one potential explanation could be that the increasing amounts of precipitation in recent years (see next section) have significantly influenced this perception. Similarly, Roncoli et al. (2003) report on the influence of the intensity and duration of rainfall on farmers' perceptions of dry season temperatures in Burkina Faso. Accordingly, narrations of rising temperatures evidently coincide with perceived decreasing precipitation (cf. Maddison 2007).

5.4.2 Precipitation

The Linguère region is clearly drier than Bandiagara, as reflected by a difference in annual rainfall of up to 200 mm (Fig. 5.3). While both study regions experienced several severe droughts during the twentieth century, the 1970s and 1980s droughts

[10] Various interviews in Kadji, Khogué (Senegal) and Kowa, Doucombo (Mali), February–April 2011.

[11] Interviews in Loumbel Mbada (Senegal) and Yawakanda (Mali), March–April 2011.

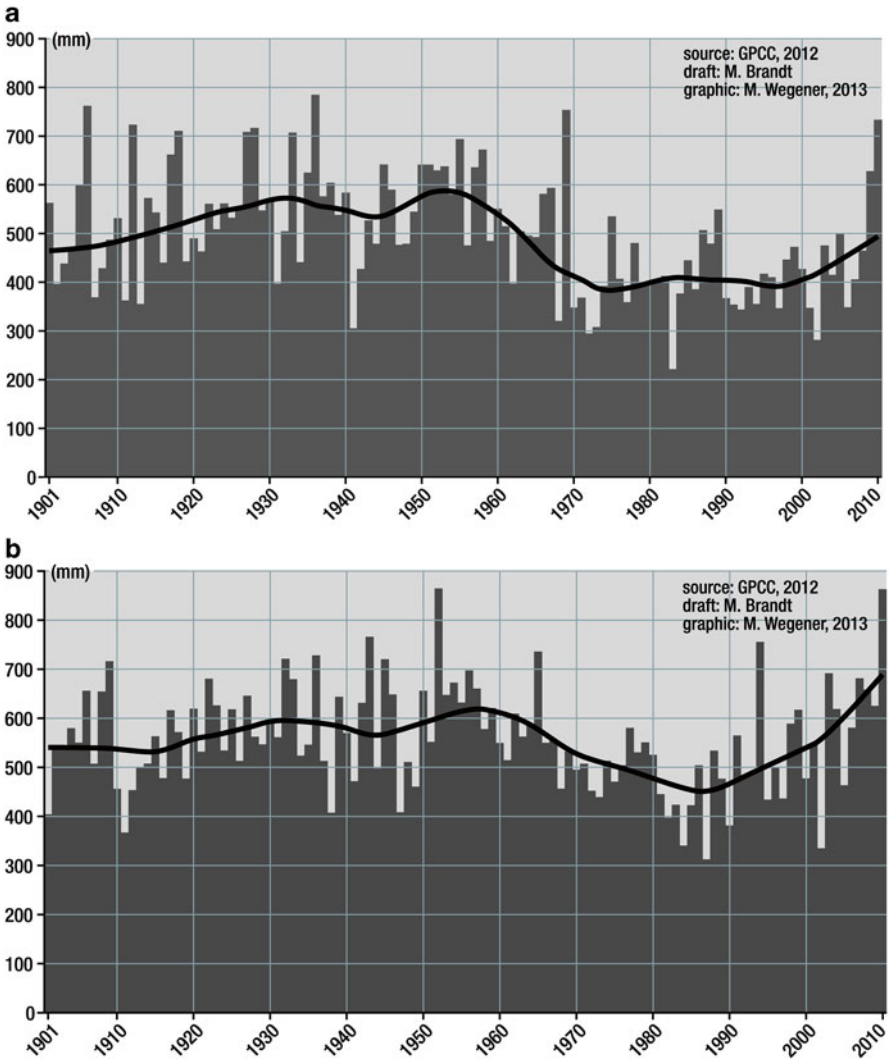

Fig. 5.3 Average annual precipitation in Linguère (**a**) and Bandiagara (**b**) (1901–2010) (*GPCC* (*Global Precipitation Climatology Centre*), data after Schneider et al. (2014)). The precipitation diagrams are given for the study areas of Linguère and Bandiagara, marked in Fig. 5.1)

coincided with a long-lasting drop in the annual precipitation level. In Linguère, for example, this rainfall decline was almost 30 %. While rising precipitation has been recorded for the past two decades in Bandiagara, almost reaching pre-drought levels, Linguère's rainfall has shown a slight increase since 1998. In 2009 and 2010, Bandiagara and Linguère had very abundant rains that locally even reached record

values.[12] Nevertheless, the apparent gain in mean values goes in hand with the increased variability and unpredictability of rainfall (cf. MEA 2009). In 2011, annual precipitation in both study areas did not exceed average amounts.[13]

The interviewed village elders confirmed that rainfall today is lower compared to the period prior to the drought in the 1970s. Generally, people seem to have a good memory of the severe droughts in the 1970s and 1980s. However, it must be noted that there are differences between villages within the same study area, and respondents did not feel equally affected. In both study regions, the informants indicated an upward trend in precipitation in the past 5 years, describing the rainfalls of 2009 and 2010 as the most abundant for a long time. Accordingly, rainfall in 2011 was clearly evaluated as being low. However, assessments of the harvests during the past years do not reveal a uniform picture. In both Linguère and Bandiagara, some villages apparently benefitted from good and very good harvests in 2009 and 2010, with people reporting increased numbers of young people reengaged in agriculture. In other places, most people stressed that the distribution of rainfall was of much greater importance[14] than its total annual amount. Missing breaks between rainfalls, floods after heavy rains, persisting moisture on the fields and delayed, altogether lacking or too little rainfall during certain periods of plant growth mean that the harvest in 2010 was even lower than in 2011 for some households.

While the remarkable increase in precipitation over the past few years was confirmed in both Bandiagara and Linguère, the local people assessed its impacts within the study areas very differently. Moreover, the interviewees also mentioned other factors determining yields, such as the access to seeds, pesticides and fertiliser, as well as their appropriate application, generally decreasing soil fertility and lack of agricultural land, equipment and labour force.[15] These first results show that the total amount of precipitation can only reflect a modest indicator of a 'good' rainy season and does not necessarily translate into better harvests and increasing food security for everyone. Moreover, it is essential to consider the cultural dimension of people's representation of climate (Hulme 2008; Peterson and Broad 2009). Therefore, Roncoli argues "an inquiry into the cultural meaning that underlies farmers' understandings of climate, both its ordinary and abnormal manifestations, is a necessary first step in climate application studies" (2006, p. 84). Important aspects that can deepen insights into assessments of climate include examining local terminologies and calendars for the different seasons (Orlove et al. 2004), or the exploration of local classifications and types of rainfall (Roncoli et al. 2002). Our respondents in both countries highlighted the impact of the timing and distribution of rainfall, which shows that "unlike scientists, these farmers think about rainfall as a process rather than as a quantity" (see p. 84 in

[12] For example, more than 720 mm for Linguère in 2010 (interview at meteorological station in Linguère, March 2011).

[13] Satellite data from *Tropical Rainfall Measuring Mission (TRMM)* (see Huffman et al. 2007).

[14] Interviews in e.g. Kadji in Senegal, Yawakanda and Kowa in Mali, 2011 and 2012.

[15] Various interviews in Kadji, Khogué (Senegal) and Doucombo, Yawakanda, Tiembara, Bamako (Mali), 2011 and 2012.

Roncoli 2006). Given that a multitude of factors besides rainfall have an effect on yields, it is clear that climate can only be of limited explanatory power with respect to people's vulnerability (Mertz et al. 2009).

5.4.3 Vegetation

Since the mid-1980s, remote sensing has detected a greening trend in large parts of the African Sahel, contesting the notion of widespread degradation (Anyamba and Tucker 2005; Olsson et al. 2005). Moreover, rainfall seems to be only one of the important causative factors for this recovery from the great droughts (Herrmann et al. 2005). While the data on local vegetation changes available for our two study sites does not provide conclusive explanations regarding the contribution of climate factors, it does provide an idea of general regional vegetation and land use trends over the past 50 years.

Linguère is located in the transitional zone of three ecological regions with different soil and vegetation characteristics (see Tappan et al. 2004). Depending on the soil type (e.g. deep sandy soils or shallow loamy and gravelly soils over laterite), there are considerable local differences in the agricultural potential as well as the mortality of woody plants (ibid.; see also Vincke et al. 2010). Generally, the trends indicate a significant expansion of cropping land and a moderate loss of woody cover since 1965, but a relative stability since 1983. In Bandiagara, two major zones can be distinguished, with the Dogon plateau characterised by rocky soils and the Séno plain by deep sandy soils. Significant losses of tree cover have been detected in the region during the past 40 years, albeit with considerable divergence in different areas (MEA 2009). Another study focusing particularly on Bandiagara describes the enormous encroachment of rain-fed agriculture and associated disappearance of natural woodlands for the same period, yet highlighting the recent success of governmental and villagers' efforts to preserve woody plants within agricultural lands (Yossi and Diakité 2008).

Regarding long-term changes in vegetation cover, local populations in both study areas report a tremendous decrease of woodlands since the beginning of the 1970s. For example, elders in Mali told us about dense forests during the time of their childhood. The interviewees related the disappearance of tree cover to the persistent water scarcity during the great droughts on the one hand, and extensive deforestation during that period to compensate for harvest losses by selling wood on the other.[16] A major change observed by the people is a decrease in the diversity of tree species: "Today you have to walk long distances to find certain medical plants and trees, some of them have completely disappeared."[17] Trees within agricultural fields are preserved by the villagers themselves and appear to be crucial for them: "Where there are more trees, there is also more rainfall. Everyone wants to have trees on his

[16] Various interviews in Khogué, Loumbel Mbada (Senegal) and Kowa, Yawakanda, Doucombo, Diamnati, Tiembara (Mali), 2011 and 2012.

[17] Informants in Kowa, Tiembara (Mali), 2011 and 2012.

fields, because it increases soil fertility and one gets a better harvest."[18] In both countries, people evaluated soil fertility as having decreased during the past 50 years, which they do not associate with a deficiency of trees but rather with shortened or even no fallow periods as a result of insufficient cultivable land.

These local assessments of vegetation change in the study areas reveal that, despite the enormous decline of woodlands since the great droughts and increasing preservation efforts being confirmed by the local populations, there seems to be a discrepancy in the evaluation of recent vegetation trends, attesting a general greening and relative stability of woody plants. Interestingly, none of the interviewees highlighted a stability or increase of trees in the study regions; rather, they emphasised the lack of trees, high population pressure on woody plants, as well as official restrictions and penalties related to woodcutting. This is in line with the findings of Mertz et al. (2009, p. 810) in Senegal, where people perceive a degradation of vegetation and do not relate it to climate but mainly to abusive use and population growth. Even if the woody vegetation is recovering in our study regions, cutting firewood is restricted to certain areas, requires a costly official permission and therefore remains a source of conflict and concern to many people, which thus might influence their personal assessment of vegetation trends.

In this section we have discussed contemporary tendencies regarding climate conditions and vegetation trends in the two study areas, providing interpretations of these trends by the local population. Even though detailed information on smaller spatial scales is not available yet, data from meteorological observation[19] and field research in the region generally point to positive trends towards more precipitation and a relative stability of vegetation cover (Tappan et al. 2004; Yossi and Diakité 2008). While people's observations of the past profound changes in rainfall and vegetation correspond to recorded data, their assessments of current trends do not draw a uniform picture and seem to be influenced by the diverse impacts these trends may have. People interpret and feel affected by the changes very differently, and name a variety of non-climate factors on which their food security and livelihoods depend. Harvest output is a result of an interplay of parameters that goes beyond rainfall and the diversification of income generating activities essentially contributes to people's livelihoods. It is clear that annual temperature, annual rainfall or overall vegetation cover are not adequate and sufficient parameters for making judgments with regard to the impact of climate on people's lives on a local level.

5.5 Hoe and Mobile Phone: Local Migration Dynamics

The high mobility of people in the study areas has a long tradition and must be regarded in the historical context of West African migration dynamics (see de Haas 2007; Merabet and Gendreau 2007). Contemporary migration patterns in West

[18] Interviews in Kowa, Diamnati (Mali), 2011 and 2012.

[19] Data from *Global Precipitation Climatology Centre (GPCC).*

Africa are shaped by colonial influence. The introduction of taxes and the high labour demand in coffee, cacao and groundnut plantations, mines or for large infrastructural projects have led to the development of a rural-rural and rural-urban circular labour migration pattern that is mainly directed from landlocked countries such as Niger, Burkina Faso and Mali towards the coastal regions of Senegal, Ivory Coast, Ghana and Nigeria (Bakewell and de Haas 2007). Fast-growing urban centres and especially harbour towns such as Accra, Lagos, Abidjan, Lomé, Dakar and Cotonou have emerged as important economic points of attraction for job-seeking migrants. Environmental and climatic conditions have always contributed to shaping the causal, temporal and spatial dimensions of human migration in the region. For example, a north-south rainfall gradient implies that regions in the south generally have more favourable conditions for crop production, thus supporting a north-south-directed agricultural and labour migration. Moreover, annual transhumant movements performed by Fulani pastoralists or the dry-season migration practised by sedentary, agriculturalist rural households are well-known migration strategies of adaptation to the effects of seasonality of rainfall and periodic droughts characteristic to the West African Sahel (see p. 451 in McLeman and Hunter 2010).

5.5.1 Migration in Bandiagara

Our results confirm that Bamako and the Ivory Coast are primary destinations for migrants from Bandiagara; moreover, apart from a few exceptions, international migration beyond Africa seems to be of lesser importance. Bamako has become an increasingly important destination thanks to rising job opportunities,[20] particularly in the informal sector.[21] Much migration from Bandiagara appears to be temporary and circular, both within Mali and abroad. In most of the villages, a tendency towards the longer absence (temporary) or intensified emigration (permanent) of young people, especially to Bamako, is associated with an increasing literacy rate and the lack of institutions of higher education or relevant employment opportunities.[22] As with many other ethnic groups in West Africa, migration as a "rite de passage" to adulthood is also an integral part of the Dogon people's culture in Bandiagara, whereby virtually all young men temporarily leave their village to "go on adventure" (Dougnon 2007; see p. 62 in Doevenspeck 2005): "It's the chat. If you didn't travel, you have nothing to tell. […] Besides, you feel less annoyed because you have experienced many things."[23] Usually, who is allowed to migrate and for how long is negotiated within the household, in order to keep at least a mini-

[20] Especially due to the growth of the construction, telecommunications, service and petty trade sectors (Kilroy 2008; OECD 2008).

[21] Various interviews with migrants in Bamako in 2011 and 2012 showed that they are self-employed or engaged in informal economic activities.

[22] Various Interviews in Doucombo, Yawakanda, Kowa and Bamako in 2011 and 2012.

[23] Interview in Kowa, April 2011.

mum of manpower at home. Young people repeatedly mentioned the lack of income opportunities in their rural home as a migration motive. For many interviewees, paying taxes, purchasing animals or farming equipment, a mobile phone or a motorbike are important objectives that can be realised through migration.[24]

The only connection between environmental and climatic factors and migration that the people established themselves was through describing an increase of seasonal labour migrants as one of their strategies to compensate for insufficient harvests caused by 'bad' rainfall (see Sect. 5.4.2). However, as Findley (1994) has shown for the drought from 1983 to 1985, short-distance, temporary migration as a response to variations in the rainfall regime of the region is not new. Even though dry-season migration is still more important, the seasonal circular movements seem to take on increasingly heterogeneous temporary patterns, with people commuting at all times of the year.[25] Depending on the individual situation, they may return to the home village for less than 3 months per year, or stay away for several years and only pay short visits to the village for family events or whenever important community affairs have to be settled.[26] Interviewees reported that migrants' remittances play an important role regarding food security, especially for poorer households, since yields are insufficient to supply the families throughout the year. However, interviews in Bandiagara revealed that harvests crucially depend on a multitude of other factors in addition to rain, including the specific location of fields, crop diversification and the degree of mechanisation. At this point, it is important to note that temporary migration is only one of various income generating activities mentioned, along with petty trade, vegetable gardening, selling animals, wild fruits and plant leaves as animal feed, or selling wood and charcoal. In a sense, all these activities can be regarded as adaptation strategies both to climate variability and economic hardship.

5.5.2 Migration in Linguère

Results show that mobility patterns in the area of Linguère are principally characterised by internal migration towards the cities and international migration towards Europe. By far the most prominent destination among the urban centres is Dakar. Even though repetitive temporary movements persist at present, young people nowadays seek to settle down permanently in the city. The most frequently cited motives for migrating to the urban centre were the same as in Bandiagara, namely education and proper employment and income opportunities.[27] One interviewee explained that

[24] Various interviews in Nianangali, Kowa, Yawakanda, Doucombo, Balaguina Baboye, Bamako, 2011 and 2012.

[25] One reason is that there is less competition between migrants for work in Bamako during the rainy season (interviews in Bamako in 2012).

[26] Interviews in Kowa, Diamnati, Tiembara and Bamako in 2011 and 2012.

[27] Interviews in Khogué, Kadji, Linguère town, Nguith, March 2011 and Dakar, February 2012.

anyone who finds a permanent job in town does not return to the village easily. A further reason is surely that movements from Linguère to the cities have persisted since colonial times, thus strengthening migration networks over a long period, which again perpetuates migration to this day.[28] Elders with their own migration experience emphasised the 'bright-light effect' of the big city: "Those people who are doing agriculture and think that agriculture is good and sufficient don't know anything and haven't seen the big cities. […] They haven't seen much in their life."[29] Although people in Linguère critically evaluate the emigration of young people by hinting at the subsequent increased workload on the farms for their elders, they also appreciate the importance of education and the positive effects of young people's migrations, as well as the importance of remittances, with typical statements including: "If you abandon school, you abandon your family"[30] or "Someone who lives in the city and sends money is closer to the family than someone who stays at home without means."[31]

Interviewees also made statements concerning environmental and climatic aspects in connection with migration. For instance, one migrant from Nguith in Dakar said that the formerly seasonal migration from his village to Dakar began to take on a permanent character following the onset of the droughts at the beginning of the 1970s, owing to decreasing yields. The community's specialisation in basket making in Dakar permitted them to become increasingly independent from harvest output in the village. The chiefs of the villages of Kadji and Khogué specified that some young people were returning to their villages and becoming reengaged in farming at the time of the investigation, due to the particularly abundant rainfalls in 2009 and 2010.[32] Even though the detailed circumstances remain unknown, it can certainly be assumed that they did not have a permanent and rewarding income in Dakar and might have returned to the capital in 2011. Another farmer from Linguère, when first interviewed in 2011, emphasised his profitable engagement in agriculture. In 2012, he was encountered in Dakar, explaining that he had decided to abandon the last cropping period following a bad onset of rainfall in 2011. Thanks to family contacts and his migration experience in Dakar, he had secured work assisting a cousin in his mobile phone shop. Such examples highlight that fluctuations in the amount and timing of rainfall are contributing factors in decisions for temporary internal movements, which are less regarded as a problem but rather a usual mode of living in a very mobile and multi-local social environment under variable climatic conditions. However, our data indicate that migration to Europe does not seem to have a causal relation to climate or environmental factors (cf. Jónsson 2010).

[28] This became evident by considering the large and still increasing community of migrants from Nguith in Dakar, April 2011, February 2012.

[29] Chef de village in Khogué and Kadji, March 2011.

[30] Interview with wife of chef de village in Khogué, March 2011.

[31] Informant in Khogué, March 2011.

[32] Interview with chef de village in Khogué, March 2011.

The contemporary migration landscape is still largely shaped by historically established patterns, with most population movements taking place within the country or region. A common, albeit not new phenomenon in both societies is the trend towards increasing emigration to the cities, and capitals in particular, which people do not primarily associate with climate and environmental factors. Dry-season migration is a well-known and important strategy of adaptation to the annual variability of climatic conditions of the region. However, there are also increasingly complex and ambiguous temporal patterns of circular migration. As shown by the remarks made in some of the interviews, the variability of precipitation (for instance, the drought of the 1970s or the varying patterns of rainfall in recent years) affects migration dynamics to a certain extent. Moreover, it also became evident that in this case migration is not the only adaptation strategy and that there can be enormous differences in the migration dynamics of different villages. The motives behind migration decisions are very complex and multi-layered, even if some respondents directly mentioned aspects of rainfall trends when explaining migration decisions.

5.6 Bringing People and Places Back in: Local Insights in Climate, Environment and Migration

In this chapter, we have adopted a local perspective to explore the relationship between climate, environment and migration in two regions of Mali and Senegal where population mobility is high and processes of environmental degradation are said to increase people's vulnerability. We have shown that seasonal and temporary migration patterns in Bandiagara and Linguère have been traditionally adapted to climatic conditions, long before the international debate on the consequences of global climate change started. Migration in this sense is a well-established strategy to adapt to seasonality and variability of rainfall (Findley 1994; de Haan et al. 2002), but likewise must be regarded as an adaptation to processes of economic, social and cultural change. This places the focus of this volume's discussion on the multiple dimensions of local contexts in which climatic and environmental change and population movements occur. Empirically, two preliminary conclusions can be drawn from our results. Local climate variability continues to impact migration, especially the magnitude of seasonal movements, although it seems that the same climate trends do not result in the same migration responses. For example, increased rainfall in 2009 and 2010 contributed to the return of migrants to Linguère, whereas by contrast, negative impacts of the higher rainfall on harvests have played a part in increased numbers of seasonal migrants in Bandiagara. However, it is evident that the contemporary migration landscape is very much shaped by historically established mobility patterns and networks. In this respect, education and income opportunities in urban centres, 'going on an adventure' and returning to the village with a mobile phone or a motorbike for prestige reasons reflect widespread migration motives. The destination and length of migration heavily depend on the migrant's assets, thus rendering migration a

socially differentiated and selective process that does not provide a homogeneous image of patterns, destinations, objectives and motives.

Complex migration patterns are embedded in an environment that, when looking at quantitative representations of rainfall and vegetation trends on a larger scale, seems to be undergoing continuous recovery from the effects of the great Sahelian droughts of the past century. However, by considering the cultural dimension of climate, people's assessments show that the timing and distribution of rainfall, or even the number of trees in the field, may be more essential than increasing mean annual precipitation. People in different places feel differently affected by recent changes in climate conditions, further stating that climate is only one of many factors that affect their livelihoods.

It must be recalled that the conceptual constraints in approaching the complexity of the environment-migration nexus imply methodological difficulties. During research, it became evident that a clear distinction between cognitive perception and people's own assessment of climate and environmental parameters is hardly possible. The answers provided by the respondents are highly biased by the impacts of climate and vegetation changes on their individual situation. Cultural aspects, experiences and concernments all impact local assessments of climate and environment (see also Roncoli 2006). Therefore, this chapter proposes an approach that conceptually and methodically separates the two research topics of migration and climate/environment. Separate research on local interpretations of climate and environmental changes allows us to deepen our comprehension of their cultural meanings and relevance for people's daily lives, rather than targeting climate variability and environmental degradation as a problem *per se* that requires migration as an answer. This approach is complemented by the inclusion of migrants at their current place of residence abroad, in an attempt to grasp mobility as a normality, a routinised practice of everyday life, as opposed to considering it as a mere coping strategy, a reaction to a concrete threat in the area of origin.

In this respect, the present study contributes to the current debate on climate and environment as drivers of migration in the West African Sahel by presenting both a local representation of migration and a local assessment of climate and environment. Considering the local level empirically and contrasting climate trends and environmental changes in the study regions with assessments by local people allows comparison with similar approaches (see Mertz et al. 2009; West et al. 2008; Maddison 2007). The multi-sited approach of presenting local people's views on migration from the study areas can provide information concerning migration motives and helps to show that contemporary mobility must not be regarded predominantly as an adaptation strategy in the face of environmental or climate stress. Given this complex framework of mobility and local assessment of climate and vegetation trends in the study areas, it becomes evident that, as discussed above, concepts adopting a disentangled view on climate as the main driver of population movements are misleading. Rather, it is important to develop a deeper understanding of local meanings of environmental change and migration in the context of multiple social, political and economic processes of change in order to understand if, how and to what extent certain climate and vegetation trends play a role for what kind of migration.

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Chapter 6
Animal Belongings: Human-Non Human Interactions and Climate Change in the Canadian Subarctic

Claudia Grill

Abstract By ethnographically delineating a specific climate culture—a locally rooted framework for making sense of environmental changes—and weaving it into a broader historical and economic context, this chapter shows how the mainstream discourse on anthropogenic global climate change does not necessarily latch on to people's everyday lives. Ethnographic field work in northern Manitoba, Canada, has revealed that while one particular local resource—polar bears—and its future reflect a popular element of accounts of warming temperatures worldwide, on-site it is interpreted in a profoundly different way. This leads to a setting with a distinct seasonality in terms of making climate change an issue or not. Taking this seasonal disparity as a point of entry, I show that the concept of anthropogenic climate change or rather its rejection enables a reinforcement of collective positioning and maintaining a particular social reality while at the same time, facing economic challenges, notions of warmer temperatures foster hope for a brighter future.

6.1 "Climate Change Is Everywhere…"

"…and it enters public discourse, everyday talk and changes our perception of the world" (see p. 152 in Krauss 2006). With statements like this in the back of my mind and a strong personal concern about where unsustainable lifestyles might take us, I set out to conduct field research[1] in Churchill, Manitoba, the so-called "Polar Bear Capital of the World." This rather small town at the edge of the Canadian Arctic is known as the place to go to see polar bears in their 'natural habitat,' and thousands

[1] The material presented here has been gathered between 2010 and 2012, as part of my ongoing PhD-project within the framework of the Junior Research Group (JRG) *Climate Worlds* (see Heike Greschke's Chap. 7, this volume).

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of tourists take this opportunity each fall, while the bears wait for their hunting season to start.

In light of the initial impression that climate, climate change and talking about it are important issues in everyday life in Churchill, the approaching of winter disabused me. While global warming, its implications and particularly possible consequences for polar bears were discussed explicitly during the first months of my stay—characterised by preparations for 'bear season,' this changed abruptly with the end of the tourist season. As soon as the tourists and the bears were gone, the issue of climate change also seemed to have left. Ethnographic data collected over the following months proved that climate change and especially its anthropogenic causes were not a significant concern for the local population. As the last bears are getting on the sea ice or are released from their 'jail,'[2] most hotels and restaurants close until the next summer or fall. As the temperatures drop, life in Churchill also changes. Trappers get ready to head out to their cabins, one can move around town more freely and the ice on the river is usually thick enough for people to cross it and access areas that are unreachable during the summer and fall. Moreover, the pace of life is no longer in line with busy tourists' schedules; rather, it is slower and more laid-back. The peak of the season is exhausting for everyone involved, so the winter months allow for some rest, with less hustle and more spare time. Along with this change of life comes a change in the way in which climate change is framed, consequently being altered from being a hot topic to a non-issue.

Therefore, taking this seasonal disparity as a point of entry, this chapter[3] will depict a particular constellation of interpretive patterns and different spatial and temporal scales that inform a specific climate culture, a locally rooted framework for making sense of (environmental) changes.

Since climate change and respective discourses about it in Churchill become manifest in polar bears, I aim to grasp the subtleties of the matter through a lens of human-animal interactions. Animals embody the "friction" (cf. Tsing 2004) emerging from the ways in which the environment is perceived locally, as well as the position occupied by tourists, environmentalists and scientists, who are seen as outsiders. This becomes particularly apparent in the case of the polar bear. Furthermore, it is their presence that triggers the described shift towards the prevalence of a different framework. In addition, other interactions between humans and non-humans can be condensed to a representation of a particular lifestyle that goes along with a self-perception of Churchillians as being northerners who emphasise their opposition towards an imagined south.

Building on the social structure of the place of study and historical influences on it, the peculiarities of how climate change 'arrives' in Churchill are interweaved

[2] "Bear jail" is the vernacular for "Polar Bear Holding Facility."

[3] I wish to express my gratitude to my fellow members of the JRG *Climate Worlds* (Jelena Adeli, Robert Lindner, Julia Schleisiek, Lea Schmitt) as well as my supervisors (Joanna Pfaff-Czarnecka, Peter Schweitzer) for their comments and discussions throughout my project on which this chapter is based. In particular, I am thankful for the editors' remarks and helpful suggestions on earlier versions of this text.

with practices of interacting with animals and the way in which they evoke notions of belonging. Here, it is my concern to explore how people are "anchoring" (cf. p. 103 in Pfaff-Czarnecka 2012) themselves by interacting with the environment, particularly animals. How do they establish attachments to a place and how are these attachments contested, both within the community and towards the perceived outside? I argue that practices of human-animal interactions serve as a means of identification and are tangent to spheres of belonging. Using belonging as an analytical concept (cf. Pfaff-Czarnecka and Toffin 2011) and placing an emphasis on practical engagements with the environment as its foundation (cf. Thompson 2008), I shed light on how pursuing activities with a long-standing history in the region forges a common frame of reference and realm of experience for Churchillians of diverse social and cultural origins. However, at the same time, they also provide an arena for identifying social boundaries.

I will start by providing an outline of the socio-economic setting that this chapter is dealing with, pointing out instances in history that I consider significant for analysing and understanding current dynamics. Furthermore, I will delve into the local understanding of observed changes in the environment. In a next section, the enmeshment of the concept of climate change and notions of belonging will become clear and consequently further consolidated by pointing out the peculiarities of the phenomenon "Polar Bear Capital of the World."

6.2 "One of the Biggest Little Towns in the Country"[4]

Interestingly, despite its relatively small population of 813 people (cf. Statistics Canada 2012), Churchill is pointed out on most world maps. This is not so much reflecting its—self-acclaimed—status of being the world's capital of polar bears and beluga whales, but more likely owing to its position at the edge of the Arctic. Featuring the most northern station of the Hudson Bay rail line and Canada's only deep-water Arctic seaport, the town is a hub for shipping goods to and from the High Arctic, as well as internationally.

However, tourism is one of the most important sources of income for many people in Churchill at present, and despite efforts to promote the town as a (almost) year-round destination, there would not be nearly as many activities without polar bears and the people seeking them. Each fall, thousands of tourists surge to Churchill to catch a glimpse of the creature that has become an icon of global warming and is seen as the ultimate victim of unsustainable lifestyles worldwide. Since several articles about polar bears and their relatively easy accessibility were published in the 1980s, increasingly more visitors have started to arrive, with the town proudly calling itself "Polar Bear Capital of the World" (cf. p. 181 in Matthews and Higginson 1998). Due to its location along a route that the animals take on their way onto/off the sea ice of Hudson Bay and the southern

[4] From Churchill Ladies Club (2002).

edge of *Ursus maritimus*' habitat, Churchill has become the place to go to see polar bears in their 'natural environment.' With freeze-up occurring later and the ice breaking up earlier in recent years (cf. p. 262 in Stirling and Parkinson 2006), the period of time during which polar bears can be watched rather easily has been extended. At present, October and November are characterised by a buzz of activities centred on polar bears. Even though numbers of visitors have been decreasing in recent years (Stanley,[5] interview, 04.07.2011), the industry seems to be blooming. Thousands of visitors arrive to go on daily excursions on the tundra, where they hope to see as many bears as possible. Studies have shown that such visitors are mostly people above the age of 60, retired and possessing a higher-than-average level of education, with guests from the United States representing the largest group of international tourists (cf. p. 325 in Dawson et al. 2010). Moreover, a formidable number of seasonal workers make Churchill their home for this time of the year. Excited visitors showing their photographs of bears to each other, locals treating them with their personal bear stories, convoys of busses between the town and the starting point for tours, groups of people in heavy parkas filling up the restaurants complete the picture.

As is probably true for many small, tourism-based communities, not everyone is happy about this state, but rather waiting for it to be over and "go back to normal." While some people have assured me that they find 'bear season' exciting due to the possibility of meeting new folk and sharing stories with them, for others the notion of having to give up one's community to annoying strangers takes over.

6.2.1 Isolated, Remote and Yet in the Centre?

Not only polar bears have put the small community on a map of global interests; moreover, its geographic location itself has made the area a contested one, with economic and political interests originating as far away as Europe having had significant impacts on local dynamics.

In the seventeenth! century, the *Hudson's Bay Company*—one of the main players in the global fur trade of the era—established a trading post at the mouth of the Churchill River, which attracted Cree and Dene people from further west and southeast to (temporarily) settle in the area and trade their furs with the English and French, respectively (cf. p. 24 in Brandson 2011). The still visible architecture of the trading post—a stone fort equipped with canons, making it look rather like a military facility—demonstrates the high value placed on this location that both England and France strived to control.

Flows of goods and people intensified with the construction of a sea port and a railway connection to the south (1929/1931), which rendered the town more accessible and brought it closer to the south of Canada, as well as to Asia and Europe. Increasingly more people were drawn to Churchill and the settlement was moved

[5] All names are pseudonyms chosen by the author.

across the river to its current location. The port remains significant in terms of being one of the major employers. However, due to the frozen waters surrounding it, the shipping season only lasts around 14 weeks per year. While increasing resource extraction in the Arctic could account for enhanced shipping in and out of Churchill, the federal government's decision for alterations in the grain industry[6] evoked an outcry in the community, triggered by a concern for the port's future and fear of job losses. One fact that is frequently stressed when talking about the port in Churchill is that it is owned (as well as the rail line) by a company based in the United States, which would alienate them from the people who work there and make the future even more uncertain (Isaac, field notes, 13.01.2012).

However, the biggest boom so far occurred during the years in which Churchill hosted a military base, Fort Churchill. The base was founded as a joint venture by American and Canadian forces and gained special strategic importance during the Cold War. During those years, the town, including its military base, counted up to 10,000 inhabitants (cf. p. 124 in Boyens 2007), a number that sank rapidly after decommissioning. However, the era of Fort Churchill is still present in many people's heads, and not only of those who knew Churchill at that time. Accounts such as "There wouldn't be much here at all, if it wasn't for the army" (Lynn, interview, 14.07.2011) are very common and indeed, much of the town's structural matter is owed to the army. Several buildings have been moved from the camp to the town site and put into new use or were abandoned and now serve as landmarks. In addition, the airport and the overall infrastructure are tokens of remembrance of those days in Churchillians' everyday lives and many people welcome current developments such as the troops coming back for special trainings.

Both the port and the army base have shaped Churchill's past tremendously, and although their heydays are over, these institutions still play an important role in Churchillians' realities. They are spoken about with pride and concern, evoking emotions of nostalgia and ambitions for a bright future. Visions of Churchill's future are often linked to its past and include a once again thriving port and military presence. This is conveyed by appeals of business owners and aspiring local politicians not to "sleep through the change" (Carol, field notes, 19.10.2010), but rather to "get ready for it and be prepared" (Stanley, interview, 04.07.2011) in case the shipping season is extended or mineral resources have to be transported out of Nunavut.

The town's earlier prosperity also impacted the constellation of its current population, which is an arrangement of inhabitants considered Indigenous (Cree, Dene, Métis and Inuit) and a great number of people of European descent (cf. Town of Churchill 2013). Numerous peoples have made the Churchill region their home for thousands of years, ranging from the Dorset people who settled along the Churchill River to European explorers attempting to find the North-West-Passage. The prospect of employment brought newcomers of different origins, in addition to many

[6] In 2012, the so-called single-desk policy regarding the *Canadian Wheat Board* (which ensured that a grand portion of Canadian grain was shipped through the Port of Churchill) came to an end (cf. p. 7 in Canadian Wheat Board 2012).

Aboriginal families coming to Churchill through (forced) settlement policies[7] by the Canadian government. Some families have been in Churchill for decades, while others have moved there from southern Canada or other parts of the planet in more recent years. Alongside the diverse cultural heritage, transience is another characteristic of the population. As implied above, the town has undergone a massive decline in its number of inhabitants following the closure of Fort Churchill. Nonetheless, after many decades, one of the main local political issues is to at least sustain the population size, if not to attract more residents. The lack of year-round employment and higher education facilities, combined with the town's location (no road access), has prompted people to move away to the province's centres. At the same time, nurses and other professionals from there are hired for a certain period of time, leaving after a few years. "Most of the time, if new people come to town, I don't even try to become friends with them, because here you never know how long they're gonna stay" (field notes, 30.11.2010), is what Sarah, a woman in her late-20s, told me, and I also made similar experiences.

Yet, while Churchill is only a temporary home for many incoming people, a fairly notable number of people have pursued exactly the opposite and decided not to leave after their assignment was over. A common story about how people came to live in Churchill is that they were planning on working there for a couple of months or years before subsequently leaving, although that was already 6, 10 or 20 years ago. Others came on their quest to "live like an Inuk" or "live in the bush," engaged in locally relevant practices of interacting with the environment and struck roots.

It becomes clear that the fur trade and the military presence were very influential for crucial moments and developments in the past, also regarding the port, political and/or economic decisions made in distant places. While the fur trade was triggered by the European nobility's interest in beaver pelts, strategic and military interests were the driving forces behind establishing Fort Churchill (also for the rather quick cessation). Another example of this aspect of Churchill's collective memory that was frequently mentioned in conversations is the impact of a diversion of the Churchill River further south on the local environment. Although mitigation projects were implemented, people experience an altered river and thus fishing opportunities. Even people who have never used the 'original' Churchill River or are too young to remember often refer to the fact that "before the diversion there was much more fish, you would get forty in a day, now maybe ten on a whole weekend" (Jack, field notes, 07.04.2012).

Having pinpointed the interplay between transience and permanence and heterogeneity as important characteristics of Churchill's population, these explanations will serve as a focal point of my analysis. Another focus that emerges from the historical outline provided is the community's dealing with external forces. The argument is that the concept of global anthropogenic climate change is seen as but another issue imposed on this particular place by outside forces that deepens existing perceptions and provides an opportunity for new positions to be claimed.

[7] For the tragic history of the Sayisi Dene, see Bussidor and Bilgen-Reinart (1997), for accounts of York Factory First Nation members, see Beardy and Coutts (1996), for instance.

6.3 "Nature Takes Care of Itself"

In line with natural scientific studies presenting Arctic and Subarctic regions as those parts of the globe where global warming is happening faster and has more dramatic effects than in mid-range latitudes for instance, Churchillians are reporting several observations regarding a changing environment. According to the *Arctic Climate Impact Assessment* (*ACIA*) released in 2004, changes in the Arctic would have significant global impacts on sea-levels and ocean circulations, as well as profoundly changing the migratory routes of certain animals (cf. pp. 4–6 in *ACIA* 2004). In particular, alterations of the cryosphere are considered to have a comprehensive impact on both people and wildlife in circumpolar areas; for example, travel/migration routes are becoming even less predictable as thin ice causes dangers for hunters, damages of infrastructure due to thawing permafrost, shifting vegetation zones, increasing exposure of communities to storms and erosion, to name a few (cf. Correll 2006). However, ethnographic evidence from Churchill shows that the way in which people make sense of these observations does not have much in common with alarming findings and rather challenges them.

Whether or not observations are interpreted within the same framework that climate researchers use, people *do* notice changes in their local and regional environment. Changes concern animals in terms of their geographical distribution and behaviour as well as seasonal patterns. Such observations also manifest themselves, for instance, in reports about changing travel routes and ice conditions. Talking about the later freeze-up of rivers and lakes, one informant stated:

> In the last couple years, he [Isaac] usually was gone in November and you didn't see him until Christmas. But this year, he couldn't get there, there was too much slush. [. . .] He had to turn around. (Curtis, field notes, 18.01.2012)

The trapper who Curtis referred to confirmed that he has not been able to get to his cabin as early in the year as he used to, owing to a lack of snow and ice. Snow and particularly sufficient ice cover are necessary to access many camps, where the only alternative would be to hire a plane and fly there. With regards to snow, another difference highlighted is that the texture of snow has changed, which in turn relates to changing wind patterns. Storms were frequently mentioned when talking about environmental changes. A common way of explaining why blizzards are not as strong as previously is that there are now more buildings in town, and thus the wind cannot hit as hard as before. Especially senior residents emphasised that this would blur perceptions (Bill, interview, 14.03.2011; Walter, interview, 21.04.2011). Another change common for communities in the north is the melting of the permafrost, which has been observed by many people. An elderly lady who has been living in Churchill for over 50 years stated:

> We got an additional problem, we got permafrost, which is now, it seems to be, melting. More and more every year. [. . .] You noticed, the buildings are sinking down, eh. They've had to raise all these buildings and apparently ours is going down in the middle [again], it's gotta be raised up. And that's because the permafrost is [. . .] not staying like it used to, eh. (Martha, interview, 18.07.2011)

While these observations are what someone informed by natural scientific findings about arctic ecosystems would probably expect, the way in which they are interpreted is not so much. The most prevalent interpretation can be summarised as a "great, big cycle of nature." The cyclical nature of things, as well as humanity's inability to manipulate this dynamic, seems to be another significant aspect of Churchill's climate culture. As Daniel, for example, explained to me, "nature takes care of itself" (field notes, 11.11.2011), which is why he would not bother or be concerned.

However, there is a paradox, namely that people who report changes that appear to be quite substantial at the same time deny their severity. This is achieved by either pointing out that the causes are not anthropogenic and thus cannot be averted by humans or by localising the drama somewhere else:

> I think … that … the earth has been changing, like, over the centuries, when you back right up, when you go … a few hundred years or whatever … there's always ups and downs and, you know, you'll have … times when it's, when it gets really warm and then it gets cold, I mean, seasons are always, always changing. The world has always been changing. It hasn't stayed the same very long. […] It doesn't really mean anything. Because, who knows, if you go down a hundred years and maybe it'll get cold again. Or maybe it won't. (Isaac, interview, 24.04.2012)

The response in the case of a woman who came to Churchill through the military and never wanted to leave ever since to me stating that Arctic and Subarctic regions are supposedly mostly affected by changes in their environment was as follows:

> There's cycles! … There's cycles in the weather and, I mean, we have bad years and … we have cold years and we have … not so cold years and we have hot summers and we have cool summers, … but they come and they go. I can't see any great change. (Lynn, interview, 14.07.2011)

When I asked her for the reason for these cyclical developments later in the same conversation, she emphasised that: "Oh, it's a natural thing! […] There's the ice age and the warm age, the trop--.[8] This is nature!" (Lynn, interview, 14.07.2011).

In both cases, as well as numerous other conversations, people subsequently referred to historic climatic changes by mentioning Lake Agassiz[9] or tree stumps found in the High Arctic in order to undermine their accounts of cycles that are responsible for any observable changes.

Another means of rendering the concept of anthropogenic climate change unsuitable for Churchill was to acknowledge environmental alterations that cause problems, although stressing that such problems cannot be viewed in Churchill, but rather elsewhere.

> I'm worried about the rest of the world. … 'Cause they are really being devastated, by flooding and fires and heat waves. Like, right now in the States, I feel for those people. They are dying from the heat. It's awful! Imagine your parents live there. You know. Eh, come north! (Martha, interview, 18.07.2011)

[8] "trop--" indicates an abruption in the word "tropical."

[9] Amongst other regions, Lake Agassiz covered what is now Manitoba in the Pleistocene (cf. Encyclopaedia Britannica Online 2013).

6.4 A Northern Experience

Another striking feature of how climate change is framed is that it is perceived as an idea of people who live somewhere else and do not take into consideration life in the north or understand it. The concept of anthropogenic climate change, not unlike anti-trapping/anti-hunting lobbies or political actors following a dubious agenda, originates 'down south.' This is revealed by the following, stated by a young woman when we were discussing the aim of my project and prospective interlocutors:

> Climate change is something that—if you mention it at a bonfire—people get upset about and might throw their empty beer cans at you and say … 'That's what the people down south want us to believe!' (Abby, field notes, 16.11.2011)

Hard to locate and with differing meanings, 'down south' symbolises a counter image to the supposed idyll in the north. Besides the different geography and reality of the physical surroundings, a number of ideas and worldviews are associated with it. From an anticipated neglect of northern lifestyles, less community spirit, an occupation with issues hardly relevant in the north, to romantic images of nature, leading to anti-hunting or anti-trapping and animal rights activism or a general environmentalist attitude, there is a panoply of associations. One important discourse is dealing with the frequent incompatibility of 'northern' and 'southern' lifestyles stemming from profoundly different experiences in these two realms. Those images come into effect when people smile about visitors not dressed properly and tales about inappropriate behaviour due to not believing the locals. Many Churchillians tend to disparage 'down south,' distancing themselves from southerners, whose ideas and worldviews are supposedly significantly different. However, the concept is very vague and used often, albeit in a casual way. One person, who—in a way—tried to make a northerner out of me, stressed that I needed to develop skills including winter survival skills such as building a shelter and making a fire, defending myself against wolves and navigating in the 'bush.' He considered these qualities essential for "a future resident of Churchill," as he sometimes introduced me,[10] or some that I could take back home and teach other Europeans. The imagined 'north' plays an important role here, building the vision of a people misunderstood by others. Frequently used examples were the *European Union* ban on seal products and the general rejection of seal hunting. When I asked a local hunter if I could film him processing a killed animal, he rather agitatedly replied that while I could do so, I would have to guarantee that my video would not show up on the internet. He stressed that he would not mind helping me out and demonstrating it for me, but that likewise he would not hesitate to use his gun in order to take action against 'them,' "not to shoot, but to defend my lifestyle" (Abe, field notes, 12.05.2011). Again, the vagueness of 'down south' becomes evident; moreover its emotional aspects, 'them'

[10] During my stay in Churchill, I found myself in a couple of situations where people tried to persuade me to come back or in fact told me that they had already heard that I would do so. This is meaningful especially in the light of municipal efforts to increase the population and people's hopes for it.

appear to be so profoundly opposed that his words even refer to warfare. Environmental organisations are generally considered with suspicion in Churchill and other northern places (cf. p. 28 in Cruikshank 2004), with conspiracy theories like this one being popular. Another theory heard on several occasions is that 'a scientist'—with 'science' representing southern views—"invented climate change to get money for his studies" (Curtis, field notes, 10.02.2011).

Summing up, 'down south' is associated with (inappropriate) laws, environmentalist/animal rights activism, science that does not take account of people of the north, tourists and generally people ignorant of life 'up north.' All such factors are consolidated in the discourse on anthropogenic climate change and the deeply-rooted differentiation from 'down south' acquires a new dimension and affirmation.

6.5 Of Animals and (Wo)men

This opposition also becomes valid in other forms of human-animal interactions that I wish to incorporate here. In order to map out the arena of social boundary making that the discourse on anthropogenic climate change encounters in Churchill, a look at hunting, trapping and Churchillians' relationships with polar bears appears fruitful. Therefore, the image of a northern people will be expanded over the forthcoming sections; moreover, it will also become clear that besides delineations towards 'down south,' there are also boundaries drawn within the community. Several ways of drawing boundaries—inside and towards the anticipated outside—are reaffirmed through the issue of climate change.

6.5.1 Trapping[11]

As indicated earlier, catching fur-bearing animals such as marten, fox, beaver or wolf has been practised for centuries by both the Indigenous population and the people of European descent. Indeed, even before a trading post was established, trapping animals for food and fur was a major social activity. However, the systematic pursuit is mainly a product of the demand for furs in Europe (cf. p. 2 in Savishinsky 1978). Although fur can now be harvested more easily through breeding minks or other animals on farms and not a single trapper is making his living exclusively from fur, trapping can still be profitable and represents an important activity, providing additional income and bringing material for sewing mitts and moccasins. First and foremost, trapping means being out in the forest, more-or-less far away from town, without seeing anybody for hours, days or even weeks, which is valued among those who practice it. Most trappers I have talked to stressed that

[11] Even though they share many characteristics, hunting and trapping are considered separately here, as they are locally. Furthermore, they refer to different subgroups of the community. Most trappers hunt, but not all hunters trap.

they have the necessary skills to survive in the 'middle of nowhere' (from a central European perspective), enjoy 'lonesomeness,' are resourceful in repairing their snow machines or other equipment and are able to outsmart certain animals. This knowledge is not only valued for trapping, but during my stay two large military operations took place where the local branch of the *Canadian Rangers* demonstrated and taught—amongst others—those skills to members of the regular forces.

Although selling the harvested furs reflects the basic idea of trapping, it seems that items viewed as especially beautiful are sometimes kept in order to emphasise one's trapping success. Houses adorned with prestigious furs on the wall or a particularly nice wolf fur around a parka's hood (besides the practical effect of preventing winds from reaching the face) are just a few examples. One event that emphasises the continued significance of trapping is the contest of finding *King & Queen Trapper* during the annual *Aurora Winterfest*. Across 2 or 3 days, participants challenge each other in making a fire, baking bannock, calling a moose, performing and setting snares.

While trapping shapes a sense of community through a particular knowledge, memories that are shared and mutual help, it also evokes tensions. Besides a notion that "often the ones that don't go out and sit at home make the rules," there is a frequently expressed perceived inequity in who gets permits and who does not (Curtis and Isaac, field notes, 12.01.2012). Reasoning is either backed up by one's productivity and effort or by a claim to the land itself, justified by blood. This dynamic is reflected by assertions of people wrongly claiming a right to trap through their descent on the one side and accounts such as "those guys don't know how to trap" (Daniel, field notes, 12.01.2012) on the other. Regarding trapping, this is one main instance of a drawing of social and cultural boundaries *within* the community I have observed. By contrast, another opposition that is often emphasised—associated with an anticipated 'outside'—are movements for animals' rights. "You guys make them animals a person, you give them feelings" (Curtis, field notes, 14.01.2012) is often seen as the major distinction between these groups. Like the origin of climate change, these movements are located 'down south.' Furthermore, through fluctuating prices for furs or a frequent readjustment of legal regulations, the sentiment of being directed by external factors is once again reconfirmed. Paradoxically, one common response to asking what it is that makes Churchill special is that certain rules and laws do not always apply there.

6.5.2 Hunting

In an area where either swampy or frozen grounds and a short growing season prevent people from performing agriculture, capturing various animals as well as birds for food and other uses has been essential for both indigenous and non-indigenous populations. However, hunting is not just a practical activity to feed members of one's social group, but also bears social importance through shared stories, the passing on of necessary knowledge and the fact that it is often conducted in (family) groups (cf. p. 2 in Manore 2007). Even though hunting success is no

longer a matter of life and death, its importance remains valid. Not only hunters' families, but especially elderly people often profit from the captured animals. It is common courtesy to share the catch with people who cannot go and hunt themselves (anymore). On several occasions, I witnessed people thanking a hunter for sharing, or hunters telling me that I would have to do the same if I happened to shoot an animal.

Ethnographic cases from all over the circumpolar world[12] highlight an especially close relationship between hunters and their prey, showing that animals are not something the hunter simply takes, but rather that both are "part of an intricate interplay of reciprocal responsibilities, ensuring the survival of both humans and animals" (see p. 90 in Bird and Bohr 2007). Modern technologies such as improved rifles, snowmobiles and Global Positioning System (GPS) have certainly altered hunting routines, although particular rules still apply. Again, those rules and practices offer a field in which to locate boundary-making dynamics. Similarly to what I have described for trappers, the activity of hunting forges notions of community and attachments. Even with modern technologies, certain skills and an intimate knowledge of the land are prerequisites for hunting success. Children are inaugurated to this sphere from a young age and many parents I met tried to teach their kids respect for animals and an appreciation for where part of their food comes from. As indicated above, one categorisation that is being made can be summed up as what is considered good or bad hunting practice. Here I am referring to often resentful statements about people being wasteful or disrespectful by shooting more than one needs or taking only the best cuts of the meat and leaving the rest behind. In addition, animal activists are often mentioned as belonging to a substantially different community that condemns hunting in general and is therefore contradicting. Categorisations of 'them' and 'us' also become relevant in terms of legal regulations. These are often considered inappropriate (or even unnecessary) and thus there is a notion of boundaries between those who kill animals and those who try to guarantee all legal obligations are met. Furthermore, boundaries that are created on a legal level[13] are reproduced in everyday lives. By obeying those boundaries or taking advantage of grey areas or pointing out how far from reality they are, they are rendered meaningful in many conversations about hunting, which are plentiful.

With their particular sets of skills and shared experiences, hunting and trapping equip people with a repertoire of mechanisms to draw social boundaries and demonstrate their belonging to a certain group, representing a particular lifestyle. While locally important, these practices seem of little concern outside the community. However, another relationship of Churchillians with an animal is acknowledged with global attention. Worldwide interest in polar bears has placed an isolated and remote town on a map of global concerns, namely relating to climate action and

[12] For an example from northern Manitoba, see Brightman (2002), as well as Brody (2000) and Anderson and Nuttall (2004) for a regionally broader perspective.

[13] Such as hunting and fishing rights granted to First Nations (First Nations, together with Métis and Inuit, constitute the indigenous population of Canada; the term has replaced the word 'Indian') or specific hunting seasons for particular animals that have to be kept in mind.

protection. What those relationships have in common with hunting and trapping are that they enable people to take up social(ly accepted) positions, to strengthen and maintain them and distinguish their community or in-group from others.

6.6 Nanuq of Churchill

Despite many Churchillians rejecting anthropogenic causes of climate change and disclaiming its significance for them, the concept makes its way up north every fall and cannot be overlooked. For 6–8 weeks of the year it takes over and challenges existing patterns of interpretation.

Looking at polar bears from a broader perspective, over the last decades they have gone from being a subject of population biology and general conservation efforts to one of the most meaningful and powerfully charged icons of global warming. Not only are they minted on Canadian two dollar coins, they also illustrate numerous reports and announcements of environmental organisations and *Intergovernmental Panel on Climate Change* (*IPCC*) proceedings, as well as news headlines. A large number of initiatives are dedicated to protecting the bears from their extinction, which seems to be certain if humanity does not manage to spark a fundamental change. This becomes obvious during 'bear season,' which is hallmarked by an emphasis on both polar bears in general and their endangerment in particular. In addition to tourists, a number of scientists, celebrities and environmental organisations are on a mission to see—and save—as many polar bears as possible. While the main drive for most tourists is to obtain good photographs, scientists hold lectures focusing on polar bear biology and their habitat, the Arctic. Presentations by reputable polar bear biologists are usually well-attended by tourists and researchers that live in town, yet do not attract many locals. Another important actor in this seasonal constellation is a non-government organisation based in the United States, which is dedicated to polar bear conservation and promotes a "polar-bear-friendly lifestyle" (PBI 2012).[14] Many lectures are held in association with them and their affiliates are highly visible. One of their programmes involves educating youth about climate change and polar bears on-site in Churchill (cf. PBI 2013). Another remarkable campaign chose Churchill as a locale in the fall of 2011, in a joint venture of the *World Wide Fund for Nature* (*WWF*) and *Coca Cola* to protect the Arctic and its inhabitants. A polar bear inspired design of cans and a donation to the *Town of Churchill* as well as appeals to contribute to the cause, financially or by acting, were accompanied by an excursion to Churchill of a group of key actors within both organisations/companies. Ironically, bespeaking the way in which such interventions depart from local perspectives, the goal was to bring donors on location so that they could "hear from northerners about the impact of climate change on their lives and livelihoods" (Riannon 2011). Locals tend to register such occurrences with a smile—and not be

[14] Polar Bears International.

bothered by it any further. Similar to what Martina Tyrrell (2006) observed for Churchill's neighbouring community of Arviat, their understanding is often that less sea ice is not a concern for the bears. On the contrary, it was often stressed that the bears who "have been here long before us and they will be long after we're gone" (Marilyn, field notes, 31.10.2012) are not in trouble and can adapt to their changing habitat. In Arviat, Inuit have reported more frequent sightings of polar bears close to the settlement and have therefore requested more permits to kill them.

This ambition stands in sharp contrast to conservation efforts to not only protect polar bears from the effects of warmer temperatures, but also from being an object for hunting and trade. Furthermore, studies suggest that increasing temperatures and a shortening of the season with sufficiently stable ice means stress for polar bears. Furthermore, this is particularly true for the so-called Western Hudson Bay population—the bears of Churchill (cf. Derocher et al. 2004). In the short term, this could lead to a boost for the polar bear viewing business in Churchill; indeed, it supposedly already does. Asking tourists why they came to Churchill during the probably most uninviting time of the year spawns various explanations with one very common denominator: "I want to see the bears as long as they are still here." Consequently, from an entrepreneurial perspective, less sea ice could be positive for Churchill's economy. However, if pessimistic expectations turn out to be true, in the long term the other side of these developments will be in effect. The polar bears of Churchill will be unappealing[15] or gone and the town's major attraction will have disappeared (cf. pp. 320–321 in Dawson et al. 2010).

However, polar bears are much more than a tourist attraction, as they matter in Churchillians' daily lives for a large part of the year and the relationships are manifold and sometimes contradictory. They provide a means of identification and, besides the real bears on the tundra, their counterparts out of wood, metal or fabric can be found in people's yards and windows, on shirts and hats, taking part in the Canada Day parade or serving as namesake for hockey teams or events. At the same time, bears can be a threat, both to people and other animals. During the height of the bears' presence, employees working night shifts or in the early morning are known to take a taxi for what could be a two minute walk. Understanding what that actually means is hard to grasp for many newcomers, as it was for me, but my hosts quickly made clear that I would "soon realise how silly it is" (Karen, field notes, 25.08.2010) to plan to hike around in the tundra without bear protection and necessary experience. Ever since its beginnings, the town has been on a major migratory route of polar bears on their way onto the sea ice and back inland. For decades, people in and around town have been living with them, and consequently the knowledge about how to avoid encounters and what to do in case of such is common. Moreover, people have aligned their behaviour with the situation by leaving cars and doors unlocked or having a gun with them when they go 'into the bush.' There is a repertoire of stories of encounters between humans and bears circulating through town and sightings are spread through various channels, such as word of mouth or *Facebook*. Bears used to try to stay away from human settlements, with

[15] Dawson et al. speak of the possibility that unhealthy and troubled bears naturally might not attract as many tourists (cf. p. 321 in Dawson et al. 2010).

frequent gun noises keeping them away during the presence of the military anyway. However, in recent years, sightings of polar bears outside of 'bear season' have become more common. Especially in the summer and fall, most bears are becoming anxious to get out on to the ice of Hudson Bay again and recharge their fat reserves. Naturally, the smells of food attract them and they are wandering close to or into town. Although a Polar Bear Alert Programm is in effect and on-call around the clock during the height of the season, the occasional bear is literally making its way on to people's doorsteps.

In addition to instructions about appropriate behaviour, another practice of introducing people to life in Churchill is to take a drive and look for bears. Also for me, not a tourist, but—at first—hard to categorise, my hosts and later friends made sure I got my share of polar bear sightings. Given that bears are the foremost reason for tourists to come to Churchill, the "community is under immense pressure" (Karen, field notes, 03.09.2010) to meet their visitors' expectations. Here, Karen—making an important fraction of her income during 'bear season'—was referring to the fact that narrations of tourists who were disappointed because they did not see as many animals as they wanted are fairly well-known, with people thus striving to ensure that every visitor gets to see at least one bear. Yet, especially elderly people have reported that there was much less excitement about the bears several decades ago, owing to the fact that they did not get as close to human settlements and because "people just didn't make that much fuss about it" (Anna, field notes, 23.04.2011). Nonetheless, people who spent most of their lives in Churchill seem to view the idea of sharing their habitat with a potentially dangerous predator as normal, while those who are fairly new express greater agitation. However, it seems that with an increasing interest in polar bears from outside the community, its potential to function as a criterion for belonging has grown. Churchillians take pride in 'their' bears, using them as a marker of identity and willingly letting tourists partake in that. On the other hand, there are diverging opinions about what the touristic exploitation means for the bears, with critics pointing out that due to the massive presence of people and their smells (of food they had before) on the tundra, polar bears were habituated to associate humans with food. For instance, Henry pointed out that bears that are used to the tourists on the tundra vehicles tend to be more fearless than others (field notes, 25.05.2011). Here, a dissonance between the pride of being able to 'show off' the bears on the one hand and an objection towards converting them into money on the other evolves.

Finally, different spheres of belonging also emerge in this most peculiar local interaction with animals. While, according to long-term resident Henry, attitudes towards them were used to distinguish "white people who are afraid of bears" from "the Natives who like to chase them" (field notes, 29.09.2010), in the light of climate change they evoke a sense of communality, collective northernness. People in Churchill claim solidarity with other northerners in their understanding of polar bears not being endangered, thereby opposing themselves to southerners, meaning scientists who state different opinions and players[16] who benefit from the polar bear

[16] Who are in many cases not based in Churchill, but rather elsewhere, leading to much of the tourism money not staying within the community.

industry and their assumed ill fortune. From this perspective, polar bears and their image as climate change victims reproduce the perceived difference between 'down south' and 'up north.'

6.7 Conclusion

By ethnographically delineating a specific climate culture and weaving it into a broader historical and economic context, this chapter has shown how the mainstream discourse on anthropogenic global climate change in this case does not latch on to people's everyday lives. While one particular local resource and its future reflect a popular element of accounts of warming temperatures worldwide, on-site it is interpreted in a profoundly different way. This leads to a setting with a distinct seasonality in terms of making climate change an issue or not.

It has been shown that the concept of anthropogenic climate change or rather its rejection provides a means of affirming a perceived 'otherness' and reinforces collective positioning in relation to 'down south.' Through framing the belief in climate change as something made 'outside,' Churchillians try to maintain their social reality. In the opposition of 'down south' and its ideas and conceptions, the community positions itself as one, with people demonstrating their belonging by reproducing a narrative of a fundamental opposition with 'down south' and carrying on a memory of negatively influential outside forces. Thus, social boundaries valid in other instances can be overcome. At the same time, the concept is further used to relate Churchill to a global community and make claims for participating in it. Especially in the light of former changes the community was dealing with and a continuous struggle to maintain economic importance, certain actors such as business (wo)men and local politicians utilise exactly the awareness of changes to foster hopes for a brighter future due to mining and shipping activities. The possible positive effects of warmer temperatures and therefore less ice have to be perceived as a long-awaited opportunity for the community.

Finally, it became clear that social science climate research needs to look closely at particular life-worlds in order to grasp different nuances of how people navigate between their locally rooted social reality and globally circulating concepts in their everyday lives.

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Part III
Spinning Global Webs of Local Knowledges: Collaborative and Comparative Ethnographies

Chapter 7
The Social Facts of Climate Change: An Ethnographic Approach

Heike Greschke

Abstract Climate change is considered to be global in at least two respects: it firstly denotes social-ecological processes affecting the whole world and secondly refers to a scientific body of knowledge claiming universal validity. Climate change, however, is not directly perceptible; knowledge about its causes and effects has to be mediated and can only become socially relevant at particular local sites if it connects to general life experiences and culture-specific patterns of interpreting the environment. Against this background, one might question the supposed global distribution and acceptance of climate change knowledge beyond academia. Drawing upon current experiences of the junior research group *Climate Worlds*, this chapter queries the prospects of climate change for becoming a globally shared issue of concern, paying particular attention to the role of social and cultural sciences in climate change research. It argues against an equation of physical and social facts of climate change and the disciplinary self-limitation to the study of mitigation and adaption strategies. In this regard, the parallels between the current shape of climate change-related social and cultural studies and the research tradition within the modernisation paradigm will be highlighted. The last part of the chapter finally explores the potentials of ethnography for developing a non-nostrifying approach to comparing distinct "climate cultures." In respect thereof the notions of culture and belonging will be refined from a cross-linked ethnographic perspective.

7.1 Who Are *We* in Times of Global Climate Change?

> The story of humankind and our relationship to the earth may be seen as a continuing adventure or a tragedy shrouded in mystery. The choice is ours. (see p. 79 in Gore 1992)

Due to high social relevance and a sense of urgency regarding the phenomenon of global warming, research on climate change has become intimately connected with

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politics. This implies a trend towards applied science, namely concerning the production of knowledge serving for policy making. Moreover, by sharing common concerns about the planet's future, scientists and politicians have established a common agenda for a global social movement. Seeking to answer the question of "how do we know we have global environmental problems," Taylor and Buttel (2005) highlight this relationship between "scientists and political actors [who] jointly construct them in global terms … [and] act as if we are a unitary and not a differentiated 'we'" (see p. 408 in Taylor and Buttel 2005). Al Gore is probably the most illustrative example of climate aware politicians who are committed to changing people's attitudes towards sustainability. His initially posted statement indicates this unified notion of we, but at the same time reflects a particular view of the world, as well as humans' position in it. According to Gore, it is a matter of choice to dispose over our (i.e. humankind's) future, and even that of the planet.

In his highly regarded book, "Why we disagree about climate change," climatologist Mike Hulme challenges such a simplifying "problem-solution framing" (see p. 328 in Hulme 2009) of climate change. Pointing to the complexity and 'bigness' of socio-ecological processes, Hulme defines climate change as a "wicked problem" (see p. 359 in Hulme 2009) that resists any (global) answers. According to Hulme, any attempts to solve environmental problems of this magnitude would rather bring forth further unintended problems. Rather than "seeking ever larger and grander solutions to climate change … [thereby] unleashing ever more reactionary and dangerous interventions" (see p. 359 in Hulme 2009), he proposes to "reveal the creative psychological, ethical and spiritual work that is climate change doing for *us*," hence framing climate change as an "intellectual resource around which *our* collective and personal identities and projects can form and take shape" (see p. 326 in Hulme 2009; *italics H.G.*). Despite distinctly disagreeing regarding its social meaning, for both the politician and climatologist climate change seems to stimulate the engagement with a unitary *we*.

The primarily natural-scientific orientation of climate research has been challenged in recent years. Social scientifically oriented climate researchers argue that social and cultural impacts of global climate change cannot be 'measured' with natural scientific instruments. The ways in which affected communities and societies might be able to deal with the impacts of global warming could in fact only be assessed by exploring the diverse 'climate cultures' that have been evolving across the world throughout human history, with this originally being a matter of the social and cultural sciences (Leggewie and Welzer 2009; Szerszynski and Urry 2010).

Climate Worlds[1] is one of a number of research initiatives investigating the social implications of climate change with methods of social and cultural studies that have

[1] *Climate Worlds* is an initiative of the *Institute for Advanced Studies in the Humanities* (Essen) and the *Bielefeld Graduate School in History and Sociology*. It has been financially supported by the *German Research Foundation*. I owe a great personal debt of gratitude to these institutions and the projects' directors Claus Leggewie and Jörg Bergmann for trusting me with the possibility of such

been stimulated by this critique. Since June 2010, the *Climate Worlds* research team has been ethnographically studying the social implications of global climate change and its cultural framings in several local spots around the world. In order to narrow down our focus a little, the research concentrates on the respective effects of global warming and rising sea levels in coastal regions. While the group was being assembled, one of the project's parameters was to choose regions that are already experiencing strong impacts of climate change. Moreover, the doctoral students held a personally motivated ambition to participate in the project: they wanted to take action against climate change and assumed that inhabitants of their coastal field sites would feel similarly concerned about this matter. The research team was all the more surprised upon realising that climate change concerns in most of the studied communities were not as easy to trace as we had assumed.

Despite being regarded a serious problem for all humans in present and future times, climate change is not directly perceptible. Knowledge about the causes and effects of global warming has to be mediated and can only become socially relevant at particular local sites if it connects to general life experiences and culture-specific patterns of interpreting the environment. Hence, some authors question the globality of climate change in terms of a globally shared concern about a present and future threat of humans' livelihoods, particularly from the perspective of people living in precarious conditions, as Demerit emphasises:

> They contend that the threat of future climate change holds little meaning for developing nations and the poor people in them struggling daily in the face of crippling structural-adjustment policies with more basic and immediate needs of sanitation, health, and hunger. From this perspective the environment is not self-evidently or exclusively global in nature. (see p. 313 in Demeritt 2001)

Current social research initiatives have also been struggling with empirical evidence suggesting that natural-scientific findings on regional effects of climate change are not always in line with local perceptions (Romankiewicz and Doevenspeck, Chap. 5, this volume). Moreover, the conception of global climate change as a socio-ecological process that is not only caused by humans (through massive emission of CO_2) but could also be prevented by mankind has proven not to be the most meaningful explanation of environmental changes in all locations (Grill, Chap. 6, this volume). During the course of the *Climate Worlds* research, we learned that even in regions where meteorological and environmental effects of global warming are most obvious, people do not necessarily share these perceptions, or if so, they might resort to (from their perspective) more self-evident patterns of interpretation.

inspiring collaborative work. My gratitude also goes to Tink Diaz for her wonderful documentary work and her overall support to the project's progress; to the good soul of the project Johanna Gesing, to the project fellows Jelena Adeli, Claudia Grill, Robert Lindner, Julia Schleisiek and Lea Schmitt, whose detailed observations and intelligent thoughts are the centrepiece of this chapter, and to Julia Tischler for an extremely pleasant teamwork as well as for helpful suggestions on an earlier version of this chapter.

How do we interpret and respond to these findings in actual research projects? Are they all 'sceptics' or ignorant? Do we primarily have to enlighten our research fields about the 'real' causes and dynamics of the global socio-ecological system in the age of the 'Anthropocene'? Or, to turn the question around: whose choices, ethics, collective and personal identities are compatible with global climate change and whose are not? Who are *we* in times of global climate change and how do culture, ways of belonging and even society become puzzled in the dawn of a 'new age'? This chapter discusses the challenges of global climate change in terms of becoming (or not) a socially shared reality all over the world, paying particular attention to the role of social and cultural sciences in 'globalising' climate change knowledge. Hulme emphasises that:

> far from simply being a change in physical climates […] climate change has become an idea that now travels well beyond its origins in the natural sciences and as this idea meets new cultures on its travels […] climate change takes on new meanings and serves new purposes. (see p. xxvi in Hulme 2009)

With this in mind, I shall recall Alfred Schütz (1953), who pointed to a fundamental difference between physical and social facts, which I consider a suitable starting point for reflecting on the methods, aims and possible roles of the social and cultural sciences in an emerging and intrinsically interdisciplinary field of research. It is argued that social climate change research does not discriminate conceptually between the physical and social facts of climate change. This lack of reflexive distance to its own research object suggests linking up with the tradition of social research, termed as "nostrification" by Joachim Matthes (1992) in his critique of modernisation theory.

The structure of the argument is as follows. The first part of the chapter is dedicated to the question *how do we know about climate change in everyday life*? It briefly touches on some of the problems related to different scales, practices and modes of knowing and informing about climate change. Drawing upon current experiences of the junior research group *Climate Worlds*, the second part of the chapter subsequently addresses the question *how do we know whether or what others* (*should*) *know about climate change*? Far from positioning within any of the competing climate change ideologies of *scepticism*, *gradualism* and *catastrophism* (see p. 22ff. in Urry 2011), this part critically responds to the taken-for-granted globality of climate change, albeit in terms of a *social* reality. Using the example of *Climate Worlds*, the last part of the chapter finally explores the potentials of ethnography for developing a non-nostrifying approach to comparing distinct "climate cultures." In this regard, I shall refine the notions of culture and belonging from a cross-linked ethnographic perspective. As our findings indicate, global climate change challenges traditional conceptions of culture and belonging of both our research fields *and* disciplines. By way of cross-linking and juxtaposing different fields, perspectives and scales of observations, the assumed unified *we* collapses into a mosaic of diverging and often conflicting *we's* and *they's*; in other words, communities of interests that are drawn together by the challenge of negotiating the inconsistent meanings and purposes they associate with climate change.

7.2 How Do *We* Know about Global Climate Change in Everyday Life?

Let us assume that we were part of the *we*-group evoked by Al Gore and others to join the battle against climate change and change *our* way of life accordingly. *We* were supposed to be part of the first generation with a 'global consciousness,' fostered by an image of our own planet that one of the astronauts of *Apollo 8* took during the first manned moon landing in 1968. In other words, *we* were growing up in the wake of the mediated experience of the "Overview Effect,"[2] witnessing how, at the same time, "the still emergent environmental movement" was mobilised (mainly in particular sites in North America and Europe) by the massively circulating image of the *Blue Planet* (see p. 25 in Urry 2011; see also Radkau 2011). Imagine, *we* were living most of our lives in some urban, if not metropolitan, in any case industrialised and technologised site in the world, having water, energy and all other kinds of necessities at our disposal in abundance almost always and everywhere. A great deal of the air we breathe would be conditioned. We would use our eyes regardless of the time of the day and would communicate with others bridging any geographic distance. Most of what we knew about the world, we would have learned from media. Therefore, if we assume to be *us*, how do *we* know about climate change and what does it mean in our everyday lives? On the one hand, we cannot experience climate change with our own senses, as we experience single weather phenomena. On the other hand, according to our urban lifestyle, including an experienced distance from ecological processes and the technological means at our disposal, we might feel rather independent from (seasonal) climatic varieties such as temperature, precipitation or hours of daylight. That is to say, it might be plausible for *us* to think that *we* affect *our* climate rather than climate affecting *us*.

Now, imagine we were inhabitants of a small Cape Verdean island.[3] *We* would mainly make a living engaging in fishing or agriculture. Missing rain could destroy our crop and a severe storm could even decide upon our life, in case we misinterpret a weather situation and go to sea. *We* would thus feel strongly dependent on actual weather changes in our daily life. We would use any available source of knowledge to evaluate current weather situations. We would measure the sea current with our feet in the water, while waiting for our peers to share the current weather forecasts published via the internet. Periodic restricted energy resources and power failures would be as normal for us as seasonal alterations, including dry spells and rainfall periods. Given that we only had television at our disposal after the first moon landing and none of our compatriots were astronauts anyway, the mediated experience of the "Overview effect" would not have had any appreciable impact on us. In any case,

[2] Many astronauts report about a radical change of perspective on the Earth and humans' place on it due to the experience of having seen the planet in space with their own eyes (see Planetary Collective 2012).

[3] Many thanks to Jelena Adeli for providing me with her field observations from Cape Verde, upon which the following notions are based.

what we knew about the world from media would be limited to rather locally relevant issues. We would not have yet heard much about global warming. Nevertheless, shrinking fish stocks would be a serious problem for us, although we would primarily blame the international trawlers we usually observed off the coast for snatching our good catches away. Coastal erosion would also be threatening our livelihood, although we would assess this as merely being a home-made problem. It would be obvious for us to relate coastal erosion with the massive digging of sand, which has recently been used as construction material, particularly in the growing tourism sites of Cape Verde. After all, the idea of humans affecting the course of nature and causing climatic alterations would be rather incompatible, as much with our daily experiences as with our deep faith in divine justice.

The contrastive juxtaposition of the (assumed) experiences of environmental changes in two considerably different local contexts points to the limited connectivity of the 'travelling-through-cultures-idea' of climate change. But how do climatic changes become at all relevant in our everyday lives? In terms of making sense of abstract phenomena such as global climate change in ordinary life, there are two points of reference that I wish to briefly touch upon: first, weather; and second, as indicated above, media systems.

7.2.1 What Is the Weather Like (in Times of Global Climate Change)?

While weather refers to the current and local state of the atmosphere, including the day-to-day temperature and precipitation activity, climate, as well as climate change, denotes much more complex correlations between average atmospheric conditions stretching over space and time. The phenomenological features of the current weather are sensible, observable and talkable. Indeed, weather is a basic yet permanently shifting constituent of our locally grounded life-worlds, which makes it a suitable topic of small talk in almost any encounter. Weather is a rewarding issue in encounters on the move or states of transition between one and another activity. It serves to end awkward lulls in conversations, as much as sailing around sensible issues, although it similarly works as a source for relational talk (Coupland and Ylänne-McEwen 2000). Put briefly, whether or not we like a certain state of the atmosphere, talking about the weather helps to resolve many interactional problems.

However, as far as global climate change is concerned, weather turns from a "phatic resource […] filling out those moments in social interaction when people are 'avoiding other problems'" (see p. 163 in Coupland and Ylänne-McEwen 2000) into the problem itself. In contrast to weather, climate, and particularly climate change, is not sensible as it denotes aggregated average values. The meaning of climate and climate change at best can be experienced by humans in everyday life as "the weather phenomena at large at their place of residence" (see p. 17 in Stehr and von Storch 1999; *own translation*). However, individual and socially shared memories of the local weather at large might significantly differ from meteorological recordings.

Fig. 7.1 "Future of global warming" (Branco 2013)

"Typical weather" (see p. 17 in Stehr and von Storch 1999; *own translation*) serves as a rule, especially in situations of sudden or severe irregularities. An extremely cold or long-lasting winter, unseasonable storms or exceptional amount of rainfall are phenomena that shape the respective perceptions of 'normal' weather and climatic changes much more than average temperatures or precipitations. In everyday life, these exceptional weather phenomena in relation to 'normal' weather are manifest references for the local appropriation of abstract knowledge about global climate change. This is what we often do in small talk situations, explaining why 'climate sceptics' can take it for granted that we get the joke in Fig. 7.1.

7.2.2 Performing Globality: 'Weather and Climate Talk' in Media Systems

Given that knowledge about the causes and effects of climate change has to be transmitted through means other than sensual perception, media and news agencies play a particularly important role at the interface between climate change-related concerns in science, politics and (recipients') life-worlds. Indeed, mass media coverage of climate change-related issues has been growing in many countries across the world over the last decade, simultaneously corresponding to significantly increasing political and scientific concerns about global warming (Neverla and Schäfer 2012).

However, mass media do not merely 'transmit' scientific knowledge or 'report' about political issues; rather, they construct a particular body of knowledge about climate change that ties in with everyday practices of weather talk in times of climate change, yet combine them with "own rules for treating subjects, attracting attention and eventually construct a media specific shape of reality" (see p. 9 in Neverla and Schäfer 2010). Similar to everyday conversations, newscasts also show a marked preference for irregular weather phenomena around the world, such as extreme weather events, floods, storms and unusually heat or cold snaps. These are often explained as being caused by climate change. Moreover, scientific knowledge about global warming is likely to be illustrated with extreme weather events. Therefore, climate change can be easily depicted as a global phenomenon by means of comparing images and stories about meteorological events across time and space. In this way, climate change becomes a plausible global phenomenon. As a result, by employing a specific set of functional rules, global media systems substantially contribute to an intuitively plausible yet delusive concept of weather and climate change relationship.

At the same time, global climate change has emerged as a suitable issue for demonstrating the global reach of media systems. However, the media coverage of global climate change is not global at all, with spots on the world map where climate change is rarely a mentionable issue in public discourse. Although media in the digital age are deemed as potentially global, there are significant differences regarding the actual coverage of particular media systems, which in turn distinguish global news agencies from those operating on a rather regional or local level. Eskjaer's (2009) comparative study of regional news systems in Denmark, Jordan and Lebanon points to a highly unequal distribution of climate change-related news coverage in different regions, which can be partly explained by unequal distributed financial resources of the news systems, but at the same time reflects regionally differing focal points in public discourse. "Whereas climate change is a topic of public debate and political dissent in the Danish newspaper, in the Middle Eastern it is treated as part of international politics, with almost no public engagement in the matter" (see p. 364 in Eskjaer 2009). In other words, while climate change has become a domestic affair in some communities, in others it largely remains a concern 'elsewhere.' This impression is reinforced by data gathered in the course of the *Climate Worlds*' research. In general, the media environments in San Francisco and Tokyo are much more comprehensive compared to Ameland, Churchill and Cape Verde. For Churchillians, newspapers have in fact not represented a convenient source for getting the latest news. The only newspaper available in town, the *Winnipeg Free Press*, tends to be delivered irregularly and with a delay of some days. Today, most people keep themselves up-to-date via online versions of the *Winnipeg Free Press* and the Canadian news portal *CBC*. Indeed, the most important news source has proved to be the social network site *Facebook*. Several "Churchill groups" have been launched by participants actually living in Churchill or in some way belonging to the town in order to exchange news and information. The group members gather pieces of political, economic, social or cultural news from different sources and share them via *Facebook*. However, most of this information circles around the town's fate. Despite the potentially global distribution of the participants

and sources of information, this media system has a rather local focus. In a similar vein, the media's focal points in Ameland and Cape Verde also tend to prioritise local issues over international affairs or global concerns. This general tendency was also confirmed by the team members' observations regarding media attention on two climate summits (Cancun and Durban). In respect of both events, news coverage was distinctively more comprehensive in the metropolitan field sites. The apparent lack of interest of the Cape Verdean media agencies even prompted the *United Nations Development Programme* (*UNDP*) to arrange a workshop on climate change issues, aiming to sensitise Cape Verdean journalists regarding climate change concerns.

7.3 How Do We Know Whether or What *Others* (Should) Know about Climate Change?

So far, we have identified a strong relationship between people's local environment (and its socio-cultural framing) and their concerns for global environmental problems, which is partly reflected in regional asymmetries regarding media and news coverage on climate change. What does this mean for the study of social and cultural implications of climate change? It is an ageing truth in social sciences that any situation is defined by its participants and that they act upon this very perception of reality.[4] Alfred Schütz (1953) argues in a similar vein, pointing to a fundamental distinction between physical and social facts, which entails highly different research subjects for the natural and the social sciences. According to Schütz, the natural sciences' objects of study are constructs of the first degree, because "the facts, data, and events with which the natural scientist has to deal are just facts, data, and events within his observational field, but this field does not mean anything to the molecules, atoms, and electrons therein" (see p. 5 in Schütz 1953). By contrast, the research world of social science is a world that has already been interpreted,

> thus, the constructs used by the social scientist are, so to speak, constructs of the second degree, namely constructs of the constructs made by the actors on the social scene, whose behaviour the scientist observes and tries to explain in accordance with the procedural rules of his science. (see p. 6 in Schütz 1953)

Despite working in the same field of research, social and natural climate researchers technically depart from very different layers of reality, with natural sciences being dedicated to the *physical* and social sciences to the *social* facts of global warming.

[4] The so-called "Thomas theorem" was first formulated by W.I. Thomas and D.S. Thomas in 1928 in the realm of childs' behaviour studies. The authors point out that "the subject's view of the situation, how he regards it, may be the most important element for interpretation. For his immediate behaviour is closely related to his definition of the situation, which may be in terms of objective reality or in terms of a subjective appreciation—'as if' it were so. […] If men define situations as real, they are real in their consequences" (see p. 572 in Thomas and Thomas 1928).

However, social climate change research, insofar as being primarily concerned with societies' resources and strategies for mitigating and adapting to the effects of global warming, does not even differentiate conceptually between the physical and social facts of climate change. As a result, it proves very difficult to handle empirical situations where local perceptions do not coincide with our expectations, which we mostly base on natural scientific knowledge about global warming. What is even worse, this lack of reflexive distance to the object of study suggests linking up with a problematic tradition of social research. Joachim Matthes (1992) criticised common modes of social scientific comparison within the modernisation paradigm, which, according to the author, were better defined as "nostrification," meaning the appropriation of the others' perspective by means of one's own set of cultural references (see p. 84 in Matthes 1992). The author argues

> that many social scientific research initiatives while investigating social phenomena in different places (or in different times) in a comparative manner, apply a benchmark, be it explicit or not, to distinguish whole societies or smaller social figurations according to their 'stage of development'. (see p. 82 in Matthes 1992; *own translation*)

According to Matthes, the social-scientific practice of comparison within the modernisation paradigm is oriented on a hierarchy of development, wherein western European societies occupy the top position. Thus, one's own society is taken to be the abstract model of "modern society" with which other forms of societies are compared, the characteristics of which are, notwithstanding, at the same time taken to form the very criteria of the comparison. Put differently, there is no *third*, in terms of an abstract entity of comparison, in relation to which one unit could be compared on an equal footing with another; rather, one of the two is declared the *tertium comparationis*.

Yet, there is one significant difference between comparative studies in social and cultural climate change research and the modes of comparison within the modernisation paradigm. The theory of modernisation is a sociological abstraction that attempts to universalise western European's own social-historical experience and constructs its own measure of comparison. By contrast, by adopting the concept of climate change, social and cultural climate change researchers take on a natural-scientific construction of the first order. Rather than seeking to perceive the world from 'natives'[5] (multiple) points of view, *we*, by distributing knowledge about global climate change, try to make us and our research subjects comprehend the

[5] I entirely agree with Kirsten Hastrup (Chap. 8, in this volume) that "native" is a highly problematic notion, because it adheres to the imagination of culture in terms of territorial bounded and homogeneous units, which are treated as being rather immutable, that is to say fixed in time and space (Abu-Lughod 1991). I suggest the ethnomethodological reading of the term "member" and its underlying notion of culture to be a more suitable tool for approaching the subjects in contemporary ethnographies. Put in Paul Ten Have's words: "The notion of 'member' refers to capacities or competencies that people have as members of society; capacities to speak, to know, to understand, to act in ways that are sensible in that society and in the situations in which they find themselves" (see p. 17 in Ten Have 2002). This fits very well with ethnography's interest in studying culture as an assemblage of practices, signs, things and values, and help to question clear-cut boundaries between *we* and *others*, including the ethnographer.

world in natural-scientific terms, which, notwithstanding, are based on a particular culturally framed concept of human-environment-relations. In the shape of adaption or action research, which solely concentrates on the question of how people in particular affected places deal with the impacts of global warming or seek to disseminate scientific knowledge about the matter, social and cultural climate change research above all contributes to the universalisation of one particular mode of conceiving the world and humans' place in it.

Gabriele Cappai points out that "cross-cultural comparison remains a naïve social science method, as long as the authority over the *tertium comparationis* is not put in question" (see p. 23 in Cappai 2010; *own translation*). Therefore, how can a suitable 'third' of comparison be found that does not confuse physical with social facts of climate change and hence avoid "nostrifying" (Matthes 1992) the 'other' by explaining socio-environmental processes per se within the 'climate change paradigm'? Moreover, how can we shift the authority of defining the *tertium comparationis* from the researcher towards the research field, following Matthes' advice that "in establishing cultural alterity the act of comparing is a reciprocal matter and therefore it's [scientific] reflection has to adhere to this reciprocity" (see p. 95 in Matthes 1992; *own translation*)? Taking the example of *Climate Worlds*, the remainder of this chapter explores the potentials of ethnography for cross-cultural comparative research concerning global phenomena such as climate change. Prior to discussing the problems faced during the research process and how we responded to them, I briefly introduce the methodological framework of the junior research group.

7.4 Refracting the Global: Multi-Siting and Cross-Linking 'Climate Cultures'

Since June 2010, the *Climate Worlds* research team has been studying coastal communities with respect to their modes of perceiving current environmental changes, how they interpret and cope with such changes and whether 'global climate change' has taken root as a frame of interpretation in these communities. *Climate Worlds* aims at understanding culture-specific bodies of practical (not only cognitive) knowledge of interpreting and dealing with the social implications of climate change. Hence, the methodological concept provides for long-term ethnographic fieldwork (approximately 20 months) in combination with a strong focus on video recording. An electronic network, including regular audio conferences and a shared video blog, supported communication between the geographically dispersed fellows during their fieldwork. The group was assembled during a 6-month qualifying workshop, while a 6-week interim analysis workshop intermitted the field research, forming the transition between the explorative and focused stages of fieldwork. In accordance with the "unique adequacy requirement" (Garfinkel and Wieder 1992) formulated by ethnomethodology's founder Harold Garfinkel, the project's methodological concept was developed alongside the

research process. The team members' studies are located at different sites around the globe, all of which are assumingly threatened or have already been affected by rising sea levels and/or global warming. In Tokyo and San Francisco, two of the young researchers projected exploring the ways in which societies with different cultural backgrounds perceive and cope with rising sea levels in metropolitan environments. By contrast, the researchers working in Ameland, Cape Verde and Churchill/Hudson Bay sought to investigate culturally specific ways in which small and remote communities that are economically and culturally close to the sea perceive and handle the consequences of climate change.[6] The entire research team agreed to jointly follow climate change-related local discourses in order to identify how and by which social actors and institutions knowledge about global climate change is constructed and disseminated. Spread over the continents, we suggested these studies to form a 'global ethnography' in the shape of a 'teleidoskop,' in which a central topos of climate change discourse is refracted in a number of local interpretations. In this respect, our point of departure was, as a matter of course, the *physical facticity* of climate change.

7.4.1 Going Native: From Climate Change Perceptions to Weather-Talk and Human-Environment Relations

This is how we started in June 2010. Subsequently, the team members stayed in their sites of research for quite a long time, establishing themselves in the fields and attempting to find adequate, i.e. socially recognised positions (carefully observing and documenting their interactions with the field[7]) that would enable them to engage with the local population, participate in their everyday life, learn their language, practices and rituals and little-by-little assume the emic cultural patterns of interpretation of climate change-related issues. Along the way, they wrote down and video recorded whatever they experienced in great detail. These observations and recordings formed the empirical basis of our regular virtual discussions during fieldwork. Therefore, we maintained a video blog, which was used as a kind of joint field diary. In this electronic platform, the fellows regularly posted a synopsis of their current impressions, findings or problems they wanted to discuss with the group. In addition, we met once a week for synchronous communication. We used these meetings for discussing current concerns of the team members, as well as joint analyses of data and discussions of relevant literature. By doing so, we attempted

[6] Since August 2012, all fellows are back from fieldwork and have been writing their individual PhD-thesis, apart from one (the San Francisco-study) who abandoned the project at an early stage due to a lack of funds.

[7] The *Climate Worlds* methodology includes methods for analysing the process of becoming a member. This ethnomethodological principle is discussed and exemplified in Greschke (2012).

to support the proceeding of the members' individual PhD-theses, as well as identifying common issues for cross-cultural comparison as an essential part of the overall framework of the *Climate Worlds* research programme.

Yet, during our virtual discussions, we soon realised that things were turning out quite differently from what we initially thought. In most of the research fields, problems other than climate change loomed much larger in people's everyday lives. Apart from Churchill, a town economically dependent on the endangered polar bear—the icon of global warming that attracts thousands of tourists each year—climate change turned out not to be the most prominent topic of public interest in most areas. Moreover, even in Churchill, the issue of climate change seemed much less pronounced the more deeply the researcher became involved with the field. Behind the scenes, a profound scepticism prevailed concerning the insights and the presence of natural scientists, who worry too much about melting ice and vanishing polar bears. The fellow in Cape Verde was fairly surprised when she realised that climate change was not a public issue at all. By contrast, the concept "climate change" seems to be well known on the Dutch island of Ameland, although locals mainly associate the term with external actors trying to implement—as the islanders tend to think—questionable political changes in spatial planning or defining parts of the island as a laboratory for climate change-related simulations (see also Krauss, Chap. 4, this volume). We learned from more than one site that climate change issues were quite prominent in expert discourses, whereas lay people relying on their own perceptions of their local environments tend to display certain distance (if not even distrust) to such official discourses. On the contrary, a high consciousness of climatic changes and how to prevent these through altering one's habits has been growing in Tokyo in recent years. However, social values have drastically changed after the earthquake on 11th March 2011 and the subsequent nuclear meltdown in Fukushima. Explicit discourse about climate change retreated into the background, while questions of energy saving and alternative sources of energy came to dominate environmental debates.

Not that these findings would have worried us. So much all of us already knew about ethnography that we assumed ourselves to be on the right track into the fields, leaving behind our culturally framed assumptions and taken-for-granted interpretations about climate change. Nevertheless, without the help of our own modes of understanding the matter, the researchers in the fields had to tackle the difficulty of observing perceptions and interpretations of a phenomenon, which is not directly sensible. We were faced with the challenge of distancing ourselves from our own internalised interpretation frame, whilst attempting to be open to local frames of interpretation. In addition, we had to find a 'third' comparative entity, one that would help us to avoid 'nostrifying' the 'other' and instead enable a cultural comparison in the sense that these different places examined and the themes that are socially relevant there could be related in a meaningful way.

7.4.2 *Searching for the 'Third.' Cross-Cultural Comparison Through Visualising and Cross-Linking Local Perspectives*

More recent ethnographers such as Niewöhner and Scheffer (2010) have ascertained that comparability in ethnographic fields is not a given or self-evident matter; rather, it has to be established during the research process. These authors emphasise that a meaningful comparison is only possible if the entities involved in the comparison are related to one another in their local context. Hence, we began to search for more basic concepts that would possibly serve as vehicles for climate change-related issues. We started most fundamentally with weather talk and weather-related actions, attempting to explore how people relate to weather in the respective fields and whether there was any connection with observations of environmental changes. Inspired by the work of Coupland and Ylänne-McEwen (2000), we examined if weather figured in small talk at all and what other meanings were attributed to weather in specific cultural settings. We further examined situated practices of forecasting weather. It turned out that people in every field site gather information from all available sources, including their own senses, experiences of interpreting weather signs, and weather forecasts from different media (radio, TV, internet), thereby integrating different levels and types of knowledge; thus reinforcing the assumption that situated knowledge practices in everyday life are not merely local, but rather inherently hybrid (see also Hastrup, Chap. 8, this volume).

Strauss and Orlove (2003) emphasise that the ways in which weather and climate are experienced very much depends on culture-specific time frames. As the authors point out, the natural scientific distinction between short-term weather events and long-term climate patterns, although counting for the dominant mode of structuring meteorological phenomena, does not encompass the multitude of

> social and cultural forms [which] also shape the ways that these phenomena are perceived, recalled, and anticipated. In concrete settings around the world, people experience, discuss, and interpret meteorological phenomena in ways that are dependent not only on the physical characteristics of the events, but also on the cultural frameworks that divide time into current, recent, and distant periods. (see p. 6 in Strauss and Orlove 2003)

Inspired by their work, we compared meanings of seasonality in the different field sites, learning that seasonality has become a double meaning in tourism-intensive sites such as Ameland and Churchill. Rather than simply denoting changes of weather, ecology and hours of daylight, the seasonal circle of the year is determined by the presence and absence of tourists, having a strong impact on social life and senses of belonging in these sites.

The close and intensive image-based teamwork has also proved helpful for the development of a cross-linked mode of cultural comparison. The use of video cameras considerably supported our teamwork as a source of visual context information, which compensates for the constraints of computer supported collaboration; moreover, and most notably, video data from several field sites created a shared frame for interpretation for the whole *Climate Worlds* team. Each

researcher could later analyse this material and crosscheck on his or her previous interpretations. Furthermore, the team as a whole was able to discover some unexpected common ground or dissimilarities among their respective video data collections, which might have been lost in the narrative structure of a written account. Finally, we based a film project on the video data from the different field sites, in order to exemplify our methodological approach with audio-visual means (Greschke and Diaz 2012[8]).

7.5 Who Are the *We's* in Times of Global Climate Change? Notions of Belonging from a Cross-Linked Ethnographic Perspective

In my last move, I return to the initial question of this chapter, which now has to be extended in order to embrace different and possibly conflicting notions of *we*. I will now illustrate some findings of our cross-linked comparative analysis, seeking to answer the question of in which ways climate change stimulates the emergence of new and the altering of existing patterns of belonging.

By means of comparative analysis of the data gathered in the respective sites, we learned in the first place that the differences and similarities we identified did not necessarily coincide with 'nationally' or 'ethnically' territorially bounded units. Whereas comparing along the lines of what is generally called ethnic-national culture proved to be of little value, we found striking differences between urban and rural life-worlds, as well as quite distinct notions and practices (e.g. of environment/environmental change, practices of forecasting weather, the social meaning of certain species) existing in parallel at one site. The differences are rather related to specific professional cultures or social positions. On the other hand, those notions and practices that are specific to some groups of actors seem to be alike in most of the studied fields. For instance, occupational groups with a close relation to the sea figure in most of the field sites, conceiving the sea in terms of economic resources (i.e. fishing, tourism services) or as a space of recreation and/or adventure (i.e. tourists). Furthermore, ecologist groups who bring forward notions of nature, environment or animal protection against human ways of life play a major role in all research fields. Looking carefully across different field sites, we were able to identify very similar conflicts in Ameland, the Cape Verdean island of Boa Vista and Churchill. In Ameland, the very notion of coast is at stake. While scientists treat parts of the coast as a natural laboratory for research on the rising sea level,[9] a coalition of climate change-related political and science actors aims to implement novel forms of dynamic coast protection. In turn, this has been met with resistance

[8] The film is accessible online at: www.uni-giessen.de/fbz/faculties/zmi/projects/climate-change

[9] Due to offshore gas production near the island, the grounds in some parts of Ameland sink faster, which is appreciated by scientists to be treated as a natural simulation of the rising sea level.

by the inhabitants, who expect negative impacts for the local economy, which is mainly based on bathing tourism. At the same time, local tourism agents are at odds with environmentalist groups about the appropriate concept of beach. Whereas the former hold fast to the traditional concept of a bathing beach, the latter campaign for a transformation into a bird sanctuary. In the Cape Verdean Island of Boa Vista, bathing tourism has recently been primarily developed by transnationally operating tourism agencies. However, in one of the beaches, they encountered members of a transnational organisation of animal rights activists, who have been establishing themselves with the help of the Cape Verdean army in order to protect hatcheries of the endangered sea turtle against local hunting practices. In other words, it is not only access to and the appropriate treatment of certain coastal areas that has to be re-negotiated between different groups of actors in Cape Verde, but also the value of a certain species. As we see in Claudia Grill's Chap. 6 in this volume, the conflict in Churchill also concentrates on a symbolically charged animal, upon which very different needs, experiences and worldviews are juxtaposed.

In these conflicts, it is primarily groups of actors operating on a global scale, such as environmentalists, scientists, politicians, tourists and tourism agencies, representatives of global governmental or news organisations, who bring global climate change concerns into play. They share an interaction with the environment as well as a conception of human-environment relations, both of which are not tied to a particular place or locality. Quite the contrary, they refer to a particular object, such as an 'endangered species' or a 'paradisiacal beach,' which is symbolically charged and globalised, that is to say, detached from local contexts. In this way, they contribute to the emergence of highly mobile contexts of belonging, which may arise now, here and elsewhere, but seem to be rooted in a virtual nowhere.

In terms of studying contexts of belonging, Mecheril suggests the differentiation between three dimensions for analytical purposes. He defines contexts of belonging as

> empirical approaches to ideal typical interrelations, in which each individual can experience him or herself as an equal among equals (dimension: membership), wherein they develop and apply the power to act (dimension: agency) and, finally, with which they can be affiliated (dimension: solidarity). (see p. 234 in Mecheril and Hoffarth 2004; *own translation*)

While stimulating the emergence of global contexts of belonging for some groups of actors, from locals' perspective global climate change turns into an imported product by means of which locally valid practices and norms are questioned. As a result, in particular places where tourists, scientists and/or environmentalists appropriate (moral) entitlements for interpreting meteorological phenomena, human-animal relations or the 'right' treatment of the environment, the permanent (locally attached) inhabitants might rather associate exclusion, domination and rivalry with climate change than the experience of membership, agency and solidarity. Travelling in this way, the social facts of global warming, in brief, are more likely to be perceived as a threat to one's own context of cultural and social belonging than to the future of the planet and human civilisation at large.

7.6 Summary

In this chapter, I have queried the prospects of climate change for becoming a globally shared issue of concern, paying particular attention to the role of social and cultural sciences. I have illuminated the socio-cultural prerequisites and limits of being or not being included in a climate change-related global notion of *we*. I have argued against an equation of physical and social facts of climate change and the disciplinary self-limitation to the study of mitigation and adaption strategies. In this regard, I have highlighted the parallels between the current shape of climate change-related social and cultural studies and the research tradition within the modernisation paradigm. Similar to modernisation theory, climate change comprises a worldview that embraces the entire globe not only in spatial, but also temporal, terms. The notion of 'Anthropocene' quite clearly reflects how climate change re-arranges the role of humankind in the socio-ecological world history. Humans are not only considered responsible for current environmental changes but also capable of controlling the environment. This worldview connects to particular generations, lifestyles and experiences of self-efficacy, which are assumed to be not restricted to, but mainly represented in, metropolitan, industrialised and technologised contexts. Drawing on the collaborative work of *Climate Worlds*, I have highlighted the potentials of contemporary ethnography for contributing to an understanding of how and why a natural-scientific concept such as 'climate change' is compatible with locally grounded interpretation patterns or not. Ethnography provides valuable tools for exploring a diversity of knowledge, everyday perspectives and experiences and relating them to one another. Rather than assisting the universalisation of one particular worldview that privileges some groups of actors while continuing experiences of exclusion and domination for others, the virtue of ethnography for studying climate change lies in its capacity to uncover the many facets and asymmetries, the contradictoriness as well as the potential for conflicts—all of which are connected to the social facts of global climate change.

The story of social and cultural scientists and their relationship to climate change research may be seen in joining an anthropocentric adventure built upon shrouded conflicts or in exploring the mysteries of humankind's contradicting relationships to the earth. The choice is ours.

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Chapter 8
Comparing Climate Worlds: Theorising across Ethnographic Fields

Kirsten Hastrup

Abstract In this chapter, I discuss the issue of comparison as a road towards new climate knowledge. A point of departure is the notion of a *knowledge space*, as suggested by David Turnbull. When working with social responses to climate change, such knowledge spaces present themselves as apt analytical objects being both located and transcendent. This renders the unfolding of a particular kind of comparison possible, with special reference to *exemplars*, understood in Kuhn's sense as shared examples of puzzle solutions, identified tacitly rather than explicitly. The idea is to demonstrate how 'climate worlds' can be seen as comparable spaces of particular puzzle solutions, allowing for new forms of theorising.

8.1 Introduction

It has recently been suggested that we look at knowledge as "a complex ecosystem that is a *commons*—a resource shared by a group of people that is subject to social dilemmas" (see p. 3 in Hess and Ostrom 2006). In an important way, the idea of a knowledge commons posits all knowledge as equal and potentially shared and benefitting the many. While there are evidently many distinct knowledge making traditions, known for instance as physics, philosophy, and anthropology, there are also some issues and puzzles shared by all of them. In order to identify the commonalities of differently framed knowledge traditions we naturally must conduct some kind of comparative analysis, essentially a method "to

In this chapter, "climate worlds" do not refer to the collaborative research project based at Bielefeld University (see Heike Greschke's Chap. 7, this volume), but rather to the idea that the anthropological concern with 'climate' in itself co-configures the object of study, as will be elaborated in the course of the argument.

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make sense of differences, not to collapse them" (see p. 286 in Strathern 1987). Indeed, this applies for comparison in general.

The idea of knowledge as a commons is just one instance of a burgeoning interest in knowledge making, testifying to the major success of science studies, including various sociologies of knowledge and philosophies of science over the past decades. The wave has also hit anthropology, with the implicitly reflexive methodologies having recently been more explicitly probed (Hastrup 2004; Marchand 2010). Along with this, a sustained interest has been established in the anthropology of science (e.g. Edwards et al. 2007). Both of these trends have contributed to an increasing uneasiness about previous notions of local knowledge being opposed to and radically different from scientific knowledge—an implicit comparison, if there ever was any, yet one that now seems consigned to the past.

My take on comparison in anthropology in this chapter is premised by my work on the social implications of climate change, as framed by the project *Waterworlds*, aiming at shedding light on the question of how people across the globe respond to new environmental uncertainties.[1] Evidently, people respond differently due to their widely varying circumstances, prompting the general question of how we can generate genuinely new, general knowledge on the basis of particularities. Put briefly, in *Waterworlds* we have found that although we each have our field, analytical and theoretical work has been unusually productive due to the implicit comparison to which we have been exposed on a daily basis. We have come to realise that High Arctic hunters have much in common with Pacific Islanders and Andean highland peasants when it comes to thinking about climate change and anticipating their own futures. In this chapter, I shall seek to unpack this experience and its general implications.

To compare is to make sense of differences, not to collapse them, as Marilyn Strathern stated (1987). However, differentiation itself presupposes a sense of commonality, an analytical point of view allowing difference to be something other than simply variety or diversity. With reference to the conjunction between anthropology and climate change, it is productive to identify this commonality as a shared 'knowledge space,' in the sense suggested by David Turnbull, as an "interactive, contingent assemblage of space and knowledge, sustained and created by social labour" (see p. 4 in Turnbull 2003). While this will be further discussed, it is important to state from the outset that comparison always hinges on a third point of presumed similarity at some level or another.

In the following, I am intent on discussing how otherwise disparate 'problems' of climate change—such as melting sea-ice, rising seas, or disappearing glaciers—can also be seen as somehow alike and therefore susceptible to comparison, with

[1] *Waterworlds* is a collaborative research project at the University of Copenhagen, studying the social responses to climate change. It is financed by an *ERC (European Research Council)* Advanced Grant and has run for 5 years, 2009–2013 (inclusive). Fifteen researchers have been affiliated with the project, between them covering many hotspots of climate change, ranging from the Arctic to the Pacific and from east to west. I would like to express my deep gratitude to the *ERC* for trusting me with such possibility for collaborative work, as well as my colleagues for taking it upon themselves.

respect to making sense of differences rather than collapsing them. First, I shall further develop the concept of knowledge space and introduce the idea of comparison through exemplars. Second, I shall discuss the ways in which the anthropological practice itself creates the places that are subsequently objectified as particular spaces for comparison. Third, I shall explore the comparison of climate worlds as a means to obtain general knowledge from particular ethnographies; knowledge that transcends the local without claiming to be universal. In the conclusion, I shall return to the notion of knowledge spaces as vehicles for comparison.

8.2 Knowledge Spaces: Comparison by Exemplars

While the brief definition of a knowledge space provided above clearly does not exhaust its constituents, it does point us in a very important direction from the outset, namely towards the realisation that all knowledge is *located*. As Turnbull puts it:

> Though knowledge systems may differ in their epistemologies, methodologies, logics, cognitive structures or in their socio-economic contexts, a characteristic they all share is their localness. However, knowledge is not simply local it is located. It is both situated and situating. It has place and creates space. An assemblage is made up of linked sites, people and activities; in a very important and profound sense, the creation of an assemblage is the creation of a knowledge space. (see p. 19 in Turnbull 2003)

Turnbull's identification of a knowledge space as an assemblage stresses that knowledge links diverse phenomena, with this linkage defined as important from a particular (located) perspective.

Despite their being thus assembled, knowledge spaces quickly adopt a kind of naturalness that belies their motley character, while also tending to obscure the fact of their being resulting from social practices and particular interests. There is no knowledge without people knowing, which is of course one reason for its locatedness, being altogether different from being local in the conventional sense of 'local knowledge' previously entertained by anthropologists. All knowledge, whether scientific or traditional technological knowledge, is located, and all knowledge spaces are better seen as fields of practices than as networks of statements (cf. Rouse on p. 10 in Turnbull 2003).

The general point is that the locatedness of knowledge production provides a solid point of departure for a comparison between ways in which people conceive and respond to the current challenge of climate change:

> If we allow that all knowledge systems, from no matter what culture or period, have spatiality and localness in common, many of the small but significant differences between knowledge traditions can be explained in terms of the differing kinds of work involved in creating 'assemblages' from the 'motley' of practices, instrumentation, theories and people. Some traditions move it and assemble it through art, ceremony and ritual, whilst science does it through forming disciplinary societies, building instruments, standardizing techniques and writing articles. (see p. 38 in Turnbull 2003)

Following Turnbull's idea of comparing the different kinds of *work* involved in creating all kinds of knowledge spaces implies a comparison not of wholes or objects, but rather of elements of work or practices by which they are established and become naturalised. At a general level, this could be exemplified by the development of anthropology. In the early days, anthropologists sought to identify cultures, linking sites, people and activities (the epitome of Turnbull's assemblage), comparing them *as such* while forgetting the role played by their own concepts, interests and methods. Today, we have realised that there is no way to compare cultures as if they were actual, bounded entities. By contrast, what we face is the challenge of comparing the ways in which particular spaces present themselves as relevant within a particular social or analytical framework. When discussing climate change as perceived in different regions, it is abundantly clear that *located* knowledge concerning development incorporates knowledge from elsewhere, including the natural sciences. The task of anthropology is to show how such potentially incongruent sources and knowledge practices fuse into a shared knowledge space, upon which people may act. In the process, traditional cosmologies may bend and twist, incorporating new national ideologies as well as scientific knowledge from many sources, as shown in a recent study of the implications of the melting glaciers in the Andes (Paerregaard 2013).

In developing this argument further, I would like to turn to Thomas Kuhn, the author of the immensely important book on scientific revolutions from 1967, which was actually an early statement about the social practices involved in the makings of scientific truths (1967). The operative word here is *truths*, without the adjective, because I believe that scientific reasoning is but one kind of human reasoning in general (Hastrup 2013a). While Kuhn suggested that the human and social sciences were not governed by paradigms in the way of the natural sciences—aiming at puzzle-solving and creating a space of 'normal science' to achieve it—he was adamant that all scientific endeavours were equal in defining their own framework and producing particular realities; for the ancient Greeks, the heaven was radically different from ours (see p. 220 in Kuhn 2000). In other words, there are no 'natural' categories in the sense of their being disinterested or a-historical (or a-cultural). In these terms, all sciences are alike; they differ in that the natural sciences are governed by a greater normativity and agreement about the relevant puzzles, according to Kuhn, while the human and social sciences are more diverse. In all sciences, knowledge is created and endorsed by the community. Thus, they are engaged in comparable activities of puzzle-solving and interpretation.

In my view, Kuhn's notion of *exemplar* is one of the concepts that clearly links different kinds of science in practice. Kuhn developed the concept in a postscript to the second edition of his book, explicitly addressing the many apparent misunderstandings of 'paradigm' as a fixed view of the world. By exemplar, Kuhn refers to the concrete problem-solutions that students encounter during their education, whether in laboratories or scientific texts (see p. 187 in Kuhn 1969). It is thus at base a methodological strategy rather than a particular theory, and the exemplar is often referred back to some ancestral figure. Just like students of physics will all meet Kepler, students of anthropology will all meet Malinowski. In the case of anthropology, we

implicitly understand what fieldwork is through Malinowski's exemplary work, even if our own field is far from the Trobriand Islands. In the process, we vicariously learn how even the most opaque meanings and obscure beliefs may eventually make sense in the long-term, provided the ethnographic attention is directed towards the natives' own views of the world (Malinowski 1922). Turnbull summed up Kuhn's exemplars as "shared examples of puzzle solutions [that] are based essentially on agreements about which kinds of problems are sufficiently similar as to be treated in the same way" (see p. 8 in Turnbull 2003).

In anthropology, long-term fieldwork has represented the great solution to puzzles of understanding the (conceptually) insubordinate lifeways of other people, deemed 'other' precisely because they had not yet been translated into a common language. Through a long tradition of fieldwork, anthropologists have shown how even the 'otherest' of societies are variants of a common human theme. After a century of fieldworks all over the globe, it has also been shown beyond doubt that all societies are constantly changing in response to inner drives as well as new environmental, historical or conceptual realities. In short, while in cultures were seen as self-contained and rather fixed in the early days, today we realise that all worldviews are plastic and continuously incorporating—and *locating*—knowledge coming from elsewhere, along with new patterns of weather and wind, for instance. It can be argued that such flexibility is an all-important element in social resilience in the age of global warming (Hastrup 2009).

While the world has changed, fieldwork remains the arch-anthropological method, of which Malinowski is still considered the founder and principal exponent (at least in the British tradition). While the world is changing, long-term fieldwork remains the over-all way towards anthropological knowledge. It is in the nature of exemplars that they receive more attention than other ways of puzzle-solving and will therefore become pivotal figures in the creation of a unified sense of knowledge community. While a universalist view of science would claim that a student cannot solve any problems unless he or she has first leaned the theory and some rules for applying it, Kuhn argued that such localisation of science in theories and laws is wrong (see p. 188 in Kuhn 1969). Indeed, it is only by addressing concrete problems that one can learn consequential things about nature. It is *doing* physics or anthropology that makes the world come to life, and it is by way of exemplars that students learn to see disparate problems or situations as similar and become able to find the right answer through comparative insight. The two elements, practice and shared references, install a tacit understanding of how one may approach the world and begin to understand it, which is collectively accepted and largely based in exemplars (ibid., p. 193).

We can see how exemplars become prominent if we want to address the different kinds of work that make up the assemblages of places, people and practices that constitute diverse knowledge spaces. In a significant way, fieldwork *made* cultures as such assemblages or self-contained knowledge spaces. When focusing on the 'exemplar' rather than 'normal science' (when talking about a particular paradigm), we move towards a performative understanding of knowledge making, where "acquiring a paradigm is more like acquiring and applying a skill than like understanding and believing

a statement" (see p. 30 in Rouse 1987). This again tallies well with the idea of the locatedness of knowledge on the one hand, and the social process of knowledge making being an integral part of the resulting knowledge on the other. I hasten to add that I share Tim Ingold's misgivings about the idea of knowledge *making*, implicitly suggesting that knowledge is somehow a construction erected on the basis of cognitive mechanisms and a clear sense of direction; it is much more like a growth based on improvisatory moves in a vast terrain of possibilities (see p. 122 in Ingold 2010).

Nonetheless, certain moves present themselves more forcefully than others within particular terrains, thanks to the exemplars or the 'learned similarity situations'; this applies equally to the knowledge practices of, say, fishermen and scientists. Therefore, these are apt starting points for comparison between knowledge spaces, as well as for understanding the implication of their locatedness. Both take us to the heart of the anthropological ambition to understand the worlding processes in which humans, as social agents, are always engaged (Tsing 2010). This also applies to scientists who are figuring their object of study in the process of researching it. In a less abstract sense, we can see how 'cultures' were constituted and became naturalised in the very process of being studied. Moreover, in the wake of climate change, now widely perceived as such across the globe, we also sense that such entities have become conspicuously perforated and the world reconfigured. One could argue that the scale of anthropological work has changed accordingly. 'Scale' here should be understood more in terms of particular perspectives than the relative size or distance of places, such as local and global, being always part of the same picture (Hastrup 2013d). Scaling itself is a practice, and anthropologists should pay heed to the scales that they invoke as relevant in order to take people's worlding processes seriously (see pp. 183–84 in Latour 2005).

Looking specifically at present day anthropology, we know very well that climate change affects the disparate corners of the world differently; for instance, in the form of sea-level rise or melting glaciers, but we also know that once 'climate change' is invoked, it is unbounded. The anthropological and the 'cultural' knowledge spaces both extend far beyond the immediate horizon; in fact, they are and must always be analogous because the 'worlds' that are configured in anthropology must answer to those configured by the people with whom one works in the field. In both cases, it is the nature of a particular concern that will scale the relevant whole. In studying climate change, there is no way to continue mistaking *located* knowledge for *local* knowledge. If knowledge were indeed strictly local, the possibilities for anticipating nature's course and acting upon it would be very limited indeed (Hastrup 2013a).

That this is not the case can be seen from fields that are wide apart; for instance, in the Pacific, people in the Cook Islands have been shown to incorporate knowledge about new cyclone patterns from a host of sources, blending them into a comprehensive view of the possible futures, fraught with internal frictions yet nevertheless providing some sort of unified horizon by which to navigate (Rubow 2013). Similarly, in the High Arctic, the hunters who experience the increasingly fragile sea-ice under their feet continue to hunt from the ice and refuse to pack in despite being well versant in the global climate scenarios for the Arctic, with their

own skills at reading the ice *in situ* still carrying them over the rough patches and dangerous cracks (Hastrup 2013b). It may be a matter of time before sledging and hunting on the ice for their livelihood become impossible, although the hunters will of course be the first to know when this time has come. Meanwhile, they trust their ability to combine relevant bits of knowledge from all over the place with their practical skills of manoeuvring.

Reasoning about climate change and the possible futures is a continuous process of combining different kinds of knowledge and bringing it to bear on the present challenges. In the burgeoning anthropological literature on social responses to climate change, it seems to be a general feature that actors use available exemplars to solve the puzzles presented, including scientific sources, reports from the *Intergovernmental Panel on Climate Change (IPCC)* and other versions of the truth that are processed by their own skills. Of course, this has major implications for our understanding of the anthropological object of study, which is not so much a particular location as it is a *field of concerns* that may outstretch the preconceived notion of place and scale once we embrace climate change. Indeed, it is to this issue that I shall now direct attention.

8.3 Anthropological Objects: The Entanglement of Place and Practice

In my second move, I shall explore the entanglement of places and epistemic practices in anthropology with a view towards a better understanding of the creation of objects for anthropological comparison. The point is that if knowledge spaces are produced in part through exemplars, we realise that the perception of these spaces as either incompatible or comparable relates less to empirical distinctions than perspective, and thus to epistemology. In the case of anthropology, the epistemic commitment has been to seek to understand the world *from within*, although this does not entail a unified view of a closed world. In fact, the 'view from within' has never stopped at a particular cultural boundary. In the present liquid times, this fact has become more conspicuous than ever (Bauman 2007).

'Climate' emerged as a modern scientific concept in the nineteenth century, and being primarily spatially or geographically defined (Heymann 2010), it linked up nicely with the anthropological interests at the time, regarding the ways in which different people or races were acclimatised or shaped by the surrounding airs, temperatures, landscapes, vegetation and much more that were seen to belong to climate (Hunt 1863). At the time, mankind was the central object of anthropological interest, rather than individual social communities, and the question posed by Hunt was whether all races were equally cosmopolitan, i.e. whether they could thrive equally in all climates. However, this was to change with the invention of fieldwork and the establishment of new exemplars centring the interest on social wholes, as I have argued above. The wholeness was to be increasingly mistaken for a bounded knowledge space that could be surveyed in its totality by the fieldworker.

Climate has now re-entered anthropology and made an unprecedented impact in many ways, including a rather strange return to a kind of holism (Hastrup 2013c). It has been argued that one of the reasons for this is "the irrevocable transformations that climate change is bringing to the peoples and places traditionally studied by anthropologists" (see p. 87 in Roncoli et al. 2009). A similar view is propounded by many other anthropologists, who have seen climate change as an outcome of western culture and a destroyer of traditional culture (e.g. Crate 2008), or—in a converse movement—indigenous discourse on climate change as counter-hegemonic to western science (Smith 2007). In both cases, a kind of uniformity and immutability of local, traditional knowledge is presumed, which overlooks the unbounded nature of knowledge in the first place, and of the ethnographic field in the next. This presumption is conspicuous in the following quote:

> To this challenge anthropology brings its core theoretical tenet: that culture frames the way people perceive, understand, experience, and respond to key elements of the worlds which they live in. This framing is grounded in systems of meanings and relationships that mediate human engagements with natural phenomena and processes. This framing is particularly relevant to the study of climate change, which entails movement away from a known past, through an altered present, and toward an uncertain future, since what is recalled, recognized, or envisaged rests on cultural models and values. Individual and collective adaptations are shaped by common ideas about what is believable, desirable, feasible, and acceptable . . . Anthropology's potential contributions to climate research are the description and analysis of these mediating layers of cultural meaning and social practice, which cannot be easily captured by methods of other disciplines, such as structured surveys and quantitative parameters. (see p. 87 in Roncoli et al. 2009)

What disturbs me in such (well-meaning) statements is that climate is no longer seen to *make* places but rather mostly to *destroy* them, with anthropologists called upon to mediate local understandings through their incomparable method of fieldwork. In a growing body of works, this view of cultures as threatened by climate change in so many ways testifies to the *longue durée* of the ethnographic mode of puzzle solving. While I am all for detailed ethnographic description of how people live in the world, I find it difficult to accept the dictum that 'culture' frames the way in which people perceive and respond to climate change; it is a survival of the idea of a unified 'native point of view' and an unproductive residue from an early twentieth century anthropology. Before, cultures figured as naturalised objects of comparison in anthropology, but the very minute that 'climate change' is invoked and studied, cultures are already perforated and the natural object unlimited. This is not new: all cultures—including western cultures, of course—are snapshots of long historical processes that freeze and frame what is at base an unending process of change, also in relation to shifting natures. While, evidently, the livelihoods of many people may be threatened, compelling anthropologists working with them to engage with the plights, I believe that casting this in terms of cultural loss may be counterproductive, quite apart from being an inadmissible confinement of people to particular and rather closed worlds.

Let me compare the present propensity of a culture-bound anthropology of climate change with the development in climatology. Until the mid-twentieth century, climate was principally a geographical term; it attached to and made *regions*, such

as the Arctic, where both people and places were defined by the icy embrace (Hastrup 2013g). Subsequently, it became transformed into a physical concept, linking atmospheric, oceanic and terrestrial processes; recently, human actions have been added and a new geological era seen light, conceptualised as the Anthropocene (Crutzen and Stoermer 2000; Ehkers and Kraft 2006). This new concept of climate is inherently global, dramatically intensifying our sense of 'planetary consciousness,' earlier identified as the outcome of the enlightenment (Pratt 1992). Anthropology, as portrayed in the long quote above (from Roncoli et al. 2009), runs the risk of turning its back to the possibility of offering a general knowledge about the Anthropocene, when casting people as mere victims and their practices of place so utterly circumscribed. It is not simply by adding up ethnographies that we contribute to the larger questions, but rather through our collaborations with people across the globe we may be able to tease out new general insight, all whilst creating new reflexive spaces of our own (cf. Ingold 2008). One possible contribution is precisely to show how different practices of place and perspectives on global climate change may *locate* climate change differently; this may also affect natural scientists, who still disagree about climate change and its consequences (Hulme 2009).

In my view, it is ironical that at a time when climate has become a truly global issue, a fair number of anthropologists retreat to *local* bastions of knowledge. While ethnographies are as important as ever, the very construction of cultures now threatened by climate change creates untenable boundaries in the world of climate and relegates our collaborators in the field to victims—and, I would argue, not only of climate but also of culture. It is all the more puzzling in light of the fact that 'climate change' now contributes to the dissolving of the nature-culture boundary, as well as the entangling of global climates and local weather. In Mike Hulme's words, climate has become cosmopolitan and as such frames the ways in which science and society are mutually constructing the phenomenon of climate change (Hulme 2010). We may have come a long way from Hunt's cosmopolitan people to Hulme's cosmopolitan climate, yet we are back at the co-constitution of natural and social phenomena (Hastrup 2013e).

Studying diverse climate worlds at present makes us realise that in the many particular dealings with more-or-less dramatic changes, what we may compare are not local worldviews, but rather particular ways of incorporating scientific knowledge into the located understandings of what is happening, for instance. This provides interesting general knowledge of how particular places (islands or highlands, coasts or deserts) infiltrate and contribute to particular knowledge spaces. Equally beyond the local are widely shared concerns about the possibilities of continued habitation on the island, by the fjord, on the Sahelian fringe, or in particular Andean watersheds—to mention some of the studies in *Waterworlds*. The general point is that the 'global' is part of the 'local' and vice versa. With climate change on anybody's doorstep, places are constituted (at least in part) by concerns that outstretch locality.

In anthropology, the configurations of weather and climate are co-productive of the places studied, whether seen as cosmopolitan spaces shared by the many and

opening up new creative possibilities, or as closed cultures reserved for the few and seen to be under siege by external forces. These places may be named and marked on completely different scales, but they are always the result of emerging stories, accidental encounters and movements along lines of promise. As Doreen Massey states:

> What is special about place is precisely that throwntogetherness, the unavoidable challenge of negotiating the here-and-now (itself drawing on a history and a geography of thens and theres); and a negotiation that must take place between both human and non-human. (see p. 140 in Massey 2005)

One could claim that place itself is an event of configuration. It is "the coming together of the previously unrelated, a constellation of processes rather than a thing. This is place as open and multiple. Not capturable as a slice through time in the sense of an essential section. Not intrinsically coherent" (ibid., p. 141). Places are thus intrinsically elusive, which reflects one good reason for focusing on knowledge spaces as key-anthropological objects rather than particular geographical localities. While people continue to live and breathe in particular weatherworlds (Ingold 2007), today most of them (us) are perfectly aware that some of the unprecedented weather events originate in destabilised planetary conditions.

8.4 Climate Worlds: Sites for Theorising Climate

In this third section, I shall take a closer view of climate worlds, i.e. lived social spaces as sites of theorising climate in their own right. However, before I exemplify this, let me begin by stating my agreement with Holbraad and Pedersen, who in their meta-comparative ethnography of "Planet M" suggest that things "act as their own scales" (2009, p. 375), in my case meaning that the 'thing' of climate is what scales and implicitly compares the worlds I am after here.

An example is provided by Julie Cruikshank, who has worked on the ways in which glaciers figure in Alaskan oral tradition; moreover, she has also traced the history of exploration and shown how "ethnographic, scientific, and historical literature from northwestern America provides an intriguing narrative of how exploration and science went hand in hand and how canonical, historical and scientific knowledge emerged here during two centuries" (see p. 380 in Cruikshank 2001). Her admirable work demonstrates a high degree of convergence between the observations of scientists and indigenous residents, with both parties speaking figuratively of memory and sedimentation, even if they express these concepts differently. Memories of the Little Ice Age "play a significant role in indigenous oral traditions, and—like stories of geo-physical processes—they are 'sedimented' on land" (ibid.). By comparing the different ways in which the passing scientists and permanent dwellers have perceived the glaciers and read their stories, Cruikshank challenges the opposition between science and local knowledge, so firmly established in Arctic anthropology and elsewhere, in suggesting that the mutual stereotypes share similarities (ibid., p. 390).

There is space for a 'sentient landscape' in both, and the codification of traditional ecological knowledge as something totally apart from natural science paradoxically tends to reinforce the dualism between nature and culture, she suggests (ibid.). As I know from my own work in the Arctic, there is no way in which people would rather close themselves off from certain kinds of knowledge than seek it out; thus, while in practice they still depend on their own careful reading of the sea-ice when they go out hunting, they take every opportunity to look for satellite images of the ice cover that may further enlighten them.

What transpires from Cruikshank's (and others') work is that, whether we are talking about science or oral tradition, the descriptions offered are both *referential* and *constitutive*. They refer to particular places that are thereby naturalised, but also establish what they refer to, by positing a point of view from which to relate to the 'object' in question, whether as 'regions' or 'peoples' (see e.g. Hastrup 2013f). Therefore, we are faced with a kind of *theorising* in both cases. It is a theorising that is based on a particular kind of comparison, as nested within a form of generalisation. Anna Tsing has unpacked our conventional notion of generalisation, "in which small details support great visions and the universal is discovered in particularities" (2005, p. 89) in a way that enables us to understand our own comparative efforts in the emerging field of climate change in a new way, I believe. She writes:

> [G]eneralization to the universal requires a large space of compatibility among disparate particular facts and observations. As long as facts are apples and oranges, one cannot generalize across them; one must first see them as 'fruit' to make general claims. Compatibility standardizes difference. It allows transcendence: the general can rise about the particular. For this, compatibility must pre-exist the particular facts being examined; and it must unify the field of inquiry. The searcher for universal truths must establish an axiom of unity – whether on spiritual, aesthetic, mathematical, logical or moral principles. (see p. 89 in Tsing 2005)

She adds that convergences between disparate observations are made through the contingent collaboration between knowledge-seekers; in the process, bridges over differences are offered and convincing universals produced. Once produced, the process by which generalisation took place disappears from view and a new 'natural object' has seen light. 'Fruit' has materialised as something in its own right, while the apple has become a case of fruit, as has the orange.

In the present connection, the main issue inherent in generalisation is the co-production of difference and sameness, which is a precondition for any comparison of apples and oranges, such as Arctic hunting communities and Pacific Island communities as comparable examples of climate worlds. A meaningful comparison between them presupposes a degree of compatibility that somehow standardises difference from the outset. The standardisation is propelled forward by an—implicit or explicit—idea of a cosmopolitan climate mentioned above.

However, this does not imply an endorsement of a universal Nature that can be objectively known as such. As Turnbull has suggested, the argument for the possibility of universal, objective knowledge is based on two assumptions: "[f]irstly, that there is one uniquely correct ordering of the natural phenomena of the world and secondly, that there is a set of procedures sufficiently powerful to determine what that

ordering is" (see p. 7 in Turnbull 2003). As Kuhn suggested for the natural sciences, nature is as susceptible to particular ways of seeing as culture. When practising anthropology in the field of social and conceptual implications of current climate change processes, this clearly is not the case, yet we may still engage in generalising processes that can bridge some of the differences in the world. Recent studies of nature making in the wake of perceived climate change have shown that, far from reproducing a unified nature, all people operate within moving frames of composite knowledge—including scientists, whose concepts of nature are far from universal or fixed (see e.g. Hastrup 2013; Robertson and Rubow 2013). 'Climate worlds,' by definition, outstretch the local, yet without becoming universal.

To continue thinking of climate worlds in terms of bounded cultures, threatened the outside, is to subscribe to what de Certeau has said of maps: like maps, cultures are totalising devices that little-by-little eliminate the traces of the practices that produced them (see p. 121 in de Certeau 1984). While I certainly do not want to belittle anthropologists' genuine concern with the people that they have come to know, there is an inherent pitfall in the vulnerability rubric as glued onto the local worlds. As suggested by Cameron, the problem "is the equation of Indigeneity and the *human self* with the traditional and the local, and the ways in which such a formulation extends colonial forms of knowledge and practice" (see p. 111 in Cameron 2012). Even the most well-meaning ethnographic practice of listening to and recording 'native voices' potentially denies people their place in a global order, climatic, political and moral—and profoundly modern, if this term still holds anywhere.

From my own fieldwork in the High Arctic, I would argue that for the hunters living there, neither their world nor their knowledge is more traditional or local than anybody's. They are very concerned about the future, and I share that concern, which for all of us is based on both experienced changes and scientific predictions. Thus, the concern is *located* and enacts a particular knowledge space, although it extends as far as it takes to address a particular issue—whether related to reflections on animal behaviour, social relations, global warming or future possibilities. The hunters seek to navigate in an uncertain terrain and need all their navigational skills to find their way in a changing landscape (Hastrup 2013b). In one sense, their knowledge is as ancient as Arctic hunting in general, yet in another sense constitutes a dynamic, integrative framework, which enables the processing of observations and the assembling of knowledge of all kinds and from all available sources. In the High Arctic, a flexible framework for orientation is what has allowed the people to survive in variable climates throughout pre-historical and historical time (Wenzel 2009; Sørensen 2012). Mobility has been key factor in this, along with readiness to exploit new species and seek new knowledge in general.

When 'climate worlds' are seen as knowledge spaces in their own right, comparable to other knowledge spaces, it becomes clear that one of the constituents of such spaces is the capacity for storing, sharing and moving knowledge about and using it for puzzle solutions beyond the particular instance. In Turnbull's words, it is the capacity for movement that enables 'local knowledge' to be part of a larger knowledge system (see p. 20 in Turnbull 2003). If western science has become dominant, also in terms of discussing climate change, this is partly owed

to its having *moved* more (ibid., p. 38). The *comparison* of climate worlds, as opposed to seeing them as inherently incompatible and therefore incomparable, is to recognise that climate change, in all its multiple manifestations, actually takes us beyond the idea of a universal Nature to which we must all abide, and towards a recognition of equality between different knowledge spaces, based on located experience and human resolve, all of them entangled in processes that transcend the local, and contributing to the generality that they make up.

This recognition facilitates a seizing of the post-colonial moments, as Helen Verran calls them, which are "occasions for theorizing, for telling differences and sameness in new ways" (see p. 729 in Verran 2002). From such a position, anthropological theorising may rise from the ashes of culture, without resort to a universal nature. Indeed, one might even claim that the most significant anthropological exemplars always show how anthropological knowledge rests on a practice of reasoning *along* with other people, rather than about them.

By addressing issues of shared concern, such as how to anticipate future impacts of climate change, a common ground of reasoning about possible futures emerges. Indeed, this applies whether we work with Arctic hunters, Indian fishermen or Pacific environmentalists (Hastrup and Skrydstrup 2013). What I am trying to say is that there is no reason why anthropology should not contribute to general, theorising discussions of climate change, which is after all identified as such by humans, and increasingly referred to as an explanatory framework for the intensified experiences of violent weather events and broken courses of history. Through their direct engagements with people across the globe, anthropologists contribute a hands-on knowledge of the particular climate worlds that constitutes a privileged entry into transcendent questions that may eventually facilitate navigation in the Anthropocene. The future depends as much on the ways in which people are engaging with nature as on 'nature' itself, as well as how far they are able to integrate knowledge from all available sources.

It is one of the challenges facing anthropologists to show how located knowledge practices other than western science may move and affect not only present concerns but also future solutions. Anthropology can contribute vitally to the perception of humans, not only as destroyers but also as creators of new possibilities, precisely because the burgeoning anthropological studies of how people deal with climate change show how all people are capable of integrating diverse forms of knowledge. This is what makes a comparison of climate worlds so pertinent.

8.5 Concluding Remarks

In the preceding discussion, I have circled around the notion of knowledge spaces as assemblages of places, people and practices. Such knowledge spaces are located, rather than local; they are located in time, in disciplines, in concepts and in maps that have been forgotten as such and taken for natural categories. Through various moves, I have addressed the question of comparison between these knowledge

spaces and suggested that a focus, precisely on places, people and practices may facilitate a new kind of theorising across different knowledge spaces, all of them contributing to the knowledge commons, suggested by Hess and Ostrom. If anything, climate change has provided us with a global challenge to preconceived notions of social systems and local knowledge, sending many people on the move (Hastrup and Olwig 2012).

Comparison involves a kind of translation, as discussed by Edwin Ardener, who stressed an 'event' and its classification were simultaneous, because language always penetrated the social (see p. 172 in Ardener 1989). If we are to remain true to the particular in our descriptions, we cannot make a 'total translation' that would entail a "total remapping of the other social space in the entities of the translating one. At our destination the terrain would [. . .] be disappointingly familiar" (ibid., p. 178). The point is that a translation will have to both preserve the differences and demonstrate the similarities between the two spaces. We need new exemplars, if anthropology is to avoid being stuck in the unproductive field of conservation, instead opening up for releasing its immense powers of knowledge making—as a located and social practice—into the global concern about climate change.

In general, comparison within and without anthropology rests upon processes of both equation and disequation. Therefore, it opens up a space where new knowledge may appear in the shape of new assemblages that are both situated and situating, and which may eventually challenge well-established exemplars. In the process, they may well also provide fresh ones that are less bounded and possibly more ambitious in terms of the range of the resulting knowledge. Climate worlds are a challenging point of entry in this respect.

Theorising across ethnographic fields enables anthropologists to generalise about the world on a par with natural scientists. As anthropologists, we (I am one of them) are able to show how particular responses to new climate realities are never premised by culture alone, but rather by different senses of place, practices and concerns that themselves scale the relevant climate worlds. Whether the actualities of new weather patterns are studied in the Arctic or the Tropes, 'climate' in the Anthropocene has materialised as something in its own right, as distinct from each yet incorporating both. Climate is constituted by the climate worlds it incorporates. It is for anthropologists to show the general compatibility of located knowledge spaces for making particularities count.

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Chapter 9
Towards Imagining the Big Picture and the Finer Details: Exploring Global Applications of a Local and Scientific Knowledge Exchange Methodology

Susan A. Crate

Abstract Local knowledge informs scientific and applied understandings (development, climate change adaptation, etc.) by showing the diversity of ways in which global phenomena are affecting local cultures and ecosystems. However, is there similar value for affected communities? Can global understandings inform local knowledge and, furthermore, can the two knowledge systems inform each other? If so, what could be a model of such knowledge exchange and is there a performative context to bring about such informing? This chapter argues yes, based on a series of successful knowledge exchanges conducted in northeastern Siberia in 2010. The chapter takes this process to the next step, to explore how a model for such knowledge exchanges could potentially be adapted to several different world contexts. The chapter begins with an overview of why such exchanges are important in our twenty-first century world and how the method was developed in the Siberian case. It then discusses relevant results, before moving to explore the ways in which the model could inform other world contexts, using cases from Labrador, Canada and Chesapeake Bay, Maryland.

9.1 Introduction

When Tim Ingold delivered his talk "Walking with Dragons: An Anthropological Excursion on the Wild Side" at the 2011 *Association of Social Anthropologists* (*ASA*) meeting in Lampeter, Wales, I was struck by the parallels between his argument and my own research query at the time. To paraphrase, he argued that the human species' capacity for imagining is an integral part of the life-process and

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affords a way of knowing the world. The imaginary is not, as so much of our modern day scientific grounding would have us think, an escape route into fantasy. This is vital news in the twenty-first century. A central focus on knowing via the hard sciences continues to pervade our understanding of the world to date, established most notably in Francis Bacon's seventeenth century *The Plan of the Instauratio Magna*:

> Those who aspire not to guess and divine, but to discover and know, who propose not to devise mimic and fabulous worlds of their own, but to examine and dissect the nature of this very world itself, must go to facts themselves for everything. (see p. 251 in Bacon et al. 1905)

Today's science continues to base what is known on the process of generating hard data that is replicable and statistically robust. However, the issue herein is that it leaves out most of what we need to know and understand about humans. We cannot comprehensively understand people by number crunching, although some may attempt to. Our main entry into human behaviour is via qualitative methods that generate qualitative information and require qualitative modes of analyses for results. This was Ingold's essential argument when he asked:

> The problem, in our estimation, has been care of how to reach some kind of accommodation between the two [ways of knowing]. How can we make a space for art, for religion, or for the beliefs and practices of indigenous peoples, in an economy of knowledge in which the search for the true nature of things has become the exclusive prerogative of rational science? (Ingold 2011)

He defines the imaginary as the "worlds people in different times and places have conjured up and which—in their ignorance of science and its methods—they have taken for reality" (Ingold 2013). Although his whole argument is directed against the dichotomy of imaginary vs. the 'real' and the ontology/epistemology that such a dichotomy supports, I found this depiction of the imaginary to be analogous to the knowledge that people use who depend on their immediate local environment for their daily physical and cultural sustenance. Such peoples, who I herein refer to as 'place-based,'[1] are experts in their local environment, as a direct result of their immediate daily dependence on that environment. This expertise, based on life-long observation and intergenerational (referring to ancestral) understanding, is known in anthropology as 'local knowledge.'

Given that place-based peoples are experiencing the most extreme consequences of climate change and that their main orientation to their environment is through local knowledge, the imaginary increases the potential for facilitating adaptation to the extent that it invites individuals and communities to creatively address their present predicament by imagining the possible future scenarios (perhaps a process parallel to the statistical modelling that predicts future scenarios). Similarly, it also becomes important evidence for the rest of the world to understand how affected communities are perceiving and responding to climate change. Therefore, bringing

[1] 'Place-based peoples' refers to people who are: (1) directly dependent on their immediate environment for their daily sustenance; and (2) have inhabited an area for a long enough time to have the necessary situated local knowledge to be successful in that direct and daily dependence.

local knowledge into dialogue and integration with scientific knowledge is an important research pursuit towards informing global survival. Accordingly, finding ways of facilitating the integration of those knowledge systems is the topic of this chapter. However, before entering that discussion, I first provide more anthropological insight into how we, referring to the world's inhabitants who base most of our daily lives on scientific knowledge, have become so myopic about what we 'know' and how we might begin to think about the importance of local knowledge/the imaginary.

Anthropology, "absorbed with the artisanal task of seeing broad principles in parochial facts" (see p. 169 in Geertz 1983), has contributed a robust critical literature on the anthropology of knowledge that can help to effectively take advantage of the unique contributions that local knowledge holds. Key to this critical literature is several maxims that clarify just what local knowledge *is* and what it *is not*. It *is* a situated knowledge found in all societies and not the exclusive possession of indigenous peoples. It is *not* the 'opposite' or corollary to scientific knowledge but rather a different and complimentary way of knowing. While scientific knowledge's foundation is validity and predictability through a diversity of scientific methods, local knowledge is founded in the diverse and situated human experience. Where scientific knowledge is universal, local knowledge is culture-specific and understood within a culture as 'common sense.' The latter underscores the importance of demystifying local knowledge by focusing on what actors know in relation to specific events and issues and within specific ecological and cultural contexts rather than abstracting the many bits to create a generalisable and all-encompassing knowledge base. Like scientific knowledge, local knowledge is a highly empirical knowledge based on time-tested methods and expertise. Unlike scientific knowledge, local knowledge is not generalisable. The place-based expertise of local knowledge affords it the ability to identify environmental change that is outside the normal lived experience (i.e. Krupnik and Jolly 2002).

In recent decades, international climate scientists have generated data and models that show past and present trends in global climate change and project into possible future scenarios (Arctic Council 2013; IPCC[2] 2007, 2012, 2013; IPY[3] 2008). However, such models fail to tell us anything about local effects.[4] Some social scientists are grappling with exactly how to integrate scientific and local knowledge to facilitate adaptation to global climate change. Research suggests that local observations can provide the detail to global models in order to show how the phenomenon is affecting the diversity of the world's ecosystems and cultures in vastly different ways (Krupnik and Jolly 2002; Cruikshank 2005; Crate 2008; Milton et al. 2008; Roncoli et al. 2009; Gearheard et al. 2010). In the last decade, many studies have shown that local inhabitants' observation of areas affected by contemporary climate change reflects a valuable resource for understanding global implications (Crate and Nuttall 2009; Strauss and Orlove 2003). Similarly, to the

[2] Intergovernmental Panel on Climate Change.

[3] International Polar Year.

[4] Compare also Christoph Kueffer's contribution Chap. 2, in this volume.

extent that climate change itself is not directly perceptible on local levels but only changing weather and seasonal patterns, scientific knowledge, based on the mediation by scientists, the media, etc., has importance to inform local perceptions.

The complimentary nature of these two knowledge systems and the increased need for local to global understandings of global climate change has spurred different approaches towards their engagement. But how exactly can we bring these knowledge systems into dialogue to achieve their integration? The "problem of scale" (cf. Greschke and Tischler, Chap. 1, this volume) is not only an epistemological riddle for academics to grapple with, but also impacts how people perceive and deal with the issue of climate change in their daily lives. Almost a decade ago, anthropologists substantiated that "local knowledge needs to interface with scientific knowledge, each drawing on the other to affect sustainable adaptation to changing natural and socio-economic environments" (see p. xi in Bicker et al. 2004). To such ends, applied anthropologists have advocated dismantling the *perceived* dichotomous relationship of scientific and local knowledge in order to take advantage of how these knowledge systems can inform each other in at least two areas: (1) in development efforts; and (2) to articulate the local effects of climate change (Agrawal 1995; Cuomo et al. 2008; Eisner et al. 2008, 2009; Eicken 2010; ELOKA[5] 2012; Gearheard et al. 2010; Huntington et al. 2010). Integration and knowledge exchanges are nothing new and have been undertaken before (e.g. Krupnik and Jolly 2002; Smit and Wandel 2006; Hovelsrud and Smit 2010). Some initiatives focus on integrating the two knowledge systems, relating elders and hunters' observations to those described by scientific literature (Herman-Mercer et al. 2011). Others explore the integration via participatory means, including through 'the co-production of knowledge' (Crane 2010), performative means (Richards 2010), adaptive science (Meinke et al. 2009) and socio-ecological systems research (Adger et al. 2011).

One approach is to create an "enabling environment" (Stammler and Wilson 2006) for productive exchanges of local and scientific understandings. Here, we confront several issues; first, how to temper the power relationships between scientific and local knowledge (Nadasdy 2003); and second, how to not only identify, document and revive, but also perpetuate local knowledge—not in books or recordings but rather 'in situ.' One approach to these ends that some have argued for involves "emplacing or embedding [local knowledge] in an appropriate context of relationships with the land and people so that this knowledge can live" (see p. 444 in Roburn and Tr'ondëk Hwëch'in Heritage Department 2012). Once a successful approach is found, the next task is to create an adaptable model to emulate the process in a diversity of global contexts (Crate 2013). In turn, this process raises the issue of how to leverage the efficacy of local knowledge in places where place-based populations do not have the rights to integrate their knowledge. In some countries, indigenous populations have the legal capacity to exercise their inalienable rights and have legal protocols to integrate local knowledge (i.e. Roburn and Tr'ondëk Hwëch'in Heritage Department 2012). However, this is the exception and not the rule. How *do* we work in other country contexts that lack such

[5] Exchange of Local Observations and Knowledge in the Arctic.

legal protocol; for example, in northern Russia, where indigenous peoples lack such rights, or in countries of the 'developed' world where a thriving local knowledge exists yet without a protocol to recognise, establish or perpetuate it, like in rural areas of the United Kingdom (i.e. Jennings 2011)?

This chapter explores these and other issues involved in developing and applying a model for knowledge exchanges in other socio-cultural contexts. I begin with an overview of the successful knowledge exchange case and present a formulaic model. I then discuss how it applies in two other cases, namely in communities of Labrador, Canada and in Chesapeake Bay settlements.

9.2 Background on Knowledge Exchange in Sakha

Viliui Sakha are a Turkic-speaking native horse and cattle breeding people of northeastern Siberia, Russia, with whom the author has conducted research since 1991 (Crate 2006a). In the last decade, Viliui Sakha have found it increasingly difficult to adapt to local changes, including the inundation of hayfields, gardens and pastures that prevent the use of substantial land areas and harvesting of essential resources, changes in the quality and quantity of snow, preventing hunters and horse herds from accessing winter food, increased flooding that rots homes and other buildings and ruins transportation ways, and disrupted rain patterns in the temperate months that create droughts in spring and dampness in harvest times, thus affecting hay production.

Ethnographic research shows that Viliui Sakha are not only affected by and responding to the local effects of global climate change; they also lack a complete understanding about this global phenomenon's process and impacts (Crate 2008, 2011a, b). The issue here is not that sound bites about climate change are not reaching these settlements via newspaper, TV and internet, but rather that this information lacks the local contextualisation needed for communities to see the link to their local context. The same research shows that Viliui Sakha are observing and documenting detailed information about how change is affecting their local worlds, the type of detail that regional climate scientists lack. Concomitantly, regional scientists, themselves native Sakha, are showing how much of the changes that Viliui Sakha are observing are directly linked to global climate change effects (Fedorov and Konstantinov 2008, 2009; Fedorov and Svinoboev 2000).

In response to these complimentary needs, our research team organised knowledge exchanges, experiments in bringing those two knowledge systems into dialogue to generate results greater than the parts in order to realise their complementarities and mutualities. The objective was to facilitate the transfer to affected communities of regional scientific knowledge that is contextualised and in the vernacular so as to increase local understandings of change and facilitate the transfer of local observations to regional scientists in order to increase scientific understanding of the extent to which a global phenomenon is affecting local places in very culture- and ecosystem-specific ways.

The knowledge exchanges were a culminating activity of a four-village, 3-year collaborative effort (Crate 2008, 2011a, b, 2013). The project was based on both the results of a 2003–2005 project in the same communities showing an overwhelming concern about unprecedented changes in weather patterns, climate and seasonal timing (Crate 2006b) and a growing body of scientific data clarifying how climate change is affecting the Viliui regions. The reality of climate change in Viliui Sakha communities is primarily an overabundance of water on the land, permafrost degradation, chaotic climate and precipitation patterns and altered seasonal timings. Much of the hard scientific data showing this is based upon understanding changes in both temperature and degradation extent of permafrost (Fedorov and Konstantinov 2008, 2009; Fedorov and Svinoboev 2000). Fear of the future is visceral and people continue to adapt as they can on a daily basis. There is little, if any, readily available information on global climate change as it is affecting their regional environment. Furthermore, there is also little, if any, recognition by policymakers and other government officials concerning the plight of rural inhabitants due to climate change effects. Demographically, the rural areas are losing population, prominently through those going to the centre for higher education and not returning—not because most of them do not want to but rather because there is no work in the rural areas. Rural areas mostly depend economically on state transfer payments, which employ people in administration, education and health care. There are also some small businesses.

In designing the knowledge exchange process, organised to bring local observations and regional science into dialogue, we integrated multiple occasions for the audience to share their local observations and insights within the presentations of our research findings. Our planning team consisted of myself, an ethnographer working with the affected communities since 1991 and a regional permafrost scientist working in the capital city but originally from the region adjacent to our research. We felt that our familiarity with the communities worked to avoid any significant power relationships that could impede our work. We commenced by first inviting audience members to share their observations of local change, in order that inhabitants could be heard, their knowledge fore fronted and a precedence set for open audience input throughout the exchange. The first formal presentation was on the project's field findings, illustrating how we worked in four Suntar region villages and through focus groups and interviews, defined nine main observed changes, including how they affected livelihoods and ideas about what was causing them. Interspersed in this were three further opportunities for audience input: (1) after we detailed the nine main changes and the effects on people's lives; (2) after presenting the four main explanatory stories; and (3) after explaining that a majority of inhabitants did not understand the link between the changes they are observing and the local effects of global climate change. We concluded the field findings part by explaining that our survey results showed that this knowledge gap was not due to a lack of understanding of climate change in the communities but rather due to insufficient information about how the global phenomenon of climate change was having regional and local effects.

Next, we shared regional scientific data. We began by showing how the high latitude areas of the world are changing most dramatically due to climate change, with the Sakha Republic warming the most. Next, we explained how climate

change is affecting other world regions, resulting in droughts, floods, hurricanes and other extreme events, and also how the main effect in the Sakha Republic is the warming of permafrost and its resulting degradation. This led to a brief explanation of the types of permafrost and how the type characteristic of the pasturelands that the Viliui Sakha use for haying were characterised by ice wedges that are most susceptible to degradation. This segued into showing pictures of these permafrost effects in the central regions, where inhabitants are witnessing many of the same changes reported in the Viliui regions, involving the falling and rising of the land and also an increase of water on the land. The pictures effectively communicated such effects, with participants identifying familiar changes they were also seeing in their local landscape.

We conducted a total of eight knowledge exchanges in the summer of 2010, four in the research villages and four in the main centres of the Viliui regions, namely Viliuisk, Verkhnyviliusk, Nerba and Suntar. Our follow-up interviews in the summer of 2011 showed that the majority of participants felt that the exchanges were important, that the regional scientific data provided them a more holistic understanding of change in their locale and that the local testimonies provided a sense of community support, knowing that others were also observing and felt unsettled by the unprecedented changes. All participants agreed that this type of participatory exchange event would be useful in other Viliui Sakha villages. The only difficult aspect that 2011 interviewees shared was their unfamiliarity with and lack of experience in the participatory process, sharing their observations and opinions. This is due to the lack of a legacy of civil society in Russia and the tradition of meetings being occasions for inhabitants to attend and passively listen to a presenter. However, our eight knowledge exchanges showed that participants learned quickly to share in the supportive environment.

In response to the 2011 interview results, we explored ways to share the information and knowledge exchange process more widely. In lieu of being able to visit every village to conduct a similar knowledge exchange, or to post the information on a website since rural internet access is problematic, we decided to publish the process in an interactive publication, written in the native Sakha language to be distributed throughout the Viliui regions. We drafted the publication and consulted the communities during summer 2012 fieldwork for their input and advice. In spring 2013, we published 3,000 copies of the handbook (Crate et al. 2013), presenting several hundred copies to communities in the context of 2013 fieldwork with the remainder distributed under the cooperation of the Sakha Ministry of Ecology.

Our next objective was to bring the integrated knowledge into a life of its own in these communities or, as previously mentioned, to exist ‘in situ.’ To this end, we initiated an experimental pilot citizen science project, basing it in one of the village’s schools and engaging students and teachers. Through a participatory exercise, the team decided to focus on monitoring permafrost to understand what it could tell students and the community at large about climate and other changes. At the time of writing, the project is in its third year, collaborating with permafrost specialists to establish a permafrost monitoring station and track changes. In the final project years (2012–2013), we created a community mapping project in this same community,

collaborating with *ELOKA* (*Exchange of Local Observations and Knowledge in the Arctic*), a group who assists northern communities with cyberinfrastructure to bring monitoring and other types of local data into an interactive map *Atlas* interface. The pilot *Atlas* project, also initiated in one of the Labrador communities, proved overwhelmingly successful on many accounts (Crate 2014). Most relevant to the discussion here, the *Atlas* process further clarified each community's concerns for issues of change beyond climate and also served a vital role in engaging young persons, who are computer savvy, with elders, who are local knowledge-savvy. Via the *Atlases* inhabitants can input this and other community information, bringing them into a user-friendly intra-net community heritage project.

Although there is nothing that local inhabitants can do to stop the effect of climate change in their locale, our conviction remains that their knowing that the environmental changes they are experiencing are largely due to climate change means they can develop better adaptation strategies. For example, by recognising that the water on the land is not the result of the wet-dry cycle but rather a process that will continue to become increasingly wetter, they can develop adaptive responses to that prolonged trend and not expect a dry cycle to come.

Our next challenge concerns whether and how the knowledge exchange approach can be an adaptable model for integrating local and scientific knowledge systems in other world contexts. If so, and considering the unprecedented pace of global change, such a model could potentially expedite adaptation by bringing about more robust understandings and, in the process, bolstering adaptive capacities for those most affected.

To begin engaging this next step, I will use the remainder of the chapter as an experiment, applying a set of questions that form the basis of the knowledge exchange process, to two other regional contexts, namely Labrador, Canada and coastal Maryland.

The framework of questions and approaches to knowing in this process include:

- What are the population's direct dependencies on the natural world?

  (*Based on contemporary ethnographic methods*)

- How are those dependencies affected by environmental change?

  (*Understood by surveying the population to decipher how local people are perceiving, attributing and responding to those changes*)

- To the extent that can be possibly known, what part of that environmental change is due to global climate change?

  (*Deciphered by corroborating the available historical and contemporary scientific climate data, creating a tally of 'multiple stressors' or the other exogenous factors affecting the climate and environment*)

- Can local and scientific understandings be enhanced through a participatory exchange of each other's knowledge about local change?

  (*Determined through follow-up focus groups and interviews with participants*)

- Are there other avenues for perpetuating and generating the exchange of knowledge systems?

  (*Discerned in community consultations and to include other ways to both bring understandings acquired in a participatory event to the broader community, for example, the publication resulting from the Sakha exchange and/or establishing a community-driven/collaborative citizen monitoring project to further establish local understandings and awareness of change and create a legacy by engaging elders with youth*)

9.3 Case Example 1: Changing Seasonality in Labrador

The first case is in Labrador/Nunatsiavut communities, where I have worked since 2009 as part of a project exploring changing seasonality comparatively with Viliui Sakha communities. The project entitled *Understanding Climate-Driven Phenological Change*: *Observations*, *Adaptations and Cultural Implications in Northeastern Siberia and Labrador/Nunatsiavut* (*PHENARC*) investigated the ways in which the altered timing of the seasons due to climate change is affecting ecosystems and also how such effects are interacting with human adaptations to the environment. There are both similarities and differences between the Sakha and Canadian contexts. One main similarity is both populations' continuation of historically based subsistence practices and their daily dependence on an ecosystem based on ice, or 'ice-dependent' (Crate 2012). In that context, the main difference is in the type of ice that each population depends on. There is also a significant contrast in the level of local engagement in issues and understandings of climate change. Here we found that the Labrador communities were much more savvy about and have better access to information on climate change.

In Labrador communities, like in Viliui Sakha, climate change is a daily reality. Inhabitants hunt and trap seals and other marine mammals and land species, including caribou and fish. Although the study communities are far from being solely dependent on what they can hunt, trap and harvest to feed themselves (which can be said about many rural contexts across the world), there remains a strong cultural heritage of and preference for 'wild foods.' To a greater or lesser extent, all three of the research communities fish for trout and salmon, hunt for caribou, moose and smaller game, and hunt seal. All such activities are based on ancestral adaptive techniques that require the presence of ice in the environment, either on the water as sea ice or on the land in the form of snow. In other words, these communities are 'ice-dependent' (Crate 2012). The process of working in settlements dependent on sea ice for travelling, hunting and fishing helped to draw parallels with Sakha communities who are also ice-dependent (albeit on a different type of ice). However, despite this difference, as global climate change proceeds, those land ice (permafrost) and sea ice cycles are changing. In the Labrador context, sea ice is present for less of the season and is of a different quality than before. Inhabitants also depend

on snow cover to travel and hunt on land. Climate change has also shortened the snow season and changed the quality of the snow.

Like in the Viliui Sakha case, other changes intermingle with climate change (compare the "problem of context" discussed by Greschke and Tischler Chap. 1, in this volume). While young people are leaving the villages for higher education, in contrast with Viliui Sakha communities, a higher number are returning to their birth village and finding work. Local economies are also different from the Viliui Sakha case, with village economies not as robust as they were when initially established for employment in the thriving cod fisheries. When the cod stopped running, the local fishing industries turned to salmon and char. Since the government set salmon quotas, fishing has been limited to char and some snow crab. Local economic prospects appear few. For the last few years, inhabitants have been talking about a much-debated uranium mine scheduled to begin exploitation in the near future, promising local employment as one answer to local job needs. However, the downside of such an economic base is that it would threaten the local water sources for millennia. This example highlights the importance of discerning the various effects of change; it is not all about climate change but about communities simultaneously interfacing change on economic, intergenerational and environmental levels.

Another contrast to Viliui Sakha settlements is that the Labrador/Nunatsiavut communities are ethnically mixed, including 'settlers,' those mostly of Norwegian and Scottish descent, Metis, Inuit and/or Innu. The lingua franca for all inhabitants is English, except for some Inuit and Innu inhabitants who continue to use their native tongue, Inuktitut. In each settlement there are Inuit, the majority of whom were somewhat haphazardly resettled from Hebron in the 1950s, without consideration of familial/kinship ties. Informants who remember this move recall their main struggle as school-age children in an education system that forbid Inuktitut, their native tongue, and forced them to learn and live speaking English. In the process of native land claims in Canada, the Nunatsiavut government was established in 2005 with its central administrative office located in the settlement of Nain. Among its objectives, the aboriginal government is working to promote Inuit and Innu ways of being, including native languages, art forms and subsistence lifeways. All three of our research communities have connections to the larger semi-urban centre of Happy Valley/Goose Bay. Many village inhabitants have family, work and/or are involved in the political culture there. Happy Valley/Goose Bay is also home to the *Labrador Institute*, a branch of *Memorial University*, which has a very active research and advocacy agenda in these settlements.

For this experimental exercise in adapting the Viliui Sakha knowledge exchange process, I will focus on two of our three communities to the extent that they provide a contrast within the Labrador/Nunatsiavut context. The first is Mud Lake, a community situated along a major river threatened by a new damming project, while the second is the community of Makkovik, a coastal community within the Nunatsiavut territory threatened by a pending uranium mining project. These contexts also show how climate change will interplay with other pressing issues (multi-stressors).

The community of Mud Lake is presently a small community, compared to its history, and home to long-time residents who are now retired and families who

commute into adjacent Happy Valley/Goose Bay for their work. The dwindling state of the population and prospects for future inhabitancy is best witnessed by the Mud Lake school, which had a total of two students in 2012. Mud Lake has a rich history with its population peaking at the turn of the twentieth century when there was an active lumber/timber industry. Contemporary inhabitants continue to practice subsistence by fishing, hunting and gathering. To these ends, they are ice-dependent, albeit upon river and lake ice. Based on interviews with contemporary inhabitants, there are fairly sound understandings of climate change's local effects, and, at the same time, there are significant concerns about how the recently approved hydro-dam at lower Churchill Falls, upriver from Mud Lake, will affect river and lake water levels. The dam will not only affect subsistence resources, but also limit inhabitants' access to adjacent Happy Valley/Goose Bay, where they get supplies and where many work.

Based on this information about the community, the process of designing a knowledge exchange for the Mud Lake community would need to focus on local perceptions and responses to the changes in seasonal river ice and ice flow conditions, with an emphasis on discerning what is due to climate change and to the past and impending damming activity. In this respect, it would be important to work with regional scientists to corroborate regional scientific data to attribute changes in river ice and flow condition and seasons, as we did in Viliui Sakha communities.

Compared to Mud Lake, Makkovik has a vibrant community life. It is located on the Labrador coast within the Nunatsiavut aboriginal territory, which allows resident rights to land and resources, and also to more government programmes and assistance, none of which are found in the Mud Lake context. Makkovik inhabitants are also ice-dependent for their subsistence and travel, although they majorly depend on sea ice. Another contrast is that Makkovik is home to an active and thriving youth population and has relatively low outmigration. Like in Mud Lake, interviews and focus group information show a sound understanding among the population in terms of how climate change is affecting their livelihoods, and also how potential uranium mining, which threatens the community's water source, has become the priority concern. Based on this information about the community, there is a need to develop knowledge exchanges engaging local perceptions and responses to seasonal changes, sea ice changes and other altered conditions due to climate change and the prospect of uranium mining.

9.4 Case Example 2: Chesapeake Bay Sea-Level Rise (SLR) in Dorchester County, Maryland

This case example, set in communities of Dorchester County on the Eastern Shore of Maryland, involved three distinct populations—watermen, farmers and new residents—to tease out how each group was understanding and responding to the local effects of climate change. In Dorchester County the most apparent effect is sea-level rise (SLR). Each of these populations has a different relationship with SLR. The

watermen are long-time Chesapeake Bay residents who work in the water and live inland from the shoreline. The Dorchester County farmers reside further inland than watermen, although their land and community are near creeks, marshes and wetlands. Like in the other cases, the lack of a younger generation to take up fishing and farming is threatening the socio-economic vitality of these rural areas. Recent residents have relocated to the waterfront and include members of planned communities, weekend homeowners and/or off-farm and off-water employees in nearby towns. A number of new development communities have been built in Dorchester County over the past two decades, including some along tributaries that lead into the *Blackwater National Wildlife Refuge*. On average, these three communities range from 300 to 1,000 residents. In addition, many new individual homes are being built around small bays in the county, acquiring an informal community status over time. Within this diversity, each of the three populations has a different relationship to the natural world; for instance, watermen depend on the tides and climate patterns, farmers on the precipitation and flooding cycles and new residents on weather and climate patterns for transport and enjoyment of their surroundings.

That said, based upon interviews across the three groups, some initial generalisations show that although all three populations identify change in the environment, tides, sea level and weather patterns, they each attribute the causes differently. Watermen and farmers tend to attribute those changes to 'natural cycles,' or the fluctuation between wet and dry years, a cycle found, to some extent, in all ecosystems. New residents attribute such changes mostly to climate change.[6] Furthermore, based on deeper probing with watermen and farmers, they are concerned about other factors that implicate these issues; for instance, watermen are concerned that acknowledging climate change effects will result in the state and county applying more restrictions and requirements on them, which will further hamper their ability to practice their trade; similarly, farmers are concerned that the implications of climate change could also threaten their livelihood due to government measures and requirements. Other evidence of global climate change beyond SLR is clear. When asked, most respondents described their youth as a time when 'they skated on the local ponds every day for 3 months of the winter'—but ice like that has not been seen for at least 10 years. Although the majority attributed this to natural cycles, corroboration with regional climate data shows that it is a recent event and largely due to global climate change.

Sea-level rise in particular will have dramatic effects on the region in and around Dorchester County. Sea-level rise modelling indicates that the *Blackwater National Wildlife Refuge*, a vast marsh and wildlife refuge in the heart of Dorchester County, will be largely underwater by 2100, resulting in a loss of approximately 93 % of its tidal marshes and swamps and over 32,000 acres of undeveloped dry lands (National Wildlife Federation 2008; also see pp. 4–5 in Johnson 2000). In the Chesapeake Bay region, this means that communities located on the bay and its large tributaries will need to assess the likely sea level increases in fine resolution for effects on transportation routes and features such as bridges, utilities, docks, residential and commercial areas. Costs of building breakwaters and bulwarks, and other forms of mechanical

[6] Compare Claudia Grill's Chap. 6, in this volume regarding cyclical notions of environmental change.

mitigation or elevating foundations will have to be weighed against the costs of abandoning structures, namely homes and businesses. The most severely affected will be those who earn their living from the bay as primary resource harvesters for oysters, crabs and rockfish, those who participate in the secondary economy of supplying services to resource-dependent communities or the general consumer (e.g. seafood wholesalers) and those who live on low-lying near-shore islands such as Hoopers or Tilghman. At present, marinas, docks and even homes are sometimes only a foot above the water level, and islanders can see their homes rapidly disappearing. Indeed, Poplar Island (uninhabited) has already disappeared. Most importantly, both local and county governments will need to develop policies and programmes and find revenues for public mitigation measures. They will need to decide on zoning options, incentives and regulations to deal with the loss and protection of property.

There is strong potential in this research context to organise and conduct knowledge exchanges. There is a diversity of both local knowledge and understandings in the local population, seen with the three groups in this research, and also a robust base of regional data and ongoing monitoring. Such examples include the *Harry H. Hughes Center for Agro-Ecology*, *Eastern Shore Land Conservancy* (*ESLC*), the *University of Maryland Center for Environmental Sciences* (*UMCES*), *Farm Bureau*, local developers and real estate businesses, the *United Methodist Church*, and community civic organisations such as the *Lion's Club*.

The knowledge exchanges need to be designed carefully to accommodate local concerns, for example, the concerns of watermen and farmers about the potential that identifying local change as due to climate change will increase the regulations that they need to work under. Additionally, like in both the Viliui Sakha and Labrador cases, the Chesapeake communities are similarly struggling with intergenerational change, with increasingly fewer young people going into farming and becoming watermen, while the population is becoming increasingly elderly. Therefore, it would be important to engage the youth. Furthermore, with the good documentation of the extent to which the county has gone under water, especially in the southern extent where the *Blackwater Wildlife Reserve* is situated, knowledge exchanges would assist in discerning the extent to which this change is due to climate change and/or other changes.

Lastly, being located in the US, such knowledge exchanges could be one prime example of approaches toward increasing the awareness of the American public about the real dangers of climate change. The real-life stories and testimonies can effectively communicate climate change to the American public, highlighting that climate change is in fact in our backyards and not just a phenomenon in the world's extreme environments.

9.5 Conclusion

This chapter has made a preliminary exploration of how the Viliui Sakha knowledge exchange model could work in two contrasting cases by revealing the points of departure and clarifying the next steps needed to perform the exchanges. In the Labrador case, the main modifications would come from four main differences;

first, that these communities know significantly more about how global climate change is affecting their lands and lives; second, that inhabitants in both Mud Lake and Makkovik have a higher immediate concern about controversial economic development, in relation to the Upper Churchill Falls dam and uranium mining, respectively. A third major contrast is these communities' relatively close access to research and education facilities, which actively work with the communities on environmental issues and local knowledge, especially Makkovik within the Nunatsiavut territory. Lastly, they have relatively good cyberinfrastructure, providing access to information and communication.

The Chesapeake Bay case displays some of the same differences as Labrador in comparison to Viliui Sakha, albeit with some nuances. First, because the study was organised to delineate and characterise three distinct populations, it highlighted both their different human-environment interactions and also their difference in understandings about the local effects of climate change. Generally speaking, the watermen and farmers were hesitant to assign local changes to climate change, whereas newer residents were well versed and aware of these local effects. In the Chesapeake case, the future status of farmers and watermen seemed in greater jeopardy than the other two cases, due to the pressure from government regulations and the dwindling number of the next generation entering these occupations. Furthermore, there was also a huge contrast in the status of local knowledge. It became clear in interviews that all three groups had knowledge of their local environment based on first-hand experience, whether from lifelong inhabitance of the area or from deliberately moving to the waterfront to have that experience. Lastly, the array of research, education and community initiatives for these populations is a ready avenue of knowledge exchange.

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Part IV
Concluding Statement

Chapter 10
You Ain't Seen Nothing Yet: A Death-Defying Look at the Future of the Climate Debate

Frank Uekötter

Abstract The article looks at the ongoing debate on climate change against the background of established modes of environmental discourse. It argues that the climate discourse diverges notably from established lines of discussion in that it inspires an enthusiastic community of scientists, politicians and activists while offering no perspective for success. It uses Luhmannian systems theory to argue that the climate community shows symptoms of autopoiesis, resulting in a notable inability to communicate with the rest of society. It concludes with an agenda for the environmental humanities.

We used to know how this works. Half a century after Rachel Carson's *Silent Spring* (1962), we thought that we had the script for environmental conflicts down. Someone makes a startling discovery, searches for causes and goes public. Others follow up, refine the diagnosis and call for change. Civic leagues and the media build up pressure. The vested interests fight back. Parties start haggling. Politicians eventually come around to a set of measures that takes care of the problem. Environmentalists rejoice and move on to the next issue.

Climate change has all those ingredients, most of them for quite a while: concerned citizens, convinced scientists, alert non-governmental organisations (NGOs) and sympathetic journalists. We even have plenty of politicians across the political spectrum stressing the urgency of the problem. Since the Copenhagen summit, the global consensus on the changing climate is beyond serious debate. Nonetheless, we are stuck somewhere along the way to a solution. Carbon dioxide emissions continue to rise, as does the global temperature average.

To make matters worse, we are losing the last best apology: the climate sceptics. Since the start of the broad public discussions in the mid-1980s, we have witnessed a group of unconvinced experts (both real and self-proclaimed) who made consensus-building simple. Journalists gave them plenty of attention, as the controversy

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bestowed the notoriously complex subject with a good dose of drama. However, the community of sceptics has shrunk enormously in both size and reputation recently. Who wants to be in league with a group of people that previously helped the tobacco industry to fend off health claims (Oreskes and Conway 2010)? After all, we know how that one turned out.

So what? A sense of cluelessness is spreading among environmentalists and all the other groups who take part in the climate debate on a regular basis. Perhaps we should have another shot at the type of global deal that failed so miserably in Copenhagen in 2009? The international community committed itself to a climate deal by 2015, but it takes no great effort to already find sceptical voices years ahead of the deadline. Or shift towards adaptation? But then, nobody really knows what adaptation is. Perhaps the safest thing is to invest in morals. For the first time in history, a group of migrants, the so-called climate migrants, enjoy the sympathy of the world even before they embark on their journey—in fact, before anybody really knows who these climate migrants are going to be.

Even in its stagnant state, the climate debate is providing fodder for amazement. Stagnant debates rarely generate so much noise: there is nothing of the awkward silence that routinely goes along with a dying cause. Even the most hopeless round of climate negotiations stimulates another round of reporting. And experts are surely not scaling down their expectations. Quite the contrary, the climate community—or at least certain parts thereof—has never been bolder. The *German Advisory Council on Global Change* published a flagship report in 2011, delivering the blueprint for a "world in transition"—an industrial revolution-sized readjustment of the course of global society (German Advisory Council on Global Change 2011). If the report had been written by bankers, it would have been certain of universal scorn: how dare these experts tell the seven billion people on this planet how to lead their lives? But then, climate people can get away with everything. They are not arrogant. They are concerned.

A community in disarray produces a distinct type of research: verbose research drafts that suggest a contribution to that sought-after breakthrough—heck, probably the breakthrough itself—while being notably vague on specifics. A penchant for theory, the sure escape from empirical research and definitive answers. Essays with no point and no end. A notable disinterest in anything resembling a debate. A virtual absence of provocation. Hey, we do not have the ultimate answers, but shouldn't we get some credit for daring to look into the greatest environmental challenge of our time? Research is slowly morphing from a search for solutions to a symptom of the crisis.

The tricky thing is that the present mode of discussion is sustainable, at least for quite a while. If the climate people did not have sceptics, they would probably be inventing them now: what better way to argue (and, implicitly, justify your own intellectual existence) than to launch a vigorous defence against those charlatans who openly defy modern science, the Enlightenment and common sense? No one will ever take issue with your cause, except for those sceptics who will inevitably respond, which will justify another round, making your intellectual endeavour pleasantly

sustainable. And then there is the annual round of climate negotiations (*Conference of the Parties*, or *COP*, in climate parlance), which creates a sure demand for articles, standpoints and sound bites. Be a presence, be concerned and be safe.

The one great drawback is that such an approach lacks a powerful sponsor. It hinges on a society that continues to be concerned, or at least has enough of a bad conscience to provide the climate community with money and attention. Other than that, the climate communities have allies that are difficult (energy is a tough business, after all) or that they are not comfortable with (the military). There are better ways to justify expenditures than concern, and while the climate consensus looks solid at the moment, especially in green-pride countries like Germany, that could change over time. People could get tired. Or they could notice an excessive degree of repetition. Ongoing attempts to coin new buzzwords raise a certain suspicion: a poker player would easily identify the talk about the Anthropocene as an effort at raising the ante. Nobody knows what may reenergise the climate debate, but terminological escalation appears to be one of the more dubious options.

So is that the future of the climate debate? Looking over a quarter-century of hot air and hot tempers, the climate debate stands out for a notable lack of learning experiences. Countless initiatives and institutions have been started and few have ended, forcing every new entrant to the ring to learn a distinct alphabet: *UNFCCC*, *IPCC*, *UNEP*, *COP*, *REDD*.[1] Observers can easily make a fool of themselves if they fail to understand that *PIK* is not a call to grab something but rather the *Potsdam Institute for Climate Impact Research*. The climate community is slowly becoming reminiscent of those old people who never throw away something, because they are not sure whether they might need it again.

If the essays in this collection prove anything, then it is the need to reflect the mode of discussion: we need a reflexive climate discourse that looks at its own blinders. What if one of the things standing in the way of progress is, well, ourselves? And then, who are 'we'? The good guys, for sure (although female climate people can be good as well). Self-descriptions often end up with the formal position: researcher, consultant, activist, lobbyist. But the 'climate community'? Who are they?

Ten years ago, the sociologist of science Peter Weingart proposed to understand the climate debate as a set of three interrelated subsystems. The political system was seeking cognitive certainty so as to define wise government programmes: according to a time-honoured rationale of western societies, following the scientific mainstream was to play safe. The media system was first and foremost interested in things new, exciting, touching: from such a viewpoint, a clash of opinion was worthy of coverage, far more than a broad consensus. The system of scientific expertise was sitting uncomfortably somewhere in between: they had to define secure knowledge and research needs whilst operating under the magnifying glasses of a media system and a political system with different interests (Weingart et al. 2008).

[1] *United Nations Framework Convention on Climate Change*, *Intergovernmental Panel on Climate Change*, *United Nations Environment Programme*, *Conference of the Parties*, *Reducing Emissions from Deforestation and Degradation*.

Weingart saw little hope for convergence, or even for an alliance of interest. In fact, he made that prospect as unlikely as possible by linking up with Luhmannian systems theory. Niklas Luhmann (incidentally, a Bielefeld sociologist, like Weingart) saw society as a set of subsystems: politics, business, academia, etc. Each of these subsystems has its own distinct binary code that makes for its mode of operation. The political system ran according to the distinction between power and lack of power, academia distinguished between truth and error, and so on. Each subsystem broke down things to this simple alternative, and everything that defied that logic was beyond the horizon: it literally defied understanding. Each subsystem was closed in cognitive terms, and that made the gaps insurmountable: the only way for a journalist to understand academia was to become a scientist himself.[2]

Weingart used this model to explain the perennial struggle between scientists and climate sceptics. After all, doubts had hugely different cognitive status for each of the subsystems. Science thrives on doubt. If something is beyond doubt, researchers can stop working and move on. The political system abhors doubt, given that it makes decisions uncertain and open to criticism. Journalists like to cover clashes of opinion, thus emulating doubt while showing little interest in rationales or outcomes. While all that made sense while the climate debate was revolving around questions about the reality of global warming and the role of humans, these debates are ending. We know that our planet is getting hotter and that humans carry a significant part of the blame—in fact, the crucial one. It seems that researchers, politicians and the media have eventually found some common ground.

It would be unwise to discard Weingart's interpretation though. After all, we still see a lot of behaviour that matches his model. A more rewarding approach would supplement his view in that a new subsystem has entered the picture: the climate community. Quite a number of scientists, journalists and political players have abandoned their habitual roles for a new one. Instead of following their professional rationales, they now follow the rules of the climate discourse: they are gravely concerned about the prospect of a global warming, they believe in the *Intergovernmental Panel on Climate Change* (*IPCC*) reports and the climate calculations that they rest upon, they count on a global deal within the *United Nations Framework Convention on Climate Change* (*UNFCCC*). And they all like polar bears.

The code of the subsystem may look a bit fuzzier than the classic binary. But other than that, the climate community shows all the signs of a distinct subsystem at work: strong communication among members, distinct rules of speaking and mutual engagement, and a firm conviction that its members, and *only* its members, understand the world. For Luhmann, subsystems are delicate entities (Luhmann 1989), so one may legitimately call it a significant achievement that the climate community made it into its own subsystem, given that most expert systems never get to this level. Unfortunately, if we see the climate community as a distinct subsystem in the Luhmannian system, this also means that no one outside the climate community can really understand them.

[2] For English-language introductions to Luhmannian systems theory, see Moeller 2006; Brunczel 2010.

For Niklas Luhmann, ecology was a source of tremendous irritation. He wrote a full book on the topic, arguing that ecological communication was an exercise in absurdity: given that subsystems were cognitively closed and unable to communicate in a targeted manner, there was no hope for a broad ecological debate that crossed borders. In fact, it was a dangerous thing: given the delicate nature of a society of subsystems, ecological communication could jeopardise the entire endeavour. Ecological communication, if delivered with sufficient thrust, might irritate subsystems to such an extent that they become unable to sustain their customary mode of operation. They collapse (Luhmann 1989).

Luhmannian sociologists may be relieved that the climate community has started acting as its own distinct subsystem: the dangerous ecological communication has been safely contained within its own cognitive universe. For everyone else that is grounds for concern: what shall we do with a climate community that only speaks to itself? How do we speak with a community that carefully guards its own distinct style of communication? At this point, the model ends being an exercise in sociological theory. It is frighteningly similar to the reality of the climate debate anno 2014. The climate community reigns supreme, it has a hegemonic grip on everything that concerns the warming planet, it has a set of institutions, a stack of metaphors and plenty of abbreviations, but the rest of society is following all that with profound disinterest.

Subsystems consume a lot of resources to maintain themselves. The climate community is certainly a hungry one, albeit only by the standards of notoriously cash-strapped academia—as subsystems go, it is a lightweight. In fact, that may be the key dilemma of the climate community: it is strong enough to monopolise the climate issue and impose hegemonic rules of communication, but it is far too weak to instil the kind of change that the warming planet needs. For all its cultural capital, the climate community is surely no match for the vested interests and the power of the status quo. But then, does a subsystem really *want* to save the world? They are usually far too busy assuring their continued existence as a subsystem. And what is that world thing anyway? A subsystem in full swing does not know the world. It *is* the world.

Luhmann called this autopoiesis: subsystems have found ways to maintain themselves, but at the expense of any comprehensive vision of society. In fact, this makes his sociology such painful reading for anyone with a political agenda. Many a social movement has addressed humanity by and large, and the climate community is surely no exception here; but then, as Luhmann has pointed out, society does not have an address (Luhmann 1989). Those who want to speak to everyone may easily end up speaking to no one. The climate community knows that from painful experience.

However, there may be an exit from the climate community world. The climate people have great models and many figures, but they are short on a key resource of the twenty-first century: fun. It is rather likely that historians will one day look back on the cultural manifestations of the climate community with a sense of embarrassment. Did people really get excited about a movie that revolved around a PowerPoint presentation, courtesy of Al Gore? And where are the jokes, songs and novels that

capture our imagination? It is quite revealing that the *Live Earth* event of 2007 was following the script of the famous *Live Aid* event in 1985. As a cultural catalyst, the record of the climate debate is abysmal.

So we are lacking guidance as we find our way on a warming planet. But we have songs about obsessions, and songs about losing them. For example, what do you do when you fall hopelessly in love with a "devil woman"? Randy Bachmann brought such a scenario to a happy conclusion in the song that supplied the title for this essay (twenty-first century readers are reminded that the song was written before the invention of gender mainstreaming). In the end, the friendly brown-eyed woman gets the protagonist to a doctor who tells him of a cure. And the man lives happy ever thereafter because he had learned to tone down his ambitions: "so I took what I could get" (Bachmann 1974).

As it stands, the climate community is eluding such a stage of happiness. Insofar as it has accomplished something, it was always in terms of means, but never ends. It has achieved cultural hegemony over the topic. It has secured enormous funds for research and outreach. Probably no other community of scientists has similar political connections, and the halls of powers have their own way of bestowing humble experts with warm feelings. However, what is lacking is any kind of experience that suggests that we are moving closer towards an actual solution to the problem. In Randy Bachmann terms, the climate people have all the best songs, a fancy car and a few dates, yet they are further away than ever from actually kissing that 'devil woman.'

A marriage counsellor would quickly identify the problem in the relationship between the climate community and the debate over climate change. An exceeding desire to control is never a healthy thing in any relationship. Unfortunately, a public discourse cannot run away or slap a hegemonic interlocutor in the face, but it can—in fact, almost surely will—be fading into oblivion, as strict rules for the choice of words and the authority to speak are sapping the juice out of the debate. When they encounter these conundrums, marriage counsellors usually end up talking about the merits of going easy. But who is going to tell that to the climate community?

I guess the environmental humanities will have to do the job.

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