Chapter 1
Sustainable Development and Disaster Risk Reduction: Introduction

Juha I. Uitto and Rajib Shaw

Abstract Sustainable development and disaster risk reduction are closely linked on many levels and the relationship cuts both ways. Disasters add often devastating costs to societies and communities in terms of financial losses, destroyed infrastructure and loss of life. They can set development back for years. Environmental destruction and lack of sustainable development exacerbate disaster risk and impact. Climate change is adding to the risk and uncertainty. Despite the obvious linkages, the sustainable development, climate change and disaster risk communities each approach the common problematique from different angles. Even in intergovernmental negotiations, the processes tend to be separate and on parallel tracks. This book is an attempt to address sustainable development and disaster risk reduction from an integrated perspective. The 18 chapters highlight issues from many angles and sectors covering them from theoretical and practical perspectives. A number of case studies, primarily from Asia, are highlighted.

Keywords Sustainable development • Disaster risk reduction • Climate change

1.1 Introduction

Sustainable development and disaster risk reduction are intrinsically intertwined. A single major natural disaster – be it an earthquake, storm, tsunami or a landslide – can undo progress made and set back development by years. At the same time, environmental factors and, more broadly, development that is not sustainable, contribute to the increase in disasters. Societies build infrastructure in places exposed to the forces of nature and that does not stand up to hazards. On every continent,

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people crowd onto coasts where cities grow uncontrollably and often without planning. According to the United Nations, some 44 % of the world's people now live within 150 km from the coast. Individuals make decisions regarding settling into hazardous locations out of necessity or out of choice. In many rapidly growing cities, especially in the developing world, the places available for the poorest migrants from the countryside that still allow them access to employment and other urban opportunities are often in marginal and hazardous locations (Hewitt 1997). These may be on slopes that have been deforested by the migrants to make space for informal settlements, but at the same time making them unstable, exposed to storms and susceptible to landslides. On the other hand, many well-to-do citizens crave for a piece of waterfront property and face risks from coastal erosion and storms. Similarly, as we have seen in California too frequently in recent years, large homes are often built into forested hills that are susceptible to devastating fires (Simon 2014).

In some cases natural and technological hazards combine to compound the dangers to communities and the society at large. This was dramatically brought home by the Fukushima nuclear meltdown following the massive tsunami caused by the Great East Japan Earthquake on March 11, 2011 (Pritchard 2012; Shaw and Takeuchi 2012). On a more localized scale, such events are more frequent and often mostly affect the poor people whose dwellings in cities are often located near hazardous industrial facilities.

Human actions that degrade the environment are culpable for worsening the risks from natural hazards and increasing exposure leading to disasters. A case in point is the widespread removal of mangroves on the coasts of Southeast Asia to make way for aquaculture. It was clearly demonstrated in the case of the Indian Ocean tsunami on December 26, 2006, that the power of the tidal wave was more destructive in areas where the protective mangroves had been removed (Wun'Gaeo 2009). The mangroves also play other important ecosystem functions that get disrupted once the vegetation is removed. They act as spawning grounds for fish and other aquatic creatures, and they filter pollution from land-based sources that then runs directly into coastal waters when the mangroves are no longer in place.

Climate change is where human influence on the global environment is the most dramatic. While the exact mechanisms and the extent to which climate change is affecting weather patterns globally are still not known (Bouwer 2011; Pielke 2014), there is ample evidence to suggest that there is a correlation between climate change and the increased frequency and severity of extreme weather events, including storms, droughts, heatwaves and cold events. On regional and local scales these effects are even harder to predict, but their impact on local communities and economies is potentially devastating.

Apart from weather anomalies, climate change will result in rising sea levels that pose a severe threat to coastal settlements and infrastructure everywhere, from the richest cities in the world like New York, Miami and Tokyo, to vulnerable poor communities in Bangladesh and West Africa. Small islands are at the forefront of bearing the brunt of climate change induced sea level rise. Many of them, especially in the Pacific and Indian Oceans, consisting of little less than the coastal zone, are

at risk of being entirely swallowed by the sea. This is particularly egregious, given that the small islands have been amongst those least contributing to climate change, and are now paying the price of globally unsustainable development (Pelling and Uitto 2001).

It is thus evident that sustainable development and disaster risk reduction must go hand in hand. Losses from disasters have been constantly on the rise and now place a huge burden on the global community in terms of lives lost, property damaged and opportunities missed. The resources consumed by natural disasters are directly away from development. The increases in losses, of course, cannot be attributed primarily to climate change and other environmental factors. Most of the increase is due to the growth of exposure because of, e.g., the great coastward movement of populations and the development of infrastructure in hazardous locations. When the losses are normalised taking into account trends in economic exposure, the upward trend in losses is obscured (Neumayer and Barthel 2011). It is also due to economic and political forces that render groups of people and communities powerless and thus vulnerable to natural hazards. Such outcomes often have deep historical roots within societies and in the international system (Hilhorst and Bankoff 2004).

Despite these obvious interlinkages between sustainable development and disasters, they still are treated separately in most of practice and literature. The professional and scientific communities are different, they speak a different language using different jargon about the same phenomena. In the international arena, there have been two parallel processes that seldom if ever meet. Even in areas where the overlap is most striking, communication and collaboration are almost entirely lacking: disaster risk managers do not talk to those dealing with climate change adaptation, and vice-versa.

This book arose from the recognition of the above fact and the need to bridge the gaps. The authors in the volume include primarily researchers who have their roots in one or the other community but who recognise the need for integrated approaches. We hope that the book will nudge the debate a notch further so that we can move towards a more sustainable development path. Sustainable development will require reducing vulnerability of societies and communities to natural hazards, enhancing adaptation to the impacts of the changing climate, and strengthening the resilience of societies, communities and individuals everywhere.

1.2 International Efforts: Parallel Processes

Sustainable development as a concept was conceived by the World Commission on Environment and Development – the so called Brundtland Commission named after its chair – that defined it as (WCED 1987): “Sustainable development is the kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

From the outset, sustainable development was intended to bring together the social, economic and political dimensions. The 1992 global Human Development Report produced under the auspices of UNDP elaborated on the concept of sustainable human development (HDR 1992: 2):

> Global poverty is one of the greatest threats to the sustainability of the physical environment and to the sustainability of human life. Most of the poor live in the most ecologically vulnerable areas – 80 % of the poor in Latin America, 60 % in Asia and 50 % in Africa. They overuse their marginal lands for fuel wood and for subsistence and cash-crop production, further endangering their physical environment, their health and the lives of their children. In developing countries, it is not the quality of life that is at risk – it is life itself.

The 1992 United Nations Conference on Environment and Development[1] held in Rio de Janeiro, Brazil – the Earth Summit – sought to operationalize sustainable development on a global scale. Its main outcomes were the Rio Declaration and the Agenda 21, a massive blueprint for actions that would be needed in virtually all segments of society to move towards sustainable development. Other concrete outcomes from the Earth Summit included the global Convention on Biodiversity (CBD) and the UN Framework Convention on Climate Change (UNFCCC). The political deal was that the rich countries in the North would foot the bill to help the countries in the global South to switch their economic development patterns onto a sustainable path that would protect globally significant biodiversity and help the developing countries to avoid greenhouse gas emissions as they industrialise and develop their economies.

The Global Environment Facility[2] (GEF) was established as virtually the only source of funding for the entire sustainable development agenda and as financial mechanism for CBD and UNFCCC. Since then, new public funding sources have emerged, notably the Climate Investment Funds managed by the World Bank and four regional development banks, and the new Green Climate Fund (GCF) that is still to start operations, but these still are obviously insufficient to address the issues of global sustainable development. The overall performance evaluation of the GEF noted that the global environmental trends continue to decline and that global public funding allocated to environmental issues (around US$10 billion annually of which about one-tenth is distributed through the GEF) is dwarfed by the global public subsidies (about US$1 trillion) that lead to overexploitation of natural resources and environmental degradation (GEF IEO 2014).

Disaster risk reduction is visibly absent from the Rio documents and although this situation has improved in subsequent processes, the links are mostly at the levels of principles rather than action. The Rio+20 conference held in Johannesburg, South Africa, in 2012 identified ecosystems, climate change and disaster risk reduction among crosscutting issues. However, the UN sponsored Millennium Development Goals (MDGs; 2000–2015) were silent on disaster risk.

Instead, there has been a parallel process focusing on disaster risk reduction. The United Nations General Assembly designated the 1990s as the International Decade

[1] http://www.un.org/geninfo/bp/enviro.html

[2] http://www.thegef.org/gef/

for Natural Disaster Reduction (IDNDR) that led to the establishment of a permanent secretariat in the United Nations to promote disaster risk reduction worldwide. The Hyogo Framework for Action, 2005–2015, was the outcome of the World Conference on Disaster Reduction held in Kobe, Hyogo, Japan, in 2005. It focused on building the resilience of nations and communities to disasters. It detailed the requirements for different sectors and actors, including governments, international agencies, disaster experts and others, to reduce disaster losses. It outlined five priorities for action: (1) Ensure that disaster reduction is a national and local priority with a strong institutional basis for implementation; (2) Identify, assess and monitor disaster risks and enhance early warning; (3) Use knowledge, innovation and education to build a culture of safety and resilience at all levels; (4) Reduce underlying risk factors; and (5) Strengthen disaster preparedness for effective response at all levels (UN 2005). The Hyogo Framework identifies environmental conditions and vulnerabilities as contributing to disaster risk. It further identifies activities related to environmental and natural resource management, including land-use planning and development, integrated flood management and management of fragile ecosystems as part of the package for disaster risk reduction. It also promotes the integration of risk reduction associated with existing climate variability and future climate change, and the identification of climate-related risks.

The year 2015 is seen as a watershed with numerous important events taking place. In March 2015, the disaster community met in the Japanese city of Sendai for the Third UN World Conference on Disaster Risk Reduction. The Sendai Declaration mentions neither the environment nor climate change, although climate change and variability feature rather prominently in the final document (UN 2015). Sustainable development comes in one of the key guiding principles of the disaster risk reduction as: "The development, strengthening and implementation of relevant policies, plans, practices and mechanisms need to aim at coherence, as appropriate, across sustainable development and growth, food security, health and safety, climate change and variability, environmental management and disaster risk reduction agendas. Disaster risk reduction is essential to achieve sustainable development". In the conference, the secretary general of the UN Ban Ki-moon expressed that "an ambitious outcome at the WCDRR will put the world on a path to a new sustainable development agenda in 2015, together with the forthcoming Sustainable Development Goals (SDGs) and a meaningful climate change agreement". The Sendai Declaration also calls for collaboration across global and regional mechanisms and institutions relevant to disaster risk reduction, including those for climate change, biodiversity, sustainable development, poverty eradication, environment and others.

The UN is leading the development of a post-2015 agenda and the new Sustainable Development Goals to replace the MDGs. At the time of this writing, there are 17 SDGs that will be presented to the UN General Assembly in September 2015 for adoption. These have been produced through a lengthy and inclusive negotiation process. Four of the proposed goals make the connection to disaster risk.[3] Goal 1,

[3] https://sustainabledevelopment.un.org/sdgsproposal

End poverty in all its forms everywhere, refers to the need to build resilience of the poor and those in vulnerable situations, and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters. Goal 2, End hunger, achieve food security and improved nutrition, and promote sustainable agriculture, refers to resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters. The most extensive references to disaster risk pertain to Goal 11, Make cities and human settlements inclusive, safe, resilient and sustainable, which calls for significantly reducing the number of deaths and the number of affected people and economic losses caused by disasters, including water-related disasters, with the focus on protecting the poor and people in vulnerable situations. It further calls for cities to adapt to climate change and build resilience to disasters. Finally, Goal 13, Take urgent action to combat climate change and its impacts, urges strengthening resilience and adaptive capacity to climate related hazards and natural disasters in all countries.

In November 2015, the negotiators will gather in Paris for a landmark meeting on climate change. The UN Climate Change Conference COP21 is intended to produce a universal climate agreement to replace the Kyoto Protocol adopted in 1997.

All of these international processes are critical to the future of sustainable development and disaster risk reduction on a global scale. Despite the increasing references to links between the spheres, the practical challenge of producing a coherent and integrated framework that takes into account sustainable development, disaster risk reduction and environmental issues remains. Partly this is due to the compartmentalisation of the issues within the international negotiations and national governments, which poses limits to not only the political agreements, but also their implementation.

1.3 Importance of Implementation, Monitoring and Evaluation

The international processes and agreements, while important, obviously are not sufficient by themselves. It is essential to move from political proclamations and strategies to implementing actions on the ground. Given the daunting challenges, no one actor or sector will be adequately powerful and resourced to address the issues of sustainable development and disaster risk reduction. It is important to mobilise public action and funding, but the financing available through mechanisms such as the GEF and GCF can only be catalytic. It is far from sufficient for directly solving the problems. It is important that environmental and disaster risk reduction concerns be mainstreamed into all development endeavours.

It is also imperative that the private sector participates actively. The decisions made by companies are much more powerful drivers than the direct funding from public sources can ever be. The good news is that companies are already recognis-

ing the burden that natural disasters place on their operations and profits. They also see climate change as a direct risk. Companies are already starting to hire a new cadre of professionals to help them to manage climate risk and to adapt their operations to the changing climate (Westervelt 2015). When motivated, the private sector can move much faster than the political process.

Cities are also important actors and many have taken decisive action to reduce their vulnerabilities and enhance their resilience in the face of climate change. For New York, the 2012 Superstorm Sandy was a rude wake-up call that led to concrete actions and changes in policies in the coastal mega-city.

We will also need to know whether we are achieving results and whether we are doing so in a way that is cost-effective. Monitoring and evaluation are important tools for this purpose and will be needed at multiple levels.

It is important to monitor implementation of the agreed policies and strategic frameworks, as well as the individual programmes and projects so that the various stakeholders ranging from the funders and tax payers to the people on the ground that are intended to benefit from these actions can be assured that implementation is on track; or if it isn't, that corrective action can be taken. In developing the SDGs, the international community has placed significant emphasis on results frameworks, monitoring and indicators.

Given that we call for integration of sustainable development and disaster risk reduction goals, there is a need for developing new metrics that capture these dimensions. For one, climate change has increased the importance of risk and uncertainty that need to be also built into the monitoring and evaluation frameworks (Picciotto 2007). It is not possible to continue business as usual and assume continued linear changes in complex systems that are characterised by uncertainty, discontinuities and unknown tipping points.

Although monitoring is essential for the international community to know that strategies, programmes and projects are proceeding on target, it is not enough. Monitoring should be a routine management task and indicators can only measure change in a limited number of areas. They cannot explain why things change, what are the causal mechanisms and conditions where interventions are effective. For this, evaluation is required.

Evaluation involves an objective and rigorous analytical process using different types of data and methodologies to enhance our understanding of the causal mechanisms and underlying factors of why an intervention works or does not work, under what circumstances, and for whom. Unlike monitoring, evaluation does not take the intervention as a given, but will question whether the strategy or approach chosen was the correct one or should be abandoned. Evaluation should assess the relevance of the intervention, not only based on whether it fits into an agreed national and/or international framework, but also whether it is making a difference on the ground. In this sense, relevance approaches impact (Van den Berg 2011).

There are many approaches and ways of evaluating the performance and impact of a policy, strategy, programme or project. Impact evaluations often utilize econometric tools and experimental and quasi-experimental methods, such as randomised controlled trials. Such methods can be useful in certain contexts, but have their limi-

tations (see Puri and Dhody in Chap. 15 of this volume). Other methods can be used rigorously to enhance our understanding of what works and how to improve performance. Most often theory-based approaches utilising multiple methods are the most feasible way of triangulating evidence from different sources and arriving at useful results. To the extent possible, the intended beneficiaries should be involved in setting the evaluation questions and participating in the evaluation. After all, the goal of the interventions is to benefit the people on the ground and there is a strong element of downward accountability to them.

When designing the evaluation framework and evaluation questions, it is important to focus on the ultimate goals of what the policy, strategy, programme or project is trying to achieve. There may be multiple goals and when multiple organizations are involved, it is not always clear that the goals are fully aligned (Uitto 2014). It is important to be fully cognizant of these tensions and also to look out for unintended consequences that virtually every intervention has. As we are moving into new territory of integrating disaster risk reduction and sustainable development, rigorous evaluation can be truly helpful in ensuring that stakeholders benefit from the intervention and helping proponents learn and improve performance.

1.4 Structure of This Book

The book contains 17 chapters apart from this introductory one. They explore the linkages between sustainable development and disaster risk reduction from a variety of angles, addressing theoretical and conceptual issues as well as practical lessons from the ground. They also cover a variety of sectors.

In the next chapter, Adrienne Greve provides a summary of the state of the art on the ways in which climate change affects disaster type, location, frequency and severity. She uses this background to explore how disaster management procedures must adjust to accommodate progressive climate change, and discusses the characteristics of effective climate adaptive disaster management procedures and strategies.

In Chap. 3, Akhilesh Surjan, Shimpei Kudo and Juha Uitto deconstruct risk and vulnerability to natural disasters, recognising that they are not evenly distributed. Risk varies geographically dependent on geographical location, but vulnerability is dependent on social, economic and political factors. In many ways, poor people are more vulnerable to hazards, often living in exposed areas and substandard housing, having inadequate means to prepare for and recover from shocks brought about by natural disasters, including slow-onset disasters. The chapter also explores psychological dimensions and trauma caused by natural disasters that can lead to long-standing damage.

Urban areas are particularly vulnerable to the impacts of climate change, but there is no agreed method for assessing urban vulnerability. Tran Phong and Nguyen Huy argue, in Chap. 4, that to overcome this constraint and to make the concept of vulnerability operational, it is useful to use a resilience approach that allows for

consideration of complex systems and their interactions in cities. The chapter reviews key challenges to disaster risk management in the context of rapid urbanisation and impacts of climate change in light of experience from practice. It presents a new vulnerability assessment approach based on a climate resilience framework. It concludes with key findings, experiences and lessons learned from the application of urban climate vulnerability assessment in Hue City, Vietnam.

Climate change is most often presented as a long-term phenomenon and little attention is given to assessments of how extreme weather events already today cause serious losses, particularly in the least developed countries that are vulnerable due to low incomes, weak infrastructure and institutions, and low capacity for coping with climate change. Despite data limitations and uncertainties, Kirsten Halsnæs, Per Kaspersen and Sara Trærup develop a methodological framework for damage cost assessment that reflects key assumptions regarding the specific vulnerabilities in a developing country context. Presenting the framework in Chap. 5, they apply it to the assessment of the consequences of severe storms in Cambodia based on 18 years of statistical records of events.

Natural disasters and climate change impacts are a leading cause of hunger, affecting all dimensions of food security, including access to food, availability and stability of supplies, and nutrition. Food security, climate change adaptation and disaster risk are the focus of Chap. 6 by Umma Habiba, Md. Anwarul Abedin and Rajib Shaw. Most food insecure people live in areas prone to natural hazards and they are the least able to cope with shocks. Poor households are often trapped in a downward spiral of food insecurity and poverty. The chapter focuses on the governance of food systems in order to understand their vulnerability to environmental change and to identify solutions.

The extent to which sustainable development benefits a community is closely tied to its level of health, argue Minako Jen Yoshikawa and Akhilesh Surjan in Chap. 7. Health is a product of economic, social, political and environmental factors, as well as of health services. Sustained improvements in health must been seen as an integral part of sustainable development. Health in turn contributes to economic, social and environmental development through multiple pathways. There is thus a virtuous cycle between improved health and sustainable development.

Ecosystems, climate change and disaster risk reduction were among the cross-cutting issues highlighted in Rio+20. With this in mind, Noralene Uy Rafalea, Jane Delfino and Rajib Shaw discuss the important role of ecosystem-based disaster risk reduction (Eco-DRR) in sustaining ecosystems and building disaster-resilient communities. Chapter 8 describes ecosystem management practices that link ecosystem protection and disaster risk reduction. The authors further analyse trends in Eco-DRR elucidating the challenges in advancing its use and linking it to policy.

In Chap. 9, M. Usman Mirza and his co-author Daanish Mustafa review water research literature through the tri-focal lens of access, equity and hazards. Building resilience and adaptation capacity to guard against water-related hazards must be an integral part of water resource planning. With the increasing awareness of water-related hazards, their impacts and associated risks, it is no longer possible to forecast based on averages.

Hydro-meteorological disasters, such as flooding, storm surges and wet mass movement account for nearly 90 % of total catastrophic events in the world. At the same time, more than 60 % of economic damage due to natural disasters has been in coastal areas. In Chap. 10, Rajarshi DasGupta and Rajib Shaw highlight key linkages between sustainable development and disaster risk reduction in coastal areas, addressing the emerging challenges in risk sensitive coastal zone management in the face of climate change and coastward migration, land development, urbanization and loss of ecosystem services.

Integrated approach to water resources management under conditions of climate change is the focus of Chap. 11 by Erika Onagi. Her research focuses on the Murray-Darling Basin in Australia and the basin plan negotiated under a federal political system. She raises several questions in order to provide lessons from the case study and to suggest implications to other situations of transboundary river management.

Using the Philippines, one of the most climate vulnerable countries, as a case, Juan Pulhin explores how the current and future potential impacts of climate change threaten the contribution of agriculture and water sectors to the country's economic development. In Chap. 12, issues and challenges facing the sectors are also analysed and potential solutions explored to reduce the adverse impacts of climate change with the aim of helping achieve the country's quest of sustainable development.

In Chap. 13, Rajib Shaw explores sustainability elements of community-based approaches in development projects and links them to the risk reduction paradigm. His argument from a historical point of view is that communities have been active in development activities even before states were formed. However, after state formation and governmental control of most of development activities, community-based approaches must remain central.

Chapter 14 by Glenn Fernandez and Rajib Shaw reviews the achievements of the UN Decade for Sustainable Development in the area of Disaster Risk Reduction Education (DRRE). Specific examples of successful education, training and capacity building initiatives in formal and informal DRRE are presented. The remaining challenges of utilising DRRE as a tool to build a culture of disaster resilience are discussed to explore how DRRE can be further enhanced.

In Chap. 15, Jyotsna Puri and Bharat Dhody lay out a paradigm for evaluating adaptation in forestry projects, policies and programmes. The authors examine how experimental and quasi-experimental methods can be used to understand the effectiveness of adaptation projects in the forestry sector. There have been few studies that have used robust attribution methods to assess the impacts of programmes on how well forests are adapting and are sustainable. Impact evaluation methodologies can make big contributions to the field, but there are also many limitations in traditional methods that can limit the understanding of impacts in multi-intervention and multi-sectoral contexts. The authors present possibilities in methodology and data that represent an important way forward.

Jesusa Grace Molina and Andreas Neef in Chap. 16 make a case for integration of indigenous knowledge into disaster risk reduction and management policies for sustainable development. Due to a combination of physical, socio-economic and political factors, the Agta, an indigenous group in Casiguran, Philippines, are highly

susceptible to the threat of natural hazards. Despite their vulnerabilities, they possess valuable knowledge generated through practical and long-standing experiences, culture and local resources, which should be brought to bear on the decision-making and planning, and policy formulation processes of the local government. The authors recommend mechanisms for ensuring the Agta's inclusion.

Chapter 17 by Thi Kinh Kieu, Glenn Fernandez and Rajib Shaw traces the history, development and purpose of the Sustainability Literacy Test (SLT) promoted by several universities worldwide to ensure that they are producing sustainability literate graduates. A comparison between SLT and several similar tests is made to offer insights regarding lessons learned from experiences and to provide suggestions for improving SLT. The chapter also presents initial student feedback on SLT and their recommendations to enhance its usefulness.

To conclude the book with Chap. 18, Nitin Srivastava, Glenn Fernandez, Rajarshi DasGupta, Akhilesh Surjan and Rajib Shaw explore the inclusion of disaster risk reduction and resilience in the post-2015 SDGs. The chapter also focuses on the role various stakeholders can play in disaster risk reduction through social inclusion. Yet, investment for disaster risk reduction, enhancement of disaster knowledge and access to information, and a conducive international environment still pose challenges in the post-2015 era.

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