

Karen Sudmeier-Rieux  
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J.C. Gaillard *Editors*

# Identifying Emerging Issues in Disaster Risk Reduction, Migration, Climate Change and Sustainable Development

Shaping Debates and Policies

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 Springer

*Editors*

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# Foreword by the International Organization for Migration

The year 2015 will be remembered as a key moment in the evolution of the global development architecture. Expectations are that the endorsement of the Sendai Framework on Disaster Risk Reduction 2015–2030 (SFDRR) and of the post-2015 Sustainable Development Goals (SDGs), together with progress under the UN Framework Convention on Climate Change (UNFCCC), will result in a stronger and more cohesive international framework to promote well-being, security and resilience.

All three policy tracks have given significant attention to population movements. UNFCCC and SFDRR 2015–2030 mention displacement as one of the main potential consequences of environmental shocks and stresses, and migration and relocations as options to reduce their impacts. The dialogue on Urban Settlements—culminating in the 2016 Habitat-III conference—has also drawn attention to the vulnerability of migrants in crisis situations, while underlining the role they can play in relief and recovery.

All these processes call for an important change in perspective. The narrative that depicts human mobility as an undesirable (albeit often inevitable) consequence of natural and man-made shocks and stresses, poverty and underdevelopment must give way to a more nuanced view of mobility as a part of the normal, productive life of households and communities. Despite the political sensitivities that are often associated with the management of internal and international population movements, human mobility is clearly an option people and communities exercise in their attempt to achieve well-being, acquire resilience and successfully adapt to environmental change.

This is not to deny that population movements can have negative impacts on the lives of those who move, as well as on those of people in home and host communities. It is simply to acknowledge that mobility is an unavoidable and integral part of our contemporary world. This being the case, international, regional, national and local-level policies and actions must be put into place to maximize the positive outcomes of migration.

This book looks at the various facets of the nexus between human mobility, well-being and environmental hazards through the lens of risk reduction. The wealth of case studies, perspectives and ideas it provides will hopefully help unpack the complexity of this matter, providing useful indications to academics, practitioners and policy-makers alike. We therefore warmly welcome its timely publication, and trust that it will further the understanding of and encourage dialogue on what is a central issue for the sustainable development of our modern, interconnected societies.

A handwritten signature in black ink, reading "William Lacy Swing". The signature is written in a cursive, flowing style with a prominent loop at the end of the last name.

William Lacy Swing

# Acknowledgments

We are extremely grateful to the Faculty of Geosciences and Environment at the University of Lausanne, Switzerland for encouraging and providing funding for the 2013 workshop which provided the impetus for this book, “Linking Sustainable Development, Global Migration, Climate Change Adaptation and Disaster Risk Reduction – Identifying Emerging Issues”. The workshop was also a follow-up activity to a two-year project funded by the Swiss Network for International Studies: “Sustainable Land Management in Mountain Regions of Bolivia and Nepal In the Context of Outmigration, Climate Change and Disaster Risk Reduction 2012-2014”. Secondly, we extend a special thanks to Lorenzo Guadagno at the International Organization for Migration, Switzerland for his technical advice and close collaboration with the editors, as well as Alice McSherry at the University of Auckland, New Zealand for English editing assistance.

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**Manuela Fernández** is a political scientist and geographer. She completed her Ph.D. in Environmental studies from University of Lausanne (UNIL) on factors of risk governance and conflict resolution between actors involved in landslide risk management in Guatemala. She is also trained in interdisciplinary risk methods (FORIN) and approaches. She has developed in-depth knowledge on institutions, actors, public policies and models of public management in Latin America and Europe, and has published papers on this topic as well as several risk recommendations reports for the municipalities of Guatemala.

**Ivanna M. Penna** completed her Ph.D. at the Department of Geological Sciences from the University of Buenos Aires (Argentina) on large landslide occurrence in the Southern Central Andes of Argentina, with a specialization on assessment and management of geological and climate related risk at the University of Geneva (Switzerland). Dr. Penna's publications address the conditioning factors for large landslide occurrence and related primary and secondary hazards, as well as their impact on the long-term evolution of landscapes. She has conducted fieldwork in

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**Michel Jaboyedoff** is a geologist with a degree in physics and a PhD. in clay mineralogy. During his Ph.D., his research focused on natural hazards, especially on rockfall. Since 2005, he has been working as a full professor at the Institute of Earth Science, University of Lausanne conducting research on natural hazards and its related risks. He has been involved in several risk management projects around the world (Argentina, Canada, Nepal, Norway, Switzerland) linking natural hazards to climate change and adaptation, and is part of several European FP7 Projects (Mountain Risks, Safeland, CHANGES). He was also the principal investigator for the SNIS project, “*Sustainable land management in mountain regions of Bolivia and Nepal in the context of outmigration, climate change and disaster risk reduction.*” Many of his studies involve the use of remote sensing techniques such as Lidar his team’s research efforts have also concentrated on the development of software for hazard and risk analysis. He leads a team of several PhD students and researchers who are in charge of the project GEOCOVER that aims to provide full digital coverage of Switzerland using 1:25,000 scale geological maps provided by Swisstopo.

**J.C. Gaillard** is an Associate Professor at the University of Auckland in New Zealand. His present work focuses on developing participatory tools for disaster risk reduction and on involving marginalized groups in disaster-related activities with an emphasis on ethnicity, gender, prisoners and homeless people. J.C. Gaillard also collaborates on participatory mapping and community-based DRR trainings with NGOs, local governments and community-based organizations in Asia and the Pacific. He is author of numerous publications, including the recent *Handbook of Hazards and Disaster Risk Reduction*, Routledge, in partnership with Prof. Ben Wisner and Dr. Ilan Kelman, and is chief editor of the journal *Disaster Prevention and Management*, Emerald.

# Acronyms

ADB	Asian Development Bank
AIRDR	Assessment of Integrated Research on Disaster Risk
BNPB	National Disaster Mitigation Agency (Indonesia)
CBS	Central Bureau of Statistics (Nepal)
CCA	Climate Change Adaptation
CIAT	Comité Interministériel d’Aménagement du Territoire (Interministerial Committee for Land use planning) (Haiti)
CNR	Compagnie nationale du Rhône (National Company of Rhone River)
CRED	Centre de Recherche sur l’Epidémiologie des Désastres (Research Center on the Epidemiology of Disasters)
CRM	Climate Risk Management
DDN	Disaster and Development Network
DFID	Department for International Development (United Kingdom)
DHM	Department of Hydrology and Meteorology (Nepal)
DIDR	Development-induced displacement and resettlement
DRM	Disaster risk management
DRR	Disaster risk reduction
EbA	Ecosystem-based adaptation
EC	European Commission
ECHO	European Union Humanitarian Aid and Civil Protection Department
EIA	Environmental impact assessment
EM-DAT	Emergency events database
GCCA	Global Climate Change Alliance (European Union)
EU-GCCA	European Union—Global Climate Change Alliance
EWASs	Early warning articulated systems
EWSs	Early warning systems
FAO	Food and Agriculture Organization of the United Nations
FEMA	Federal Emergency Management Agency (United States)

FGD	Focus group discussion
FiBL	Swiss Research Institute of Organic Agriculture
GDP	Gross domestic product
GFMD	Global Forum for Migration and Development
GII	Gender inequality index
GIS	Geographic information system
GLOFs	Glacial outburst floods
GNDR	Global Network of Civil Organisations for Disaster Reduction
GNS	Gross national savings
GT	Glacier Trust (Nepal)
HDI	Human Development Index
HFA	Hyogo framework for action
HIV/AIDS	Human immunodeficiency virus infection/acquired immune deficiency syndrome
HS	Homeland Security [United States Department of]
ICIMOD	International Centre for Integrated Mountain Development
ICRC	International Committee of the Red Cross
ICT	Information communication technology
IDP	Internally displaced person
IDRM	Integrated disaster risk management
IEE	Initial environmental examination
IEM	Integrated emergency management
IFRC	International Federation of Red Cross and Red Crescent Societies
IAASTD	International Assessment of Agricultural Knowledge, Science and Technology for Development
ICRAF	World Agroforestry Center
IFAD	International Fund for Agricultural Development
IFOAM	International Federation of Organic Agriculture Movements
IMF	International Monetary Fund
IOM	International Organization of Migration
IPCC	Intergovernmental Panel for Climate Change
IRDR	Integrated Research for Disaster Risk
IRGC	International Risk Governance Council
IUCN	International Union for Conservation of Nature
MASL	Metres above sea level
MAT	Mean annual temperature
MCGM	Municipal Corporation of Greater Mumbai (India)
MDGs	Millennium development goals
MINUSTAH	United Nations Stabilization Mission in Haiti
MMRDA	Mumbai Metropolitan Region Development Authority (India)
MoSTE	Ministry of Science, Technology and Environment (Nepal)
MRPDA	Mithi River Protection and Development Authority (India)
NAST	National Academy of Sciences and Technology (Nepal)
NATO	North American Treaty Organization
NGO	Non-governmental Organization

NIC	National Institute of Colonization (Bolivia)
NIDS	Nepal Institute for Development Studies
NLSS	Nepal Living Standard Survey
OCHA	Office for the Coordination of Humanitarian Affairs (UN)
OECD	Organisation for Economic Co-operation and Development
OLTB	Overcoming land tenure barriers (Haiti)
OWGGASDG	Open Working Group on Sustainable Development Goals
PAR	Pressure-and-release
REDD	United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation
RIA	Risk interpretation and action
RPP	Risk prevention plans
SASMI	South Asian Seasonal Monsoon Index
SDGs	Sustainable Development Goals
SES	Social–ecological systems
SFDRR	Sendai framework for disaster risk reduction
SIC	Security industrial complex
SLM	Sustainable land management
SSHAC	Senior Seismic Hazard Analysis Committee
STD	Sexually transmitted disease
SWOT	Strengths, weaknesses, opportunities and threats
TLTB	Tauke Land Trust Board (Fiji)
TEPCO	Tokyo Electric Power Company (Japan)
UAE	United Arab Emirates
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNDAF	United Nations Development Assistance Framework
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention for Climate Change
UNHCR	United Nations High Commission on Refugees
UNICEF	United Nations Children’s Fund
UNIFEM	United Nations Development Fund for Women
UNISDR	United Nations Office for Disaster Reduction
UNOSEH	United Nations Office of the Special Envoy for Haiti
UNPEC	Urban National Parks in Emerging Countries and Cities
USAID	United States Agency for International Development
USP	University of South Pacific
USOHDACA	United States Overseas Humanitarian, Disaster and Civic Aid
VDC	Village Development Committee (Nepal)
WCDRR	World Conference on Disaster Risk Reduction
WOCAT	World Overview of Conservation Approaches and Technologies
WWAP	World Water Assessment Programme
WWF	World Wildlife Fund

# Chapter 1

## Introduction: Exploring Linkages Between Disaster Risk Reduction, Climate Change Adaptation, Migration and Sustainable Development

Karen Sudmeier-Rieux, Manuela Fernández, J.C. Gaillard,  
Lorenzo Guadagno, and Michel Jaboyedoff

### 1 Tackling Inter-linkages

We live in a world of increasingly complex and inter-linked environmental and societal issues, such as disasters and migrations. Disasters, development, migration and climate change are among some of the most pressing issues facing our societies today. They are closely linked through a myriad of interconnections and causal connections and have recently been given more attention in the scientific literature, primarily from the perspective of development, climate change or so-called *environmental migration* (Foresight 2011; Piguet 2013; UNDP 2010). Large disasters, which took almost 68,000 lives and affected 218 million on average each year in the last decade (1994–2013), and the many small everyday disasters that are often not accounted for, are on the rise (EM-DAT 2015; GNDR 2015; UNISDR 2015). At the same time there is a steep rise in the number of migrants worldwide, up from

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155 million in 1990 to 232 million in 2013 (OECD 2013; UNDESA 2015). Seemingly every day, the media report about a new wave of migrants taking to the sea or land to seek better opportunities elsewhere, often escaping unsustainable livelihood conditions, political upheaval or environmental stress, or a combination of all the above (UN News Centre 2015). The goal of this book is to explore these inter-linkages from a number of different geographical, social and natural science angles and contribute to the debate about how to improve disaster risk reduction (DRR) policies and practices, taking into account migration process from a large perspective where both natural and social factors are crucial and mutually “alloyed”.

It is also a contribution to counter the often criticized “silo” approach taken by institutions and academia alike, which do not foster enough integrative policies or transdisciplinary research (Gall et al. 2015). Yet, policies and practices in the fields of DRR, climate change adaptation (CCA), environmental management and migration are highly intertwined. The year 2015 will be remembered as a cross roads for the renegotiation of several relevant international agreements: the post Hyogo Framework for Action (HFA) framework led by the United Nations Office for Disaster Risk Reduction (UNISDR), which became the Sendai Framework for Disaster Risk Reduction (SFDRR) 2015–2030; the renewal of the Kyoto Protocol at the Conference of Parties meeting in Paris under the United Nations Framework Convention on Climate Change (UNFCCC); the Sustainable Development Goals (SDGs) by the SDG working group to replace the Millennium Development Goals (MDGs) and finally the Third Financing for Development Conference which aims to contribute to and support the implementation of the post-2015 development agenda. Migration is an important component in all of these agreements, and adequate migration policies will be key to the achievement of their objectives. However, it is also a politically sensitive topic, as demonstrated by the contentious inclusion of references to migration and displacement in the texts of the SFDRR and the SDGs.

This volume contributes in particular to the discussion on the SFDRR and its potential as an integrative DRR policy framework, some seeing it as a positive step forward in terms of embracing a multitude of issues, others doubting that the agreement will lead to much concrete action towards real DRR on the ground. The overarching guiding theme is succinctly summarized by Hewitt: (Chap. 3, p:45) “Risk reduction in each preventive field has required working with, and the development of improvements for, those most likely to be harmed, usually those living in disadvantaged places and groups”, and this must include migrants, who were largely sidetracked in DRR policies and practices until recently. When we refer to DRR, we understand it to encompass the practices and policies that span prevention, mitigation and response through early warning, risk analysis and management, communications and longer-term recovery (Chaps. 8 and 7).

Taking a DRR approach provides a more comprehensive platform for exploring inter-linkages between disasters, migration, climate change and sustainable development, as it adopts a comprehensive perspective. Human mobility has direct relevance for hazard impacts, exposure and vulnerability, and is therefore key to risk management decisions and policies. Mobility choices are part of complex



household-level livelihood strategies to minimize risks and optimize economic, social, political gains. However, a household decision to move from a mountain slope to a crowded urban floodplain may simultaneously translate into positive economic outcomes, increased livelihood security, access to infrastructure and education and into increased levels of disaster risk for the people involved. These livelihood decisions will also affect collective risk in the place of origin and the place of destination. It is possible that migration can both reduce and increase exposure, vulnerabilities and capacities. Adopting a DRR perspective to understanding migration allows to identify the variety of effects migration has on risk, potentially revealing dynamics of “redistribution rather than reduction of disaster risk” Guadagno (Chap. 2).

Thus, despite the varying opinions and perspectives reflected in this book, we identify two emerging themes:

- First is that disasters, climate change and migration processes are increasingly complex, cascading and intertwined and often based in skewed or mal-development, including the unsustainable management of natural resources;
- Second, migration can act as a positive and negative factor for adapting to economic, social or environmental stressors (i.e. migration to coastal urban centres can reduce economic risks by improving livelihoods while creating new exposure to hazards).

## 2 Exploring Emerging Themes

This section explores the above-mentioned themes, while providing a critical analysis of the environmental migration/displacement/climate change discourse from a DRR perspective.

### 2.1 *Trends in Disasters and Migration*

In analyzing disaster data for the past decade, we observe that flooding is associated with most middle-size and large disasters, affecting 2.5 billion people and accounting for 43 % of all recorded events (CRED 2015). Although this figure seems high, the average number of affected people has fallen over the past 20 years, from 267 million in 1994 to 214 million in 2015. Death rates however have increased over the same period, from 68,000 deaths per year for the full 20-year period (1994–2013) to 99,700 deaths per year between 2004 and 2013. This trend is partially explained by three mega disasters: the 2004 Asian tsunami, Cyclone Nargis in 2008 and the 2010 Haitian earthquake but also by continued vulnerability of some communities to natural hazards (CRED 2015). Important to note is the number of small, cumulative disasters which often go unreported but are extremely devastating for lives and livelihoods (UNISDR 2015). Although there is a steady

increase in the number of climate-related disasters, which increased by 44 % from the 1980–1989 level, a close analysis of these trends points to exposure and vulnerability of people living in unsafe places along coastlines, rivers, steep hillsides or the flanks of volcanoes and compounded by environmental degradation, rather than climate change per se as their main driver (CRED 2015; IPCC 2014a; UNISDR 2015). This is not to deny that climate change certainly is amplifying the magnitude and frequency of certain hazards, primarily sea level rise, heat waves and certain extreme rainfall events (IPCC 2014b).

According to CRED (2015), Asia led by the greatest number of disasters, with 3.3 billion people affected in China and India. Although the largest disaster events occurred in upper-middle income countries (56 %), the highest number of fatalities occurred in low income countries (68 %). Disaster profiles thus differ considerably depending on levels of wealth and preparedness rather than exposure per se. In addition to human lives, globally disasters caused high economic losses, an estimated US\$2,600 billion over the period 1994–2013, although this amount may be underestimated by 50 % (CRED 2015). Even if most of the economic losses are reported in higher to middle income countries, disasters are major setbacks to development efforts of lower income or small economy countries as a proportion of their gross domestic products (CRED 2015). This is especially true for countries which are struggling to improve basic amenities and economic opportunities (UNISDR 2014).

Disasters are one of the reasons why people move but usually as an additional trigger to underlying livelihoods issues. As Nepal is greatly represented in this volume, we illustrate the above point with the case of post-earthquake Nepal 2015. As Nepal is a country characterized by intense internal and international migration flows—30 % of its Gross Domestic Product (GDP) is based on remittances—remittance funds are likely to be critical for the reconstruction efforts. The affected areas have an unusually high proportion of migrant workers, roughly one in five and the Government of Nepal is inviting migrant workers to return to participate in the reconstruction and recovery process (IOM 2015). Not surprisingly, a 2009 World Bank study found that remittances tend to increase in the aftermath of a disaster (Karnik 2015). In the case of Nepal, some economists question whether the money will assist long-term projects beyond individual household reconstruction as remittances are often mainly used to support day-to-day needs. However in the absence of adequate government and international response to the earthquake aftermath, the private response through social networking, volunteerism and social consciousness is to some extent filling the public vacuum (Glencourse and Shakya 2015). Villages with good social capital, i.e. extended family members who can assist or connections to government officials are most likely to receive emergency and recovery assistance. At the same time, widespread access to social media is creating a push for greater transparency of the distribution of assistance, possibly leading to a movement towards greater government accountability (Glencourse and Shakya 2015).

Mobility is as old as human kind and corresponds to one of the most commonly used strategies for human survival: the ability to move around freely to optimize our

livelihoods opportunities (Diamond 2005). However in order to explain the terms used in this book, we give some definitions. Mobility is often used as a more general term to encompass movement and flows of populations, which can include daily commutes to nearby cities or faraway places. Mobility can include migration which involves the movement or change of residence from one place to another, either temporarily, seasonally or more permanently (UNDP 2009). A displaced person becomes a refugee when he or she crosses an international border, has a legitimate fear of persecution based on race, religion, political opinion or belong to a social group and is not protected by his or her country (UNHCR 2015a). People who are forced to move due to violence, political persecution or a disaster but who does not cross an international border is considered an Internally Displaced Person (IDP) and might present specific protection needs (IFRC 2012; UNDP 2010). According to IFRC (2012), there were 72 million “forced migrants” in 2012 (although it is not clear if this figure refers to refugees and IDPs, or only IDPs) and peaks of migration in 2014 and 2015 (UNHCR 2015b). Forced migration takes many forms and is a global phenomenon, such as in Haiti post-earthquake (Chap. 10) or post Indian Ocean tsunami (Chap. 12).

The 232 million international migrants in 2013 constitute the highest reliable number on record, albeit a relatively small percentage, 3.2 % of the global population. As a consequence of the international economic crisis in 2010, there was a reverse in the migration trend of increasing numbers of migrants towards the most affluent regions towards a greater increase in migration in less wealthy countries (OECD 2013). Thus over the past decade, the number of migrants has increased more rapidly in the South than in the North, and South-South migration slightly exceeds South-North migration (OECD 2013). According to the OECD (2013), refugees, a category that does not include those moving due to environmental stresses, account for 7 % of all international migrants, or 15.7 million, a relatively small proportion of the global migrant population.

Migration is often considered to stem from various push, pull factors and multiple additional obstacles and pathways or intervening factors, which are composed of a myriad of economic, political, social, demographic and environmental drivers (Black et al. 2011; Foresight 2011; Piguet and Pecoud 2011; Chaps. 8 and 15). Yet referring to migration as mainly the outcome of push, pull and intervening factors brings a risk of oversimplification as each of the push, pull and intervening factors may apply in one circumstance but not in another. Rather, Oliver-Smith (2012) stated the need to explore migration as a process explained by how well a society has progressed in achieving mutuality between society and environment. And disasters are at the core of this mutuality between society and environment (or lack of it).

Different types of migration are discussed in this volume. Displacement/resettlement is the type of migration most often linked with disasters and often involves temporary or internal migration as part of the immediate responses of the recovery process. Jahn et al. (Chap. 10) describe the aftermath of the earthquake in Port-au-Prince, Haiti, which displaced a large share of the local population within and outside the city, but also triggered movement of people towards the capital in

search of improved livelihoods. Although this type of migration was supposed to be temporary, many people actually resettled in the capital city. Other types of migration discussed include migration as an adaptive strategy to environmental stress (Chaps. 9 and 13) or as socio-ecological adaptation (Chap. 14). Migration as an adaptation strategy will be discussed in more detail below. Finally, migration as a result of conflict and violence is discussed in this book to a much lesser extent, as this type of migration is more about governance than disasters and environmental causes per se. The line between social/political and economic migration is blurry and certainly an extremely timely and important subject of debate, but one that this volume does not cover, with the exception of the chapter on “disaster diplomacy” (Chap. 12), which touches upon the relation between disasters as possible opportunities for resolving political and social conflicts. And socio-political drivers of migration are usually accompanied by indistinguishable pre-existing economic and environmental vulnerabilities. Thus, most of the cases described in this book focus on examples of intertwined environmental and economic processes, which require populations to adapt and cope, often through migration, rather than political or conflict-driven migration.

## ***2.2 Linkages Between Climate Change and Migration***

There are increasingly clear linkages between climate change and migration. This is particularly the case of small island states (Campbell and Warrick 2014; Farbotko and Lazrus 2012; Chap. 15). The causes of the mobility of their populations are certainly more complex than a single push factor and deeply rooted in societal features such as history, culture, poverty, urban slum growth, water management, unsustainable management of natural resources and poor governance, albeit compounded and multiplied by the increasingly difficult environment conditions created by global warming (Adger et al. 2013). Some chapters allude to “environmental refugees”, a definition originally proposed by El-Hinnawi in 1985. However, value, coverage and use of the term are contested (Black 2001; de Sherbinin et al. 2011; Lazarus 2011; Piguet 2013; Stojanov et al. 2014; Warner 2010).

Oliver-Smith (2012) has summarized this criticism from three perspectives: theoretical, legal and political. The theoretical objection lies with the causality of factors that lead to migration already alluded to in this introduction, as population movements are always driven by social, political and ecological variables, which are all impacted by environmental processes and change (Black 2001; Castles 2002; Kibreab 1997). As described above, a “refugee” has a specific legal status as defined by the 1951 United Nations Convention Relating to the Status of Refugees, which does not qualify people displaced by environmental causes as refugees. Finally, the use of the term is criticized for provoking fear-mongering with press predictions of thousands of immigrants flocking to the North (Morrisey 2012; Castles 2002). In parallel, Hartmann (2010) asserted that the use of “climate refugees” depoliticizes the economic and political causes of migration and obfuscates the role of

governance in addressing migration issues. Although less polemic, the term “environmental migration” is more commonly used and could be seen as an outcome of the lack of mutuality between nature and society, as described by Oliver-Smith (2012). However, it is also criticized based on many of the same arguments relevant for the critique of “environmental refugees”, mainly based on the consideration of the multiple causality of migration (Black et al. 2011; Oliver-Smith 2012; Stojanov et al. 2014). We find the following quote appropriate in summing up the discussion about migration and climate change: “[...] the key question in relation to climate change is less whether climatic variability or climate events will drive migration, and more whether climate change will increase climatic variability or the frequency of extreme events, with the result that future flows are likely to be larger than those currently experienced” (Black et al. 2011: 435). Finally, as reflected by the diversity of examples given in this book, we need to consider the multiple scales at which we consider migration—DRR—CCA interactions, not only at the international but also at the national and local scales.

Our second emerging theme is that human mobility and migration can have both positive and negative impacts on development, risk reduction and CCA (Black et al. 2011; Foresight 2011; Piguet 2010; Kaenzig 2015; Chap. 8). As mentioned above, better employment and education in the destination place may improve development opportunities, while it could lead to a transfer of risk if people move to areas such as urban slums, amplifying exposure in the place of migration (Chaps. 5, 6 and 11).

Collins (Chap. 8) provides an in-depth overview of migration as a *positive* coping and/or adaptation strategy to environmental and economic stresses. He distinguishes between adaptation and coping strategies as a function of the type of threat, and length of time required for a population to reduce risks of various sorts. Both require making adjustments to livelihoods based on decisions and choices following an appraisal of events and possible outcomes or consequences (Burton et al. 1993; Lazarus 2011). Coping strategies may be considered a more immediate response and possibly greater adjustment to a sudden stress, such as a disaster or a sudden economic crisis, based on experience of past events, while adaptation strategies are considered small adjustments to more slow onset and new/future stresses such as climate change or an economic recession.

Temporary migration or displacement in the aftermath of a hazard event or sudden shock are very common coping strategies, and could eventually lead to more permanent migration, as in the case of Hurricane Katrina, especially when people are faced with an accumulation of impacts and few other options (Chaps. 8 and 7). Slow-onset environmental crises compounded by climate uncertainty and economic/political instability, instead, often result in longer-term adaptation strategies and more permanent migration (Chaps. 9 and 11). This type of migration is not new and can be traced back to the beginning of mankind when environmental conditions no longer support human activities. Classic examples include the “Dust Bowl migration” in the 1930s in the United States, which was largely caused by poor soil conservation practices, yet compounded by a severe drought which led to permanent outmigration, mainly to California (Mc Leman 2006:331, quoted by

Black et al. 2011:433) a plight popularized by Steinbeck's (1937) *Of Mice and Men*. In Pakistan, this point has been clearly documented: drought resulted in more permanent international migration than flooding which causes more temporary internal migration (Plamer and Smith 2014; Mueller et al. 2014).

As migrants move temporarily or permanently, they bring with them their know-how, life experiences, potential for innovation and may be more adaptive to natural hazards in the place of destination (Chap. 6). Outmigration can also have empowering effects for those who stay behind: Upreti and Shrestha (Chap. 9) describe how migration in Nepal has given greater independence to women who have been given greater responsibility for managing households as such a large number of men have migrated out for work. In addition to the large remittance inflow to the country, international and urban migration from and within Nepal has also geographically expanded and enriched social capital and networks, a key factor underpinning the current post-earthquake reconstruction process.

Jacobi et al. (Chap. 14) describe research on migration from the Bolivian high plateau (*Altiplano*) to the Amazonian lowlands, and on the pressures posed by newcomers on local indigenous groups and biodiversity. To reduce the environmental drivers of migration, a number of *Altiplano* farmers converted to organic cocoa farming as a more adapted and sustainable practice to environmental conditions. This example also highlights the potential for transfers of risks from one place to another, as a negative outcome of migration. Similar examples are given by Pfeifer et al. (Chap. 4) where long-term migration in the 1980s and 1990s from the Sahel led to settlement along the coast on dunes, former wetlands and the tripling of Dakar's population, over-pumping for drinking water and irrigation for urban agriculture, and sanitation and water quality issues. Texier and Edelblutte (Chap. 6) describe the transfer of risks from rural to urban areas: the megacities of Mumbai and Jakarta are facing increasing flooding and pollution risks due to environmental factors such as growing impervious urban surfaces and lack of waste treatment, both of which are compounded by the unmanaged inflow of migrants to slum areas. Similarly, in Nepal, farmers continue to leave the less fertile hillside terraces to move to nearby and further away valley bottoms or urban areas where they are often forced to settle illegally along river fronts, increasing their exposure to flooding and disrupting social networks (Chaps. 11 and 13). All the above examples highlight how human mobility is a key dynamic in the complex interactions between natural processes and anthropogenic actions.

### 3 Conclusions: Towards Sustainable Development

We live in an increasingly complex world, which academia, with our disciplinary boundaries, is not always able to capture adequately (Gall et al. 2015). The genesis of this book was an interdisciplinary workshop organized by the University of Lausanne, Switzerland in December 2013, which brought together some of the most influential researchers, policy makers and practitioners from the fields of DRR,