Disaster Risk Management in Asia and the Pacific

Edited by Ian Davis
Disaster Risk Management in Asia and the Pacific

This book is linked with two international frameworks – the Millennium Development Goals and the Hyogo Framework for Action, a program focused on disaster risk management – to study the key trends in the region in terms of disaster incidence, sources of vulnerability and social and economic challenges. As both frameworks draw to a close, international debate is taking place during the period 2012–2015 on their current progress. This book seeks to help readers understand the process better.

The chapters are written by nine independent internationally based authors. Collectively, they have extensive regional experience in the areas of disaster risk management and climate change, as well as working in academia, research, consultancy, the United Nations (UN) and international agencies, government and the nongovernmental organization (NGO) sector. The analysis presented benefits from their varied backgrounds in medicine, architecture, economics, engineering, planning, social studies, development studies and political science.

Throughout the book, relevant examples, drawn from the region, are included to ground the project in the harsh realities of risk and disaster impact.

Ian Davis was one of the authors of a pioneering study on disaster mitigation in Asia and the Pacific for the Asian Development Bank in 1991 and became a member of the UK National Committee for Risk Reduction, serving throughout the 1990s. In 1996 he received the UN Sasakawa Award for his work on disaster prevention. Currently he is Visiting Professor in Disaster Risk Management in the Universities of Copenhagen, Kyoto, Lund and Oxford Brookes.
In this book, leading authorities have come together to explain how to make life safer for millions of residents of the Asia-Pacific region. Decision makers would do well to listen to their prescription, for disasters are likely to become ever more important in the future.

—David Alexander, Professor of Risk and Disaster Reduction, University College London, UK
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Preface

This study comes at a critical time as we approach the conclusion of a pair of international agendas: the Millennium Development Goals (MDGs), concerned with poverty reduction and sustainable development, and the Hyogo Framework for Action (HFA), concerned with disaster risk reduction. This reality has resulted in a veritable explosion of writing, conferences, and intense debate from the international disaster/development community of governments, agencies, universities and so forth. This discourse has been particularly present within the hazard-prone Asia and Pacific region. The focus of this activity concerns ‘where next’, seeking to define what actions are needed when these frameworks conclude in 2015.

The Asian Development Bank Institute (ADBI) and the team of authors hope that their chapters can assist in clarifying productive ways forward within the vital processes of disaster risk management (DRM) and adaptation to climate change (CCA). The challenge in writing about disaster risk concerns the very nature of the ‘moving target’ of the subject. As the authors debate, analyze and propose, the external ‘risk environment’ continues to rapidly evolve as risks escalate and new publications, with fresh research insights, materialize. Just after the text of this book was delivered to ADBI, Typhoon Haiyan (or the Yolanda Storm) caused immense devastation on 8 November 2013 to the town of Tacloban and the surrounding region of the Philippines. New lessons concerning risk reduction and climate change will inevitably result from this recovery experience, and such new learning has been the pattern following past major disasters.

As editor, I acknowledge the support of a team of authors with a vast range of collective experience of disaster risk reduction, as seen from varied disciplines and working backgrounds, and of detailed first hand knowledge of the region. This provided the confidence that the advice being offered was sound. These credentials of relevant knowledge and rich experience, spread over several decades, provide the essential backbone to our writing.

The essence of this volume can be captured in the recommendations that follow each chapter, and these are collected together in the concluding section. Here we emphasize the need for holistic actions, rather than narrowly drawn sectoral approaches; innovative DRM and CCA measures, rather than reliance on established patterns; and ensuring that governments take the powerful lead in implementation, rather than entrusting the task to international assisting bodies.
The authors were commissioned by the Asian Development Bank Institute (ADBI) to undertake this study in the summer of 2012, following a prior process of brainstorming and deliberation within ADBI and between ADBI and the Regional and Sustainable Development Department and other regional departments of the Asian Development Bank (ADB). A steering committee was created within ADBI to assist the authors, and three meetings were held with the authors, the ADBI and ADB professionals, and regional policy makers.

The authors wish to thank the co-chairs of the steering committee – former Dean of ADBI, Masahiro Kawai, and Vice-President (Knowledge Management and Sustainable Development) of ADB, Bindu N. Lohani – for their support throughout the project and for the unique opportunity for us to work together in an integrated manner. We also thank the other members of the steering committee: the Deputy Dean of ADBI, Jae-Ha Park; former Director of Research Mario Lamberte; current Director of Research Ganeshan Wignaraja; and the task managers, Minquan Liu and Atsushi Masuda. Our research and the publication of this volume also received professional and logistic support from the following people, to whom we also express our thanks: WooChong Um, Sandra Nicoll, Neil Britton, Yuqing Xing, Robert Davis, Grant Stillman, Peter Morgan, Anbumozhi Venkatachalam and Michael Huang, among others. Further thanks are extended to the visiting officials and experts who attended the review meetings in Tokyo and in Delhi at the presentation of interim findings at the 2013 ADB Annual Meeting.

Following a review meeting, ADBI staff and Mikio Ishiwatari kindly organized a field study visit to review recovery progress following the 2011 Tōhoku earthquake and tsunami. This enabled some of the authors to meet researchers and officials involved in reconstruction actions and view progress in a number of field visits to the affected region. We wish to express our thanks to all we met during this field study.

In writing a study of this nature, each author was dependent on his/her own sources, including helpful advice and encouragement from colleagues and family members, for which we are most grateful.

Finally, we express our thanks to the publisher’s editorial team for their valued professional support in producing the final text.
Abbreviations

ADB  Asian Development Bank
ADBI  Asian Development Bank Institute
ADPC  Asian Disaster Preparedness Center
ADRC  Asian Disaster Reduction Center
AIDMI  All India Disaster Mitigation Institute
APEC  Asia-Pacific Economic Cooperation
APRSAF  Asia-Pacific Regional Space Agency Forum
ARF  Association of Southeast Asian Nations Regional Forum
ASD  acute stress disorder
ASEAN  Association of Southeast Asian Nations
BCP  business continuity planning
CADRI  Capacity Development for Disaster Reduction Initiative
CCA  climate change adaptation
CBDM  community-based disaster management
CBDRM  community-based disaster risk management
CBDRR  community-based disaster risk reduction
CEPZ  Chittagong Export Processing Zone
CGIAR  Consultative Group for International Agricultural Research
CSO  civil society organization
DFID  Department for International Development
(Department for International Development)
DMTP  Disaster Management Training Programme
DRF  disaster risk financing
DRM  disaster risk management
DRR  disaster risk reduction
ECB  emergency capacity building
ECLAC  United Nations Economic and Social Commission for Latin America and the Caribbean
EERI  Earthquake Engineering Research Institute
ELRHA  Enhanced Learning & Research for Humanitarian Assistance
ESCAP  United Nations Economic and Social Commission for Asia and the Pacific
FORIN  Advanced Institute for the Forensic Investigation of Disasters
Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>GADRR</td>
<td>Global Alliance for Disaster Risk Reduction</td>
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<td>GAR</td>
<td>global assessment report</td>
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<td>GDP</td>
<td>gross domestic product</td>
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<td>GEJE</td>
<td>Great East Japan Earthquake</td>
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<td>GFCS</td>
<td>Global Framework for Climate Services</td>
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<td>GFDRR</td>
<td>Global Facility for Disaster Reduction and Recovery (World Bank)</td>
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<td>GNDR</td>
<td>Global Network of Civil Society Organizations for Disaster Reduction</td>
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<td>HFA</td>
<td>Hyogo Framework for Action</td>
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<td>ICIMOD</td>
<td>International Centre for Integrated Mountain Development</td>
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<td>ICSU</td>
<td>International Council for Science</td>
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<td>IDB</td>
<td>Inter-American Development Bank</td>
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<td>IDNDR</td>
<td>International Decade for Natural Disaster Reduction</td>
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<td>IFRC</td>
<td>International Federation of Red Cross and Red Crescent Societies</td>
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<tr>
<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<tr>
<td>IRDR</td>
<td>Integrated Research for Disaster Risk</td>
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<td>IRP</td>
<td>International Recovery Platform</td>
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<td>ISO</td>
<td>International Organization for Standardization</td>
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<td>JICA</td>
<td>Japan International Cooperation Agency (Government of Japan)</td>
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<td>LA RED</td>
<td>Network for Social Sciences in Disaster Prevention in Latin America</td>
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<tr>
<td>METI</td>
<td>Ministry of Economy, Trade and Industry (Government of Japan)</td>
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<td>MDGs</td>
<td>Millennium Development Goals</td>
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<td>MRC</td>
<td>Mekong River Commission for Sustainable Development</td>
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<td>NDMO</td>
<td>National Disaster Management Office</td>
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<tr>
<td>NGO</td>
<td>nongovernmental organization</td>
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<td>NOAA</td>
<td>National Oceanic and Atmospheric Administration</td>
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<td>NSET</td>
<td>National Society of Earthquake Technology</td>
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<tr>
<td>ODI</td>
<td>Overseas Development Institute</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Co-operation and Development</td>
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<tr>
<td>OFDA</td>
<td>Office of Foreign Disaster Assistance (US government)</td>
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<tr>
<td>PEER</td>
<td>Program for Enhancement of Emergency Response</td>
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<tr>
<td>Periperi U</td>
<td>Partners Enhancing Resilience for People Exposed to Risks</td>
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<tr>
<td>PTSD</td>
<td>post-traumatic stress disorder</td>
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<tr>
<td>RIMES</td>
<td>Regional Integrated Multi-Hazard Early Warning System for Africa and Asia</td>
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<tr>
<td>SOPAC</td>
<td>Pacific Islands Applied Geoscience Commission</td>
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<td>SPC SOPAC</td>
<td>Secretariat of the Pacific Community Applied Geoscience and Technology Division</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
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<td>UNCSD</td>
<td>United Nations Conference on Sustainable Development</td>
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<td>Abbreviation</td>
<td>Description</td>
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<td>UNDP</td>
<td>United Nations Development Programme</td>
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<td>UNISDR</td>
<td>United Nations International Strategy for Disaster Reduction</td>
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<tr>
<td>VCA</td>
<td>vulnerability and capacity assessment</td>
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<tr>
<td>WCED</td>
<td>World Commission on Environment and Development</td>
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<tr>
<td>WEF</td>
<td>World Economic Forum</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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<td>WMO</td>
<td>World Meteorological Organization</td>
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Executive summary

Disaster Risk Management in Asia and the Pacific is published as two international frameworks draw to a close: the Millennium Development Goals (MDGs), and the Hyogo Framework for Action (HFA): ‘Building the capacity and resilience of the community against disasters 2005–15’ – a program focusing on disaster risk management. International debate is taking place on current progress with both frameworks, and this study seeks to inform this process.

This study considers key trends in the region, in terms of disaster incidence, sources of vulnerability and social and economic challenges. This is followed with a discussion on two pressing concerns of governments: managing compound disasters and innovative financing arrangements for disaster risk reduction. The final section concerns governance for effective disaster risk reduction, considering this from the local, national, regional and international levels of action.

Nine independent, internationally based authors were commissioned to write the study. Among them they have extensive regional experience in the disaster risk management and climate change fields, working in academia, research, consultancy, UN and international agencies, government and the NGO sector. The analysis presented in the study benefits from their varied backgrounds in medicine, architecture, economics, engineering, planning, social studies, development studies and political science. The study has been managed by the Asian Development Bank Institute (ADBI), with extensive support from the Asian Development Bank (ADB). To guide the study and monitor progress four workshops were convened in Tokyo, when expert reviewers provided a vital critique of the emerging chapters. In addition the preliminary drafts were presented at the ADB annual meeting in Delhi in May 2013, resulting in useful commentary.

Four recurring themes provide linking threads for the study:

1. Expanding Risks
2. Innovative Solutions
3. Holistic Approach
4. The Pivotal Role of National Governments

The chapters are illustrated by charts, models, diagrams and tables. Throughout the study, relevant examples drawn from the region are included to ‘earth’
the project in the harsh realities of risk and disaster impact. A range of appendices
covers definitions, suggested reading material and parallel studies of disaster risk
management (DRM) and climate change adaptation (CCA).

Each chapter generates a practical recommendation:

1 Evidence-based policies are needed to inform governments on how to allo-
cate their resources more strategically.
2 In order to reduce vulnerability, the ‘drivers of risk’ need to be tackled
rather than being sidestepped, as in current approaches, with risk manage-
ment confined to the ‘consequences’ of vulnerability.
3 It is necessary to build safety nets to protect the vulnerable poor from
the social and economic impacts of disasters.
4 A science-based approach is needed to reduce the risk of compound
disasters. This will involve assessment, land-use planning and construction
and the development of enhanced ‘consequence management’.
5 The financing of risk reduction is currently underdeveloped. Therefore,
there is a need to explore economic instruments, alternative grant funding
and social grants to be extended to poor families.
6 Local disaster risk management needs to be linked to development
issues: health, education, sanitation and so on, and it needs a strong legal
framework to function more effectively.
7 At the national level disaster risk management needs to be placed as a
core element in governmental development strategies and programs.
This requires a legal framework, enhanced coordination and flexible coop-
eration with related bodies.
8 There is a need for investment in regional professional, technical and edu-
cational institutions to promote applied research and DRM data acquisi-
tion. This is needed to support the vital role of regional institutions.
9 International investments are needed to strengthen national capabilities.
A ‘process and systems focus’ is needed to reduce public risk by targeting
facilities and functions of high social value, such as schools.
10 The final recommendation provides the main message of the study: Within
the Asia-Pacific region there are expanding risks to lives, property, econ-
omies and the environment; therefore, holistic actions are needed, such
as the adoption of innovative DRM and CCA measures, with govern-
ments taking a powerful lead.
Part 1

Background
1 Introduction

Ian Davis

“Genuine learning begins when you realize that you are ‘at-risk’.”
– Anonymous

“Reducing disaster risk is everybody’s business, and needs everyone’s participation and investment – civil society, professional networks as well as municipal and national governments.”
– Ban Ki-Moon, United Nations Secretary-General, on the occasion of the International Day for Disaster Reduction (“Curbing disaster risk,” 2010)

Context of study

In 2015, two international frameworks draw to a close: the Millennium Development Goals (MDGs) and the Hyogo Framework for Action (HFA): ‘Building the capacity and resilience of the community against disasters 2005–15’ – a program focusing on disaster risk management (DRM) (UNISDR 2005). International debate is taking place on current progress with both frameworks to define future ways to effectively manage disaster risks and to reduce poverty and how to link these agendas in the coming decades (UNISDR 2013c). This study seeks to inform this dialogue.

Key trends and challenges within the Asia-Pacific region introduce the study, with a consideration of the challenges posed by vulnerability and social and economic realities. This is followed by discussion concerning two major concerns of governments: (1) compound disasters and (2) financing and insurance. The final section reviews various levels of governance of DRM, starting at the local and community levels, rising to the national level and followed by the regional level. This section concludes by considering the ways that DRM can be advanced through international frameworks. A series of conclusions and recommendations for decision makers closes the study.

Perhaps the greatest challenge faced by our team of authors as we have worked on this study has been how to capture the flood of information that this subject now generates, how to use it to develop and expand our collective knowledge and then, the most difficult part, how to distil this emerging knowledge into practical wisdom. This is needed so that those with the responsibility to make wise
decisions in the complex fields of disaster risk and climate change can protect people, their habitat and the environment.

The regional disaster threat

The Asia-Pacific region, with 60 per cent of the world population, is highly vulnerable to the impact of hazards and has experienced major and minor disasters throughout the past decade. Between 2002 and 2011, 40 per cent of all reported disasters (1,524) occurred in Asia, causing 63 per cent of all global disaster deaths (669,263), affecting 90 per cent of all those affected globally (2.2 billion) and causing 48 per cent of global damage (US$691 billion).

**Table 1.1 Populations ‘at risk’ in Asia-Pacific countries**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Percentage</th>
<th>Population</th>
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<tbody>
<tr>
<td>1</td>
<td>Bangladesh</td>
<td>97.7%</td>
<td>139.60 million</td>
</tr>
<tr>
<td>2</td>
<td>Nepal</td>
<td>97.4%</td>
<td>25.90 million</td>
</tr>
<tr>
<td>3</td>
<td>Philippines</td>
<td>88.6%</td>
<td>83.50 million</td>
</tr>
<tr>
<td>4</td>
<td>Viet Nam</td>
<td>71.4%</td>
<td>62.70 million</td>
</tr>
<tr>
<td>5</td>
<td>Bhutan</td>
<td>60.8%</td>
<td>0.40 million</td>
</tr>
<tr>
<td>6</td>
<td>Indonesia</td>
<td>59.3%</td>
<td>143.30 million</td>
</tr>
<tr>
<td>7</td>
<td>Pakistan</td>
<td>49.6%</td>
<td>87.84 million</td>
</tr>
<tr>
<td>8</td>
<td>Afghanistan</td>
<td>46.0%</td>
<td>12.20 million</td>
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What is particularly striking about these statistics is that the vast majority of the population of Bangladesh, Nepal and the Philippines (with a combined total population of 249 million people) was faced in 2005 with the threat of virtually blanket exposure and vulnerability to hazards. While it is not known how these statistics have changed during the intervening eight years, the likelihood is that these patterns of virtual risk saturation remain.

The year 2011 was an ‘extreme year’ for global disaster exposure and vulnerability. It was the costliest on record for disasters, with economic losses exceeding the previous record of US$262 billion – a record set in 2005. Some 80 per cent of these losses were attributed to the Asia-Pacific region (Guha-Sapir et al. 2012;
During this year the Great East Japan Earthquake and Tsunami occurred, with 19,846 reported dead or missing, the destruction of almost 300,000 buildings and an estimated total economic loss of US$201 billion, but this figure is projected to rise to approximately $375 billion (ESCAP and UNISDR 2012, p. 7). The disaster had severe economic consequences, including a decline of 47 per cent in Japanese automobile production during 2011.

Later in 2011, the Southeast Asia floods caused massive devastation, and the international economic consequences were particularly felt in Thailand, where 813 persons died and the reported economic losses were US$45–45.7 billion. Swiss Re reported that insured losses were estimated at US$12 billion (the highest number on record for a single flood event) (Jha & Stanton-Geddes 2013, p. 66).

One consequence of the flood impact was the increase in the global cost of computer hard drives, which tripled on account of factory damage and the consequent disruption of international supply chains (ESCAP and UNISDR 2012, p. xxv). (See Thailand flooding case study in Chapter 3, p. 78.)

But in September 2011 there was some encouraging news. A serious earthquake, measuring 6.7 on the Richter scale, occurred in Banda Aceh, Indonesia. This coastal town had suffered extensive damage and loss of life in the South Asian earthquake and tsunami of 2004. However, due to improved disaster preparedness as well as the quality and safety of the reconstruction, only two persons were killed in this event (Jakarta Post 2011).

The trends described and analyzed in Chapters 2–4 indicate that disaster risk management activities within the region have a fourfold concern, with closely interwoven priorities:

- **Protecting lives**
- **Protecting property** (in the form of all forms of investment in buildings, infrastructure, etc.)
- **Protecting livelihoods at the micro-scale and economies at the macro-scale** (a concern requiring authorities to look beyond regional boundaries to global supply chains)
- **Protecting and sustaining the natural environment.**

(See Appendix 1, Table 1.1, The impact on lives and property of major Asian Disasters 2004–2013.)

**Aim of study**

The serious risk situation in the Asia-Pacific region provides the impetus for this study, which seeks to provide senior decision makers in the governments of the region with an overview of the steps they can take to reduce disaster risks. Such steps include developing their staff capacities, building ‘learning cultures’, creating appropriate governmental structures and developing sound policies. All are needed to reduce the unacceptable level of growing disaster threats to lives, property, economic assets and the environment and to adapt to the changing climate.
To achieve the aim of this study a number of critical questions require answers. They concern the anticipated changes in patterns of risk facing the Asia-Pacific region in the future. These questions are set within four threads that run throughout the fabric of the entire study:

1. **Expanding risks** (Chapters 2–5)
   - Increases in vulnerability and exposure lie at the heart of the escalating risks throughout the region, provoking the following questions:
     - what risks in the region are expanding and why?
     - how can the progression of vulnerability be reduced?
     - what social and economic challenges need to be faced?
     - how can complex, compound disasters be managed?

2. **Innovative solutions** (all chapters)
   - Examples include innovative disaster risk financing as described in Chapters 4 and 6 and a wide range of community awareness approaches described in Chapter 7. Questions include:
     - what financial instruments are available?
     - how can compound disasters be managed?

3. **Holistic approach** (all chapters)
   - A key message of this book is that vulnerability is a micro and macro process, concerning all hazard categories, and is multi- and inter-sectoral. Each of the case-study examples cited in the various chapters indicates the complex amalgam of factors that must be understood before they can be addressed through a broad holistic approach. Questions include:
     - how can risks be most effectively managed at various levels?
     - what sectors does disaster risk management need to be linked with?
     - what are the significant gaps that need to be closed in well-integrated DRM strategies?

4. **The pivotal role of national governments** (Chapters 3, 7, 8, 9 and 10)
   - There is a strong tendency for governments to focus their attention on emergency management and the assessment and monitoring of hazards, with less attention devoted to assessing and reducing patterns of vulnerability and exposure. The examples cited throughout the study, and in particular in Chapters 3 and 9, highlight the critical roles that governments play in creating and maintaining vulnerability, or in countering such processes by building resilience. Therefore, questions are raised concerning these issues:
     - why should governments give high priority to risk reduction?
     - what are the incentives and constraints on taking action?
     - where in government structures should DRM be located?
     - what opportunities exist at the varied levels of governance?
• what recommendations for governments emerge from the study?
• how can governments effectively relate to wider regional and international frameworks?

Organization of study

The study, conceived by the Asian Development Bank Institute (ADBI) with support from the Asian Development Bank (ADB), was reviewed by regional experts and government officials in ADBI in Tokyo in October 2012 and February and June 2013.

Highlights of this study were presented at the ADB Annual Meeting in Delhi in May 2013, with additional valued feedback (ADBI 2013). These review processes have strengthened the study with a useful critique from officials, experts and practitioners, and the dialogue has raised awareness of the need for national commitment to effective disaster risk reduction (DRR) measures and to building common ownership.

Audiences of the study

The primary audience is composed of national government leaders and senior policy-making officials within ADB member countries. They have the main responsibility to manage and reduce the risks faced by their citizens. This group can be broken down into political leaders and senior government officials in varied government locations ranging from the apex of political power to officers within individual line departments. In addition there are regulatory authorities and emergency services who are also involved in risk reduction and climate change activities. These officials may exist in the center of governments, but within more ambitious safety structures they may be replicated in local government or urban government offices (see Chapter 8).

Government authorities include:

Disaster/crisis management authorities

These bodies are often called the national disaster management offices (NDMO). Their main function is to manage disaster events, deploying the full range of government emergency services, civil defense forces, etc. But they also undertake risk reduction through aspects of their ‘preparedness measures’. These include the development of national and local disaster plans as essential risk reduction tools, early warning systems, evacuation plans, development of standards, metrics of capacity/capability and ‘certification’ of agencies and NGOs.

Disaster risk management and climate change authorities

Gradually certain progressive governments are establishing specific DRR and climate change adaptation (CCA) focal points. These may be placed within the Prime Minister’s Office or the Cabinet Office, and they are also to be
found as DRR cells within relevant line departments of government such as education, public health authorities, etc. Progressive governmental bodies that become involved in developmental work – such as the creation of buildings and infrastructure – recognize the importance of protecting their investment from the risk of disaster impact. Typical government DRR tasks may include undertaking risk assessment, regulatory planning, protecting critical facilities and implementation of environmental protection.

A further audience of these guidelines is composed of diverse groups with a mandate or commitment to reduce risks. Since major disasters affect all levels of civil society, there are numerous groups that can become involved. They include students and their teachers, nongovernmental agencies, religious organizations, the media and the private sector. In addition there are a rich array of regional and international agencies that share a mandate and commitment to reduce risks wherever they are found. So it is the hope of ADBI and the authors that a study of this nature will have something important to say to diverse national and international audiences.

Study focus

In the field of DRR there has been a concentrated international effort that stretches back to the late 1980s to apply energy and resources on risk reduction. Two parallel processes need to be undertaken, and both are reflected in the following chapters:

• first, the need for **stocktaking**, with reflection on what has been achieved and what is urgently needed, and
• second, the need for **application**. The authors believe that the current requirement is for far less talk and fewer conferences, platforms, frameworks and targets. The noisy dialogue needs to be replaced with what has so often been missing in the past: well-trained officials, a strong legal framework, proven governmental structures, progressive policies and considered and well-planned actions on the ground that deliver safe conditions.

The focus of the study is defining ways towards a resilient and sustainable development path throughout the Asian and Pacific regions. This is to provide a broad and informative view of the main challenges that nations will face in disaster risk in forthcoming decades. From this assessment, the study recommends DRM actions to address these challenges given current financial and human resource constraints. This required the authors to look beyond the current Hyogo Framework for Action (HFA) and the Millennium Development Goals (MDGs), with suggestions for future opportunities to reduce disaster losses in the region.

There are a variety of tasks to undertake to reduce risks. The tasks set in bold type are considered in this study; the others are considered in other recent literature.

• Integrating disaster risk management into the national development strategies of ADB developing member country (DMC) governments (ADB 2012).
• Assisting ADB with integrating disaster risk management into its lending strategies.
• Taking action on account of increasing risks of compound disasters, climate change and expanding globally extended production networks.
• Defining roles and opportunities for effective governance at varied levels: local/community, national, regional and international.
• Examining how the emerging economies of Asia can cooperate at the regional level to improve their disaster risk management practices.
• Developing disaster risk management strategies that integrate and balance staff development, organizational learning, governmental structures and proven policies.

It is inevitable that as the HFA draws to its close in 2015 after 10 years of intense international activity, to make way for a new framework, an extensive collection of guidelines, studies, evaluations and reports is being produced by concerned agencies. These publications, listed in Appendix 1.2, tend to be the collective work of large teams of editors, writers and researchers. For example, a team of 58 authors was required to produce the Foresight Study (Government Office for Science, UK 2012). In contrast, this study is of modest proportions, the work of just nine authors. But it has a positive distinguishing feature, since it contains ‘independent perspectives’ from our team of authors, all of whom are external to ADBI. Therefore, the views expressed in the following chapters are those of the individual authors and do not necessarily reflect the position of ADBI or ADB or of the affiliated bodies where we work.

Study chapters and authors
The study is in four parts.

Part 1. Background

Chapter 1 Introduction
Ian Davis introduces the aim, scope and content of the study.

Part 2. Trends and challenges
This lays down the foundation for the subsequent chapters.

Chapter 2 Trends and patterns in disasters and their impact in the Asia-Pacific members of the Asian Development Bank
Debarati Guha-Sapir and Philippe Hoyois review and analyze regional disaster impact data in the EM-DAT (the International Disaster Database), maintained by the World Health Organization Collaborating Centre for Research on the
Ian Davis

Epidemiology of Disasters (CRED), based in Brussels at the Louvain School of Medicine (Institute of Health and Society). As they describe recent trends within the region with a series of graphs, they conclude that trends in disaster impact are not encouraging and there is an urgent need to put in place more evidence-based policies for DRM in order to allocate resources in a more strategic manner.

Chapter 3 The vulnerability challenge

Ian Davis uses an adapted version of the ‘crunch model’ to explore the progression of vulnerability from underlying causes to dynamic pressures to unsafe conditions. This analysis is related to three case studies drawn from Pakistan, Thailand and Japan. These examples range from the micro scale of vulnerability of rural families to the macro scale of vulnerability at regional and international levels. The second part of the chapter considers the threats posed by climate change, and a further model is presented that describes the overlap between disaster risk management and climate change adaptation.

The chapter includes a section that considers vulnerability that may be generated by governments, with practical advice to the many actors who face the challenges of vulnerability on ways they may respond to these powerful and pervasive pressures.

Chapter 4 The social and economic challenge

Anshu Sharma examines the economic and social challenge of disaster risk management in Asia, focusing in particular on the micro-level perspective, the unequal impact of disasters on the most vulnerable and the need for safety nets. It concludes with a recommendation to build these protective mechanisms, to ensure that the poor and most vulnerable are protected from the direct and indirect economic and social impacts of disasters through their own strengthened resilience.

Part 3. Responding to major concerns in the region

Two pressing issues are presented about which governments have requested expert advice.

Chapter 5 Managing the risk of compound disasters

Richard Eisner addresses the factors that determine how series of concurrent disasters interact, merge and expand into a compound disaster, with impacts far beyond the source region. Pre-disaster factors are identified including the quality of the built environment; the capacity of civil government structures and communities to alleviate the underlying causes of disasters and vulnerability; a regulatory culture that prevents disasters from occurring and contains their propagation; and the ability of local, regional and national institutions. Post-disaster elements are the ability to rapidly respond and efficiently manage the disasters’ consequences.
The chapter suggests regional approaches including alert and warning systems, education and disaster scenario modeling to promote risk management and the promotions of standards that enable regional cooperation and collaboration.

Chapter 6 Financing and risk financing disaster risk reduction in Asia and the Pacific: experiences and innovations

Reinhard Mechler discusses financing and risk financing options for supporting risk reduction. Both types of financial mechanism need more attention in the Asia-Pacific region and globally. To this effect, four overarching questions are pursued in this chapter:

1. How can one shift the financing balance towards more support for pre-disaster activity?
2. What lessons can be learned from recent experience regarding such mechanisms?
3. How are incentives provided for DRR?
4. What are innovative mechanisms helping to support this agenda?

Specifically, the chapter discusses how governments, donors and multilateral development banks can help enhance the implementation of DRR measures before events strike as well as increase the provision of risk financing options in the Asia-Pacific region, in particular in ADB borrowing countries. In terms of the overall messages of the volume, the chapter primarily deals with a pair of concerns:

1. applying and integrating a rich diversity of tools in order to manage expanding risks to the Asia-Pacific region;
2. emphasizing the primacy of governments as being positioned at center stage in the DRR process.

Part 4. Governance structures for disaster risk management

A detailed review is presented of governmental structures for risk reduction at local, national, regional and international levels.

Chapter 7 Disaster risk management at local and community levels

Rajib Shaw focuses on the experiences of DRM at local and community levels. Using experiences drawn from the member countries, the chapter emphasizes the link of national and local level and explains some primary issues: the changing nature of disasters, diversity in communities, evidence gained from past disasters, increasing global awareness of local needs, sustainability and ways to expand programs to higher scales.

The chapter concludes that local DRM needs to be linked to development issues like health, education and sanitation and should have a legal framework of
responsibilities, capacities and resources, which requires the support of the national government.

Chapter 8 Disaster risk management at the national level

Mikio Ishiwatari reviews trends and patterns in developing governance and institutions in DRM at the national level. Countries in Asia and the Pacific have substantially developed risk governance by creating focal point agencies, establishing national platforms and promoting legislation in line with the HFA. Focal point agencies are classified under three models.

The chapter examines a range of practical mechanisms to coordinate government organizations and relationships between national and local governments. Actions are recommended for developing countries to place DRM as a core part of national development strategies and programs to mainstream DRM into the fabric of government. The countries should strengthen the coordination roles of national governments through an enhanced legal framework and build up flexible cooperation systems among concerned organizations and local governments.

Chapter 9 Disaster risk management at the regional level

Terry Jeggle notes that despite a few significant examples to the contrary, regional relationships and institutions have been underutilized in advancing the application of disaster risk management practices across Asia and the Pacific. This chapter reviews the variety of organizational resources and associated subjects which have significant bearing on addressing disaster risks in adjacent countries or within areas of similar subject, political or cultural characteristics. Regionally focused commitments can motivate, bind and sustain wider interests for a combined expression of interests internationally and a mutually supported purpose among countries.

The experience in the Pacific over the past 20 years demonstrates how collective political leadership can support the growth of shared technical institutional efforts across subject areas to provide a lasting basis for comprehensive and sustained commitments to applied DRM. The chapter closes with a recommendation for more and improved association of regional professional, technical and educational institutions linked with a currently absent regional data and information management network to advance shared DRM objectives.

Chapter 10 International frameworks advancing disaster risk management

Terry Jeggle records that beyond the more obvious international institutional frameworks that have served in an important advocacy role by defining and advancing the political rationale for disaster risk management for the past 25 years, there are now more notable frameworks that can further DRM activities within countries. While there have been undeniable benefits in the various international advocacy frameworks that have encouraged the broader acceptance of DRM
conceptually, because of the current level of tacit political promotion of the subject, it is timely to consider a reallocation of emphasis and resources.

Despite similar observations routinely appearing in international framework conferences, there is now a pressing obligation for international organizations and national authorities to actually assign the technical, human and financial resources which they command to more effective and tangible activities on the ground. The chapter closes with a recommendation to do just that with an emphasis on facilities and functions of high social value, primary infrastructure and local communities.

Conclusions and recommendations

The conclusions and recommendations from each chapter are brought together in this final section to inform various stakeholders on how best to operationalize and increase the effectiveness of existing DRR frameworks and deliver more effective DRM and CCA within the Asia-Pacific region.

### Principles of an integrated approach to disaster risk reduction and climate change adaptation

The expanded text of the following principles is set out in Appendix 1.3.

1. Increase understanding of the hazard and climate change context.
2. Increase understanding of exposure, vulnerability and capacity.
3. Recognize rights and responsibilities.
4. Strengthen participation of, and action by, the population at risk.
5. Promote systemic engagement and change.
6. Foster synergy between multiple levels.
7. Draw on and build diverse sources of knowledge.
8. Instill flexibility and responsiveness.
9. Address different timescales.
10. Do no harm.

### Disaster risk management terminology and definitions

As our team of authors has worked on this study, we have been confronted with various terminology issues where there is continual debate on agreed definitions, but for the sake of consistency, we have adopted the definitions from ADB (2013, Glossary on page 312).

To these we have added certain further definitions from a publication from the Emergency Capacity Building (ECB) NGO Consortium (Turnbull et al. 2013). (These definitions, which apply to the entire study, are in the glossary.)
Over the past decades, attempts to create a safer environment have adopted various descriptions. In the 1970s and 1980s the initial term ‘disaster prevention’ gradually became discredited. Unrealistic assumptions that the vast power of hazards could be ‘tamed’ or ‘prevented’, as well as similarly unrealistic assumptions that societies possessed unlimited resources to deploy for prevention, gave way and led to the use of the more realistic term ‘disaster mitigation’.

Then in 1991 the International Decade for Natural Disaster Reduction (IDNDR) was introduced – and from then on the expression ‘disaster risk reduction (DRR)’ held sway within the international community. This is still widely used – and it appears in this study. However, since DRR is a description of measures adopted to reduce risks, a broader expression was needed that covered ‘risk reduction’ as well as associated tasks, such as ‘risk assessment’ and ‘risk management’. Therefore, the preferred term within this study is ‘disaster risk management’ (DRM).

A parallel term, ‘resilience’ – borrowed from the engineering, corporate management and health sectors – became fashionable in the late 1990s and now occurs throughout the subject in the titles of government departments, reports, programs, frameworks and conferences. For example, four of the significant publications listed in Appendix 1.3 contain the term ‘resilience’ in their titles. The term also became the title of the chair’s summary of the 2013 Fourth Session of the Global Platform for Disaster Risk Reduction: ‘Resilient People, Resilient Planet’ (UNISDR 2013e).

The popularity of the word relates to three important functions: First, the ability of a given society, system, community or individual to bounce back. (This role links disaster risk management effectively with the emergency management and disaster preparedness community.) Second, this function concerns the ability of a given society, system, natural environment, building or infrastructure to absorb shocks. This function relates to the heart of this study. Third, this function of resilience relates to the capacity of a given society and all its assets to adapt and change as it recovers from disaster impact. This is also an important element in this study since disaster recovery and reconstruction offer unique opportunities to introduce safety measures. These functions are summarized in the IPPC definition (IPPC 2012) that is included in the Glossary on page 316.

So although ‘resilience’ has these useful meanings, it has now become a catchall phrase that can numb the senses with its over-familiarity, thus suffering the same fate as the ubiquitous terms ‘development’ or ‘sustainability.’ This concern led Alan Duncan, a British minister for the Department for International Development (DFID), to issue a memo in 2013 to his departmental staff, asking them when writing about disaster reduction or humanitarian action to spell out exactly what they mean rather than use the term ‘resilience’. He wrote, “[T]he constant repetition of a word such as ‘resilience’ as a substitute for saying what is meant, risks rendering a submission purposeless” (Duncan 2013).

The concern of the authors and ADBI is that in the HFA 2 international landscape, discussion concerning disaster risk reduction and adaptation to climate change will replace fashionable jargon with precise and accurate descriptions. Vague, overused terms not only conceal or distort actual meanings; they can also
promote wishful thinking and platitudes, often used to conceal political inaction.

To summarize, the terminology used throughout the study seeks to be:

- **Consistent** with the ADB definitions and current best practice.
- **Realistic** – thus we describe attempts to reduce risks rather than prevent or eliminate them.
- Related to the **processes** of risk reduction, hence disaster risk management (DRM) or climate change adaptation (CCA).
- Related to the **Products** that are adopted to reduce risks such as the varied measures used in disaster risk reduction (DRR).
- **Unambiguous** – therefore we seek to use specific and accurate descriptions throughout this study.

**Approaches to risk**

Throughout this study various terms are used to refer to DRM and CCA. Where a topic is particularly relevant to the study, chapters are indicated in the following list:

- **Risk avoidance:**
  Evacuations following effective disaster warnings are often regarded as ‘risk avoidance’ measures; however, the term is misleading since an evacuation can often generate new risks, such as house burglary during the absence of homeowners. Similarly, permanent migration may be undertaken to avoid risks of, say, persistent drought, but the process generates its own risks of social dislocation and possible unemployment in the adopted region or country.

- **Risk identification:**
  Decision making to determine which risks facing a given society require attention leading to reduction.

- **Risk assessment:** (see Chapters 3 and 4)
  Mapping hazards – both in short- and long-term time frames – and vulnerability and capacity assessment leading to loss estimation. Assessment can occur within all key sectors: social/economic/physical/natural environment.

- **Risk awareness:** (see Chapters 7–10)
  By the general public and authorities.

- **Risk acceptance:**
  Adaptive learning responses, defining community tolerance of possible loss and disruption, decision making on levels of acceptable risk, leading to the recognition and use of standards or levels of protection and contingency planning, including preparedness initiatives such as evacuations undertaken in response to warnings.
Gaps in disaster risk management

Numerous gaps can be located in unsafe environments or within governmental structures and policies for DRM and CCA that are beyond the focus of this study. Three particularly important issues are addressed in the study as suggestions for governments in the Asia-Pacific region to consider. They are also submitted in the hope that they may be recognized as important growth areas at an international scale during HFA 2.

First gap: promoting education, staff development and learning organizations

These needs particularly relate to the four chapters in Part 4, where varied levels of governance for effective DRM are discussed.

Priority 3 of the Hyogo Framework for Action is to “use knowledge, innovation and education to build a culture of safety and resilience at all levels”. The text then refers to the “inclusion of DRR into formal and informal education” (UNISDR 2005).

During the past 43 years I have been a board member of four NGOs that operate in the humanitarian field, have taught in university departments in four countries (leading courses in DRM) and have worked alongside numerous officials in governmental or international agency offices undertaking research or consultancy. The common element in each body has been the aim to reduce disaster risks or adapt to climate change.

• **Risk management**: (see Chapters 7–10)
  “Processes for designing, implementing and evaluating strategies, policies and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life and sustainable development” (IPCC 2012).

• **Risk financing transfer and sharing**: (see Chapter 6)
  Using varied financial instruments such as insurance/catastrophe bonds etc.

• **Risk reduction**: The application of structural, non-structural and environmental measures to reduce disaster risks.

• **Climate change adaptation**: “In human systems, the process of adjustment to actual or expected climate and its effects in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate” (IPCC 2012).
In these environments, there were occasional examples of agencies that were diligent in their respect for learning and staff development. But more often the opposite was true. Apologies from staff, along the broad lines of “don’t expect too much from us, we re-invent the wheel twice daily in this department”, are frequently heard. Reasons are rarely offered for their frustrations, but answers may lie in a lack of staff that are adequately educated or trained for their tasks, high levels of staff turnover, changes in leadership and a lack of a ‘learning culture’ within their organizations. This critical gap, highlighted in the HFA, requires urgent individual and collective action.

**Education**

One area of significant progress during the first eight years of the HFA was in persuading governments to allocate resources to protect schools from disaster impact and develop curricula for all ages of children that include an understanding of the dynamics of disasters, with a particular concern for students’ safety (GFDRR and INEE 2009). However, this progress (and the priority it stems from) has yet to expand into the vital higher education sector. Although higher education institutions have long played important implicit roles in disaster risk–related capacity building and research, the absence of an integrated academic approach to DRM within higher education was an identifiable gap throughout the entire International Decade for Natural Disaster Reduction (IDNDR), and this neglect has persisted during the HFA. The shortcoming was materially reflected in limited technical or financial support for the university educational sector.

This serious oversight by donors – and lack of engagement by many higher education institutions themselves – has constrained advancement of the global risk reduction agenda. A recent exception to this has been the systematic mobilization of higher education institutions in Africa, where, despite limited donor support, there has been incremental – but sustainable – growth in the number and range of DRM-related higher education programs offered (Holloway 2009; Lewis, Spaven & Wickham 2011).

This progress has been reflected in a range of new postgraduate offerings, including master’s degrees in disaster risk management (Ardhi University, Tanzania), in disaster risk management and sustainable development (Bahir Dar University, Ethiopia) and in multidisciplinary disaster and risk management (University of Antananarivo, Madagascar). The gradual introduction of these and other academic programs in Africa and elsewhere underlines the challenges of balancing ‘project-driven’ deliverables against strategic, longer-term investments in human capital, where benefits may not be apparent in the short term.

Within the higher education sector some professional disciplines have long traditions of engagement in DRR, such as the key areas of public health and civil engineering and others, such as architecture, where design of buildings and settlements for disaster risk reduction remains in its infancy. For example, on 15 April 2013 in Barcelona was the first meeting of representatives drawn from schools
of architecture in Australia, Denmark, the UK and Spain, jointly convened by Royal Melbourne Institute of Technology (RMIT) and the International Federation of Red Cross and Red Crescent Societies (IFRC) to consider the future of higher education for architects in pre- and post-disaster studies working in developing countries. The conference took initial steps to develop an integrated international program called Disaster Management, Resilience and Reconstruction (RMIT 2013).

Given the obvious priority of architectural design in creating hazard-resistant buildings, this is a belated but vital initiative. But the question must be asked: why has it taken a full 22 years since the initiation of the first international framework for DRR (the IDNDR) for this first step to occur when the need is so obvious?

Staff development

A further major gap concerns the training of officials in government, the private sector and NGOs in DRM and CCA. The first international training course was undertaken by the Office of Foreign Disaster Assistance (OFDA) as far back as the late 1970s, and there have been many disaster risk management staff training courses since then. In Oxford I led a rather rudimentary course in DRM in 1982, the first to occur in the UK. But, as with the lack of higher education collaboration, UN initiatives have failed to materialize in a sufficiently ambitious form to meet the widespread training need.

The clear requirement is for a comprehensive training strategy, coordination of courses and development of the training capacities for UN officials and national leaders. The last time this happened was in 1990 when the progressive Disaster Management Training Programme (DMTP), led by INTERWORKS and the University of Wisconsin for the United Nations Development Programme (UNDP) and the Department for Humanitarian Affairs (DHA, was established for about five years. The program included staff training within the UN system as well as for governmental officials. During this time 3,600 staff members from 55 countries received this training. A vital element was the development of an extensive range of training materials for trainers as well as trainees. They became the definitive course material both within the DMTP program and for those running courses for NGOs and governments (University of Wisconsin, n.d.).

However, DMTP was prematurely cancelled by UNDP for reasons unknown, perhaps a result of bureaucratic ignorance of the strategic value and potential of the program. This cancellation can be regarded as one of the most serious setbacks to DRM within the past two decades.

The only equivalent has been a UN initiative called Capacity Development for Disaster Reduction Initiative (CADRI), formed in 2007 as an inter-agency initiative of UNDP/BCPR, (Bureau for Crisis Prevention and Recovery), the Office for the Coordination of Humanitarian Affairs (OCHA) and the UNISDR. Its mission was to advance knowledge and strengthen sustainable capacity development for disaster risk reduction worldwide (CADRI, n.d.).
CADRI still exists in a limited role and offers a central resource of knowledge and expertise to UNISDR as a whole, bringing together the various actors and organizations working within DRR to pursue a three-pronged approach:

1. People (develop human resources)
2. Organizations (enhance their systems and performance)
3. Institutions (develop legal and policy bases for effective engagement among state, private-sector and civil society actors).

Thus, the laudable intention behind the mandate of CADRI has never produced the excellent body of DRR training materials that flowed from DMTP, which formed the international benchmark for staff training in DRR in the late 1980s and early 1990s, nor has it run an extensive international training program along the lines of DMTP. One reason may relate to CADRI not succeeding in attracting inter-agency funding in recent years. Therefore it has yet to fulfill its potential as a global resource for training government and UN staff in DRM, and donors hold the key to CADRI’s mission being eventually fulfilled, meeting a pressing need.

There has been an admirable continuity of staff training in the Asia-Pacific region from the Asian Disaster Preparedness Center (ADPC) in Bangkok from 1986 onwards, but the scale of the staff training task is so great within the region that this groundbreaking regional program needs to be replicated and expanded exponentially to create additional regional and national programs to suit varied risks, cultures and nations. (See Chapter 9 for a discussion concerning the role of regional centers in support of DRM; p. 252.)

In considering the educational and training challenge for DRM throughout the vast Asia-Pacific region, the founding director of CADRI, Joanna Burke, has noted wisely,

[W]hat needs to be acknowledged is that a ‘one size fits all’ model for education or training does not work. The basic principles and concepts to be covered in x type of curriculum could be more consistent than they currently are but how the content gets packaged and delivered will differ from context to context. And, acknowledgement of the wide proliferation of regional and national entities that can deliver the education and training services – meaning the capacity is there in a lot of the countries but not well understood or in certain instances well utilized or sufficiently networked.

(Burke 2013)

Learning organizations

There has been a growing recognition among current academic thinkers and management theorists and practitioners concerning the critical need for organizations to ‘learn’ in order to function effectively and to develop. This collective requirement is closely related to individual staff members being well educated
and trained to apply the results of that training within their work. In ‘best practice’ both concerns are based on the need to focus on ‘learning outcomes’ from education, rather than ‘teaching inputs’.

This organizational need is particularly vital in any agency concerned with DRM and CCA for three rather obvious reasons: high levels of staff turnover, a fluctuating policy environment and the dynamic nature of DRM and CCA, which are inevitably subject to rapid change. Organizational learning has been described as “the intentional use of learning processes at the individual, group and system level to continuously transform the organization in a direction that is increasingly satisfying to its stakeholders” (Dixon 1994, page 77).

One of the key elements in organizational learning is known as ‘knowledge management’. The approach here is to regard organizations as knowledge systems, which can be broken down into five related processes: creation, storage and retrieval, transfer and application of knowledge (Easterby-Smith & Lyles 2011).

When applied to this study, this could refer to managing knowledge by a typical governmental DRM focal point in the following manner:

- **Creation:** the development of a policy for the implementation of DRM in specific urban contexts, based on knowledge and information from each context’s own experiences.
- **Storage:** the formation of a dedicated information storage systems to store the focal point’s experience and knowledge, with a link with local universities which also store and share public access information that the organization generates (such as assessment data and project evaluations).
- **Retrieval:** the organization of an effective system to enable staff to secure the information they need.
- **Transfer:** transferring information and knowledge across sectors and levels as well as contributing to its operational partners that may include regional sharing protocols, such as collective hazard warning systems.
- **Application:** the application of relevant knowledge and information in policy formulation and project design.

Through this sequence the work of the DRM and CCA focal points can be regularly refreshed and transformed as its staff members, as well as its structures and policies, continually adapt. This can be achieved through the creation, management and flow of knowledge.

**Summary**

A strong case can be made to support the view that investment in education and learning provides the most effective value. These opportunities relate to both short-term and long-term timescales. The following is an example of such strategic investment.
Short- and long-term investment in structural flood defenses

Option 1. Investment in structural flood protection measures
Physical measures require the application of current knowledge and available technology of flood risk reduction. But 30 years from now the entire approach will have inevitably developed following advances in the technology of flood protection.

Option 2. Investment in the education of staff involved in flood DRM
By way of comparison, if investment is currently made in higher education, or training, to enable people to acquire knowledge and skills, then they are able to apply the fruits of that education throughout every stage of their professional life.

Thus, in 30 years’ time, when approaches and technology may have radically changed, a well-trained official is still likely to perform better on account of his or her earlier education. Therefore, education and learning can be regarded as a strategic investment into present and future needs. In contrast, it is inevitable that any form of physical intervention can only apply the present state of knowledge and technology.

Both option 1 and option 2 are complimentary DRM actions that need to run parallel.

Therefore, as the first phase of HFA draws to a close and HFA 2 frameworks are being considered, several questions need to be raised:

- is any priority being given to investment in higher education?
- what support is to be provided for integrated staff training programs at international, regional and national levels to train key officials to administer the growing range of DRM and CCA initiatives?
- are present DRM and CCA organizations developing into ‘learning organizations’?

Second gap: the need to define effective governmental structures to facilitate DRM and CCA

This need particularly relates to Chapter 8.

Priority 1 of the Hyogo Framework for Action is to “ensure that disaster risk reduction (DRR) is a national and local priority with a strong institutional basis for implementation”. The document then refers to the “DRR institutional mechanisms, . . . designated responsibilities . . . [and] Legislation to support DRR” (UNISDR 2005).
However, as indicated in Chapter 8, minimal progress has been made by countries in enacting comprehensive legislation of DRM. Most national laws are confined to the practice of emergency management or safety legislation for buildings and infrastructure. In 2012 the Economic and Social Commission for Asia and the Pacific (ESCAP) and UNISDR reported that among the 47 countries and areas that they had analyzed in the Asia-Pacific region,

only 10 countries have available laws and policies on DRR and development plans that cover both DRR and CCA. Only one of the countries reviewed, Vietnam, has DRR legislation, a DRR plan projected over a long-term, and DRR and CCA issues fully integrated into the national development plan.

(ESCAP and UNISDR 2012, p. xxvi)

The most comprehensive legislation on risk reduction can be found not in North America or Europe but in South Africa, where the government has put laws in place that require DRM to occur at all levels of government, within rural and urban settings and covering all sectors of DRR. I recall Pat Reid, one of the architects of the progressive laws, attending a Cranfield University disaster management course in the early 1990s, where she presented her vision for legislation requiring DRM at all levels throughout South Africa. Later, after her hopes had become reality, I was privileged to attend a national conference on DRR in South Africa in 2007 and noted the wide-ranging impact of this progressive legislation, not least its educational value for government officials with responsibility for DRM. The IFRC have attached such importance to these groundbreaking risk reduction laws in South Africa that they have commissioned a book describing the entire legal process (IFRC 2011).

Along with the gap in legal frameworks, there has been minimal discussion on the placement of DRM and CCA within national, urban and local governments. In most cases (as indicated in Chapter 8), DRM is merely regarded as an adjunct to the national disaster management office (NDMO). While there are important links to DRR in disaster preparedness planning, it is nevertheless vital that DRM has its own identity and status in government so that it can fulfill its many vital coordinating and integrating functions. Thus, to close this gap, there is an urgent need for evidence-based guidance for governments on the effectiveness of various models that define the location, status, functions and responsibilities of DRM in relation to line departments and the apex of political power.

**Disaster management in the UK**

In the UK the government has established the Civil Contingencies Committee as a British Cabinet committee chaired by the Home Secretary. It is intended to deal with major crises such as terrorism or natural disasters. This is supported by the Civil Contingencies Secretariat, which is part of the Cabinet Office.
Introduction

The committee includes the Prime Minister and is often called COBRA, named after its location – Cabinet Office Briefing Room. Thus disaster emergency management secures attention from the apex of political authority.

But DRM and CCA are not on within their remit – these subjects are the responsibility of varied government departments. This is an example of split responsibility: this high-level committee is concerned about one function of resilience, the capacity of the country to bounce back from a crisis, but is not mandated to be concerned about another function of resilience – the ability of UK society to absorb shocks and adapt with DRM and CCA.

A further gap is to identify precisely how a DRM function can relate to the climate change office or focal point, a pattern of responsibility that was established by all governments that were signatories to the UN Climate Change Convention as part of their agreement.

Third gap: the need to take action to reduce the ‘drivers of risk’

A detailed discussion on ‘underlying causes’ or ‘drivers of risk’ can be found in Chapter 3.

Priority 4 of the Hyogo Framework for Action is to “reduce the underlying risk factors”. The HFA then refers to a range of elements, such as “sustainable ecosystems and environmental management”, “food security for resilience”, “protection of critical . . . facilities”, “land use planning and building codes” and “public-private partnership” (UNISDR 2005).

This fourth ‘Priority for Action’ – to “reduce underlying risk factors” – was commented on in the communiqué from the High-Level Dialogue, held on 21 May 2013 in Geneva, Switzerland, at the Global Platform for Disaster Risk Reduction with the participation of government ministers, business executives and senior experts. Their task was to reflect on the future of disaster risk and a post-2015 framework for disaster risk reduction.

Participants recognized that there is an urgent need to address the drivers of risk as this is instrumental to social, economic and environmental sustainability and well-being of people and this should be a core part of the post-2015 development agenda, future sustainable development goals, and the mitigation of, and adaptation to, climate change.

(UNISDR 2013f)

Summary

In writing this introductory chapter to the study, I have tried to describe the scope of the text and to set out some of the issues that will be discussed in the following nine chapters.
We have gathered material for our respective chapters from many directions – reading reports, attending policy reviews, visiting disaster sites and interviewing officials in governments and international agencies. As we share our varied experiences and perceptions we trust that readers and organizations will find the text interesting, challenging and informative. Our concern is that this study will inform and challenge the decision makers within governments throughout the Asia-Pacific region to reflect and apply.

Throughout the process of writing we have become increasingly aware of the formidable challenges of disaster risk reduction and climate change adaptation within this region. However, we are encouraged that these tasks are being tackled with energy and commitment by concerned people, officials, agencies and governments. Therefore, it is the hope of ADBI and all the chapter authors that readers will find the chapters useful as well as useable and that this study will help fill some of the gaps in our current understanding of disaster risk management.

Notes


2 This study does not specifically describe disaster risk reduction actions. A good entry point for useful literature on these topics can be found on the website of the United Nations Strategy for Disaster Reduction (UNISDR): www.unisdr.org/we/inform/publications.

3 This study does not describe climate change adaptation measures. A good entry point for useful literature on these topics can be found on the website of the Intergovernmental Panel on Climate Change (IPCC): www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml.

Bibliography


Burke, J. 2013, June 10. Private communication with Ian Davis.


## Appendix 1.1
The impact on lives and property of major Asian disasters 2004–2013

<table>
<thead>
<tr>
<th>Disaster Event</th>
<th>Date</th>
<th>Lives Lost and Missing</th>
<th>Number of People Affected</th>
<th>Economic Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Great East Japan Earthquake and Tsunami</td>
<td>2011</td>
<td>19,846</td>
<td>470,000 initially evacuated 362,887 (CRED Data)</td>
<td>US$210–375 billion (estimates vary)</td>
</tr>
<tr>
<td>Thailand Floods</td>
<td>2011</td>
<td>813</td>
<td>9.5 million</td>
<td>US$40–45.7 billion</td>
</tr>
<tr>
<td>Pakistan Floods</td>
<td>2010</td>
<td>1,985</td>
<td>20.3 million</td>
<td>US$9.5 million</td>
</tr>
<tr>
<td>Cyclone Nargis, Myanmar</td>
<td>2008</td>
<td>138,366</td>
<td>2.4 million</td>
<td>US$4 billion</td>
</tr>
<tr>
<td>Wenchuan Earthquake, PRC</td>
<td>2008</td>
<td>87,476</td>
<td>45.6 million</td>
<td>US$85 billion</td>
</tr>
<tr>
<td>Mumbai, India, Floods</td>
<td>2005</td>
<td>780</td>
<td></td>
<td>US$120 million</td>
</tr>
<tr>
<td>Pakistan Earthquake</td>
<td>2005</td>
<td>73,338</td>
<td>5 million</td>
<td>US$5.2 billion</td>
</tr>
<tr>
<td>South Asian Earthquake and Tsunami</td>
<td>2004</td>
<td>226,408</td>
<td>1.3 million</td>
<td>US$2.9 billion</td>
</tr>
</tbody>
</table>

Source: EM-DAT: The OFDA/CRED International Disaster Database (www.emdat.be, Université Catholique de Louvain, Brussels, Belgium)
Appendix 1.2
Parallel studies of disaster risk management and climate change adaptation 2012–2013


Introduction


Appendix 1.3
Principles of an integrated approach to disaster risk reduction and climate change adaptation

As global commitment to and investment in disaster risk reduction has grown, so has practitioners’ and policy makers’ knowledge of good practice, enabling factors and barriers to success. Meanwhile, innovative action-research in the field of climate change adaptation is rapidly producing valuable indicators of the fundamental elements for effective adaptation programming. Most recently, interest among development and humanitarian actors in improving understanding of how to generate greater resilience to shocks and stresses, including hazards and the effects of climate change, is resulting in constructive debate. There is significant convergence in the lessons, recommendations and challenges emerging from each of these spheres of activity, and a growing consensus on the need for an integrated approach.

The following 10 principles for an integrated approach to disaster risk reduction and climate change adaptation are drawn from this increasing body of knowledge. Together, these principles provide development and humanitarian practitioners with a set of criteria for building disaster and climate resilience that is applicable across the program cycle in multiple sectors and varied contexts.

1 Increase understanding of the hazard and climate change context:
An understanding of past trends, present experiences and future projections of hazard occurrence, climate variability and the range of effects of climate change on the area and population concerned should underpin any decisions or actions to build disaster and climate resilience. It should include mapping at different scales to allow for regional and local hazards and effects of climate change. The risk analysis process itself should increase understanding among all stakeholders, both as a result of its participatory nature and through sharing of the results.

2 Increase understanding of exposure, vulnerability and capacity:
An assessment of the vulnerabilities and capacities of the population, systems and resources should be the foundation for decisions on the location, target populations (including understanding differential vulnerability), objectives and approach of measures to build disaster and climate resilience. It should include analysis of the projected effects of climate change as well as of those currently
observed. The assessment should also increase understanding among all stakeholders of the causes of exposure, vulnerability and capacity, both as a result of a participatory process and through sharing of the results.

3 **Recognize rights and responsibilities:**
Disaster risk reduction and climate change adaptation should be regarded among the responsibilities of states and governments as duty-bearers for the realization and enjoyment of human rights. Governance systems and the political environment should enable people at risk or affected by disasters and climate change to demand accountability for their decisions, actions and omissions. The role of other stakeholders, including NGOs, should be complementary to, and enabling of, the relationship between duty-bearers and right-holders.

4 **Strengthen participation of, and action by, the population at risk:**
All people at risk have the right to participate in decisions that affect their lives. Their firsthand knowledge of the issues affecting them is critical to ensuring that analysis and subsequent actions are based on empirical evidence. In addition, the sustainability of resilience-building strategies depends on their ownership and agency. Therefore all decision-making processes and actions should directly involve the population at risk, ensuring that women, men and children, as well as high-risk groups, are included.

5 **Promote systemic engagement and change:**
As there are multiple causes and drivers of vulnerability and exposure to hazards and the effects of climate change, strategies to build disaster and climate resilience should engage all sectors of society and government. The goal of multi-sectoral and multi-stakeholder engagement should be to make the building of disaster and climate resilience central to development planning. The commitment of all actors to this goal should be reflected in their respective policies, plans and budgets.

6 **Foster synergy among multiple levels:**
An enabling political environment is critical to actions taken at the household, community and local levels. Similarly, the impact of a policy or law depends on its implementation by different levels of government and its relevance to the population at risk. Decisions and actions taken at each level should be mutually informative and facilitate the development of a coherent and coordinated approach.

7 **Draw on and build diverse sources of knowledge:**
Analysis of disaster and climate change risk should seek to complement local and traditional knowledge with the results of scientific research in order to continue to generate new knowledge. Measures to build disaster and climate resilience should promote replication of effective practices, encourage
autonomous innovation and introduce, where appropriate, external technology to help address new or magnified challenges. Strategies and programs should be monitored and evaluated to ensure that learning is captured and made available to others.

8 Instill flexibility and responsiveness:
As the effects and impacts of climate change remain uncertain, particularly on a local scale, and many dynamic processes (such as urbanization and environmental degradation) influence exposure and vulnerability, analysis of disaster and climate change risk should be responsive to emerging knowledge. Similarly, strategies and programs to build disaster and climate resilience should be flexible to accommodate new inputs.

9 Address different timescales:
Analysis, strategies and programs should address current, identified risks and likely future scenarios. Preparing for the occurrence of known hazards should not be neglected in favor of building capacities to adapt to medium- and long-term effects of climate change and other, potentially unknown shocks or stresses. Resource allocation and activities should be planned accordingly.

10 Do no harm:
Processes to define strategies and programs to build disaster and climate resilience should always incorporate an assessment of their potential negative impacts, including their contribution to conflict and effects on the environment. In cases where potential harm is identified, measures to substantially reduce or remove it should be built into the strategy and program design. To avoid creating a false sense of security, or promoting maladaptation, programs should always be based on a multi-hazard, multi-effect assessment.
Part 2

Trends and challenges
2 Trends and patterns in disasters and their impact in the Asia-Pacific members of the Asian Development Bank

Debarati Guha-Sapir and Philippe Hoyois

Introduction

Expanding risks are a recurring theme throughout this study. This chapter lays down a foundation for all the subsequent chapters by providing the essential evidence base. It reviews emerging trends in order to discern patterns in disaster impact that demand concerted action by governments within the Asia-Pacific region.

Between 1980 and 2012, a global annual average of 189 million people are affected by natural disasters according to the EM-DAT database. These disasters claimed the lives of an average of almost 70,000 people per year who died as an immediate and direct consequence of the event, and this excludes those who died, after the emergency phase ended, from disaster-related food shortage, loss of livelihood or permanent disabilities (Guha-Sapir & Hoyois 2012). The number of disasters triggered by natural hazards and their severity has increased over the last 30 years, only a part of which is attributable to cyclic changes in climate patterns. Of greater relevance is the fact that population density in cities and in areas with high geophysical risk has increased dramatically since 1950, in both developed and developing countries.

In the first decade of this period, 1980–1989, 1 in 39 persons worldwide were affected, which increased substantially in 20 years to 1 in only 28 people in 2000–2009. The economic losses associated with natural disasters increased more than eightfold. But as always, gross statistics disguise important variations and gaps visible when broken down and examined closely. Nonetheless, these overall global statistics often mirror local trends and patterns and point to directions that require further exploration.

The data used here are from the EM-DAT global reference database maintained by the World Health Organization Collaborating Centre for Research on the Epidemiology of Disasters (CRED) based in Brussels at the Louvain School of Medicine (Institute of Health and Society). The records are systematically compiled using standard definitions, validation protocols and methodologies. The database covers all natural disasters from 1900 to today from 184 UN member countries of the world. Further information and data can be found on www.emdat.be/database.
Clarifications regarding the scope of this paper are as follows.

For the purposes of the paper, a disaster is, according to the UNISDR (2009), “A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources”.

The paper focuses only on ADB members located in Asia and the Pacific region. The members are further regrouped by the five ADB socioeconomic categories reflecting loans and grants status (ADB 2013). To simplify the graphics, we collapsed the two wealthier categories into one, forming four income groups – low, low-middle, upper-middle and upper. These member groupings are set out in Appendix 2.1. Disasters are defined and classified according to the system set up by Munich Re and the CRED classification system (Below et al. 2009) in order to harmonize the two databases (Appendix 2.2).

For this analysis, we have not included droughts because they require a DRM and response approach different from the other disaster types and the data require specific analytical techniques (Ye et al. 2012; Global Assessment Report – ISDR 2011; Habiba et al. 2010). Similarly, epidemics and locust infestation have singular characteristics that make comparisons with other types of natural hazards invalid. These particularities are described by Wilson and Halperin (2008) and Monard et al. (2009). The analysis is undertaken from 1980 to 2012 for which the data are of good quality.

This paper begins by presenting brief analyses of the ADB members in Asia and the Pacific and its position vis-à-vis the rest of the world. The next section examines the trends by disaster types and their impact using standardized indicators. The following section examines economic losses, the patterns and distribution and discusses the weaknesses of the economic loss data. The paper finally summarizes the main findings and suggests some ways forward.

### Trends and patterns by disaster types among ADB members in Asia and the Pacific

#### Overall patterns among ADB members in Asia and the Pacific versus the rest of the world

The numbers of disasters in the world increased from 1980 to 2000, after which they have stabilized and then declined. By far, most of the increase has occurred in hydrometeorological or climate-related events such as storms and floods, which tripled in two decades and then decreased but remained nonetheless at nearly twice the levels recorded at the beginning of this period. Geophysical disasters (mainly earthquakes, tsunamis and volcanic eruptions) were reported at more or less the same rates throughout the 30 years (Figure 2.1).

The trends of disasters over time among ADB members in Asia and the Pacific are not very different from the rest of the world; however, the share of disasters from this region is 40 per cent of the world total (Figure 2.2). Moreover, the
region is disproportionately affected by natural disasters. ADB members in Asia and the Pacific represent 57 per cent of the world population but 88 per cent of the disaster affected (Figure 2.3). The varied hydro-meteo-topographical character of the region encompasses many hazards. Large river basins, flood plains, mountain ranges and highly seismic and volcanic zones contribute to frequent large-scale disasters. And as economies develop, they bring with them population concentrations, industrial development in high-risk zones and unregulated
growth of urban centers, which further add to the natural risks of the region. All of these factors may increase the severity of an event which, had it occurred some years ago, would have been a minor event.

Disasters with highest impact among ADB members in Asia and the Pacific

Hydrometeorological

The distribution of disasters by categories in Asia is largely dominated by floods and storms (hydrometeorological), and these account for over three-quarters of all disasters (Figure 2.4). Storms and floods also generate the highest human impact as both occur regularly and floods are often in densely populated plains.

Mortality from floods has been decreasing in the last few years, but not the numbers of people affected (Figure 2.5). Nearly 60 per cent of all affected population among ADB members in Asia and the Pacific is those affected by floods compared to 23 per cent in the rest of the world. A resident of this region has three times the chance of being affected by floods than any other person in the world.

Today, the available evidence suggests that floods are one of the most significant disasters in Asia and pose wide-ranging threats to lives and livelihoods in many countries. According to UNISDR computations, in the Asia-Pacific region, the modeled number of people exposed to floods was multiplied by 1.72 in 2010 compared to 1980; for tropical cyclones, the multiplier was 1.41 and for earthquakes 1.59 (ESCAP & UNISDR 2012). These events affect many key development processes such as health and education among poor and marginal communities. But the current impact data provide few insights into the impact of recurrent flooding on specific factors such as food supply, malnutrition, disease transmission of vector-borne diseases such as malaria or leptospirosis or other factors. These remain rarely assessed.
Storm-related death tolls have also declined in the last decade, with the exception of Cyclone Nargis in 2008 – a single event that increased the death tolls significantly (Figure 2.6). Cyclone paths typically cut through wide swaths of densely populated zones in the region, and frequent storms are tending to affect very large populations. Although Cyclone Nargis was indisputably an exceptional
event, bringing with it a death toll of 140,000 in Myanmar alone, the preceding event of such a scale was Cyclone Gorky in Bangladesh, which also killed nearly 140,000 in 1991. In recent years meteorological forecasting has made extraordinary progress, and predictions, especially within a 48-hour range, are highly reliable, which could be one of the reasons for the decrease in death tolls. The trends in increase of affected in the recent years therefore are likely to be more a result of inadequate preparedness on the ground rather than the severity or unexpectedness of the event.

The combined human impact of floods and storms in this region is substantial by any standards. They have claimed almost 200,000 lives and affected 1.27 billion in the last decade. Scientific evidence suggests that global climate change will only increase the number of these types of extreme events, and the population requiring protection can be expected to increase, at best at the same rate of population growth in the affected regions (Trenberth 2011; Blunden et al. 2011; Handmer et al. 2012; Thomas et al. 2013). On a positive side, both these phenomena have reliable early warning potential, and in the case of floods, low-cost engineering solutions exist for primary prevention. With additional persuasive evidence on the specific ways in which they affect child growth or disease outbreaks, major policy reform to reverse the trends should be within reach.

**Geophysical**

Earthquakes, tsunamis and volcanoes are rarer phenomena but can have spectacularly high direct death rates in extremely short periods of time. In Asia, the numbers of seismic shocks with human death tolls represent a larger share (approximately 15 per cent) of all disasters than in the rest of the world, where
10 per cent of the total are geophysical disasters. Among ADB members in Asia and the Pacific, the best known recently were the Indonesian tsunami of 2004 where 225,000 died in seven countries, the Wenchuan earthquake in the People’s Republic of China (2008) with 87,476 deaths, the Pakistan earthquake in 2005 with 73,338 deaths and the Sendai earthquake and tsunami (2011) in Japan with 19,486 deaths. But many others occur with smaller death tolls but massive destruction. Earthquake mortality has also been increasing in the last decade (Figure 2.7).

For earthquakes, the pattern is quite contrasting among ADB members in Asia and the Pacific. The wealthiest in the region (e.g. Japan, New Zealand or Taipei, China) account for just over 10 per cent of events but incur 78 per cent of all the losses in the region. In contrast, the People’s Republic of China and Indonesia have had 48 per cent of the earthquakes on their territories and report merely 18 per cent of the total losses. Wealthier members, of course, disproportionately influence direct economic loss estimations in absolute terms due to asset values and insurance coverage, and therefore the raw figures need to be used with caution.

The determinants of mortality due to geophysical events are mainly key factors such as unregulated construction practices, population concentration in seismic zones and inadequate evacuation or preparedness measures (Yi et al. 2011; Keefcr et al., 2011; Nic Bhloscaidh et al. 2013). Effectiveness of preparedness policies would be much improved if the relative contribution of these factors towards mortality were established. This would allow choosing measures that would target those factors that are more likely to reduce impact than others. Institutional capacity to enforce such measures (e.g. building codes and regulations) is a prerequisite for policies to be effective.

In the following sections we standardize the data to reduce some of this bias and present a clearer picture.

*Figure 2.7* Earthquake mortality and affected per million inhabitants among ADB members in Asia and the Pacific (log scale), 1980–2012
Standardizing indicators for better measures

Implications of using raw, non-standardized data

In 2012, the five top-ranked countries for numbers of disasters were the People’s Republic of China (18), the Philippines (16), Indonesia (10), Afghanistan (9) and India (5). These are countries which systematically feature in the top ranks in terms of absolute numbers of disasters since 1980 (Figure 2.8). Arguably, using absolute numbers of events, people affected and people killed can be misleading as economies differ in their population size and geographic exposure at the primary level. But national authorities, nonetheless, have to respond to, prepare for or prevent large numbers of events with correspondingly large numbers of victims.

On the other hand, countries with large populations or large geographic spread clearly rank higher simply because they have a larger land exposure or more people

<table>
<thead>
<tr>
<th>Top 20</th>
<th>No. of disasters</th>
<th>Top 20</th>
<th>No. of victims</th>
</tr>
</thead>
<tbody>
<tr>
<td>China, P Rep of</td>
<td>531</td>
<td>China, P Rep of</td>
<td>2,476,873,508</td>
</tr>
<tr>
<td>Philippines</td>
<td>351</td>
<td>India</td>
<td>783,427,586</td>
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<tr>
<td>India</td>
<td>312</td>
<td>Bangladesh</td>
<td>302,532,924</td>
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<tr>
<td>Indonesia</td>
<td>222</td>
<td>Philippines</td>
<td>133,519,094</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>190</td>
<td>Viet Nam</td>
<td>69,149,364</td>
</tr>
<tr>
<td>Viet Nam</td>
<td>147</td>
<td>Pakistan</td>
<td>68,644,034</td>
</tr>
<tr>
<td>Japan</td>
<td>142</td>
<td>Thailand</td>
<td>50,977,496</td>
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<tr>
<td>Australia</td>
<td>131</td>
<td>Indonesia</td>
<td>15,980,242</td>
</tr>
<tr>
<td>Pakistan</td>
<td>101</td>
<td>Sri Lanka</td>
<td>13,275,304</td>
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<tr>
<td>Afghanistan</td>
<td>97</td>
<td>Cambodia</td>
<td>11,424,668</td>
</tr>
<tr>
<td>Thailand</td>
<td>94</td>
<td>Lao P Dem Rep</td>
<td>4,696,146</td>
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<tr>
<td>Taipei, China</td>
<td>65</td>
<td>Australia</td>
<td>4,289,825</td>
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<td>Korea, Rep of</td>
<td>63</td>
<td>Nepal</td>
<td>4,248,990</td>
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<td>Sri Lanka</td>
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<td>Nepal</td>
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<td>New Zealand</td>
<td>42</td>
<td>Taipei, China</td>
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<td>Hong Kong, China</td>
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<td>Azerbaijan</td>
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<td>Fiji</td>
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<td>Korea, Rep of</td>
<td>1,718,115</td>
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<tr>
<td>Tajikistan</td>
<td>34</td>
<td>Afghanistan</td>
<td>1,211,185</td>
</tr>
</tbody>
</table>

Figure 2.8 Ranking of ADB members in Asia and the Pacific by nos. of disasters and victims (killed and affected), 1980–2012
in harm’s way. The People’s Republic of China for example, has three times the disaster victims compared to India and the Philippines nearly twice the numbers affected in Viet Nam. Although raw numbers are indisputably a function of population and country size, they do reveal aspects of the sheer burden the country bears in absolute terms.

While absolute values provide an idea of the magnitudes, standardizing by country population or size provides better relative measures for formulating regional policies and balanced comparisons.

**Standardizing for population: mortality and affected per million persons**

Very small or very big population sizes distort the proper understanding of the burden of a disaster. This is especially true when making inter-country comparisons or those across time or for regional monitoring. For example, setting baselines to monitor progress is challenging if comparable thresholds that control for a changing denominator are not available.

When mortality is standardized by population size, Myanmar leads the ranks with nearly twice as many victims as the second- and third-ranked Sri Lanka and Bangladesh (Figure 2.9). The People’s Republic of China and India, the two population giants, rank well below 15 other countries. On the other hand, standardizing numbers of affected for population size changes the ranking slightly, bringing the People’s Republic of China and the Philippines up to the higher ranks but keeping Bangladesh at the top (Figure 2.10). The four contiguous countries of Southeast Asia – Viet Nam, Cambodia, the Lao People’s Democratic Republic and Thailand – had higher rates of affected per million than they did for mortality. High population densities and floods in the great plain areas of these countries, which submerge vast tracts of inhabited land, could be an explanation. For example, one of the biggest floods in the last decade, the Yangtze River flood in 2003, affected over 150 million people in the People’s Republic of China, which is large by any standards. As estimates of those affected probably include the cumulative population of all the districts affected by the floods, these figures should be taken as indicative of the magnitude rather than as a precise, counted figure.

Numbers of deaths from disasters are highest in middle-income (lower and upper) members of ADB in Asia and the Pacific when data are grouped by their economic status (Figure 2.11). Mortality is lowest in the upper-income economies but also low in the low-income countries compared to the two middle-income groups. When the numbers are converted into mortality rates per million population, the low-income group has a mortality rate nearly four times as high as that in the upper-income group and three times as much as the categories in the middle. Moreover, the difference in disaster-related mortality rates between the low-income and all of the rest is not just a gradual but a startling increase and justifies closer examination of the specific conditions that led to this large variation.
Figure 2.9 Crude disaster-induced death rate (/mill) by income category (cf. Appendix 2.1), Asian ADB members, 1980–2012
Figure 2.10  Crude disaster-induced affected rate (/mill) by income category (cf. Appendix 2.1), Asian ADB members, 1980–2012
Standardizing indicators by size of the country

The geographic size of a country unquestionably influences the probability of natural hazards on its territories and therefore the numbers of disasters that are likely to occur. Large countries such as the People’s Republic of China, India, Indonesia and the Philippines have many disasters not only because they may be located in seismic zones or cyclone paths, but their size also increases the probability of such hazards. We standardized the numbers of disasters by the square kilometer size of the member, to allow a more balanced inter-economy comparison (Figure 2.12).

The small islands and territories such as the Maldives; Hong Kong, China; and Taipei, China top the list. Countries such as the Philippines and Bangladesh – which are not quite as small in geographic terms as the others – remain in the top 10 economies with the highest numbers of disasters per 1,000 square kilometers.

Association between incidence of disasters and human impact

Finally, we explored the association between victims per million population and disasters per 1,000 square kilometers, allowing a visualization of countries with many disasters but fewer victims (bottom right-hand quadrant) compared to those with few disasters but many victims (top left-hand quadrant). Figure 2.13 presents all Asian and Pacific ADB economies.
Figure 2.12 Spatial exposure to disasters – no. of events by 1,000 km² by income category (cf. Appendix 2.1), Asian ADB members, 1980–2012
Figure 2.13 Association of disaster-induced victimization and spatial exposure, Asian ADB members in Asia and the Pacific, 1980–2012
The usefulness of this graph is principally in reviewing countries in the region, balancing both the frequency of disaster occurrence and the magnitude of their impact. It can also serve as a guideline to examine countries where the exposures of the population to disasters need to be better analyzed and the community-level risk factors for mortality, morbidity or economic stress studied. It also helps to identify countries which are able to control the disaster impact and examine what lessons could be learned for translation into policy for other countries.

The location of the countries on this graph should be viewed with some caveats in mind. For example, the type of disaster that dominates a country may be more or less disposed to effective prevention or preparedness. Earthquakes have little scope for prevention (short of moving whole cities), early warning is not yet an option and preparedness such as retrofitting buildings are often expensive measures. Therefore reducing the impact may be challenging in terms of both resources and organization (Satrianoa et al. 2011; Hoshiba et al. 2011). Most of the reductions in mortality are likely to be brought about by improved construction techniques and close enforcement of building codes, which require dedicated resources, and institutional structures that enforce building codes. Resources to invest in such mechanisms for low-probability events (return periods in the same sites for earthquakes can be very long) compete with other priorities in low-income countries.

On the other hand, for storms and cyclones for instance, the meteorological systems today in most countries have reliable predictive models, and therefore early warning and protective actions can be a reality in most settings and are likely to save lives (Hallegatte 2012). That said, evidence regarding the effectiveness of early warning systems (EWS) in saving lives is still rare. Most conclusions of how well an EWS worked, or indeed did not, are often opinion based, and evaluating their effectiveness through well-designed studies would provide insights into the value of the investment (Meissen & Voisard 2008; Rogers & Tsirkunov 2010). Also, in resource-poor settings, competing priorities of a pressing nature may influence investment on disaster preparedness and prevention, regardless of how frequent a disaster type may be.

Trends and patterns in economic losses

Total direct losses that have been reported among ADB members in Asia and the Pacific since 1980 have been along the order of 2012 US$1.3 trillion. Of this, the largest contribution is from earthquakes (2012 US$600 billion), which account for 47 per cent of the total, followed by floods (34 per cent) and storms (19 per cent) (Figure 2.14). Economic loss from an event is significantly underreported compared to human impact indicators, and particularly from poorer economies although the wealthier members are far from full reporting of losses (Figure 2.15).

Reporting disaster losses

Among the ADB members in Asia and the Pacific, the proportion of disasters for which economic losses are reported declines as countries are poorer. This is probably true for the rest of the world. Nearly three-quarters (12 of 17) of the economies
Figure 2.14 Disaster types: total damages (2012 US$ billion) and percentage of total damages, ADB members in Asia and the Pacific, 1980–2012

in the low- and low-middle-income group reported losses on less than 50 per cent of their disasters (Figure 2.15). Some of these reported losses for less than a third of the events. In contrast, the wealthier half (upper-middle and upper) reported losses for nearly three-quarters of the events and missed reporting on about 30 per cent of their disasters. Notable exceptions were Armenia, Viet Nam and Azerbaijan (all three of which are part of the low-middle-income category), but losses were reported for 75 per cent of their disasters for the first and nearly 60 per cent for the latter two countries. Among the wealthier members, Thailand, the Philippines, Kazakhstan and the People’s Republic of China report for over 60 per cent of their disasters. The Republic of Korea and Taipei, China lead the entire group, all of them reporting economic losses for well over 70 per cent of their events.

We further examined if countries report better for one type of disaster compared to another. In other words, are economic losses somehow easier to estimate for certain types of disasters or are there social or political preferences to assess the full impact of certain types of disasters rather than others? On a rough examination, over all countries, loss estimations are the highest for storms (nearly 60 per cent) compared to just around 40 per cent for earthquakes and floods. Exploring which disasters do not get their loss estimated and why could provide insights into the priorities policy makers place on them.

A possible reason for underreporting economic losses is that disasters are traditionally seen as humanitarian emergencies and less as a development problem. Thus, economic losses whose implications are arguably setbacks to development (infrastructure destruction, loss of livelihood) have been neglected in the past, and controversial discussion appeared on short- and long-term economic impact of
Figure 2.15 Reporting bias: per cent of disasters reporting losses, by income category (cf. Appendix 2.1), Asian ADB members, 1980–2012
Disasters (Skidmore & Toya 2002; Rasmussen 2004; Cavallo & Noy 2010; McDermott 2011; Loayza et al. 2012). In recent years, interest in capturing economic losses is increasing and ways to do so are at least discussed, if not widely (Committee on Assessing the Costs of Natural Disasters 1999; Cochrane 2004; Hallegatte & Przyluski 2010). Munich Re, Suisse Re and CRED – having established a joint methodology for the physical and human impact indicators – plan on an expert consultation process to take the discussion about economic loss definitions forward. An important body of work on this issue has been done by ECLAC (2003), which has produced the well-accepted damage and loss assessment (DALA), now used by the World Bank’s Global Fund for Disaster Reduction and Recovery (GFDRR), who has adapted it for their post-disaster needs assessments (PDNA).

**Economic losses standardized by GDP**

Economic losses from disasters in industrialized countries run into the billions, prime examples of which are the Great Hanshin earthquake in Japan in 1995 (2012 US$154 billion); Hurricane Katrina in the United States in 2005 (2012 US$147 billion); and, in 2011, the Tohoku earthquake/tsunami in Japan (2012 US$214 billion) and the Christchurch earthquake in New Zealand (2012 US$31 billion). Economic losses expressed in absolute terms are a function of the size of the economy in which it occurs. To normalize the numbers, we transformed the cumulated annual loss values as a percentage of the national GDP of that year.

Over time, the losses as share of GDP among the ADB members in Asia and the Pacific are increasing for both earthquakes and floods but not for storms (Figure 2.16).

![Figure 2.16 Time trend of losses as share of GDP for storms, earthquakes and floods, ADB members in Asia and the Pacific, 1980–2011](image-url)
At national levels, we used loss data by each type of disaster. There is an increase in losses from earthquakes and tsunamis in the People’s Republic of China, India, Indonesia, Japan, New Zealand and Pakistan. Earthquake damages increased also in Papua New Guinea until 1993, the last year for which losses were reported for earthquakes in this country. In contrast, there is a decrease in economic losses in the Philippines, an observation that warrants further investigation. Nationally reported losses for floods present a contrasting picture. Flood-related losses are on an increase in Indonesia, Pakistan, Thailand and Australia but decrease significantly in Bangladesh, the People’s Republic of China, India, Nepal, Tajikistan, the Republic of Korea, New Zealand, the Philippines and Sri Lanka. In Viet Nam, losses are stable over time.

Issues in data reporting could explain such observations, but it seems also credible that the decreases in flood losses in many economies have other explanations such as development measures that mitigate economic impact of flood disasters, implementation of effective engineering solutions and community awareness or education that promote protective actions at household levels. Further detailed analysis will be necessary to fully understand this phenomenon. Losses from storms are decreasing in the People’s Republic of China, India, Japan, the Philippines, Taipei, China and Thailand. The decline in Viet Nam is slighter than others, and an increase in storm losses is observable in the Republic of Korea. Again, reporting issues have to be examined but will certainly not give a definitive explanation for such a steady decline in the economic impact of storms on these economies.

Poorer economies report losses less frequently than richer ones (Figure 2.16). Globally, losses are reported for only 28 per cent of disasters in the poorer members against 60 per cent in the richer ones. The total amount of losses reported for richer ADB members in Asia and the Pacific is about 40 times higher than the poorer ADB members in Asia and the Pacific (Figure 2.17). Reporting bias is, unquestionably, one of the factors that feeds into this enormous discrepancy of impact, along with other well-known biases such as asset value and insurance penetration in richer economies.

Nonetheless, the picture presented when losses are standardized by GDP is revealing no matter the limitations associated with reporting biases (Figure 2.17). Losses from the poorer economies are almost five times as high as they are from wealthier members. If the economic losses from disasters on the strongest economies are of concern today, their effects on the weakest economies should be even more worrying, especially taking into account the substantial underreporting of losses in poorer countries. In addition to better reporting of losses from the poorer economies, greater effort should be made to integrate the informal into the national accounts and include them in the overall assessment of disaster losses (Handmer & Choong 2006; Jamil 2013). Further studies should be developed in this direction.

**Focusing resources on high-impact disasters**

In a context of limited resources and competing priorities, making choices within disaster preparedness and prevention options is inevitable. For example, evidence on the effectiveness of interventions is still inadequate, leading to stereotyping of preparedness actions whose impact is unknown or immeasurable.
As a very broad indicator, the EM-DAT economic damage by each disaster type was classified by economy and by share (Figure 2.18). Nearly 90 per cent of the economic losses and human impact were generated in the Asia ADB region by one type of disaster in 8 economies, by two types in a further 21 economies and by multiple types in only 2 countries. DRM measures should be differentiated according to the main disaster risks that a country faces and not for all hazards, which could mean a waste of resources. Countries may have different acceptable levels of risk according to competing priorities, and risk reduction decisions should be taken based on evidence of levels of probability and levels of potential impact.

This is particularly significant since DRM measures for specific hazards can be radically different (e.g. EWS for floods but not for earthquakes) and can be challenging for national policy setting. This analysis provides indications of what would be the most cost-effective targets for preparedness and prevention. Acquiring evidence of past events to strengthen loss statistics would greatly strengthen the evidence base for regional preparedness policy.

**Caveats of using economic loss data**

The use of economic loss data should be handled with care for a variety of important reasons.

First, economic loss data are *available for a minority of disaster* events. Loss figures are typically reported by insurance companies, governments of affected

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**Figure 2.17** Losses among ADB members in Asia and the Pacific: absolute and as share of GDP by income category (cf. Appendix 2.1), 1980–2012

<table>
<thead>
<tr>
<th>Low-income members</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lower-middle-income members</td>
<td>B</td>
</tr>
<tr>
<td>Upper-middle-income members</td>
<td>C</td>
</tr>
<tr>
<td>High-income members</td>
<td>D</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Asian Region</th>
<th>1 disaster type</th>
<th>2 disaster types</th>
<th>Multiple disaster types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>flood</td>
<td>Afghanistan</td>
<td>EQ, flood</td>
</tr>
<tr>
<td>Kyrgyz Rep.</td>
<td>EQ</td>
<td>Armenia</td>
<td>EQ, flood</td>
</tr>
<tr>
<td>Macau, China</td>
<td>storm</td>
<td>Azerbaijan</td>
<td>EQ, flood</td>
</tr>
<tr>
<td>Mongolia</td>
<td>storm</td>
<td>Bangladesh</td>
<td>flood, storm</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>flood</td>
<td>Bhutan</td>
<td>EQ, storm</td>
</tr>
<tr>
<td>Thailand</td>
<td>flood</td>
<td>China</td>
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</tr>
<tr>
<td>Turkmenistan</td>
<td>flood</td>
<td>India</td>
<td>flood, storm</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>EQ</td>
<td>Indonesia</td>
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<tr>
<td></td>
<td></td>
<td>Japan</td>
<td>EQ, storm</td>
</tr>
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<td></td>
<td>Kazakhstan</td>
<td>EQ, flood</td>
</tr>
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<td></td>
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<td>Korea, Rep. of</td>
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<td>Lao PDR</td>
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<td></td>
<td>Malaysia</td>
<td>EQ, flood</td>
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<td>Maldives</td>
<td>EQ, storm</td>
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<td></td>
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<td>Myanmar</td>
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<td>Nepal</td>
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<td>Pakistan</td>
<td>EQ, flood</td>
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<td>Sri Lanka</td>
<td>EQ, flood</td>
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<td></td>
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<td>Taipei, China</td>
<td>EQ, storm</td>
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<td>Viet Nam</td>
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<td>Pacific region</td>
<td>1 disaster type</td>
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<td>Multiple disaster types</td>
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<td>Kiribati</td>
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<td>Fiji</td>
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</tr>
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<td>Marshall Isl.</td>
<td>storm</td>
<td>Papua New Guinea</td>
<td>flood, storm</td>
</tr>
<tr>
<td>Micronesia, Fed. States of New Zealand</td>
<td>EQ</td>
<td>Timor-Leste</td>
<td>flood, storm</td>
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<tr>
<td>Niue</td>
<td>storm</td>
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<tr>
<td>Samoa</td>
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<tr>
<td>Solomon Isl.</td>
<td>storm</td>
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<tr>
<td>Tokelau</td>
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<td>Tonga</td>
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<td>Tuvalu</td>
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<td>Vanuatu</td>
<td>storm</td>
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*Figure 2.18* Prioritizing DRM – which disasters cause > 85 per cent losses or victims by economy
countries and intergovernmental agencies. As a consequence, in countries or communities where most losses are in the informal sector and ownership and value of economic assets and insurance penetration are low, estimates will also be commensurately low. About a fifth of the poorest countries report economic losses at all and, as in these countries insured assets are a minor part of the losses incurred by disasters, the loss data from insurance sector can be misleading for global analyses.

Second, methodology to assess economic loss is not standardized and therefore precludes reliable comparability between estimates. Lack of methods and tools to collect economic loss data is not only a major barrier for improved data coverage but, worse, it discourages efforts to collect the data at all. Third, loss of life is not included in the economic loss calculations, seriously underestimating the loss in poor countries, where values of physical assets are low and lives lost are high. In consequence, losses from disasters such as Cyclone Nargis (140,000 dead) or Haiti (222,000 dead) remain insignificant as the economic value of human lives lost is not factored in. The wider debate around the economic valuation of life and its ethical implications complicates the calculation of a global estimate. But meanwhile, the death tolls are not factored in at all in recovery planning.

Finally, the greatest losses are from the wealthier countries, which report losses of US$16 for every dollar lost due to natural disasters in the poorest countries. In contrast, almost 30 individuals died in poor countries for every one death in wealthier countries In other words, the global ranking of disasters depends on the indicator used. Richer countries rank higher if economic loss data are used as an indicator of impact, while poor countries rank higher if death tolls are used as the impact indicator.

Conclusions

Global analyses from the EM-DAT database can provide insights into trends and patterns and help guide regional policy. In this chapter, we show that the ADB members in Asia and the Pacific are at higher risk of disasters than the rest of the world and the data here confirm this. The data indicate that floods and storms are the main drivers of human impact, and other research suggests that these are likely to increase in frequency in the medium term. We also examine the ways in which the impact of disasters differs across countries, across disaster types and between the indicators we choose to analyze.

The key message here is that not all disasters occur or indeed affect human lives and economic activities with equal frequency or intensity, and choices will have to be made in investment of resources. Cost-effective policies for disaster preparedness and building resilience will need hard evidence and analyses on disasters regarding which have measurably the greatest impact and on what subgroups of population.

Main conclusions

First, there is evidence that those smaller and low-income countries bear a disproportionately larger burden of the impact of disasters, but more with regard to mortality than economic losses. But as loss of human lives are rarely included
in the estimate of losses, poor countries rank low when absolute loss figures are used to set policy. Furthermore, as death tolls are typically higher in poor countries, while economic losses are higher in wealthier countries, disaster impact ranking can change substantially depending on the indicator used. Finally, standardizing indicators, at the very least by population, land area and size of the economy, can also give a very different picture of the importance of impact by country.

Second, the analysis in this paper points to the urgency with which some countries in this region need to put in place more evidence-based policies for DRM. Particularly, many countries can focus their resources on one or two disaster types to lessen substantially the levels of impact on their populations. Our analyses show that more than 85 per cent of mortality or economic losses in many countries are generated by only one or two disaster types. Preparedness measures that focus on those high-impact disasters are likely to bring about the most substantial reduction of losses. But in the interim, more effective response programs are required in order to reduce the levels of victimization, which are persistently high in some countries. Clearer understanding of the mechanisms by which communities are directly affected by disasters would inform disaster mitigation policy towards concrete actions whose effects should be measurable.

Third, while disaster databases provide useful insights into trends and patterns, it is difficult to further analyze their implications for policy. Greater availability of well-designed studies that evaluate causal associations between DRM measures and reduction in impact would help to better exploit and interpret the data.

Lastly, a major weakness in the disaster impact data situation is the lack of standardized methodologies and definitions in the primary data-collection process. Methods, definitions and validation protocols adapted to the ADB region would ensure higher quality data for the future and encourage authorities to manage national and regional data. This is particularly urgent for loss estimations where the lack of methodology is almost certainly a barrier to better reporting.

Six action points derived from our analyses are summarized below.

1. Spatial and demographic variation in impacts of disasters is high in the region. *Sub-national analyses with reliable data required for policy;*
2. National reporting needs improvement. *Lack of data-collection protocols is a major barrier;*
3. Trends in disaster impact are not encouraging. *Effective policy and monitoring progress requires clear baselines and burden analyses to measure progress;*
4. Different disasters have different kinds of impact. *Differentiated impact analyses are central for policy to be relevant;*
5. More than 85 per cent of mortality or economic losses are generated by two disaster types in most ADB members. *Focusing on those high-impact disasters is likely to reduce losses substantially;*
6. Impact of disasters, especially floods, on human capital factors such as health, education or migrations are badly understood. *These and other such direct developmental implications need to be better evidenced.*
Main recommendation and proposed solution

Our analyses in this chapter reveal the patterns of vulnerability of countries. But they also expose the need for high-quality data at sub-national levels. Regional and national DRR and CCA policy requires impact data at higher resolutions that are comparable across time and space. Equally importantly, reliable technical quality and sustained analyses are key for effective policy take-up and require close collaboration and leadership from regional technical institutions.

Based on our analyses, a review of data collection on Asian countries undertaken by CRED/USAID/Office for Foreign Disaster Assistance (Below, Vos & Guha-Sapir 2010) and a regional expert consultation in Bangkok (CRED 2013), we recommend that a consortium of well-established technical institutions be created in the region, which will compile and analyze regional disaster impact data for sound evidence based on vulnerabilities, risk factors and related sectorial policy. Furthermore, their analyses are coordinated with other ongoing initiatives such as the post-MDG process.

Recommendation 1

There is an urgent need to put in place more evidence-based policies for DRM. If effective data acquisition, storage and dissemination occurs, this can have a significant impact on the development of strategic and effective investment by governments in DRM and CCA.

Notes

1 Natural disasters are those that are triggered by a natural hazard and have an impact on human populations. Without a human impact, the event remains a hazard but not a disaster (IPCC, 2012; Haque & Etkin, 2007).
2 EM-DAT defines a disaster as an event that has either 10 killed or 1,000 affected, or includes a call for international assistance.
3 This may indicate the absence of reporting bias since an increase in disasters due to better reporting should have affected both the hydrometeorological and the geophysical events.
4 We calculated the annual numbers of killed and affected by economy per year and divided it by the midyear population of that year, to arrive at an annual rate.
5 Concluding that the cause is poverty, which puts poor people at higher risk, is not helpful.

Bibliography

—. 2013. Investing in resilience: ensuring a disaster-resistant future. Manila, Philippines: ADB.


Appendix 2.1
List of ADB members in Asia and the Pacific

<table>
<thead>
<tr>
<th>ADB Category (Income level used by CRED’s authors)</th>
<th>Characteristics according to ADB MO Section A1/BP of 27 May 2013</th>
<th>Asian Region members</th>
<th>Pacific Region members</th>
<th>Colors for figures</th>
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<tr>
<td>A (Low-Income Members)</td>
<td>Eligible to Asian Development Fund</td>
<td>Afghanistan</td>
<td>Kiribati</td>
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<td>Bhutan</td>
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<td>Tajikistan</td>
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<tr>
<td>B (Lower-Middle-Income Members)</td>
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<td>Country</td>
<td>Eligibility</td>
<td>Notes</td>
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<td>PRC, Indonesia, Kazakhstan, Malaysia, Philippines, Thailand, Turkmenistan</td>
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<td>Light grey</td>
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<td>Brunei Darussalam, Hong Kong, China, Republic of Korea, Singapore, Taipei, China, Japan</td>
<td>Developing members graduated from regular ADB assistance and High-income ADB members</td>
<td>Black outline</td>
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<td>Cook Islands, Fiji</td>
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## Appendix 2.2

Typology and classification of natural disasters

*Table A2.2* Typology and classification of natural disasters

<table>
<thead>
<tr>
<th>Class</th>
<th>Type</th>
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</thead>
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<td><strong>Geophysical disasters</strong></td>
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<tr>
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<td>Tsunami</td>
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</tr>
<tr>
<td></td>
<td>Volcano</td>
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<td></td>
<td>Mass movement (dry)</td>
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<tr>
<td><strong>Meteorological disasters</strong></td>
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<tr>
<td></td>
<td>Extra-tropical cyclone</td>
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<tr>
<td></td>
<td>Winter storm</td>
<td>Snowstorm/Blizzard.</td>
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<td></td>
<td>Local/convective storm</td>
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<td>Duststorm, Tornado.</td>
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<td>Storm surge/Coastal flood.</td>
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<td></td>
<td></td>
<td>Subsidence.</td>
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<td><strong>Climatological</strong></td>
<td>Drought</td>
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<td>Extreme temperature</td>
<td>Heat and cold wave, Frost,</td>
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<td>Extreme winter condition.</td>
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<td>Wildfires</td>
<td>Forest fire, Landfire (grass,</td>
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3 The vulnerability challenge

Ian Davis

Introduction

The expanding impact of disasters in the region as highlighted in Chapter 2 is due to the product of hazards as they interact with sets of toxic vulnerable conditions. This is the subject of this chapter.

To achieve genuine progress, social well-being and overall safety within a given society, a certain sequence of actions is needed by governments:

1 *Create stability*
   Sustainable development is best secured in stable conditions – and this requires responsible governance and freedom from disaster impact.

2 *Understand vulnerability*
   Since disaster risk reduction is synonymous with the reduction in vulnerability, this requires an understanding of the nature, scope and progression of vulnerability.

3 *Examine cause and effect*
   This requires the identification, measurement and assessment of the risks that apply in any natural or human-made context. Such processes require close attention to both the *causes* and the *consequences* of vulnerability.

4 *Devise ways to reduce risks*
   Armed with this knowledge, officials can develop a concerted holistic program to reduce disaster risks, as well as to adapt to climate change.

Therefore, this chapter seeks to describe such actions – particularly to understand the nature of vulnerability, exploring its cause and effect with specific attention to the Asia-Pacific region.

The text seeks to answer a number of pertinent questions that relate to a theme of this study – ‘expanding risks’ – such as what makes a community, region, government or industrial plant vulnerable? Allied to this is the need to understand the dynamics of vulnerability in varied sections and levels of society – identifying both causes and consequences.

This chapter also considers the trends in vulnerability to hazards and to climate change, looking at the commonalities and differences of DRM and CCA, discussing whether their agendas can be merged (Figure 3.6).
This chapter examines a pair of vulnerability challenges: Part 1 takes a broad look at the cause and effect of vulnerability, exploring the ‘progression of vulnerability’, from underlying causes through dynamic pressures that lead to unsafe practices (Figures 3.1–3.5). Part 2 considers the vulnerability posed by climate change (Figures 3.1 and 3.6).

The cause and effect of vulnerability

During the first ADBI workshop held in Tokyo to plan and develop this study, a senior representative of ADB repeatedly asked our authors for “new insights please, not just repeats of what we have all heard already”.

Well one of the ‘new’ items, long neglected by authorities and donor bodies, is for governments and international bodies to focus their attention, and the actions that may follow, on the drivers of risk not just the consequences of risk.

Vulnerability is complex, multi-sectoral and continually changing and extends from the micro-level of an individual family in their dwelling to the macro-level of an entire city or region. It covers the full range of threats – ‘natural hazards’ – where two broad categories of hazard need to be considered. The first are geophysical, where human agents are not present in the creation of seismic or volcanic hazards, and the second are hydrometeorological, where in addition to natural causes there can be strong human dimensions to floods, storms and droughts, termed ‘anthropogenic’.¹ These forces are playing decisive roles in climate change and variability. Vulnerability can also apply to technological and industrial hazards and to the actions or inactions of governments.

The chapter is structured around an adapted version of the crunch model (Figure 3.1), which explores the links between vulnerability and hazards. This model seeks to visualize the generation and maintenance of risk through the ‘progression of vulnerability’ as well as the ‘progression of human and natural hazards’. These processes are considered by looking at the stages of risk generation: underlying causes, dynamic pressures and unsafe conditions.

The following micro and macro examples are explored in this chapter, each using the template of the crunch model for comparative purposes:

Example 1. Marginal families exposed to multiple threats in the mountains of northern Pakistan. This is an example that considers the possible relationship between regional economic relationships and their impact on the safety of a village dwelling of a poor rural family. (Figure 3.2)

Example 2. The Fukushima Daiichi Nuclear Power Plant compound disaster of 2011. (Figure 3.3)

Example 3. The flooding in Thailand in 2011 that developed into a national-scale disaster due to a range of powerful risk drivers. The description shows how this event affected a national economy with global implications. (Figure 3.4)

Example 4. Patterns of vulnerability in government. (Figure 3.5)
A discussion follows the presentation of these ‘worked examples’ of the crunch model to note common issues that emerge from different contexts. This is followed by observations on the implications for governments and the international community of the challenges presented by ‘underlying causes’ and ‘dynamic pressures’.

The second part of this chapter relates to climate change by considering the distinctions and commonalities of disaster risk management (DRM) and climate change adaptation (CCA) (Figure 3.6).

**Defining vulnerability**

‘Vulnerability’ has been defined in various ways. The definition adopted by ADB is as follows: “The propensity or predisposition to be adversely affected” (Field et al. 2012, p. 3).

In our book *At Risk: Natural Hazards, People’s Vulnerability and Disasters*, we expanded the scope of the definition to include the state of being ‘at risk’ in all the stages and phases of a disaster: before, during and after a disaster event.

The characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard.

(Wisner et al. 2004, p. 11)

However, our definition is narrowly restricted to people, but the term ‘vulnerability’ is widely used to also relate to other assets or systems that may be ‘at risk’ from hazard impact: vulnerable buildings, infrastructure, economic systems, livelihoods, industrial processes, economies, political ideologies, ecosystems, etc.

The opposite of vulnerability is capacity or resilience. Therefore, an effective vulnerability assessment, conducted as an element in risk assessment, will in effect also define the capacities that are needed.

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**The anatomy of vulnerability**

The scale of vulnerability depends on a number of closely linked factors and processes:

**Physical**

For example, unstable locations, closer proximity to hazards, fragile unprotected buildings and infrastructure, a lack of enforced building regulations and unenforced land-use planning, permitting building on earthquake fault lines, lack of hazard awareness in engineers, architects, planners, builders and building craftspeople.
Environmental
For example, destruction of natural environmental storm barriers – such as coral reefs or coastal mangrove plantations – deforestation and consequent slope instability, lack of flood protection through river controls.

Economic
For example, lack of productive assets, limited income earning opportunities, low pay, single income revenue, a lack of savings and insurance protection, concentrations of industry and commerce in hazard prone areas, a lack of business continuity planning (BCP).

Social
For example, lack of education concerning hazard safety, low status within society, gender discrimination, ethnic minority discrimination, unsustainable population growth, fewer decision-making possibilities, oppressive formal and informal institutional structures, and political, economic and social hierarchies.

Psychological
For example, fears that derive from religious and other belief systems, ideologies, political pressures, mental illness.

Physiological
For example, status in life – the young and the old, pregnant women, lactating mothers, chronic illness, disability, exposure to sexual violence and harassment.

Political
For example, democratization often being regarded rather naively as a prerequisite for effective DRM, short political terms of office resulting in failures to address long-term risks, lack of basic freedoms, lack of participatory decision making, lack of a press freedom, lack of control of corruption, lack of governance, lack of enforced regulations, centralization and the lack of devolved powers to local levels, lack of governmental priorities for DRM and CCA, lack of national or local disaster plans (adapted from Leoni, n.d., p. 14).

The disaster crunch model
In 1978, I was writing a book on disaster shelter (Davis 1978) and struggling with a chapter concerning unsafe dwellings, and I attempted to devise a diagram that captured the idea of a Disaster or Risk being the product of an earthquake Hazard meeting an unsafe building as a Vulnerable situation (Wisner et al. 2011, p. 23).
With some imagination this ‘collision’ of a hazard and vulnerability could be likened to a ‘crunch’. This could be placed in a crude equation: \( D/R = H + V \). The result, in a rather rudimentary form, eventually developed into the crunch model (Figure 3.1). My co-authors, Ben Wisner, Terry Cannon and Piers Blaikie, and I developed this as one of the pair of vulnerability models that formed the linking themes of our 1994 book (with a second edition in 2004) (Wisner et al. 2004).

In developing this explanatory model we decided to break down the concept of vulnerability into three elements that linked cause and effect. We called the causal factors ‘underlying causes’ that generate risk and then through a series of ‘dynamic pressures’ lead to sets of ‘unsafe conditions’. In recent years the causal factors have been described as the ‘underlying risk factors’ as in the HFA or as the ‘drivers of risk’. Both terms can be regarded as alternatives to ‘underlying causes’.

The version of the crunch diagram (Figure 3.1) is a refinement of the original with the addition of dynamic pressures and underlying causes on the ‘hazards’ side of the equation. This change has been made on account of the growing awareness, as noted earlier, that human factors play a significant part in the generation of hydrometeorological hazards, while this is not the case for geophysical hazards.

First example of vulnerability: rural communities in the Karakoram region, Pakistan 1980–2013

Including contributions by Ali Ahmed Shah

The initial case study is a 30-year-old narrative of one of my earliest encounters with people and how they managed risks within a particularly hazardous environment. From this experience, a multidisciplinary group conducting applied research was able to understand how vulnerability is generated and maintained. The situation described in the mountains of Pakistan identifies key aspects of social and physical vulnerability that contain rich lessons for groups seeking to assist communities who are ‘at risk’. Although the example dates from 1980, the situation remains relevant, since the patterns of vulnerability described are still present within the region (Davis 2011).

Vulnerable conditions in the Karakoram region of northern Pakistan

In 1980, the UK-based Royal Geographical Society (RGS) formed an international expedition to the mountainous Karakoram region of northern Pakistan. The expedition comprised varied well-established geological disciplines. But one of the study themes was certainly not established, since the expedition topic I had the privilege of leading was ‘Housing and Hazards’. While housing in relation to natural hazards had been widely researched for at least half a century, and hazard research has an even longer history, before our expedition it appears that there had never been an attempt to study this specific problem. Our task was to bring
Figure 3.1 Disaster crunch model
together a multidisciplinary team, within a developing country, to examine the way in which communities, and their traditional dwellings and settlements, cope with or adapt to the threats posed by a variety of hazards: earthquakes, landslides, flooding, drought, etc.

**Vulnerable communities**

The key question we raised with local isolated and very poor communities concerned how they coped with the threats that surrounded them. Gradually, we came to recognize the astonishing ability of the local families (perhaps better described as ‘survival artists’) to cope with the various hazards they faced (rockfalls/erosion/floods/avalanches/earthquakes/droughts, etc.) – events that continually threatened not only their lives but also their day-to-day survival in such a harsh landscape. We learned that their main survival strategies were social adaptations to their living patterns. Only rarely did we see examples of families adapting their homes or settlements to achieve better protection from natural hazards.

When we questioned them about why they paid so little regard to these risks, they replied that in their eyes there were far greater worries than any of these hazards. In fact, one house owner shook his head in total mystification as to why we should come all the way from Europe to consider such a strange matter. Local priorities were more to do with their daughters’ education (or lack of it), their fear of ill health and the lack of medicine in the village dispensary and the difficulty in selling their crops for a decent price, which was related to the problems of access to available markets given the inaccessible mountainous terrain (Davis 1984, p. 224).

Our major lesson came from the recognition that while officials from international bodies continually emphasize the need to mainstream DRM into every aspect of public life and grapple with ways to integrate DRM, CCA and the MDGs, these villagers, living in remote areas on a subsistence level of incomes, were practicing a holistic approach to risk management in relation to their traditions, culture and search for sustainable livelihoods.

**Vulnerable dwellings and settlements**

We examined local dwellings and settlement patterns that were at risk from a range of hazards noted earlier. In this region traditional buildings were constructed with stone masonry walls. A series of timber bands were set at regular intervals in the height of each wall to hold the rough stones together, and complex timber roofs were constructed with a very heavy covering of earth to provide much-needed insulation from summer heat and harsh winter cold conditions.

These traditional dwellings were built until around the 1960s or early 1970s and provided some protection against earthquakes. But subsequently, local building patterns changed in favor of concrete construction. The new houses were intended to be reinforced, but in reality they were built without any real understanding of how to connect steel to concrete or roofs to walls. The siting of most buildings was equally dangerous, since to avoid reducing their meager
Ian Davis

landholdings (all available flat land was used for agriculture), many houses were built on exceedingly steep slopes, putting them at risk from landslides, rockfalls and avalanches.

The result was an extremely hazardous situation, produced by a number of factors together, including minimal or zero concern about building safety and the diversion of money intended for dwellings to fulfill everyday needs. There was also a lack of knowledge of both concrete construction and aseismic (shock-proof) construction techniques, a shortage of skills and a radical change taking place in the availability of building materials.

In turn, some of these factors (especially the lack of both skills and materials) could be directly attributed to ‘dynamic pressures’ (Figure 3.2).

**Dynamic pressure: deforestation**

First, the shortage of timber for building and other purposes in the region had arisen because of deforestation, mostly due to illegal felling and corrupt practice. In addition, population growth over a long period undoubtedly increased the demand for fuel wood in such a cold climate and for building materials. This led to a rapid increase in tree cutting and forest clearing to create additional fields for cultivation.

**Dynamic pressure: urbanization**

Second, there was a serious shortage of skilled carpenters and masons, so buildings were constructed and maintained by farmers and laborers who freely admitted that they knew very little about the task. In our attempt to piece together the reasons for the absence of knowledgeable builders, another dynamic pressure emerged. During the 1970s the Government of the People’s Republic of China had built the Karakoram Highway, a major access road into the area. This linked the People’s Republic of China with the Pakistani capital, Islamabad. The road was built for political and strategic reasons, but it was also intended to bring ‘development’ into the remote northern areas. Risk was ‘imported’ via the highway to the extent that heavy (unsafe) concrete buildings were developed and considered ‘modern’, and their use increased dramatically – as a direct consequence of the road being built.

The road also enabled the migration of carpenters out of the area to Karachi, Islamabad and even to the Gulf region (where earnings were 20 times higher). As so often happens, while the road was being used to bring in medical and educational resources, it also enabled loggers to enter the region for the first time, and they had removed vast quantities of timber (often illegally), a process that continues today in spite of logging bans imposed by government. It is likely that the resulting deforestation contributes to soil erosion, slope instability and downstream flooding. The slope instability increased on-site hazards when earthquakes occur.
VULNERABILITY AND EXPOSURE

UNDERLYING CAUSES*
- political ideologies
- lack of political commitment
- economic system
- poverty

DYNAMIC PRESSURES
Lack of:
- health
- education
- skills
- press freedom
- information on risks
- effective government

UNSAFE CONDITIONS
Fragile:
- physical environment
- local economy
- ecosystem

Macro-forces:
- population growth
- gender discrimination
- urbanization
- industrialization
- globalization
- environmental degradation
- deforestation
- corruption

Access denied to:
- representation
- resources
- power
- knowledge

Lack of:
- disaster risk management (DRM)
- adaptation to climate change (CCA)

THE PROGRESSION OF VULNERABILITY

HAZARDS (HUMAN AND NATURAL)

TRIGGER EVENTS
- earthquakes
- landslides

DYNAMIC PRESSURES
- ground motion

UNDERLYING CAUSES*
- tectonic plate dynamics
- ground deformation

- Climate change due to natural and human actions
- Climate variability due to natural or anthropogenic forcing

- storms
- floods
- landslides
- temperature extremes
- droughts
- fires
- avalanches
- infestation
- disease pathogens and vectors
- natural or human-induced erosion

The Progression of Human and Natural Hazards

Disaster Crunch Model: Rural Communities in the Karakoram Region of Pakistan, 1980
("Underlying causes are sometimes described as 'underlying risk factors', 'risk drivers' or 'root causes')

Figure 3.2 The disaster crunch model: rural communities in the Karakoram region of Pakistan, 1980
In 2013, the rapid, haphazard and unplanned urbanization processes noted above continued to take place in the entire Karakoram region ranging from small settlements and villages to the towns. In the absence of land-use planning and land regulation mechanisms, dangerous physical development occurs within hazardous sites (for example, along the river beds or in areas subject to rock falls or within flood-prone areas).

New patterns of urbanization are mismatched with vernacular building practices. Traditionally, criteria for the selection of site and location of human settlement were developed through a strategic perspective considering such primary factors as the:

- availability of water for irrigation and human consumption;
- risk factors from human-made threats and natural hazards;
- utilization of fertile and planned land for cultivation and agricultural purposes and
- use of barren and hard surfaces areas for human habitation.

The new urbanization trends ignore the vernacular knowledge and wisdom and basic land-use planning guidelines. As a result urbanization patterns place excessive pressure on the built environment and contribute to environmental degradation, including consumption of agricultural land, deforestation and development on hazardous and unsafe area, thus adding risk to the lives and livelihoods of local people. Specifically, it directly affects the limited agricultural productivity of rural communities and increases their vulnerability.

Dynamic pressure: out-migration

Furthermore, the Pakistani government encouraged, and still encourages, their workforce to immigrate to the Gulf with its insatiable construction labor market, so as to attract the foreign currency remittances sent for family support by the workers abroad. This was a policy designed to boost the country’s balance of payments deficit. In this way we are led to more remote ‘underlying causes’. The net result was that the families were left to live in dangerous homes, often with a depleted and de-skilled labor force due to out-migration.

Dynamic pressure: climate change

In 2013 experts suggest that the region is highly susceptible to the adverse effects of climate change phenomenon and extreme weather conditions due to the nature of the dynamic geo-physical environment. This includes: irregular glacial movements and avalanches, melting of glaciers, glacier lake outburst floods (GLOF), snow falls, windstorms, droughts, landslides, debris and mud flows, and rock falls. In consequence, lives, livelihoods and built environment are continually at risk.
Dynamic pressure: civil conflict

In 1980, this region was politically stable in sharp contrast to 2013 when Talibanization and terrorism have emerged as major human-induced hazards as the surrounding regions have been extremely exposed and affected by these pressures. The area has experienced severe ethnic and sectarian strife since 1988, when dozens of villages and settlements of a sect in the region were burnt down by another sect backed by Afghan Mujahidins and Talibans. Since then, the culture of weapons and terrorism was imposed on the communities of the area and ethnographic and demographic changes were promoted and sectarian clashes and disputes were provoked and the area remains unstable due to planted sectarian violence.

This unstable situation adversely affected the only tourist industry of the region and the 9/11 assault and an attack in 2013 on foreign tourists/climbers further destabilized the tourist industry of the region. Further, the tendency of communities to invest in weapons to defend themselves against the invaders such as Talibans, and internal displacements and migrations also badly affected the fragile economic conditions of the local communities. Overall, the area is extremely vulnerable to the ongoing Talibanization and terrorism which has significantly increased the vulnerability of the local people of the Karakoram.

Dynamic pressure: lack of governance

In 2013, government institutions with responsibility for managing urban settlements in the region were constrained by many factors, including insufficient financial and human resources, lack of coordination, insufficient technical expertise, inadequate monitoring and evaluation systems, and ambiguous roles and responsibilities both within and among the departments.

Currently the only approach for dealing with the disasters is the post-disaster response, for which the available institutional mechanisms fall far short of requisite technical, human and financial resources to effectively respond to post-emergency situations. Policies and institutional mechanisms for preparedness have yet to be taken seriously. Ineffective coordination among departments and fragmentation of roles and responsibilities to mainstream urbanization processes and lack of integrated approach for the advancement of sustainable development pose serious challenges. There is also a lack of commitment by responsible institutions to ensure implementation and compliance to approved and binding polices and legal instruments and building codes. Policies for land-use planning, provision of services and infrastructure and rapid urbanization are not in place. Furthermore, there is limited financial support for public organizations to invest in preparedness and there is an absence of readily available financial mechanisms to mount effective disaster risk reduction and adaptation to climate change. Also, there is insufficient institutional capacity to mainstream urbanization trends, and integrate disaster risk management into governments’ annual development plans. Thus these scenarios indicate the general weakness of governance – a significant vulnerability factor.
Three lessons from the Karakoram study remain powerful and relevant:

1. **Vulnerability to short- or long-term natural hazards has always to be recognized within its natural context of the everyday livelihood, health and social concerns of affected communities.**

   Just as within more affluent societies, where long-term, logical action is often overwhelmed by short-term expediency, the economically poor but culturally rich families we met in the remote villages of northern Pakistan were preoccupied with immediate rather than more remote long-term threats. Expressed another way, DRM can never be isolated from the business of living; it has to be regarded as a key element in overall human development.

2. **Vulnerability has to be understood as a complex interaction of multiple processes.**

   This simple case study of an isolated and marginalized community and their settlement patterns combines the following range of issues:
   - Social dimension: perceptions of risk, pressing everyday threats, population growth, social change and coping strategies, lack of education, rural health deficiencies
   - Ethical dimensions: corruption
   - Economic dimensions: livelihoods, urbanization and globalization
   - Technological dimensions: technological change in building practice
   - Environmental dimensions: deforestation
   - Political dimensions: strategic geopolitical road building and support of international migration of labor

3. **Vulnerability of dwellings and settlements has to be tracked back to its source in underlying causes, the ‘drivers of risk’ (Figure 3.2).**

   Therefore, any attempt by the Government of Pakistan to reduce the risks to the rural vulnerable dwellings and settlements in the Karakoram cannot be confined to the cosmetics of improvements in the unsafe conditions of local building practice. To make any impact, they must look further to address underlying causes and dynamic pressures such as controlling corruption, controlling explosive population growth, addressing the problems of the out-migration of skilled builders and craftsmen, controlling deforestation and tackling the extreme threats posed by terrorism (adapted from Wisner et al. 2004, pp. 57–59; and Davis 2011, pp. 84–85).

*Second example of vulnerability: Fukushima Daiichi compound disaster, 2011*

In sharp contrast to the Pakistan example, the second crunch model (Figure 3.3) relates to the progression of vulnerability that led to a natural disaster and then escalated into an industrial/technological disaster with global repercussions. Even a few years ago it would have been inconceivable that an industrial disaster, within a single industrial complex in Japan, could change the entire energy policy of the German government to renounce nuclear power as being unsafe.
Disaster Crunch Model: Fukushima Daiichi Compound Disaster, 2011

(* Underlying causes are sometimes described as ‘underlying risk factors’, ‘risk drivers’ or ‘root causes’)

Figure 3.3 The disaster crunch model: Fukushima Daiichi compound disaster, 2011
Because the Fukushima Daiichi Nuclear Power Plant compound disaster is described in detail in Chapter 5, ‘Managing the Risk of Compound Disasters’, there is no need to elaborate here, other than to introduce the crunch model of this disaster. The text on this model has been particularly difficult to finalize since at the time of writing, the disaster continues to rapidly develop in the form of radiation contamination of coastal seas and as multiple causation issues continue to unfold.

Third example of vulnerability: flooding in Thailand, 2011

The description that follows of this disaster indicates the impact of a series of interrelated dynamic pressures and the consequences of a government placing economic development of a region above a land-use policy to protect their citizens and property from flood impact.

Vulnerability as a result of conflict between agriculture production, urbanization and flood management goals

Contribution by Gabrielle Rosales Iglesias

Large areas of Thailand are subject to severe flooding, and the country has a long history of attempting to withstand the threat by building extensive flood defenses (Engkagul 1993). However, the major flood in 2011 was an exceptional event that made the world take notice. It affected about 13.5 million people (Rerngnirunsathit 2012) and losses were estimated by the World Bank (2012) at 1.43 trillion baht (US$45.7 billion). This made it the fourth costliest disaster recorded up to 2013. In human terms 830 persons died in the disaster. While many remember the floods as having occurred from September to October, the actual duration was from the end of July 2011 to mid January 2012, as the waters moving through flooded 65 out of 77 provinces in the north and northeastern sections of the country and headed for Bangkok, where the water exits into the Gulf of Thailand (Aon Benfield 2012).

Until that point, flood mitigation had been largely structural, with the construction of water storage systems (including dams, reservoirs, retention ponds and temporary storage ponds called “monkey cheeks”) and the diversion of water (Prajamwong & Suppataratarn 2009). The flood was certainly an extreme event in that excessive rainfall was brought to the country by a combination of an early-onset rainy season plus five tropical storms that led to an eventual breach at weak points in the dyke systems of the Lower Chao Phraya River basin (ENW 2012) and attenuated by the peak high tide in the Gulf of Thailand that occurs from September to October. Needless to say, the flood management and drainage systems were severely challenged. Still, there are other factors related to agriculture policy and land conversion.

Land-use and vulnerability

Twenty-two of the flooded provinces are part of the country’s ‘rice bowl’ and have an extended network of irrigation canals to bring in water to nourish crops
during periods of low rainfall or drought (Sirisup & Kammeier 2000). However, much of the delta containing and surrounding Bangkok had undergone major reclamation for agricultural use (Molle 2005) and then land-use change that saw a significant reduction of land for agriculture in favor of residential and industrial uses (Tonmanee & Kuneepong 2004). As a result, the surface areas that could absorb water are paved with concrete, converting the water into runoff that needs to be drained and effectively reducing the space for inundation, which is directly linked to the increase in flood damage since 1942 (Hungspreug et al. 2000) despite corresponding increases in flood protection.

Prior to the flood, the country had about 192.64 km² of available industrial plots, 33 per cent of which (about 63.57 km²) are found in the central region (Colliers International Thailand 2011). The shutdown of seven industrial estates during the flood is now spurring relocation to the northeast and eastern areas even as measures are being taken to raise dyke walls and flood barriers.

**Vulnerability has to be understood as a complex interaction of multiple processes**

This case study combines the following range of issues:

- Social dimensions: 830 deaths and a massive impact on 13.5 million people
- Ethical and political dimensions: The decision to take vast areas of agricultural land and convert it to industrial use without fully comprehending the consequences in enhanced vulnerability and the need for DRM appears to be a major ethical/political issue.
- Economic dimensions: The disaster cost of US$45 billion was vast in scale and will adversely affect the future economic status of Thailand.
- Technological dimensions: International supply chain management practices are being reviewed in light of the disruption caused by this disaster.
- Environmental dimensions: Changes in land use had significant consequences on the environment.

**Learning from the disaster**

Many lessons have been drawn from this disaster. The event contains a range of implications for the growth of vulnerability of national economies and international industrial supply chain management. One of the main findings must be to advise governments that are putting in hand major economic developments (such as the vast factory-building program undertaken in southern Thailand) to think hard before taking action. The need is to assess, plan and consider the positive and negative aspects of any proposed development in relation to whether it will result in enhanced disaster risk – in social, economic, physical and environmental terms.

The following notes expand on the headings in Figure 3.4.
Disaster Crunch Model: Thailand Flooding, 2011

(“Underlying causes are sometimes described as ‘underlying risk factors’, ‘risk drivers’ or ‘root causes’)

Figure 3.4 The disaster crunch model: Thailand flooding, 2011
Underlying cause: economic system

Thailand’s economic productivity is centered on Bangkok, and the agricultural areas around it are traditionally converted into temporary flood storage (“monkey cheeks”) and compensation given to the farmers who have lost their crops. Productivity of Bangkok is therefore valued higher than the other provinces, which may be flooded to save Bangkok.

Dynamic pressure: lack of effective government

One week before Prime Minister Yingluck Sinawatra was elected on 5 August 2011, the floods started, later to threaten Bangkok. The Prime Minister, new to office, made a controversial decision to form a temporary body called the Flood Relief Operations Centre (FROC) rather than relying on the Department of Disaster Prevention and Mitigation (DDPM). The FROC struggled to implement its mitigation strategy and was ultimately redundant in relation to the working systems of the DDPM and the Royal Irrigation Department. It was even forced out of its headquarters twice as the flood eventually engulfed these locations.

Dynamic pressure: agricultural practice

It is ironic that Thailand is a major exporter of food and favors reaping rice three times a year, whereas it should naturally be only once a year. The floodplain of the Chao Phraya River has been converted into rice land and is crisscrossed with a network of irrigation canals to ensure a steady supply of water during the months of minimal rainfall. These canals are natural pathways for water, and so they are the source of floodwater in the areas within the network. This strategy ensures that one crop of rice is allocated for local consumption and the others for export. However, multi-cropping means that multi-purpose dams tend to retain water for irrigation rather than be empty enough to be effective for flood mitigation.

Dynamic pressure: globalization

The growth of global distribution of production processes has increased the vulnerability of multinational corporations in the automotive (e.g. Honda) and electronics (e.g. Western Digital) industries, who had located the production of some parts in the industrial estates that were flooded. The interruption in production effectively slowed down production of their end products, such as cars and external hard drives (Chongvilaivan 2012).

Dynamic pressure: industrialization and urbanization

Industrialization spurred the development of industrial estates along the river in the provinces of Ayutthaya and Pathumthani, and urbanization resulted in the explosion of much of the urban area of Bangkok and its suburbs in the 1990s.
The combination has led to a significant reduction in flood storage within the floodplains and wetlands.

 Unsafe condition: an ineffective flood mitigation strategy

A Bangkok-centered flood mitigation strategy – comprising a system of floodgates, dykes, polders, sea walls and pumps – protects Bangkok. The provinces that immediately surround Bangkok are not part of this system, and part of their lands are periodically flooded in order to retard the flow of water through Bangkok and into the gulf.

 Review of the Pakistan, Japan and Thailand crunch models

A pair of significant lessons emerges from these varied examples of vulnerability.

 The decisive influence of global economics on vulnerability

In each of the three examples, at national, regional and global scales, economic forces exerted a potent influence on the vulnerability of citizens. This affected several dynamic pressures: globalization, industrialization and urbanization. However:

- it is unlikely that the Pakistan government was aware that its promotion of the migration of building workers to the oil-rich gulf states could affect the safety of village housing in the remote northern regions of the country.
- the Fukushima Nuclear Power Plant appears to have operated without effective on-site or off-site safety mechanisms being in place. It is unlikely that the Government of Japan was aware of the scale of risks present at the site, as well as risks to local communities, to the wider economy, to national prestige abroad and to the global nuclear power industry.
- when the Government of Thailand encouraged the development of rice paddy fields for factories to produce electronic goods for global markets, it is unlikely that it considered enhanced vulnerability to flood impact as part of the planning and decision-making process. It is also unlikely that the factory owners were aware of the commercial impact of interrupted supply chains.

 The influence governments have in creating and reducing vulnerability

These three examples suggest that governments play decisive roles both in creating vulnerability (often unwittingly) and in building disaster resilience. Therefore:

- The building of the International Karakoram Highway in Pakistan brought obvious benefits to remote areas of the country – such as reducing health vulnerability to isolated communities and encouraging trade links with the
People’s Republic of China. But it also facilitated the out-migration of skilled builders and accelerated deforestation – both dynamic pressures in creating unsafe conditions.

- The Fukushima tragedy highlights the role of governments in creating a safety culture that will affect virtually every aspect of society: education, public awareness, laws and the full regulatory environment, structural design, the government planning process, etc.
- The Government of Thailand failed to develop a closely integrated flood risk reduction plan that was devised to protect the Bangkok metropolis as well as surrounding rural areas. This case study, summarized in Figure 3.4, is a reminder that extreme social, economic and environmental underlying risk factors and dynamic pressures – including the expansion of urbanization, industrialization, globalization, climate variability and change and coastal development – can outstrip attempts to manage risks, with devastating consequences.

**Fourth example of vulnerability: vulnerability in government**

The final example takes a different direction from the three ‘place- or event-related’ models noted earlier. This suggests that vulnerability is generated and maintained within the working of certain governments. The topic is included to encourage government and international agency officials to recognize that vulnerability is not always an external set of causes, pressures and unsafe conditions; rather it can exist and flourish within their internal functions.

I am struck by the not infrequent occurrence of situations in which decision makers have all the knowledge and information and understanding that they could possible need to make what external experts and observers would universally consider to be sound risk management / reduction decisions and do not do so . . .

The CRUNCH MODEL does not provide space for, or draw attention to the circumstances in which decision makers often find themselves faced with pressures not to act or to delay decision perhaps indefinitely. There is often a power structure and a set of political interests to which decision makers respond or comply with and fail to act in the best interests of the community as a whole in terms of risk and damage reduction. This power structure and political interests can be local, national and international (global) and that there can also be expressions of private sector interests.

(Professor Ian Burton, 2013)

Following this critique of the crunch model (Figure 3.1), a variant of the model has been developed to specifically look at patterns of vulnerability in government (Figure 3.5).

The following notes expand on headings in Figure 3.5.
Figure 3.5 The disaster crunch model: patterns of vulnerability within government
Underlying cause: lack of political commitment

This can be expressed in varied forms:

First, short-term political dynamics and expediency, motivated by political self-interest, compared to a long-term concern for the ‘public-good’.
Second, a lack of political consensus that can exist across party divisions concerning risk reduction priorities and policies.
Third, short sightedness of politicians in failing to tackle ‘low-probability’, yet ‘high-consequence’ disaster events.

(Lewis & Kelman 2012)

Dynamic pressure: lack of effective government

(See Chapter 8, ‘Disaster Risk Management at the National Level’.)

This can apply to varied contexts:

First, any government that fails to take appropriate actions to reduce risks, such as the governments that fail to fulfill the tasks outlined in the Hyogo Framework for Action (HFA), despite being signatories to the framework.

Second, governments that seek to address unsafe conditions but ignore the risk drivers that create and sustain these patterns of risk.

Third, corruption of government officials, on account of vested commercial or political interests.

Fourth, failure to collect, store, analyze and disseminate essential risk data.

Fifth, governments that fail to set good examples of risk reduction for their citizens, for example, by building their own facilities in unsafe areas; not applying full safety standards in their own investments in buildings, infrastructure and economic developments; failing to train their own employees in risk awareness, etc. (Turnbull et al. 2013; Olson et al. 2011).

Unsafe conditions: lack of policies

These gaps can be numerous, so the following are typical examples of policy failures:

First, political shortsightedness in devising investment policies – attending to a short timescale corresponding to elections, rather than investing in long-term risk reduction concerns that will affect future generations (Olson et al. 2011).

Second, ignoring the need for sustainable policies that protect people, property and the environment whenever such policy conflicts occur. An example could be the economic development of unsafe areas, such as flood plains of exposed coastal zones versus a prudent avoidance of such areas for development and occupation on account of the flood risk (Bender 2011).

Third, narrowly defined policies that represent a given sectoral view, often promoted by a single government department, that fail to make essential connections with other closely related sectors (Lewis & Kelman 2012).

For example, a policy and program to introduce building bylaws for safe building, which typically may be promoted by a Housing or Environment Ministry,
requires the training of builders, crafts-persons, engineers and architects that may be promoted by a Department of Education or Professional Bodies (Alexander 2002).

Similarly, the value in the synergy in joint programs may not be recognized, for example by merging river catchment policies for water supply and land drainage, typically under water boards or environment agencies with flood controls, that may be the responsibility of the National Disaster Management Coordinator.

Unsafe conditions: lack of civil society links

(See Chapter 7, ‘Disaster risk management at local and community levels’, and Chapter 4, ‘The social and economic challenge’.)

Governments can fail to recognize the need for full engagement and partnership with civil society in reducing risks. Given the scale of vulnerability, where needs generally far exceed governmental capacity, the vital process of mobilizing all sections of society, supported by government in an integrated mission, is often ignored (Twigg 2009; Maskrey 2011).

Unsafe conditions: lack of financial instruments

(See Chapter 6, ‘Financing and Risk Financing Disaster Risk Reduction in Asia and the Pacific: Experiences and Innovations’.)

A critical gap can exist in the financing of risk reduction measures. This can present a challenge to governments as they seek support from donor governments and multilateral development banks.

Gaps occur in providing affordable risk finance in the form of insurance coverage for poor vulnerable families, and financial incentives may not exist to accelerate DRM and CCA.

Unsafe conditions: lack of decision making

A common problem concerns political leaders who fail to make essential decisions, a persistent problem in hierarchical governmental structures. Another problem is the ‘delayed decision’, which can often be as damaging as the failure to decide on a course of action.

In hierarchical governance structures, situations often exist where critical decisions are not made: the designated person with the authority to make the decision is unavailable due to failures to devolve decision-making authority to subordinates (Collymore 2011; Davis 2011).

Unsafe conditions: lack of government structures

(See Chapter 8, ‘Disaster Risk Management at the National Level’.)

This problem relates to the lack of:

First, dedicated focal points in government for DRM, with coordination powers across line departments and with the necessary authority and resources.
Second, the devolution of the central powers of government to implement DRM to local government is often lacking, this results in the neglect of local knowledge of risks and available resources that are so as essential in taking action to reduce local risks.

Third, competing ministries who seek to gain position and resources rather than seeking to integrate DRM approaches with parallel departments and sectors.

Fourth, governments that deploy resources for disaster relief, and emergency management, but fail to invest in reducing risks.

Fifth, governments that establish emergency management at the apex of political power, within the Prime Minister’s or Cabinet Office, but who consign DRM and CCA to subordinate levels of leadership and authority (DFID 2011; Lewis & Kelman 2012).

Unsafe conditions: lack of regional and international cooperation

(See Chapter 9, ‘Disaster Risk Management at the Regional Level’, and Chapter 10, ‘International Frameworks Advancing Disaster Risk Management’.)

Since hazards ignore political boundaries, the need is obvious for regional DRM data acquisition and management, with joint regional academic research to analyze the data as the basis for sound evidence-based policies.

In recent years the impact of disasters on regional and international supply chain management has become of critical economic importance.

International cooperation for DRM may lack focus and coordination. It needs a strategic approach to be better applied to facilities of high social value (such as schools and hospitals).

There has been continual neglect of the strategic importance of investing in human development. This relates to education from primary schools upwards to higher education levels and to the need for vocational and professional training for DRM and CCA functions.

This lack may be attributed to the desire of political leaders to invest in tangible projects that may appeal to the media and the electorate, preferred over allocating money for ‘invisible processes’ to train teachers and lecturers and to develop essential curricula for risk reduction (Twigg 2009; Davis 2011).

Unsafe conditions: lack of consistent levels of protection for all communities

While there is a logical need to provide enhanced protection for strategic resources, it is nevertheless essential to ensure that all sections of society (rich and poor, urban and rural, young, middle-aged and elderly, majorities and minorities) are protected (Wisner et al. 2011).

Unsafe conditions: lack of laws supporting DRM and CCA

The failure to enact and enforce legislation requiring government and all relevant actors to reduce risks may lie behind many failures in risk management. This can include defining patterns of authority, sectors of DRM and CCA, risk assessment responsibilities, deciding on ‘levels of acceptable risk’, coordination requirements, delegation of powers to local government, allocation of resources, etc.

For example, an aspect of a DRM law will require the development and implementation of early warning systems against impending flooding. Effective laws will identify and clarify responsibilities to initiate, develop and operate warnings, disseminate them to those ‘at risk’ and then take appropriate actions to protect citizens and assets, such as evacuation plans.

Without such laws a situation can develop where key elements of DRM and CCA may be operated ineffectively or sidelined or even totally ignored at the whim of successive governments who possess differing agendas or priority concerns (Lewis & Kelman 2012; Handmer & Dovers 2013).

Unsafe conditions: lack of regulatory environment

(See Chapter 5, ‘Managing the Risk of Compound Disasters’.)

An effective legal framework, or regulatory environment, yields vital risk reduction benefits:

1 Laws, standards and controls are essential in all societies to provide vital protection. They also serve to raise awareness and educate all levels of society on safety concerns.
2 Laws are needed for building and infrastructure safety, land-use planning controls, industrial development, tourism development, environmental planning, etc. (Krimgold 2011).
3 Laws require supervision, monitoring and enforcement by trained staff. They require detailed training programs for those who build such structures, as well as those who occupy or operate facilities. There are examples of countries experiencing severe financial cuts where government inspectorates have been cut as cost-saving exercises.
4 Business continuity planning (BCP) can also be a legal requirement to ensure that economic losses and employment disruption are minimized from disaster impact (Lewis & Kelman 2012).

Unsafe conditions: lack of disaster risk management

(See Chapter 8, ‘Disaster Risk Management at the National Level’.)

As noted earlier, a well-resourced dedicated authority is needed, with close working links to the apex of political power, relevant government departments, local government, CCA authorities, the national disaster management office, civil society and UN and international bodies (Wisner et al. 2011; Handmer & Dovers 2013).
Unsafe conditions: lack of climate change adaptation

In a similar manner to DRM, CCA also needs a well-resourced dedicated authority, with close working links to the apex of political power, relevant line government departments (especially those that are climate related), local government, DRM authorities, the national disaster management office, civil society and UN and international bodies such as the IPCC (Shaw et al. 2010 Anbumozhi 2012; Handmer & Dovers 2013).

Observations on the role of governments and international agencies in reducing vulnerability

Having suggested the crunch model as a template or model for the progression of vulnerability and hazards (Figure 3.1) and then applied it to three contexts (Figures 20, 21 and 22), as well as to governments (Figure 3.5), this section seeks to relate the model to the actions needed by governments and international agencies to reduce vulnerability.

Responding to underlying causes

There is an urgent need to recognize systemic failures by the international humanitarian system.

In the UNISDR Mid-Term Review only three under-lying factors were identified: poverty, urbanization and climate change. Although poverty is obviously a key ‘driver’ of vulnerability, both urbanization and climate change are surely the consequences of underlying factors, rather than being causal, or underlying risk factors. There is no mention in the HFA, or in the UNISDR Global Assessment Reports, of such underlying factors . . .

(Alexander & Davis 2012)

However, as the chair summed up the findings of the Fourth Global Platform on Risk Reduction held in Geneva in May 2013, there was a welcome recognition of this reality when her statement contained three terms with similar meanings: ‘root causes’, ‘underlying risk factors’ and ‘risk drivers’.

The UNISDR addresses targeting the root causes of risk:

To date, countries and organizations report least progress on Priority 4 of the Hyogo Framework for Action: to ‘reduce the underlying risk factors’.

Throughout the session, participants raised the need to take concrete measures to tackle risk drivers including poverty, hunger, disease, conflict, violence and inadequate health services, education, infrastructure, poor water and sanitation, housing, unemployment, land degradation, displacement, forced migration and discrimination.

(UNISDR 2013a)
The chair’s summary highlighted the great difficulty that the international community has experienced in taking ‘concrete measures’ against the causal factors that generate risk. This concern was mirrored by the ISDR High Level Dialogue that took place during the Fourth Global Platform (quoted in Chapter 1, p. 23).

In essence, there appears to have been a general reluctance by all parties to rise to the challenge of taking decisive and courageous action on a number of critical as well as highly sensitive issues that drive, advance, underpin and sustain vulnerability. These are noted in the chair’s statement, but there are additional deep-rooted causal factors that are described throughout this chapter.

In 2009–2010 an important initiative was announced by International Research for Disaster Risk (IRDR) that has the potential to take the subject of underlying causal factors much further. The Advanced Institute for the Forensic Investigation of Disasters (FORIN) was jointly established by the International Council for Science (ICSU), the International Social Science Council (ISSC) and the UNISDR (IRDR 2011).

The intention of FORIN is to conduct detailed scientific research into disasters in the context of everyday life. This is to include knowledge creation and its communication and the relationship with decision making; responsibility of governance; measurement of outcomes and differential impacts; and attribution of cause and effect by social actors.

One of the founders of FORIN, Professor Ian Burton, has described the final attribution function noted above as a

\[
\ldots \text{medium and a mechanism for developing better comparative understandings of the root causes and underlying process that lead to disaster risk in diverse socio-economic, cultural, national, regional and local settings.}
\]

(Burton 2011, p. 5)

However, can such noble intentions ever be realized? Since the root causes of disasters, and dynamic pressures to be described in this chapter, cover some issues that are acutely sensitive to the national governments where the forensic investigations will need to occur, and since this political sensitivity may apply to an even greater degree to the donor governments who support the work of FORIN (and IRDR via UNISDR, ICSU and ISSC), it remains to be seen just how far the forensic research will be permitted to proceed without restrictions being imposed.

This section introduces the causal factors, the underlying risk factors, that start the progression of vulnerability. As the columns of the crunch model (Figure 3.1) indicate, they are an amalgam, or toxic mixture, of political, economic, cultural and oppressive forces that combine as the ‘root causes’ or ‘risk drivers’ that may lead through a series of dynamic pressures to unsafe situations. Therefore, in any disaster concerned officials will always wish to look beyond the cosmetics of a damaged economy or failed buildings, weakened infrastructure or fallen trees, to seek the real cause, where possible using the forensic tools of investigation. The
The vulnerability challenge

aim is not just to assign responsibility, it is to learn from each tragedy, disseminate the lessons widely and avoid their repetition.

**Responding to dynamic pressures**

The chair’s statement at the close of the Fourth Global Platform in May 2013 contained a useful list of proposed actions. In the categorization proposed in the crunch diagram, (Figure 3.1), these are responses to dynamic pressures.

For example, in responding to the dynamic pressure of a ‘lack of education’, a proposal is made concerning the need for “promoting education services and systems, and committing to safe, uninterrupted education and other measures identified in the Children’s Charter for Disaster Risk Reduction” (UNISDR 2013a). Or in response to another dynamic pressure concerning ‘environmental degradation’, a proposal is made concerning the need for “systems for protected areas management and integrated water resource and coastal zone management to address environmental degradation” (UNISDR 2013a).

A further set of factors were listed in the recent Global Assessment Report 2013 as ‘risk drivers’: “vulnerable rural livelihoods, declining eco-systems, the concentration of extensive disaster risk in low-income communities and households” (UNISDR 2013c, p. xiii).

In the many discussions concerning the nature of vulnerability there is often a rather redundant academic debate over which aspect is a ‘cause’ of vulnerability and what is a ‘product’ or ‘effect’. For example, can the absence of land-use planning be considered a ‘driver of risk’? Or is this omission a ‘product’ or consequence resulting from the actions or inactions of various actual ‘root causes’ or ‘drivers of risk’ where risk originates? These could include political neglect or blatant corruption when an official is bribed by an unscrupulous developer to sign off on a development on a piece of highly unsafe land that has been officially excluded from development.

Each of these are vital issues to be dealt with in DRM, and in each case the question arises about whether they cause vulnerability or whether they are the consequences of actions or underlying processes. For example the ‘concentration of extensive disaster risk in low-income communities and households’ in Port-au-Prince, Haiti, that led to thousands of deaths and destruction of dwellings in the 2010 earthquake was driven by multiple drivers of risk.

These included a litany of ‘underlying causes’ or ‘dynamic pressures’: inequitable patterns of land ownership, corruption, explosive population growth in the country, poor or nonexistent governance that manifestly failed to protect its poor citizens, and urbanization pressures induced by international trade agreements that killed off local rice production for rural farmers, resulting in urbanization with lethal consequences (Davis 2012).

If the powerful risk drivers in Haiti and elsewhere are not identified and dealt with, then their consequences, in the form of unsafe death-trap conditions, will continue to be generated. Therefore, if disaster losses are to be stemmed within the Asia-Pacific region, the gap needs to be filled with sustained attention and courageous action to tackle the actual ‘drivers of risk’. The list of such forces and
pressures set out below is long, and they are inevitably politically highly sensitive. Then, to make matters worse, many of these ‘risk drivers’ are exacerbated by the problems associated with economic growth. The rapid growth of economies within the region has brought its own threats as exposure and vulnerability expand in the wake of intensive development and social progress.

A series of dynamic pressures is indicated in the selected examples (Figures 3.2–3.4). The list can be expanded to an extensive list of forces having a major impact in the generation and maintenance of risk, and a fuller list of topics is set out in the ‘dynamic pressures’ column in Figure 3.1.

Space in this chapter does not permit a detailed examination of all these considerations. Therefore just five of these topics, which make up some of the most significant dynamic pressures, are considered here.

**Dynamic pressure: population growth**

The continual growth in the global population is a significant factor in generating risk. By 2100, the world population is projected to increase from its current total of 7.2 billion to 10.9 billion. The growth rate remains, although there are encouraging signs that it may stabilize by about 2070. The rate at which the world population grows has roughly halved from more than 2 per cent a year in the 1960s to roughly 1 per cent a year in 2013 (Ridley 2013).

But for the present, growth continues, and it is calculated that by 2025, there will be an additional 1 billion people living on our earth (United Nations 2011; UNFPA 2013).

These projections cause particular concern when they are applied to highly vulnerable countries such as Pakistan, which is affected by the full range of hazards and within the past decade has suffered a devastating series of floods and severe earthquakes. Here, the population (in 2010) of 173.5 million is projected to grow by 88.6 million to 262.1 million by 2100. Even more alarming is the projection for Nigeria, which is highly vulnerable to the impact of climate change and where the population (in 2010) of 158.4 million is expected to grow by 755.6 million to an unsustainable 914 million by 2100. In Indonesia the current population of 250 million is projected to grow to 315 million by 2100.

The situation is more encouraging in Bangladesh, where the current population of 160 million is projected to grow to 182 million by 2100. This indicates that their population growth rate is becoming more controlled since fertility in Bangladesh has fallen from nearly seven children per woman in the 1960s to just over two in 2013. Similar patterns prevail across the globe: Kenya from 8 to 4.5, Brazil 5.7 to 1.8, Iran 6.8 to 1.9 and Ireland 3.9 to 2 (Ridley 2013).

However, population density remains a critical vulnerability factor. Bangladesh has three times as many persons per square kilometer than India and seven times as many persons per square kilometer than the People’s Republic of China. These concentrations result in the dense occupation of unsafe lands prone to most hazard categories: earthquakes, droughts, cyclones, river and coastal surge flooding and sea level rise (United Nations 2011; Provost 2013).
The vulnerability challenge

The implications of population growth in generating risk are also focused on the impact on over-stretched government services such as food and water supply, urban pollution, health-related disaster threats and migratory population movement.

Dynamic pressure: new developments or expanded towns and cities in exposed coastal regions

Many of these developments are occurring in seismic-prone areas subject to ground failure, landslides and liquefaction and in flood-prone areas subject to inundation.

Wherever governments plan for new settlements, or give planning approval for such developments, in zones of high hazard, they may be putting citizens and their livelihoods at risk, usually for political or economic reasons (McFadden et al. 2009; Bender 2011).

Dynamic pressure: corruption

Reinforced concrete dwellings (in the People’s Republic of China, Haiti, Turkey, Pakistan, etc.) continue to collapse in earthquakes, killing their occupants, but when damage inspections are made it becomes clear to the damage assessors that all was not well with the original construction or siting of a given building. There are numerous examples of steel being omitted from concrete beams and examples where the concrete included cheap sea sand containing corrosive salts rather than the specified more expensive quarried sand (Krimgold 2011).

Clear evidence of the scale of corruption as a risk driver came when two of the world’s leading experts in earthquake engineering, Nicholas Ambraseys and Roger Bilham, calculated that 83 per cent of all deaths from building collapse in earthquakes over the past 30 years occurred in countries that are assessed as ‘corrupt’ by the German-based NGO Transparency International (Ambraseys & Bilham 2011).

Only independent regular inspection can ensure the integrity [of building construction] But the main perpetrators may not be site workers. Pressure for omissions, to cut costs or to save time, may be applied by managers as a consequence of backhanders to obtain the work and to secure the contract, an increase of overheads only redressed by cutting costs and reducing quality in the process.

(Leoni, n.d.)

But corrupt construction practices are not the only expression of corrupt practice; thanks to the work of Transparency International, the negative impact of corruption on progress in development and disaster vulnerability reduction has been brought to the wider attention of the international community (Maxwell et al. 2008).
Preventing corrupt practice requires a range of linked approaches

Education
- Ethical education from primary schools onwards in schools, mosques, temples, churches.
- Ethics to be part of the higher education curriculum for building and infrastructure professions.
- Ethics to be built into staff training and ongoing professional development.
- An expansion of training opportunities of enforcement officials by the NGO sector.

Professional standards
- Establishing professional codes of practice for engineers and architects – perhaps using the example of ethical medical codes (Ambraseys & Bilham 2011).
- Governments setting an example of exemplary practice in all their dealings, contracts, etc.

Anti-corruption practices and procedures
- Tendering procedures for contracts.
- Developing building and planning code supervision as a key requirement of governance (Lewis 2010).
- Paying enforcement officials good living wages so that they do not need bribes as income supplements.
- Strong legal support, with sanctions imposed for failures.
- Avoidance of large contracts where possible.
- Avoidance of ‘middlemen’ in the allocation of funds. Direct cash grants to beneficiaries in disaster reconstruction projects has been found to reduce corrupt interception of grants or loans.
- Building specific anti-corruption measures into guidelines. The GFDRR World Bank Guidelines on Reconstruction provide an excellent example (Jha et al. 2010).

Public awareness to promote advocacy to avoid corruption
- Recognizing the vital role of an informed media to draw attention to corrupt practice (Sen 2004).
Dynamic pressure: gender discrimination

An excellent example of an NGO campaign against a major dynamic pressure is the work of OXFAM in seeking gender justice. Their advocacy campaign has existed for many years and highlights the reality that discrimination and injustice are major causes of poverty worldwide. Ensuring women and men benefit equally from our work is a vital part of their work (Le Thi & Dung Vu Minh 2012). OXFAM asks, “Why equality for women?”

You’re more likely to be poor if you’re a woman. And as a woman – according to research – you’re likely to be doing most of the work. But this discrimination does not start there – it actually starts much earlier. Girls are too often denied access to education, health and nutrition from birth. This has to change. The right to gender equality underpins all Oxfam’s work across the world.

Globally, the facts show that women are getting the rawest deal.

- Education: Two-thirds of all children denied school are girls.
- Work: Women earn only 10 per cent of the world’s income yet work two-thirds of the world’s working hours.
- Welfare: Domestic violence is the single biggest cause of injury and death to women worldwide.
- Democracy: Women hold only 14 per cent of the world’s governmental seats (Oxfam 2013).

In addition to the inequalities noted above, the increased vulnerability of women and girls to disaster risk is well established (Alexander 2013). The causes can be found in deeply entrenched cultural, political, religious, legal, educational and administrative forms of discrimination that are official policy and practice in large parts of the world, including several Asian countries (Chew & Ramdas 2005; Lucus 2010; IFRCS 2007).

Women are more likely than men to die from natural disasters when their socio-economic status is low. Women represented an estimated 70 per cent of casualties after the 2004 Indian Ocean Tsunami in Banda Aceh.

(Jha & Stanton-Geddes 2013, p. xxix)

Dynamic pressure: lack of the human right to risk information and protection by governments

Over one-fifth of the world’s population (1,354 billion people), especially concentrated within the Asian region, are denied basic human rights by their governments, including the right of access to knowledge of the risks they face (Mol et al. 2011). Without such knowledge, progress in raising public awareness of disaster risk reduction (DRR) opportunities for family protection will inevitably be minimal.
In 2008, the European Court of Human Rights made a landmark ruling that
the Russian Federation failed to protect the citizens of Tynauz near Mount
Elbrus from the risk of a mud and debris slide. This had occurred in 1999, causing
eight deaths. The court held that

\[
\ldots \text{the State’s obligation to respect, protect and fulfill the human right to life, is particularly important in the context of disasters that are recurrent and foreseeable \ldots governments know, or should know that there will be threats arising from physical hazards \ldots and should take appropriate measures to respect, protect and fulfill rights in the context of foreseeable events.}
\] (Connolly & Dale 2011)

A further related issue concerns press freedom and DRR. The Nobel Prize–
winning economist Amartya Sen has made a frequently quoted assertion concern-
ing political freedoms supported by a free press as an essential prerequisite for
reduced disaster vulnerability.

While India continued to have famines under British rule right up to inde-
pendence \ldots they disappeared suddenly with the establishment of multiparty
democracy and a free press \ldots A free press and an active political opposition
constitute the best early-warning system a country threatened by famines can have.

(Sen 2004)

Some dynamic pressures also bring opportunities (such as urbanization and
coastal development); however, the problem is that disaster risk management is
rarely systematically factored into the planning and protection of such develop-
ments. These opportunities may present political opportunities for governments
to capitalize on positive aspects while reducing risks.

**Responding to unsafe conditions**

This chapter is not concerned with describing specific DRR measures, as these are
well covered in other publications concerned with specific sectors: agriculture and
DRR, buildings and DRR, public awareness and DRR, school safety and DRR
and so forth.

The tendency is for all parties who seek to reduce disaster risks (such as govern-
ments, civil society, NGOs, international agencies, professions and academic
groups) to focus their energy and resources on addressing unsafe conditions, such
as building flood dykes and ensuring that buildings are constructed to resist haz-
ard forces, rather than addressing macro-scale underlying causes or the massive
dynamic pressures described previously (Wisner *et al.* 2004).

Reasons for this focus of energy and resources are not hard to find. Develop-
ing a disaster warning system or strengthening a school against seismic forces
are not likely to be controversial actions; in fact they may bring political or
Vulnerability posed by climate change

The nature of the problem

The symptoms of climate variability and change – rising temperatures, changing frequency and intensity of tropical cyclones, floods and droughts, sea level rise, coastal erosion and accelerated ecosystem degradation – have economic impacts that include the loss of agricultural production, increased damage to physical assets, greater protective infrastructure costs, high insurance costs, and increased costs of emergency services. To these can be added the social impacts of such weather changes, including the loss of livelihoods, higher injury rates, a decrease in fresh water availability, food insecurity, migrations and increased risk of conflict. These potential impacts inevitably reduce the resilience of the affected communities. These effects from changing climates have characteristics common to risk patterns tackled through DRM (Field et al. 2012).

Hydrometeorological hazards

Figure 3.1 indicates two categories of hazards: geophysical and hydrometeorological. In the case of geophysical hazards, vulnerability caused by human actions is confined to the left-hand side of the disaster crunch model; however, this is not the case for hydrometeorological hazards. Thus in Figure 3.1, human actions are playing a decisive part in the generation of vulnerability as well as the generation of hazards. Two factors are noted as underlying causes: ‘climate change due to natural and human actions’ and ‘climate variability due to natural and anthropogenic forcing’.

IPCC Fifth Assessment Report: ‘Climate Change 2013’

This report from September 2013 states that there is now 95 per cent scientific consensus that global climate change has been induced by human factors:

> Human influence has been detected in warming of the atmosphere and the ocean, in changes in the global water cycle, in reductions in snow and ice, in global mean sea level rise, and in changes in some climate extremes. This evidence for human influence has grown since Assessment Report 4. It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century.

(IPCC 2013, page 17)

Therefore, a pragmatic ‘twin-track approach’ is being adopted to reduce the threats posed by climate change and variability. It is hoped that with the electoral gains. Many of these measures are visible and provide tangible evidence of official concern.
publication of the IPCC Fifth Assessment, international agreements will be forthcoming to implement a concerted global program of mitigation measures to reduce carbon emissions.

First, this will require a change in national energy policies and industrial practices, and second, it requires the implementation of practical programs of climate change adaptation (CCA). The two processes are of course interrelated, since if global policies to cut emissions fail, then adaptation will be the only way forward to protect societies.

The development of CCA approaches since the mid 1980s overlaps with well-established and much older DRM approaches. But while there are overlapping commonalities, each sphere of CCA and DRM action retains its own distinctive differences. Figure 3.6 seeks to describe the content of each sphere.

As Figure 3.6 indicates, both DRM and CCA share the goal of increasing community resilience. The main overlap between the DRM and CCA agendas is the management of hydrometeorological hazards where DRM needs to take account of changes in weather hazards and both aim to reduce their impacts. On the other hand, CCA considers long-term adjustment to changes in mean climatic conditions, including the opportunities that this can provide, and how government organizations can develop capacities to stimulate and respond to a much longer-term process than has been a traditional focus of practical applications of DRM. Hence, scientific policy and practice on CCA needs to be better integrated with DRM to create a solid foundation for action.

**Links between CCA and DRM**

Addressing disaster risk across multiple scales and in multiple sectors and integrating climate change adaptation into today’s planning decisions has now become government policy in many countries in Asia and the Pacific region (Anbumozhi 2012). This involves adaptation to future changes in climate extremes as some weather-related disasters are projected to increase in intensity, duration and frequency. Adaptation to climate change should be regarded as different but closely related to DRR and DRM and should not be seen as an alternative or conflicting approach when dealing with risk and uncertainty (Schipper & Pelling 2006; Burton 1998).

**Implications of converging CCA and DRM agendas**

Progressively over the past decade more attention has been given to converging DRM and CCA agendas, conceptually and in practice, at international, subnational and local levels. Despite the linking of DRM and CCA concerns and projects, the current institutional context discourages collaboration between and within levels of government. Governments have traditionally divided their responsibilities into discrete areas, such as emergency services, housing, infrastructure and agriculture. This strict demarcation has led to a silo mentality within organizations that encourages narrow views of the issues and tends to overlook the broader cross-agency implications. These kinds of rivalries are exacerbated by issues such as CCA and DRM that cut across defined areas of responsibility (Burton 1998).
Differences and Commonalities in Disaster Risk Management (DRM) and Climate Change Adaptation (CCA)

**COMMONALITIES**

**Climatic hazards:**
- storms / floods / landslides / temperature extremes / droughts / fires / rising sea levels / avalanches / climate change following volcanic eruptions

**Impacts of climate hazards:**
- population shifts / international conflict / impacts on health services, agriculture and fisheries, economies and human settlements / institutional adaptation

**Joint DRM and CCA programs to create resilience**

**GeoPhysical hazards:**
- earthquakes
- tsunamis
- landslides
- volcanic eruptions

**Risk assessment**
- Based on hard historical evidence as part of disaster risk assessment

**High levels of certainty**
- (in disaster planning)

**Average to low political commitment**

**Long history**
- (over 1,000 years)

**DRM**

**CCA**

**Non-disaster aspects of CCA:**
- (including the positive benefits from climate change)

**Risk assessment**
- Based on climate risk assessment and climate models

**Wider aspects of adaptation:**
- political / social / economic / environmental

**Low levels of certainty**
- (in climate change)

**High political commitment**

**Short history**
- (since about 1985)

---

*Figure 3.6 Differences and commonalities in disaster risk management (DRM) and climate change adaptation (CCA)*
But as perceptions grow through the enhanced attention that both CCA and DRM are now receiving, there will be growing opportunities for effective response in the integration of climate change and disaster risk management (Handmer & Dovers 2013).

**Climate change and corruption**

The architect and disaster researcher James Lewis has made a detailed examination of the impact of corruption on the expansion of vulnerability relative to climate change. He notes in the South African Pat Reid Lecture of 2010,

. . . the consequences of climate change world-wide are making themselves apparent and adaptation, corruption and people’s vulnerability are interlinked. Corruption acts as an engine of poverty and vulnerability, creating weaknesses that are exacerbated by changes of climate. Climate extremes will especially affect poorer countries, in many of which endemic corruption accompanies weak governance and adaptation funding is exposed to corrupt depletion. Impoverished communities already suffer a disproportionate share of losses in extreme weather events and are then rendered even more vulnerable to subsequent extremes of climate and corruption.

(Lewis 2010)

**Financial investment in both CCA and DRM**

Compared with international spending on humanitarian relief and reconstruction, financial support for disaster risk management remains relatively low. Although relatively recently, climate change adaptation is receiving significant attention from international donors and development banks, and it is anticipated that increasingly funding will be made available. Funding for adaptation follows the development assistance approach. There are both positive and negative consequences of this route. Additional thinking needs to go into finding an optimal funding strategy for adaptation that takes DRR into account. Thus, there is a need to grasp opportunities that exist to create synergies in international finance for disaster risk management and adaptation to climate change.

The first two sections of this chapter lead to a number of conclusions and necessary actions, regarding both the cause and effect of vulnerability and vulnerability posed by climate change.

**Conclusions**

1 **Take concerted action**

There has been an admission by the ISDR that during the eight years of the HFA, from 2005–2013, no decisive actions have been taken against the
underlying causal factors or against the powerful dynamic pressures that generate and sustain risk (UNISDR 2013a, 2013b). Thus the message from this chapter is clear: the time has come to rectify this significant gap (Alexander & Davis 2012). If UNISDR takes a leadership role in this regard, that could have a decisive influence on other international actors and could serve as an example to national governments. Therefore, governments, UN agencies, international agencies, international finance institutions and NGOs must now take decisive and courageous actions to address the drivers of risk as well as unsafe conditions. If they fail to do so then the symptoms of vulnerability will return relentlessly to destroy lives, property, economies and the environment (Collymore 2011; Turnbull et al. 2013).

2 Deal with causal factors

The underlying causes noted in the first and last columns in Figure 3.1 of the crunch model are vast in scale and complexity, and many factors interact to expand vulnerability. As noted, all of these factors are politically sensitive and some relate to deeply entrenched cultural patterns. Therefore, international agencies, in respecting the sovereignty of nations, are always reluctant to express their concerns. However, such constraints must not prevent actions being taken (Olson et al. 2011; Burton 2011).

Governments and international organizations charged with DRM and CCA will find it much easier to deal with underlying causal factors that generate risk if they follow certain steps:

First, gather crucial information to support their actions. This is why the FORIN initiative, to gather forensic data on the drivers of risk as described in this chapter, is so important (Burton 2011; IRDR 2011).

Second, in seeking to reduce the underlying causal factors, governments are advised to begin with small-scale initiatives, perhaps in the first instance focusing on a single issue, rather than contemplating extensive programs that can present daunting challenges.

Third, form alliances with civil society (including religious leaders), NGOs and human rights organizations that have attempted to tackle some of these issues, such as Oxfam in challenging gender discrimination and Transparency International in vigorously challenging corruption (Davis 2011; Transparency International 2008).

3 Give priority to reducing corruption

Vulnerability is an all-pervasive reality for vast numbers of people and is generated at all levels in the formal and informal structures of society. As described in this chapter, elements of vulnerability involve criminality (Krimgold 2011; Ambraseys & Bilham 2011).
Corruption as a key element in generating vulnerability has to be recognized and reduced through:

- the promotion of ethical standards in civil society through education,
- links with national and local religious bodies,
- the development of professional standards,
- a well-resourced regulatory environment with independent inspection to ensure compliance with building bylaws and land-use planning controls,
- guidelines on disaster risk reduction following the World Bank’s example and the building of anti-corruption measures into the practical advice they offer (Jha et al. 2010),
- finally – and perhaps the most important element – governments setting the highest standards in their own practices as an example for their own society.

4 Reduce vulnerability in dynamic pressures

The cumulative impact of these dynamic pressures in generating risks has become increasingly difficult to ignore because of their increased complexity and their interrelationships. Another reason facing developing countries is the international community being no longer prepared or unable to respond and fund major investments in safety measures now as it had in the past (Bender 2011; Lewis & Kelman 2012).

The dynamic pressures identified in this chapter have yet to be systematically factored into governance frameworks – either singularly or in combination. For example, cities facing extreme urbanization pressures need the following policies:

- to build the full range of risk assessment and DRM/CCA measures into their urban management/urban upgrading programs;
- to provide households, communities and business with incentives, cushioned by equity considerations, to reduce risk in their respective decisions and actions;
- to create staff development programs to enable officials to better assess vulnerability and devise effective risk reduction programs.

5 Recognize that vulnerability is not confined to developing countries

Events such as the following disasters serve to remind us that vulnerability and exposure to major disasters, resulting in devastating economic and cultural losses, are not confined to developing societies.

- Hurricane Katrina, 2005 (with estimated total losses of $125 billion);
- Hurricane Sandy, 2012 (with estimated total losses of $65 billion);
The vulnerability challenge

- the Christchurch earthquakes in New Zealand, 2010 and 2011 (with estimated total losses of $40 billion);
- Thailand flooding, 2011 (with estimated total losses of $40–45.7 billion);
- Japan’s earthquake and tsunami, 2011 (with estimated total losses of $210–375 billion).

These and events of lesser magnitude have now become one of our greatest global challenges. Therefore, what are the policy priorities and positive practical steps to be taken by concerned governments, sub-national systems, regional bodies, international bodies, civil society and communities?

6 Formulate an effective international framework for DRM and CCA

The management of climate change and of disaster risk by many governments have followed independent routes in the past. Thus parallel structures, programs and projects may exist and compete for resources in both national and international arenas.

Since the Asia-Pacific region is subject to climate change as well as prone to a diverse range of hazards, linkages are vital. An international framework is needed to integrate DRM and CCA with a specific focus on climate information exchange, supporting vulnerable developing countries and promoting sectoral collaboration and international financing. Certain DRM and CCA projects can be synchronized for mutual benefit. However, as noted in Figure 3.6, there are elements of CCA and DRM that will always remain distinctive, requiring their own identity (Burton 1998).

7 Integrate policies

Addressing social welfare, quality of life, infrastructure and livelihoods and incorporating a multi-hazard approach into planning and action for disasters in the short term facilitates adaptation to climate extremes in the longer term, as is increasingly recognized internationally. Strategies and policies are more effective when they acknowledge multiple stressors, different prioritized values and competing policy goals. Integrate DRM and CCA, and incorporate both into local, sub-national, national, regional and international development policies and practices, thus providing benefits at all scales, advise Handmer and Dovers (2013).

Thus the essence of this chapter, the main message, is that the scale of the problem of disaster vulnerability demands a response of similar proportion. The opposite of vulnerability is capacity or resilience built through a combination of DRM and CCA. The starting point is to expand the scope of vulnerability reduction to the range of causal factors that start the deadly progression of vulnerability seen in Figure 3.1.
Recommendation 2

Give priority concern in HFA2 to expand the scope of risk reduction, considering and acting to reduce the ‘underlying causes of vulnerability’ (‘risk drivers’) rather than merely confining attention to the ‘consequences of vulnerability’.

Notes

1 Anthropogenic: relating to, or resulting from the influence of human beings on nature (Merriam-Webster’s Dictionary).
2 Comments in the Karakoram case study that describe the situation in 2013 are the insights of Architect Ali Ahmed Shah, Honorary Secretary, Board of Architectural Education-Institute of Architects Pakistan (BAE-IAP) and Associate Professor Architecture and Head, Department of Architecture, National College of Arts, Rawalpindi Campus, Pakistan. Ali Ahmed Shah is a resident of the main town in Karakoram Region, and has expertise in rural housing and settlements in relation to disaster risks and threats from terrorism.
3 Gabrielle Rosales Iglesias’s family members were all displaced by the Thailand floods.
4 At the conclusion of the study, on page 309, a selection of key affordable books is proposed by experts in the field for concerned government and international officials.

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Ian Davis

4 The social and economic challenge

Anshu Sharma

Introduction
The primary aim of all governments in their disaster planning is to save the lives of their citizens, and closely linked to this concern is the protection of livelihoods and the overall economy. This chapter explores these issues and considers in detail a number of themes of the study: expanding risks – with particular attention to the expansion of social and economic risks; innovative solutions – describing the use of ‘social safety nets’ to protect the most vulnerable people; and the pivotal role of national governments – implicit in taking appropriate social and economic protective actions.

The invisibility of economic and social dimensions of disasters
Disasters are most visible in their physical dimensions of deaths and damage to infrastructure. The economic impacts of disasters, though felt deeply by affected societies, are less visible and often inadequately addressed. These impacts range from the macroeconomic scale wherein gross domestic product may be significantly set back for years to the micro scale affecting the life and livelihoods of localized communities. The most invisible impacts of disasters are the social impacts on the affected communities. These may range from short-term displacement to permanent psychosocial setbacks, distress migration and human trafficking. The immediate direct effect of disaster events on the built, natural, economic and social environment is treated as ‘disaster impact’ for the purpose of this chapter, while the long-term and indirect effects are seen as implications.

The trend of unprecedented disasters in Asia in recent years raises the concern of a future with recurrent large-scale events that society has never before experienced, let alone managed. The capability of our systems to manage such impacts, particularly in the less visible economic and social dimensions, needs to be assessed and strengthened as appropriate.

The Great East Japan Earthquake and Tsunami of 2011, the Bangkok floods of 2011 and the Indian Ocean tsunami of 2004 are cases that highlight issues including transnational economic implications of disasters, consequences of urban and regional concentration of economic activities and the marginalization of informal economies and the poor in disaster situations.
The disaster experiences also bring to fore the conflicting situation between increasingly cutting-edge and technologically oriented developmental paradigms and a fragmenting social base with economic disparities, increasing migrant populations and conflicts.

With the increasing growth that the region is witnessing, the most urgent action needed is in the area of better-informed planning decisions across sectors, including disaster risk management. Prevention begins with information, and socioeconomic information grids that capture vulnerability-related factors, especially vulnerability to natural hazards, are thus needed to plan for a resilient Asia. Additionally, the coming together of various stakeholders on multi-stakeholder platforms, a process that has been initiated regionally and globally, needs to be strengthened to create a robust cross-sector and multi-level system of managing risk.

Implications: macro and micro, direct and indirect

Earthquakes, cyclones and tsunamis attract media attention and aid with their graphic imagery of collapsed buildings, destroyed infrastructure and dead bodies. Floods and droughts, though affecting a greater number of people, do not generate such imagery and thus attract less media and public attention. Droughts, seen as creeping disasters due to their slow onset and low-visibility nature, are indeed social disasters with a greater social impact than physical. The same holds true for all natural and manmade disasters, shocks and stresses – higher-visibility physical impacts attract greater response than low-visibility social impacts.

With increase in scale of disaster impacts, usually measured in terms of human casualties or economic losses, the social repercussions are bound to be increasing even though they are usually not captured in their entirety. Disaster risk management thus needs to account for these economic and social impacts across the emerging patterns and trends of disaster risk. The economic and social concerns need to be addressed through policies, governance and financing of disaster risk management. The issues of climate change and compound disasters are now emerging as major threats and economic and social implications of disasters in the specific context of a changing climate, and increasing complexities of disasters solicit customized risk management approaches. For this to happen, the nature of economic and social implications of disasters needs to be understood both at macro and micro levels.

At the macro level disasters can cause severe and far-reaching adverse implications. The supply chain disruptions and consequent shortfalls in procurement and production in different sectors would have a direct impact on the GDP growth of a country. If the influence zone happens to include export-related units and activities, such damages and disruptions would result in lowering exports and export earnings. The ripple effect of disasters can directly and indirectly result in lowering of employment levels, loss of competitiveness of the country’s products in overseas markets and declining living standards.

At the micro level, economic consequences of a disaster include destruction of and losses to the agricultural produce, manufacturing output, infrastructure, communications and buildings in the area of influence. The social losses are in the form of loss of human lives, public health and education services, trauma and
disruptions in normal social functions. Loss of livelihood is a major cause of concern as it has immediate economic impacts that in turn lead to a decline in quality of life and thus has social implications.

It will be observed from a case study on 2011 Thailand flooding, presented later in this chapter, that as an immediate impact of these floods, the Thai economy suffered a contraction of output in the last quarter of 2011, forcing the GDP growth forecast to be revised downwards from 2.6 per cent to 1 per cent even though the worst flood damages were geographically limited to the central and northeastern locations (Aekapol 2012). Thailand being a transitional economy and the flood affects being felt on the large industrial establishments as well as on the poor, the case has impacts on both the developed and the poorer sections of society. The 2011 Great East Japan Earthquake and Tsunami on the other hand is a more complex disaster with very large-scale economic impacts, and the Indian Ocean tsunami of 2004 is an even larger disaster in terms of geographic spread and human losses but with less economic impacts and more social implications. These cases are discussed to bring out the issues of concern.

**Differential impacts and the need for safety nets**

A significant concern that emerges is that socioeconomic implications of disasters are much more severe and damaging in the rural hinterlands, less developed districts, coastal areas and urban poor settlements in the developing countries that have little internal capacity to cope and recover. This can be due to low income and saving rates, absence of safety nets such as insurance, highly inadequate accessibility and poor public health facilities. A study of the range of economic and social impacts of disasters allows an understanding of direct and indirect implications. Economic impacts include loss of assets, lowered primary and secondary sector output, lowered incomes and loss of livelihoods. Social impacts include loss of lives, education infrastructure and opportunities, health services and related issues. Indirect impacts are more in the social dimensions – including decline in quality of life due to economic impacts and lowered well-being and increase in social friction due to social impacts.

While the effects on physical infrastructure and utilities including electricity grids, water supply networks, sewerage and drainage networks and transportation and communication systems is felt immediately and the priority is placed on their restoration, the impact on other infrastructure systems can be less immediate but long term. Schools are often damaged themselves, and if they survive then they are the first to be turned into relief shelters for the disaster-affected families. The result is that education is disrupted and can stay so for months, thus affecting the future potential of the children. Sanitation and health services often take time to be re-established and can also be the cause of decline in health, in turn affecting learning abilities in children and productivity in working adults. These multiple and diverse dimensions of economic and social implications of disasters need to be seen in a single interrelated framework.

Such a framework also helps one envision the safety nets that are needed in theory to protect society from these impacts. Economic safety nets may include risk-averse land-use planning, stronger insurance regimes, diversified economic sources with distributed risks, savings and credit mechanisms especially for the
poor, structural and non-structural safety measures to protect assets and improved contingency planning for supply chains. Similarly, social safety nets may include safety mechanisms in lifeline systems of education, health and security and community-based local systems that will be able to trigger internal response mechanisms that are quick and sensitive to specific local social needs.

This approach helps identify the vulnerable sectors and groups and establish safety nets. Though the concept of economic safety nets has been around for long, a new perspective is needed to see safety nets as an innovative solution cutting across economic and social dimensions of disasters, addressing compound disasters and climate change impacts, cutting across macro and micro levels and eventually offering vulnerable families basic levels of protection. A broad scheme is illustrated through a safety net model as in Figure 4.1. Governments and civil society will need to play active roles in the creation of such a system of safety nets.

The single biggest concern across all these parameters is the impact on the most vulnerable, who are often the poorest and the least able to survive without severe and long-term impacts. The politics of prioritizing saving the assets of the formal economies over those of the informal economies and those on the margins, both socially and economically, can play havoc with the lives of these most vulnerable.

At the same time very significant opportunities exist in the current information-based world, where information on risk attributes, early warnings, response information and information on risk reduction measures can be generated and can flow from any part of the world to any other in real time at ever-decreasing costs and ever-increasing accessibility. These, along with the trend of partnerships, platforms and multi-stakeholder cooperation, have solutions to offer through the soft domain of knowledge and partnerships. Table 4.1 illustrates a framework detailing the dimensions behind this approach.

Figure 4.1  The safety net model
<table>
<thead>
<tr>
<th>Economic impacts</th>
<th>Social impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Loss of assets (earning lives, buildings, infrastructure, movable property)</td>
<td>- Loss of human lives</td>
</tr>
<tr>
<td>- Lowered agricultural, fisheries, mining output</td>
<td>- Loss of education opportunities</td>
</tr>
<tr>
<td>- Supply chain disruptions, shortfall in procurement</td>
<td>- Loss of health services</td>
</tr>
<tr>
<td>- Lowered industrial output</td>
<td>- Poor health resulting from poor water, sanitation and hygiene</td>
</tr>
<tr>
<td>- Lowered exports, loss of competitiveness</td>
<td>- Trauma and psychological stress</td>
</tr>
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<td>- Loss of livelihoods</td>
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<thead>
<tr>
<th>Implications</th>
<th>Implications</th>
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<tbody>
<tr>
<td>- Cascading effect on rapidly growing supply chain network</td>
<td>- Decline in living standards, health and longevity</td>
</tr>
<tr>
<td></td>
<td>- Lowered gross domestic happiness</td>
</tr>
<tr>
<td></td>
<td>- Increase in crime (particularly crime against women and children, human trafficking)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economic safety nets needed</th>
<th>Social safety nets needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Better informed planning decisions for safer investments</td>
<td>- Secure lifeline facilities – health, education, security</td>
</tr>
<tr>
<td>- Safer land-use, transport and services planning</td>
<td>- Improve sanitary infrastructure</td>
</tr>
<tr>
<td>- Robust insurance and reinsurance</td>
<td>- Strengthen support systems for aging societies</td>
</tr>
<tr>
<td>- Wider net of micro-insurance</td>
<td>- Community-based disaster management systems with internal support mechanisms</td>
</tr>
<tr>
<td>- Thrift and credit in informal and marginal communities</td>
<td></td>
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<tr>
<td>- Diversification in economy</td>
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<tr>
<td>- Structural and non-structural safety measures</td>
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<tr>
<td>- Better contingency planning in supply chains</td>
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<table>
<thead>
<tr>
<th>Cross-cutting issues</th>
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<tbody>
<tr>
<td>- Identification of vulnerable groups</td>
<td></td>
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<tr>
<td>- Political influences on technical decisions</td>
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<table>
<thead>
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<th>Areas of strategic attention</th>
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<tbody>
<tr>
<td>- Information-based planning and decision making</td>
<td></td>
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<tr>
<td>- Multi-stakeholder collaboration and action</td>
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The Asian context of population, economy and risk growth

Housing the largest chunk of the world’s population, Asia is also the most disaster-prone and vulnerable region in the world. According to recent estimates, both the number of people reported affected and the number of people reported killed in the first decade of the current millennium have risen significantly for the region, as compared to the preceding period (IFRC 2012).

In recent years, countries in the region have had to respond to challenges on an unprecedented scale. Among these were earthquakes in Pakistan, Indonesia, the People’s Republic of China and New Zealand; cyclones in the Philippines and Myanmar; floods across Pakistan and India; a region-wide tsunami; a complex disaster in Japan involving an earthquake, tsunami and nuclear disaster; and unprecedented urban floods in Thailand just to name a few. Traditionally most Asian countries have been in the lower bracket of the human and economic development indices and have been frequent recipients of international relief in the aftermath of disasters. The economic impacts have mostly been seen at a micro level with communities being at risk of a secondary wave of disasters due to lack of food, water, shelter and basic services and the inability of governments to provide for these. Social impacts of chronic disasters have been seen in the form of distress migration, male workforce migration, internally displaced populations and even crimes such as human trafficking.

A rapidly changing environment has however brought about a perceptible change in the way the region is seeing itself manage disasters. The primary overall reason is the economic emergence of Asian countries and the larger global economic slowdown, which they have faced better than developed parts of the world in terms of relative growth. While the People’s Republic of China and India are among the most talked about economic growth stories, mainly due to the sheer volume of their middle class that is increasingly hungry to consume more and has increasing purchasing power, other countries including Indonesia, Sri Lanka and Viet Nam are showing surging trends.

A direct result of an overall improving economic situation is the interest and ability of governments to establish and fund better developmental and disaster management mechanisms. Almost all countries in the region have shown progress in recent years in the area of disaster management policy environments and capacity-building efforts (UNISDR 2012a). There has been a spurt in enactment of national and provincial disaster management acts, establishment of disaster management authorities, preparation of plans, launching of capacity-building initiatives and recognition of multi-stakeholder platforms.

While economic indicators of the emergence of Asian economies are found in the domestic product output trends, and social indicators found in improving human development indices, disaster reduction and response capacities and the attention paid to them can also be seen as a key indicator of the growth story in Asia. Unfortunately, the efforts that have been made in this area are still too few and far between, and the absence of their translation into significant on-the-ground action is resulting in their being inadequate to address the increasing trend of population growth and disaster impacts in the region. In fact, the intertwining of economic
aspirations and cross-border trade is making disaster situations more complex with more frequent mega disasters having more far-reaching transnational implications, as will be discussed in the following sections.

Urban risk has emerged as an area of increasing concern in recent years, and though the UNISDR established an Asia Regional Task Force on Urban Risk Reduction (RTF-URR) in 2008, the focus on urban risk reduction has been very insignificant compared to the magnitude of the problem and the rate of its increasing threat.

2011 Great East Japan Earthquake and Tsunami: complex event with national and international economic aftershocks

(In relation to the Fukushima disaster see Figure 3.3 in Chapter 3, ‘The Vulnerability Challenge’, and see Chapter 5, ‘Managing the Risk of Compound Disasters’.)

The 2011 Great East Japan Earthquake and Tsunami and the resulting Fukushima nuclear power plant accident caused an economic loss between US$210 and $375 billion, the highest in history from any earthquake. It also caused the highest death toll from an earthquake in any developed country (HDI > 0.8) by about three times (James et al. 2011).

The impact of the disaster on the manufacturing supply chain is one element that magnified the disruption of economic activities (Geneva Reports 2012). It revealed the complex web of manufacturing interdependencies on a global scale, as numerous manufacturing facilities within and outside Japan were forced to close or drastically reduce their production. An illustrative case is of an automotive microcontroller chip manufacturer whose product line disruption affected assembly lines of leading automobile manufacturers across the region. The supplier had differentiated architecture to meet the designing specification of different vehicle models. The assembly process customized for each model made it very difficult for the final assemblers to find an alternate supplier. It took six months to bring the production in the plant back to the pre-disaster level (Wall Street Journal 2011).

The accident at the nuclear power plant caused widespread fears of radioactive contamination, and other nuclear power plants were also closed down as a precaution and for review. The resultant electric power shortage affected not just the area that the plant served, including greater metropolitan Tokyo, but also the entire country. The government declared limits for peak power consumption during the summer, and regulated power cuts were put into effect. The industry coped by introducing measures such as running assembly lines during weekends and taking a weekday off, encouraging employees to work from home and shifting schedules. The restriction added labor and cost burdens to manufacturers in order to meet the expected production output. Besides this burden on the already hurt industry, the export-oriented manufacturers and distributors were also adversely affected by radioactive contamination surveillance requirements imposed on imports from Japan soon after the event.
It is estimated that the decommissioning process of the Fukushima power plant alone may cost JPY1 trillion (US$12.5 billion) or more over a course of 40 years. Other than steps to be taken at the plant, local towns need to undergo decontamination processes. The local farming industry has been hit by radioactive contamination as well as reputational damage that may take decades to recover from.

Overall, it is evident that the disaster marked a major dent in the already sluggish Japanese economy. The Cabinet Office estimated the total loss to tangible assets, not including the elements linked to the nuclear plant accident, was JPY16.9 trillion (US$210 billion), about 3.3 per cent of the Japanese GDP. The national mining and manufacturing sector production fell nearly 15 per cent in the month immediately after the event. The effect of the disaster on manufacturing activities in the Tohoku region and the power shortage led to a nationwide production slowdown and a chain reaction overseas.

Besides the direct impact of the disaster, the economy also suffered from the fact that consumer spending went down after the event. Because of the fear of prolonged economic slowdown and the need to prepare for another disaster, the general public opted to save more and stayed away from spending on leisure activities and luxury goods. True to the Japanese culture, sympathy for the victims gave rise to a ‘voluntary restraint’ behavior across the country, which also contributed to the 2 per cent drop in consumer spending from the preceding month. The consumer behavioral index suffered an 18 per cent fall from the previous month, indicating a sharper decline in consumer confidence. The reduction in demand, though, helped prevent prices from shooting up, which typically happens after a major disaster (Government of Japan 2011).

Japan suffered multiple hits in 2011. Besides the multi-dimensional economic impacts of the Great East Japan Earthquake and Tsunami, flooding in Thailand in October gave another serious blow to the manufacturing and supply chain of the Japanese industry that has significant production capacity in the Bangkok region hit hard by the floods. To top it all, the uncertainty surrounding the ongoing European debt crisis and the yen’s continuing appreciation against euro and U.S. dollar discouraged Japanese exports, resulting in the country posting an annual trade deficit for the first time since 1980 (Wall Street Journal 2012).

The hidden social face of economic mega disasters

While most of the international attention on the Japan earthquake was on the physical and economic impact of the tsunami, its effects on health as a social dimension were significant. A study of the impact of the disaster on the health, medical care and public health systems in Iwate prefecture identified a range of
health risks besides direct physical injuries (Nohara 2011). Concerns including hypertension, deep vein thrombosis, infectious diseases and mental health were recorded, though they did not translate into major outbreaks.

Softer impacts on society ran deep. Japanese society as a whole suffered a huge social repercussion, which it dealt with in its typically silent and internalized yet systematic manner. The event happened at a time when children were at school, parents at work and grandparents at home. Heart-wrenching tales of schoolchildren on the upper floors of Arahama School watching the tsunami waves sweeping away their houses with their elderly grandparents inside reflect the differential risk in local communities and also the trauma suffered by the survivors. The rehabilitation decisions to be made after the disaster posed the dilemma between safer communities or safe economy, as the option of leaving high-risk coastal areas vacant was not possible due to the acute shortage of habitable land in the country. It was finally decided to relocate the school and community to an inland location while the affected area was declared a future industrial zone. That choice clearly put people first and the economy second. The attention given to often-ignored issues such as careful relocation of cemeteries reflected the sensitivity of the Japanese society to softer elements. In a remarkable effort, search and rescue teams carried out the retrieval of family photographs from the rubble with great care. The photographs were collected by a volunteer organization, carefully cleaned and packed by a network of volunteers across the country and brought back to be put up in a local stadium so that surviving relatives could claim them. Thousands of the remaining unclaimed photographs hung on display strings or sat in trays in the stadium months after the disaster. There were wedding photographs, happy families in their homes and children playing. The setting told a tale of the intangible and immeasurable dimensions of a disaster.

Bangkok floods, 2011: weak local structures, big global impact

See also Figure 3.4 and the case study in Chapter 3 titled ‘Third example of vulnerability: flooding in Thailand, 2011’.

The Bangkok floods of 2011 are one of the largest urban disasters in Asia in recent times. The vulnerability dimension highlighted by the floods has been discussed in Chapter 3. This section looks at the economic and social challenges of disaster risk management as exposed by the incident.

Effects of heavy rainfall due to Tropical Depression Haima and Tropical Storm Nok-ten led to severe flooding in 65 of Thailand’s 77 provinces, mostly in the Mekong and Chao Phraya basins, beginning July 2011 (AFP 2011). The monsoon rains were 46 per cent higher than the year before. Northern, northeastern and central Thailand were the worst affected as the floodwaters moved from north to south over a few months. Floodgates could not hold the waters back, and large paddy fields were inundated in Singburi, Ang Thong and Ayutthaya in the central region by September (Bangkok Post 2011a). A third of the kingdom’s
total surface was under water. The filled-to-capacity dams were forced to increase their discharge, worsening downstream flooding by the beginning of October (The Nation 2011). The floods breached barriers protecting industrial estates in Ayutthaya. This led to major economic impacts being felt by the end of October.

The floods killed over 800 persons and affected about 15 per cent of the country’s population. The cost of the floods is estimated at over $45 billion, with the severity of the economic and social implications reflected in the fact that 700,000 people were out of work (UNISDR 2012b). Manufacturing losses occurred not only because of the damage done to factories but also because of the large-scale disruption in widespread manufacturing networks caused by the flood (World Bank 2011). According to the Labour Ministry more than 14,000 businesses were shut down across the country. The floods damaged seven major industrial estates in the central region, and 1,300 factories were affected, halting production. The case of the Bangkok floods demonstrated how disaster risk is following economic development pathways in the world’s current developmental paradigm.

The supply chain disruptions led to losses globally. Car manufacturers, electronics manufacturers and insurers were the worst affected. The floods had knock-on economic effects around the world. The Economist reported that American bank JP Morgan had estimated that the disaster set back global industrial production by a surprisingly large 2.5 per cent. Economic exposure to floods is increasing faster than per capita GDP in all regions (Wahlström 2012).

Supply chain disruptions – cascading impact

The World Bank defines damages as “the destruction of physical assets. Damages occur immediately and can be built back . . . [whereas losses are defined as] foregone production/income. Losses occur over a longer period of time following a disaster and cannot be recovered. Together the damages and losses make up the total effect of the economic impact of a disaster” (World Bank 2011). Of the total losses, 90 per cent were borne by private owners. The public sector bore 6 per cent of the losses, not including losses suffered for flood prevention construction and humanitarian relief. In terms of magnitude by business sector, manufacturing suffered the most significant losses, followed by tourism, housing and agriculture. The disruption in supply chains resulted in long-term impact and global implications. Chapter 9 (‘Disaster Risk Management at the Regional Level’) discusses the issue in detail and highlights the implications of disruptions in regional production networks and supply chains.

Car manufacturing was one of the hardest hit sectors. All nine Japanese car manufacturers with operations in Thailand had to suspend production, and about 450 Japanese manufacturers were affected. Hi-Tech, Bang Kadi and Nava Nakorn, Thailand’s oldest and largest industrial estates with a large concentration of Japanese manufacturers, were among the worst hit, hurting Japanese companies already reeling from the effect of the East Japan earthquake, tsunami
and nuclear disaster. Many of these companies had moved significant operations into Thailand to avoid the strong yen and power shortages affecting Japan since the East Japan earthquake. Consequently, the production impact was felt outside Thailand, forcing companies such as Toyota and Honda to cut down emoluments and delay the launch of new products. The Thai floods also impacted factories in India, Indonesia, Viet Nam and the Philippines (Carpenter 2011). Honda suffered significantly since some critical parts for certain models produced in Thailand and India were produced only in the Thailand factory, and the Bangkok floods resulted in the shutting down of production facilities on the outskirts of faraway New Delhi. Honda car showrooms across India were literally out of work for three months as the most popular models were not available due to the production cut. In a nuanced economic and social sense, this was an illustration of the creeping spread of a modern compound disaster. Compound disasters emerging as a significant threat to the region, as discussed in Chapter 5 (‘Managing the Risk of Compound Disasters’), will need to be seen in the context of their ripple effects in the economies and societies across the boundaries of their direct influence.

Like car manufacturers, electronics firms such as Toshiba, Sony, Nikon and Nidec suspended production at their Thai factories due to flood damage or supply shortages, leading to major annual losses. Sony reduced its full-year operating profit outlook by 90 per cent. It also reported an unexpected third-quarter loss of US$345 million. Sony predicted a US$1.2 billion loss for the year 2011–2012 (Carpenter 2011).

Besides manufacturing, the agriculture sector was also badly affected, with the Agricultural Extension Department reporting that 1.44 million hectares of rice paddies across the country had been flooded from mid-September to mid-November 2011. The World Bank estimated the damages at US$1.3 billion. The Office of Agricultural Economics (OAE) found that up to 1.4 million farmers were affected by the floods. “It might not be possible for many farmers to resume next year as their houses were also heavily damaged,” said an OAE official (Bangkok Post 2011b).

The tourism industry in Thailand suffered exposure to disasters triggered by natural hazards for the second time in recent years, after the devastating blow of the 2004 Indian Ocean tsunami that very severely hit the coastal belt dotted with resorts. Tourism accounts for 6 per cent of GDP and employs roughly 15 per cent of the workforce in Thailand (Reuters 2011). The flooding was expected to have reduced the number of overseas tourists in 2011 from a target of 19.5 million to 18.5 million, causing a loss of over US$3 billion in revenue. Domestic tourism was expected to fall more drastically, by 90 per cent, according to the president of the Association of Domestic Travel (Reuters 2011). Several analysts, however, predicted that the drop in tourist numbers will be brief since historically tourists have quickly returned to Thailand post-crisis due to its warm weather, reputation for hospitality, relatively low costs and better travel infrastructure than its neighbors, among other reasons (Reuters 2011).
Complexities of urbanization, politics and climate change

The floods had evolved slowly, with the waters descending over a period of five months from the northern hills of the country. The capital was overwhelmed by the huge quantities of water because many of its drainage canals had been blocked as a result of poorly planned and managed development. The situation was aggravated by the decision of government officials to keep the city center free of water at the expense of other areas (Landelle 2012).

Despite all this destruction, central Bangkok was mostly spared, though not without political controversy. According to the Asia Foundation, “Having exhausted all stop-gap measures to protect Bangkok, the authorities insisted that they had no other option left than to initiate a controlled release of the floodwaters through the Chao Phraya and the labyrinth of canals or klongs that flow through and around the capital. This decision led to greater flooding and destruction in the city’s surrounding areas” (Asia Foundation 2011).

This complexity has also an impact on insurance. Due to a very low penetration rate of flood insurance for residential properties, the insured losses have occurred almost entirely in the manufacturing sector. Given the large losses manufacturers incurred, insurers were affected seriously by the floods. In reaction, primary insurers started imposing flood coverage sub-limits and increased premiums, and reinsurers tightened underwriting (Geneva Reports 2012).

The vulnerability of Bangkok is projected to rise substantially over this century. Simulated results show that for baseline conditions of 1995, the overall inundation area in Bangkok may increase up to 26 per cent in 2050 due to a sea level rise of 32 cm and to 81 per cent in 2100 due to an 88 cm sea level rise (Dutta 2011). The number of flood-affected buildings is likely to increase by a factor of 1.5 in the 75 years from 2025 to 2100.

The Bangkok floods raise a number of concerns that Asian countries collectively and individually must find answers to. The main challenge is of the economic development paradigm that has become the norm – a paradigm based on corporations aiming to minimize production costs by shifting base to less developed regions where infrastructure and labor is cheap, and governments in such areas aiming to attract huge investments while ignoring the risks that are built in due to fast-track processes of land-use change. Risk data is usually not compiled, and planning decisions often ignore whatever little does exist in the name of risk assessments.

Short-term politics can be blamed as one of the factors behind strategically blind developmental approaches. While establishment of industrial estates, creation of jobs, income from taxes and corruption give quick returns, often within a term of office, policy decisions based on long-term vision are often detrimental to quick growth and income and are thus either not attempted or scuttled by final policy decisions by political masters. The same mindset often rules decisions related to disaster response. The poor are often sacrificed in order to protect economic investments that are giving substantial returns. Industrial estates win over urban slums, and ports win over fishing villages.
Another dimension of economic growth is that rapid industrialization and urbanization are increasing risk across the region. Overall, the population is rapidly urbanizing and urban growth far exceeds infrastructure development, giving rise to sub-standard and high-risk habitations. Delhi is adding over 300 families a day (2011 Census of India), with no planned provision of housing, infrastructure, basic services and safety for these citizens. The figures are similar for mega cities across Asia.

In this heavily profit-driven planning environment, non-tangibles such as suffering and loss of future potential and complex issues such as value of human life across different economies find no space. Non-formal economies are the worst sufferers – first with their livelihoods at risk due to competition posed by industrialized alternatives of scale, then with the adverse impacts of the industrialization that they suffer in the form of forced displacement, pollution and technical disaster risks, and finally because they don’t directly count in economic impacts of disasters as their figures hardly make a dent in national GDPs. These communities who need help the most are the ones who fall through the gaps and do not even get caught in formal safety nets.

Social implications of disasters are also getting worse because social contexts are changing very fast. There is a significant value system change due to effects of the media in a world that is shrinking very fast as the benefits of communications reach the last miles. The accompanying erosion of traditional systems is adding to the emergence of unprecedented risks. Neighbors who used to stand by each other and share frugal resources with affected persons within their communities are today competing and fighting for aid being delivered in their area. The biggest concern is thus of communities on the fringe who already had little coping capacity and are fast losing what little they had. This is further aggravated by the changing nature of disasters, discussed in detail in Chapter 7 (‘Disaster Risk Management at Local and Community Levels’), also highlighting an additional range of complexities emerging from the diversity of communities.

Indian Ocean tsunami, 2004 – a mega disaster on the fringe of the developing world

As opposed to the Asia-wide economic implications of the Great East Japan Earthquake and Tsunami and the Bangkok floods, the Indian Ocean tsunami is an example of minimal macroeconomic implications but devastating microeconomic and social impacts in the affected areas.

The tsunami killed about 250,000 people across 13 countries in the Indian Ocean, and about 1.5 million lost their livelihoods. The worst affected was Indonesia. In Indonesia, although the impact on national gross domestic product for 2005 is estimated to be only 2.7 per cent, the total damage and loss amounted to 97 per cent of the GDP for Aceh, the worst affected province (Scheper et al. 2006). As a result of the tsunami, the per capita income for the people of Aceh was estimated to decline by as much as 32 per cent in 2005 (BAPPENAS 2005b). Yet the effect was not large in national economic terms. Much worse was the loss
of income and jobs in affected areas – in farming, fishing, local services and especially tourism – and its impact on affected families and local communities (Roberts 2005). The resultant displacement and relocation had far-reaching, though not quantifiable, repercussions.

Similarly in Sri Lanka, the damage was estimated at about $1 billion, or 4.5 per cent of GDP, with an additional $330 million lost in income flows. Most of the affected assets were in the private sector, however, particularly in the informal fisheries sector and the semiformal tourism sector. As in Indonesia, the impact on the national economy was minimal, but the impact on the affected areas was huge (Inderfurth et al. 2005).

India suffered damage in four mainland states and the Andaman and Nicobar Islands, with over $1 billion lost in assets and incomes. The largest losses were in housing at $490 million and fisheries at $285 million (World Bank 2005a). Since the affected belts were the coastal strips that house informal fishing settlements along with fishing harbors and boats, the overall impact on India’s national economy was negligible.

Informal-sector livelihoods, education and health – invisible social implications

The International Labour Organization (ILO) estimated that one million jobs might have been lost as a result of the tsunami (ILO 2005). According to the ILO, about 600,000 people in Indonesia may have lost their sole source of livelihood, particularly those who worked in fishing, small-scale agriculture and small business. The unemployment rate in affected provinces could be 30 per cent or higher, up from 6.8 per cent before the tsunami. In Sri Lanka, over 400,000 workers lost their jobs, mostly in fishing and tourism. The unemployment rate in affected provinces rose from 9.2 per cent before the tsunami to over 20 per cent afterwards (Inderfurth et al. 2005). The situation in India was similar. The impact was felt most by the fishing communities, marginal farmers along the coast and tribal communities on small islands. These communities themselves were hit very hard as they have minimal safety nets of assets, insurance or savings or even a formal status, yet they hardly made a dent on the national economic environment, let alone regional and global. The tsunami led to the highest life loss in a disaster in recent times and rightfully earned an overwhelming worldwide outpouring of support. However, it makes a good study of social and microeconomic implications for the marginalized and poor as compared to the larger dimensions related to the Great East Japan Earthquake and Tsunami or Bangkok floods.

The tsunami impacts also highlight the fact that besides livelihoods, education and health are other areas of concern as it can result in serious long-term implications with permanent setbacks to the society. Over 2,000 schools were destroyed or damaged, and some 45,000 students and 1,870 teachers were killed by the tsunami in Indonesia (BAPPENAS 2005a). The tsunami damaged 168 public schools, 4 universities and 18 vocational/industrial training centers in Sri Lanka, with primary and secondary schools being hardest hit (World Bank 2005b). The
medical infrastructure was severely affected in many coastal communities, a problem compounded by the deaths of doctors and other health providers. The greatest health threat was of communicable diseases, and people were at risk of water-borne and vector-borne diseases such as cholera, malaria and dengue. Mental health was an invisible but significant area of concern, with the WHO estimating that up to half of all residents in affected areas were in need of some psychosocial interventions (Inderfurth et al. 2005).

Seen at a larger scale, impacts of disasters on the marginal and poor communities can include distress migration. The tsunami did not lead to any known international migration, but it did create a large number of internally displaced persons in the most affected areas. Experience elsewhere shows that the longer displacement caused by natural disasters lasts, the greater the risk of discrimination and violation of human rights, especially of poor and marginalized groups. The national human rights commissions of India, Indonesia, the Maldives, Sri Lanka and Thailand considered the matter serious and met in March 2005 to discuss strategies to address human rights problems arising from the tsunami (OHCHR 2005).

Having said that the most significant impacts of the tsunami were localized and of the social domain, one must recognize that the tourism industry was hit hard since it is concentrated along coastal areas that were affected by the tsunami and that the tourism industry has a high multiplier effect, employing a significant number of people in its allied services. Most hotels, however, rebounded quickly. The industry’s physical infrastructure was either spared or quickly rebuilt, and tourist arrivals slowly started picking back up after a sharp drop right after the tsunami. For a few months, however, tourist arrivals in tsunami-affected countries were still down 30–40 per cent compared to the previous year (Hu 2005). A senior Tourism Ministry official in the Maldives called the tsunami the worst disaster of the country. Hardest hit of all economic sectors, tourism directly represents one-third of the Maldives’ GDP and indirectly supports 60–70 per cent of national GDP. The industry suffered direct losses of $100 million, half of which was insured (World Bank 2005c). It can be safely assumed that a majority of the indirect contributors to the national GDP and the ‘other half’ that was uninsured were mostly the lower income, informal-sector service providers.

The result of the tsunami impact being largely on the lower income and informal-sector communities was that there was no impact on financial markets, there was no downgrade in credit ratings of affected areas (Standard and Poor’s quoted in ADB 2005a), currencies of affected countries remained stable and there was no major impact on the stock markets of each country (ADB 2005a).

The major impact was on the poor, and economic impact was local – not national, as seen in the case of Aceh, Indonesia (Stephanie 2005). The most affected sectors were fisheries and agriculture, which are not significant contributors to the formal national accounts. The major socioeconomic impact included intensification of local poverty, damage done to private assets of the poor especially fishing boats and housing and hundreds of thousands of already poor people being dragged into deeper poverty at the local and community level, with an
estimated two million people sinking deeper into poverty largely because they lost their already precarious employment and means of living (ADB 2005b).

The irony of these disaster victims in the informal sector is that though they form the basis for the region being an aid recipient in general, and a humanitarian aid recipient in particular, and they often make it to the fundraising posters for aid mobilization efforts, the aid promised to them almost never reaches them in total. This is not a unique Asian phenomenon though, and it has been found that aid delivered in the aftermath of disasters always falls short of pledges. A study of Haiti cyclones in 2004, the Bam earthquake in 2003 and Hurricane Mitch in 1998 established that only 30–50 per cent of pledged aid gets delivered (Reynolds 2005). This adds another major dimension to the concern that the main challenge Asia faces is to reduce risks to the marginalized communities. Chapter 6 (‘Financing and Risk Financing Disaster Risk Reduction in Asia and the Pacific: Experiences and Innovations’) discusses the context of insurance coverage for the vulnerable, and it has yet to be seen how this filters down to the poor. It further highlights that risk reduction cannot be an aid-based intervention. If it remains so, targets will never be achieved. Alternate models such as mainstreaming in development, statutory-rights-based approaches and enterprise-based models will need to be worked on more seriously. In any case micro-level development issues will need to be addressed in the long term, as also discussed in Chapter 7 (‘Disaster Risk Management at Local and Community Levels’), underlining the need for addressing the critical issues of housing, health, livelihoods, education and natural resource management.

### National Rural Employment Guarantee Act, India – an economic and social opportunity for mainstreaming DRR in development

The Mahatma Gandhi National Rural Employment Guarantee Act (NREGA), enacted by the Indian Parliament in 2005, aims at enhancing the livelihood security of people in rural areas by guaranteeing 100 days of wage-employment in a financial year to a rural household whose adult members volunteer to do unskilled manual work. The act built on a previous initiative in one Indian state – the Maharashtra Rural Employment Guarantee Programme – to ensure that a minimum amount of paid work would be available to those in rural areas who need it. As an act of Parliament, it confers statutory rights – unlike a project, which could be prone to short-term changes. In specified districts (now more than half of the districts in the country), NREGA offers up to 100 days of employment per rural household per year on public works, at the prevailing minimum unskilled wage rate.

The NREGA is one of the largest rights-based social protection initiatives in the world. The national budget for the financial year 2006–2007 was about US$2.5 billion and almost 0.3 per cent of GDP. Once fully
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operational – by which time it will cover 40 million households living below the poverty line – it is estimated that the scheme will cost about four times this amount (Sjoblom & Farrington 2008).

According to 2012–2013 reports, the program provided 42.8 million household person days, of which about 38 per cent were to scheduled caste and scheduled tribe beneficiaries, the most marginal groups due to social exclusion and economic disadvantages. Over 53 per cent of the beneficiaries were women (Government of India 2013). The program thus has the potential to reach out to the most vulnerable and marginalized, those who are often the worst sufferers and the invisible ones in terms of macroeconomic implications of disasters.

While NREGA is not primarily designed to address the issue of disasters, it invariably is helping reduce risk at local levels, with the primary focus on the poor and marginalized. Each year, across a number of states in India, first there are droughts between December and June, then devastating floods in the next few months. Though the cycle is fairly predictable, and the probable states to be worst hit are also known, the droughts and floods are largely due to a failure of water and land management, and the ways of mitigating them are known as well (Narain, n.d.). Water conservation, land development, afforestation, provision of irrigation systems and construction of flood management measures are all ways that can, if planned and executed well, help mitigate the impacts of floods and droughts to a large extent. Since NREGA targets the poorest, who are often the most remotely located, the programs are being implemented in the rural areas, remote and unconnected parts of the country. Given that it aims to employ the target population in large numbers as unskilled labor, it invariably means construction work is carried out at a large scale. The most common labor-intensive works under NREGA are thus water harvesting features such as check dams, village ponds and traditional water management systems; flood control works such as embankments; and road building to connect settlements without access. All of these very directly help reduce disaster risk, and in the most remote areas and in the most vulnerable communities.

Though there have been accusations of corruption in the program, which no doubt hinders its reaching its full potential, its impact on the ground is undeniable. New infrastructure built by local labor employed under NREGA dots the rural Indian landscape. Rural–urban migration (the large supplier of construction and other labor to India’s teeming cities) is showing signs of abatement in part, reflected in the acute shortage of labor for construction in North India’s cities and agriculture in traditionally productive states like Punjab. The states of Bihar, Madhya Pradesh, Rajasthan, Odisha and Uttar Pradesh, which traditionally supplied most of the labor, are now not sending out the distress migrants and wage seekers that they used to. A visible direct indicator is the sharp increase in labor rates, telling a story of labor shortages, fewer distress migrants willing to
do manual work in poor conditions for low wages and more rural people staying home and working. Seen in reverse order, it is a story of micro- to macroeconomics, with work, wages and better living conditions in rural pockets affecting worker supply to larger economic activities. At the same time, however, it is also a tale of local disaster risk management through a developmental route.

NREGA’s effective decentralized planning and implementation and its benefits reaching out to millions of poor across the country through pro-active disclosures and mandatory social audits of all projects have benefitted 41 million households to date, according to the UN Global Assessment Report (United Nations 2011). The disaster risk management stemming from NREGA has never been estimated but is bound to be a very significant achievement.

The developmental approach and its challenges

Mainstreaming is not a new concept in the field of disaster management. In fact, many have held the view that risk management is a development subject, not a disaster one. The Yokohama Strategy and subsequently the Hyogo Framework for Action (UNISDR 2005) established risk reduction as the global paradigm for the disaster management community. Priority 4 of the HFA aims at reducing the underlying risk factors through sustainability, climate change adaptation, health and public facilities, social safety nets, risk sharing, land-use planning and rural development plans. In a 2011 assessment of the HFA progress in the region, it was found that Priority 4 was the one with the least achieved. The result is not surprising given the lack of understanding and appreciation of some of the issues being addressed and the linkages between the developmental sectors and the priority. Marginalization and vulnerability are still not completely mapped. Indirect impacts of climate change such as distress migration with multi-level implications are neither fully understood, nor clearly owned by any sector of governance.

National plans for adaptation have remained on paper. Even on paper, they still do not adequately draw the links between climate change adaptation and disaster risk reduction. Neither do disaster management plans address climate change concerns adequately. Within sectors, migrants as a challenge are owned neither by rural nor urban policy makers or managers. Urban planning is still happening with 20-year horizon periods in a world where projections and realities change beyond recognition within five years. At the same time underlying social and economic trends are increasing risk. Overall, accelerated migration due to rural push and urban pull factors, poor health and sanitary conditions in human settlements, aging society, growth of informal industries and rapid growth of supply chain network have all been adding to the underlying risk spectrum in Asia.

Given this context, the alignment of development goals and disaster management action agendas seems a very challenging task. Efforts at the global policy
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level are under way given the fact that the MGDs and the HFA both reach their horizon year in 2015 and a new agenda needs to be set. While a common framework for measuring impacts and future planning have been discussed, there are significant challenges in evolving such a framework. Within the disaster management sector there have been concerns regarding the point of anchoring the disaster risk management agenda, but the issue of fragmentation is far more severe in the development goals with cross-cutting policy, strategy and action requirements and a detrimental operational environment of working in silos. At the Asia level, the work of regional bodies such as UNISDR, ASEAN and the South Asian Association for Regional Cooperation (SAARC) itself has been unable to create the policy push and follow-up to get national governments into action towards implementation of the various action agendas and frameworks that form subsets of global and regional development goals and risk reduction frameworks. National governments have enacted instruments that support their international commitments, but in most cases the responsibility for translating the words into action rests at sub-national levels. Provincial-level governance structures are richer than ever before in financial terms, with revenues flowing in from the rapidly growing industries and urban centers, but lack the capacity to put resources to use and generate results. Local governments, the last tier, remain grossly ineffective, with poor resource flows, restraining local politics, lack of capacity and pressures from higher agencies, political masters and the ever more powerful industry.

A major challenge in assessing the impact of disasters accurately is the absence of a system for establishing and accounting the cost of human life. As a result, casualties are an absolute number and cannot be accounted in terms of their larger impact. The reason for not being able to establish this cost is largely political, as an economic principle–based costing would expose a huge difference between the costs of human lives in the developed and the developing worlds, and this would be against the universally accepted principles of equality. Unless this issue is addressed head-on, however, the task of quantifying disaster impacts will remain riddled with ambiguity and the grey area between economic and social impact assessments will remain wide. Recognition of the value of human life will remain low in the developing world, and risk management measures will not have the resources, or even intent to invest resources, that they desperately need.

Existing opportunities and instruments

In spite of the challenges, the Asia-Pacific region has shown progress on risk management measures across a number of countries through a range of initiatives that pave the way for larger actions towards managing disaster risks more effectively throughout the region. The need is to identify and recognize existing opportunities and instruments and to find ways to adapt and integrate the established DRM tools in the development approach by embedding disaster risk management in socioeconomic development.
One of the most significant developments has been the establishment of national disaster management authorities and the enactment of national disaster management legislation in a number of the region’s countries. This has effectively created an enabling policy environment by giving strength to the legislative as well as executive functions of governance for managing disaster risk and improving response. Chapter 8 (‘Disaster Risk Management at the National Level’) discusses this in detail with reference to the national-level initiatives and the need to position DRM as a core part of national strategies.

The second initiative witnessing success in a number of countries is the establishment of multi-stakeholder national platforms. These have brought together government, civil society, corporate, academic and media actors in a cohesive partnership specifically for disaster risk reduction. While many of the national platforms are in nascent stages, they are creating a positive space for cross-sector engagement and targeted efforts towards risk reduction. These platforms need to be strengthened where they have been formed and need to be initiated where still not established. Local platforms for disaster risk reduction similarly need to be conceived and activated, especially in areas chronically prone or highly vulnerable to disasters. Besides bringing together multi-stakeholder groups, the platforms also provide a practical way to secure improved links between key government departments of planning, finance, environment, industry, commerce, infrastructure, health and education.

Specific tools have also emerged and evolved in recent times in ways that aid social and economic dimensions of disaster risk management. The post-disaster assessment focus has moved from pure economic dimensions to include social concerns. Damage and loss assessment (DALA), which used to be a largely economic tool, has given way to post-disaster needs assessment (PDNA) that includes human development impacts and social dimensions. The adoption of these tools needs to be encouraged across all nations and all disasters. The shift of focus from damage and loss to needs will also positively influence risk management planning processes.

Stronger social security systems, including those based on cash transfer mechanisms, are making a way to countries in the region and promise to be more effective than traditional food and housing security systems that were often riddled with corruption. Evolved telecommunication-based banking and money transfer systems along with an improved outreach of banking services are aiding these processes. Such systems will not only aid the poor but will also help manage the escalating demographic and aging risks in vulnerable communities.

Finally, the social instrument of the influences of the civil society and media are a powerful tool that can effectively mobilize social pressures from concerned individuals and institutions to democratize the DRM processes and address the concern of the primacy of governments. Participation is a powerful tool and is critically important for the region as it can make up through social engagement what it lacks in financial resources.
Mapping informal economies and marginalized societies and planning for them

Identification of vulnerable groups from the economic perspective makes it important to look at informal economies that may not form a significant part of the national GDP but are vulnerable in terms of the local domestic product. Populations around new economies concentrated in high-risk locations require specific attention as they are exposed to multiple layers of risk. Economies dependent on complex webs of export-based chains are particularly vulnerable to disruptions by disasters. Those on the front lines of climate change, including fishing and agricultural groups, are particularly vulnerable and need specific attention.

Similarly, identification of vulnerable groups from the social perspective needs to be an integral part of disaster risk assessments and reduction planning. Socially excluded groups have an inbuilt vulnerability due to their marginalization over time and are doubly vulnerable during and after disasters. Migrants have been on the radar as a subject of concern, but climate change threatens to increase the problem many times over, with projections of ‘migration storms’ of over 100 million facing regions such as the Indo-Bangladesh coast in coming decades. Development and disaster risk management plans need to come together to address this concern. Distress caused by disasters in already marginalized groups leads to crimes such as human trafficking, most often of women and children, and abuse. Appropriate social safety nets need to be ensured to curb the exponential growth that is feared in these areas with growing economic disparity, improved access and communications, and increasing disasters and environmental stresses on livelihoods. These also need to be linked with economic measures and risk financing instruments as discussed in Chapter 6 (‘Financing and Risk Financing Disaster Risk Reduction in Asia and the Pacific: Experiences and Innovations’).

The most important primary requirement to address these needs is information on status and projection of risks. Governments lack the capacity to plan and take suitable risk management decisions in the absence of databases on risk arising from demographic trends, land-use patterns, economic investments, related activities and climate change. Establishment and strengthening of a regional socioeconomic database with national hubs is needed to support planning decisions, particularly for disaster risk management but also across sectors. Such a system will help measure and monitor the effectiveness of social and economic policies to reduce risk.

It is therefore important to first identify risks – all types of risk to all sections of population. Settlement patterns, especially industrial location policies, need to look into the impacts of disasters on supply chains and follow sound principles of short- and long-term resilience. At the same time, housing and other land uses need to be made adequately safe through location, infrastructure planning and soft components of risk reduction and preparedness using community-based approaches. It is equally important to articulate impacts of disaster events. Proper
social and economic impact assessment of disasters is needed to understand what types of social and recovery programs are required for the affected area and population.

For both risk management measures and post-disaster assessment and response, countries need to better utilize the opportunities offered by the current information-based world. Improved remote sensing, information systems and communication media can achieve desired results more efficiently and quickly than was ever possible before. The way these tools are being used in the corporate sector can give lessons on deploying them for disaster risk management. Risk management tools in the finance sector and the shipping and aviation industries are state of the art and offer much for the DRM sector to learn from.

Once made, planning decisions need to go through a reliable mechanism of implementation and management. This is a big lacuna in the DRM systems across most countries in the region. The cross-sector nature of the subject results in lack of ownership. Mainstreaming has remained a concept only partly addressed in some sectors at some levels in an ad hoc manner. Strengthening of multi-sector and multi-stakeholder platforms is urgently needed to address this concern. Only by strengthening the regional, national and sub-national platforms can the desired effect be seen across the wide range of sectors and levels. Existing platforms need to come together and networks including development and disaster management players need to pave the way for effective disaster risk management in Asia from regional to local levels.

Priority concerns of the economic and social challenge

The range of issues linked with the economic and social dimensions of disaster impacts is very wide and the interface between the domains very complex. The three priority concerns identified from within this range are as follows.

1 The micro perspective

Dimensions of the economic and social challenge show that impacts of disasters are felt worst at the micro level, by people in their immediate lives. Assessment of disaster risks at the local level is very weak, and indirect impacts are particularly underestimated. In the face of an uncertain future with unpredictable and unprecedented risks such as those of climate change and compound disasters, there is little capacity in local communities to cope with the micro-level impacts. This is true not just for populations but also for governments. Local governments are the worst hit and have the lowest capacities to manage risks.

2 Unequal impact of disasters on the most vulnerable

Those at the bottom of the pyramid feel the maximum impacts of disasters. They get directly hit due to the high exposure inherent in the location and design of their settlements. They also feel the secondary impacts of economic damage
caused by disasters through loss of livelihood opportunities in allied and informal sectors. Importantly, they have low capacities and few assets that can help them sustain and recover. The poor and the most vulnerable feel the maximum impact and have the least capacity.

3 Need for safety nets

The primary and overarching need is of policies that support sustainable development at the macro level. Factors of disaster risk management are engrained within the concept of sustainability, since sustainability implies development within carrying capacities of natural systems. This is grossly lacking in the current economic development trends in Asia.

Human resource, equipment and conditions for appropriate action are all part of capacities that are currently missing in Asia, particularly at the local level. Appropriate infrastructure to manage and reduce risks is also needed and is at present not keeping pace with the increasing risk arising from rapid physical growth. Capacity building is needed across institutions and communities to create resilience.

Production networks across the region are driving economic growth and providing livelihoods to Asia’s teeming millions. There are many more that get the trickle-down livelihood benefits in the allied and informal sectors. The fragility of the livelihoods, and the absence of insurance and fallback options at these lower levels, creates very high vulnerability, which needs to be addressed.

Conclusion

It emerges from the discussions presented here³ that a significant need arising from the economic and social challenge is that of enhancing resilience across the board, with a specific focus at the micro level. In the entire process, risk management will need to be seen as a development subject and will have to be addressed in all development sectors. At the national level, economic instruments such as crop insurance policies and national building safety codes and social instruments such as rural health missions and urban slum improvement policies can provide overall improvements in the policy environment. At the local level, economic instruments such as micro-insurance and development regulations and social instruments such as health services and disaster education can create cushions.

This has to include the informal sector and have a focus on livelihood security at the local level, which will further translate into social security for vulnerable families. Building such systems will require a range of actions, including those that reduce barriers and improve access to resources. It will require going beyond meeting basic needs to helping the poor and the vulnerable in building physical, financial and social assets that will protect them from disasters. As a cumulative base, this will lead to building capital at the community level, in terms of both microeconomic options and social capital.
The emerging primary recommendation in this respect is thus as follows:

**Recommendation 3**

*Build safety nets, with special focus at the micro level, to ensure that the poor and most vulnerable are protected from the direct and indirect economic and social impacts of disasters through their own strengthened resilience.*

**Notes**

1 Observations based on a field visit by the author to the Sendai region of Japan in December 2012.
2 Anecdotal reference to local perception in Leh, India, as observed by the author during rehabilitation planning workshops with local communities after the 2010 Leh flash floods.
3 The author acknowledges an ongoing study on Socio-Economic Impacts of Disasters in Sikkim, India, commissioned by the Sikkim State Disaster Management Authority and being carried out by the Centre for Development and Disaster Management Support Services, New Delhi, in which the author is a team member, as a source of global literature research and discussions that have informed the writing of this chapter with the approval of the concerned agencies.

**Bibliography**


Part 3

Responding to major concerns in the region
5 Managing the risk of compound disasters

Richard Eisner

Introduction

The management of a major disaster can stretch the resources of any government to the limit, even for those that are well prepared. Therefore, managing an unfolding ‘compound disaster’ that escalates into unknown risks presents a massive challenge. One of the threads that run through this study is ‘expanding risks’, so this chapter takes up this concern. Thirty-one countries use nuclear power, and there have been numerous accidents and disasters in nuclear power plants within the past decades. The most damaging events were Windscale, United Kingdom, 1957 (a level 5 disaster); Mayak, USSR, 1957 (a level 5 disaster); Three Mile Island, Pennsylvania, United States, 1979 (a level 5 disaster); and Chernobyl, Ukraine, 1986 (a level 7 disaster). Each event was caused by technical failures within the nuclear plants.

Then in 2011 the Fukushima disaster occurred (a level 7 disaster) and for the first time an earthquake and tsunami triggered an escalating technological disaster within a nuclear power plant with global consequences. This chapter describes how complex disasters, including the catastrophic events noted above, require a holistic approach using all the resources of governments, the private sector and nongovernmental organizations (NGOs).

The discussion of compound disaster risk management (CDRM) cannot be separated from the specific discussions of the elements of disaster risk management (DRM) in this study. DRM factors that either contain or exacerbate disasters are addressed in detail within the other chapters. There is inevitable duplication as compound disasters have their origin in the same vulnerability, limitations of DRM and dysfunctions in the governance structures at the local, national, regional and international levels that put the Asia-Pacific region at risk. These duplications are reflected as themes common to several of the chapters in this study. One common theme is the increasing risk of disasters and compound disasters in the Asia-Pacific region as a result of development pressures and the concentration of population and industry in hazardous locations. A second theme is the critical role that local and national governments and the private sector play in managing disaster risk through standards and regulation.
of the built environment. It should be recognized that compound disasters influence all sectors of communities and regions: public and private, community- and faith-based organizations, cultural and educational infrastructure. Therefore, disaster risk and consequence management must be conceived as a holistic process in which all sectors of communities and nations collaborate, not independently but interdependently. This chapter will focus on those interdependencies, as well as structural and infrastructural weak links and forces that tip disasters over the threshold of singular events into complex compound events.

**Defining compound disasters**

Over the past several years, the spate of disasters in Japan, the People’s Republic of China, Haiti and the United States has stimulated a discussion of very large and complex disaster events. These events, characterized by progressive or cascading failures, were often the aggregation of multiple, unrelated, independent and near-simultaneous events that were collocated in time and space. These events often grow from an initial emergency or disaster, expanding in scale and intensity and spawning secondary disasters that vastly exceed the initial event.

Current definitions of disasters have not accounted for the complexity and fragility of interdependencies of systems and sectors or the consequences of their individual and collective failures in recent events, including the number of incidents or events that are occurring, the spatial distribution of these events, the number of jurisdictions affected or the capacity of infrastructure, organizations and jurisdictions to respond. For example, earthquakes, floods and landslides result in fires, loss of electric power and damage to water supplies and sanitation infrastructure. Coastal storm surge floods developed and agricultural lands, destroying food production, food supply, communication and transportation systems. Industrial accidents spread airborne and waterborne pollution into residential communities and fragile wetlands, forcing the relocation of thousands of residents. An emergency that is not contained and controlled can evolve into series of calamities that greatly increase losses and disruption, cross jurisdiction or national boundaries, and require multinational response and relief.

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**Professor Kawata’s manuscript**

Professor Yoshiaki Kawata of Kansai University suggests that compound disasters are multiple sequential disaster events that produce “more serious damage than individual disasters occurring independently” (Kawata 2011). This definition focuses on the impact of a Tokyo metropolitan earthquake.
Managing the risk of compound disasters

as the catalyst for widespread damage across the Tokyo region. Kawata also equates compound disasters with catastrophic disasters, defined by the number of casualties, the large area of damage and the number of spawned secondary disasters. He provides two examples of compound disasters. The first is the aforementioned 1923 great Kanto earthquake and fire. The second example is the collapse of earthquake-damaged levees in a typhoon that occurred in the same region in 1924. Neither event would fall within the definition of ‘compound’ if the term were not applied to sequential, related events.

Kawata’s manuscript was published in March 2011, but he foresaw and addressed the challenge of the Tohoku-Oki events. The Japan Cabinet Office is now developing plans for response to a massive earthquake in the Nankai Trough in the ocean off Honshu. Projections of damage and losses provide a basis for preparing for the estimated 300,000 fatalities, 600,000 injured and 9.5 million evacuees and the impact of ¥220 trillion in economic damage (Goda 2013). Losses from this catastrophic event will be a result of the earthquake and widespread compound and contributing events in the region of the disaster.

Disasters as defined by the UNISDR in 2009 are “a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceed the ability of the affected community or society to cope using its own resources” (UNISDR 2009). The UNISDR does not differentiate between singular disasters and those that are compound, nor does its definition seem to encompass events of the magnitude described by Kawata or of the 2011 Tohoku-Oki or forecast Nankai Trough events.

The threshold for tipping from a disaster to a compound disaster is also not clearly defined and depends as much on ex ante risk management by the public and private sectors as on the ex post capacity of individuals, businesses and governments to respond. Therefore, the term ‘compound disaster’ will continue to be a term of art to describe disasters of a type and scale that exceed the generic UNISDR definition.

A brief typology of compound disasters

Compound disasters can be multiple independent events, sequential or simultaneous events in large disasters, progressive failures of infrastructure, catastrophic infrastructure collapses or disruption of communications, transportation or energy networks as identified in Table 5.1.
<table>
<thead>
<tr>
<th>Type of Event</th>
<th>Characteristics</th>
<th>Example</th>
<th>Disaster Impacts</th>
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<tr>
<td>Multiple, Coincidental, Simultaneous</td>
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<td>Earthquake, Fires, Typhoon, Conflagration, Catastrophic Loss of Life</td>
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<tr>
<td>Sequential, Progressive</td>
<td>Series of Linked Hazards</td>
<td>Tohoku-Oki Earthquake and Tsunami</td>
<td>Modest Earthquake Damage, Great Near Shore Tsunami, Mass Casualties, Inundation of Fukushima Daiichi, Melt Down Reactor Cores, Nuclear Release</td>
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<td>Tohoku-Oki Tsunami Damage to Fukushima Daiichi Nuclear Reactors and Loss Capacity from Nationwide Reactor Shut Downs 2003 Damage to the Power Grid in the Northeast US</td>
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<td>Regional Mass Casualty</td>
<td>Catastrophic Loss of Life Impacts Multiple Countries, Overwhelms International Response Resources</td>
<td>2004 Sumatra Earthquake and Indian Ocean Tsunami</td>
<td>Impacted 15 Countries From Asia to Africa, and Resulted in 200,000 Deaths. 543 Swedish and 539 German Tourists Perished, Making the Tsunami the Greatest Disaster to Strike Sweden in 300 Years</td>
</tr>
<tr>
<td>Information Systems</td>
<td>Disruption of World Wide Data, Telephony and Information Systems.</td>
<td>Tohoku-Oki Earthquake and Tsunami</td>
<td>Disruption of World Trade and Commerce Resulting From Interruption of Transnational Supply Chain and Logistic Networks</td>
</tr>
</tbody>
</table>
Examples of historic compound disasters

The 1923 great Kanto earthquake and fire as a compound disaster

An initial concept of compound disasters was developed in the aftermath of the 1923 great Kanto earthquake and fire that destroyed Tokyo and Yokohama. In the great Kanto earthquake and fire, the earthquake created the fire ignitions, which evolved into a firestorm driven by winds of a distant typhoon, resulting in the conflagration that consumed Tokyo and Yokohama. Dense wooden residential and commercial construction provided fuel for the fire, ignited by overturned hibachis used for home cooking. Land uses were not segregated or separated by roadways and open-space firebreaks. Commercial and industrial facilities were interspersed with residential land uses. The water system was damaged by the earthquake and inadequate for the ensuing fires. Driven first by winds from a distant typhoon, the fire quickly created its own firestorm and conflagration that burned until the winds subsided, killing an estimated 140,000 persons in the earthquake and fire and the tsunami that followed. The disaster “whipped up nationalist and racist passions” that resulted in the killing of an estimated 6,000 Korean immigrants as scapegoats blamed for causing the fires (Hammer 2011). In this case, the earthquake was the primary causal event that produced fires, mass casualties, a tsunami and a nationalist backlash against Korean immigrants as illustrated in Figure 5.1.

Figure 5.1 1923 great Kanto earthquake and fire
Figure 5.2 1924 typhoon and flooding in Kanto

Seventeen years before the earthquake and fire destroyed Tokyo and Yokohama, an earthquake and fire destroyed San Francisco. At that time San Francisco was the largest city west of Chicago in the United States, but the population was a fraction of that in Tokyo, the density of development was considerably lower, casualties were estimated at fewer than 5,000 and the majority of the population was able to evacuate to refuge areas. San Francisco’s earthquake and fire was a compound disaster of catastrophic proportions for the United States, but not at the scale of disasters now being considered compound.

The 2010 Haiti earthquake

At the time of the 2010 earthquake in Port-au-Prince, Haiti, the local and national government of Haiti was in disarray, not able to provide basic services to the population. The potential for earthquakes in the region was well known in the scientific community, but government institutions in Haiti did not have the capacity to regulate development or impose seismic building codes on unregulated construction. The $M_w 7.0$ earthquake left as many as 230,000 dead and more than 1,000,000 homeless and the civil government incapacitated. Most hospitals in the capital region were destroyed and residents were responsible for search, rescue, care and sheltering. Port facilities, airports and road systems critical for response were destroyed. In the absence of a functioning civil government,
international NGOs organized and took responsibility for providing humanitarian assistance to the population. The combination of related factors that influenced the magnitude of the disaster in Haiti are illustrated in Figure 5.3.

Haiti was in a continuing economic and infrastructure emergency before the earthquake, and the earthquake tipped the country into a disaster that continues today. Ten months after the earthquake, cholera broke out for the first time in Haiti in more than a century. Sanitation systems and civil organizations to monitor the public health and provide health care had been overwhelmed and disrupted by the number of residents injured by the earthquake and were not capable of a rapid response. It is tragically ironic that the epidemic was introduced into the country by foreign military personnel sent to Haiti after the earthquake to provide law enforcement functions, further exacerbating the earthquake’s impact on disaster victims (Science Daily 2011). Without a functioning civil government, building safety and public health risks were not addressed, creating an environment where the damage, life loss and disruption of the earthquake reinforced dysfunction of civil society and prevented containment of the cholera outbreak.

**Figure 5.3 2010 Haiti earthquake**

The 2011 Great North East Japan Earthquake and Tsunami (Tohoku-Oki)

The Tohoku-Oki earthquake and tsunami of 2011 (referred to as the Great North East Japan Earthquake and Tsunami in the popular media) struck one of the most prepared countries in the world. Civil government structures in
Japan are robust, structural engineering is mature and the population is educated in disaster preparedness. Seismic networks and earthquake early warning (EEW) systems alert businesses and the general population of the occurrence of quakes and the approaching strong ground motion. Radio and television as well as cell phones can alert the public. Tsunami sea walls along the Sanriku coast protect harbors and port facilities. In the Tohoku-Oki earthquake and tsunami, the earthquake caused relatively little damage, but the resulting tsunami affected a wide area of eastern Japan, resulting in nearly 20,000 fatalities (92 per cent of the fatalities were drowning) and inundation of the Fukushima Daiichi nuclear facility, causing loss of power, damage to backup generators and control systems and, ultimately, the release of radioactive materials. The sequence and complexity of the compounding events referred to as the Great North East Japan Earthquake and Tsunami are illustrated in Figure 5.4.

The high quality of structural design and construction in Japan and the population educated about the earthquake threat and risk of tsunamis were overwhelmed by a series of events that “exceeded their expectations” (personal communication). The same comment was made by local officials in Kobe after the 1995 great Hanshin Awaji earthquake (Eisner 2000). Earthquake monitoring and warning systems had been developed but were not designed for the Mw 9.0 event that occurred. The earthquake and tsunami events were catastrophic in losses and the

Figure 5.4 Tohoku-Oki earthquake and tsunami

Continuing Release of Radioactivity, Loss of Energy Generation, Economic Impact, Unknown Health Hazard, Unknown Cost of Recovery and Reconstruction

Sequence of Linked Disasters
Managing the risk of compound disasters

Impacts complicated by the progressive failure of communication systems, damage to the transportation system, landslides and debris, thousands of homeless in need of shelter and the deaths of many local government officials. The loss of communication infrastructure and a resulting lack of information from the damaged region prevented emergency management coordination of local and regional response, delaying damage assessment and logistic support to residents for several days. The tsunami inundated 561 km² and disrupted transportation systems in Tokyo, 350 km from the epicentral region, where five million commuters found themselves temporarily stranded when loss of electric power shut down the train system. The 2011 M₉.0 quake continued to trigger both aftershocks and new earthquakes across Japan into 2012, causing additional damage (Maki 2013). The damage from the earthquake was minor compared to that resulting from the tsunami. Dozens of communities were flooded within minutes of the earthquake. Communications were disrupted, limiting the effectiveness of warnings to the public near the earthquake source and making it impossible for prefectural officials to understand the impact of the tsunami and needs of victims. Three prefectures were simultaneously influenced but neither the prefectures nor the national government comprehended the extent and intensity of the damage for several days.

**Impacts of the earthquake and tsunami on Fukushima Daiichi nuclear reactors**

At Fukushima Daiichi, the compounded impacts of loss of power from the electrical grid, the height of the tsunami and the loss of reactor control systems from “unexpected” flooding was followed by mass evacuation of the surrounding communities and social and economic losses that continue at this writing.

The progressive damage to Fukushima Daiichi and the radioactive releases were catastrophic, and concern for the safety of other nuclear generating facilities in Japan resulted in closure of all generating facilities for inspection, safety assessments and “stress testing.” It has also raised questions about the relationship of between operators and the regulatory agencies and the credibility of the science and engineering related to siting and construction of high-risk facilities. The apparent rejection by the Japanese public of nuclear generation as a source of electrical power will have unknown consequences on the national economy, as well as in countries that have responded to the damage of Fukushima Daiichi by scaling down their dependence on nuclear power and increasing the use of fossil fuels.

**Managing the risk of compound disaster**

Risk management is generally focused on the functions that happen before the disaster occurs, including risk assessment, education, regulation, prevention and preparedness. However, the prevention of compound disasters is as much a function of those activities that occur during and after a disaster, including response and other consequence management functions. Compound disasters affect entire communities, regions and nations. Therefore, participation of both public and private sectors is essential for effective CDRM. Community education on hazards
Richard Eisner

and risk and preparedness are the foundations of CDRM. It encompasses all sectors, all disciplines and all phases of risk and consequence management as illustrated in Figure 5.5.

Every large disaster evolves through time and is defined by preexisting conditions and the built environment, natural forces such as weather, fire ignitions and effective and timely response actions. Managing effective and timely response actions is essential to containing a disaster and preventing the aggregation of component events into a compound disaster. Managing the consequences of an evolving disaster requires adaptation to the unexpected and ad hoc improvisation. The objective of the disaster prevention and planning process is to plan for what can be expected so disaster managers can provide time and attention for the unknown and unexpected. Determining the risk of a compound disaster requires an understanding about the multitude of natural and technological catalysts of disaster and their potential and chaotic interaction. In order to gain an understanding of this complex and dynamic environment, CDRM must be able to create models that simulate the performance of individual hazards as well as the interaction among combinations of hazards in the chaos of natural environments.

Managing the risk in the Tohoku-Oki disaster

In the case of the Tohoku-Oki earthquake and tsunami, basic elements of intelligence gathering, communication, logistic support and coordination/collaboration among the prefectures and national government were left to be formulated
Managing the risk of compound disasters

during the initial crisis period. After the 1995 great Hanshin Awaji earthquake, the national government developed a plan for major disasters that simultaneously impacted multiple prefectures. Unfortunately, during the 16-year period between 1995 and 2011 they had not promulgated their plan, nor convened training, testing and exercising of the plan’s organization and procedures. Management of the disaster has been described by Maki as “ad hoc” and improvised, as the earthquake/tsunami was the first multiple-prefecture disaster to strike Japan since Kobe (Maki 2013). Standardized systems for collaboration and coordination, shared by local, prefectural and national government agencies, were not in place and the provision of mutual aid by non-affected local governments and prefectures was delayed. Japan had prepared for a “probable earthquake and tsunami” and concentrated planning on the potential large disaster in the Tokyo region but was not prepared for underestimation of the tsunami wave heights and the cascading failures of transportation, communication and civil protective works. Much as Tokyo had discounted the risk in the Kansai region prior to the 1995 Kobe earthquake, they had discounted the potential for a multi-segment fault rupture along the Sanriku coast before 2011. Comfortable in their probabilistic assessment of the earthquake and tsunami risk, neither the government nor the Tokyo Electric Power Company (TEPCO) was prepared for the damage to Fukushima Daiichi and the ensuing nuclear disaster.

Risk management at the reactor was the responsibility of TEPCO and the national government regulatory agencies. They had accepted the design of the reactor and its systems as adequate. They had accepted the seismologists’ and engineers’ assurances that the tsunami barriers were adequate and assured the public that the facility was safe before and initially after the tsunami hit. TEPCO and the government were also responsible for consequence management in the event of an emergency.

These disasters may have been prevented if development decisions had incorporated risk management as a criteria for location and construction of critical facilities, and if hazards were mitigated as knowledge of those hazards and their risks evolved. In Japan, structural standards for design and construction, seismology, EEW systems and public education were well developed. The history of earthquakes and tsunamis were well known, and coastal areas of Sanriku were repeatedly inundated. Civil protective works were built along the coast to protect communities against the high-probability recurrence of tsunamis, and the population was educated about the threat and risk from coastal flooding. Disaster planning, monitoring systems and construction were based on a probabilistic assessment of risk and the most likely earthquake based on assumptions of fault segmentation, accumulated stress on the fault and average frequency of recurrence, but they discounted the infrequent great earthquake. The Jogan earthquake and tsunami (in the year 869) produced an inundation similar to the 2011 tsunami. Rupture of multiple segments of the fault was not considered in estimating probability of inundation, nor was progressive failure of the monitoring and EEW systems.
Probable risk versus possible risk

The Tohoku-Oki earthquake and tsunami were “1,000-year events” and exceeded the size that the earthquake monitoring system was designed for. The resulting tsunami exceeded the height of the sea walls and the flooding inundated evacuation routes, refuge areas, disaster shelters and the sea walls protecting the Fukushima Daiichi nuclear reactor. In the most prepared country in the world, they had prepared to manage the “probable risk” but not the possibility of the recurrence of a historic event. The Daiichi reactor was designed with the expectation that it would be fail-safe – that is, that it was designed with a structure, system of procedures, operator training and mechanisms to prevent malfunction. Unfortunately several concepts for the building of high-reliability facilities to avoid progressive or catastrophic failure were not adequate to prevent damage and release of radioactivity. Multiple power sources critical to maintaining the reactor cooling system failed in the earthquake and flooding. Backup generators to maintain the cooling systems if line power failed were located where they were flooded by the tsunami and failed. Command and control systems were inadequate. The facility did not have an adequate supply of radiation monitoring or protective equipment. There was confusion between the on-site disaster managers, government officials and the corporate headquarters of TEPCO in Tokyo, the owners of the reactor. Neither the reactor nor the organization for managing an emergency was designed to withstand the impacts of an earthquake, a tsunami and control system damage (National Diet of Japan 2012).

Comprehensive DRM in Japan

Japanese officials had implemented a “Plan A,” a land-use and regulatory environment that prescribed seismic building codes that were enforced for most construction with especially stringent provisions for critical facilities, including nuclear facilities. A “Plan B” provided for detailed education of the population about the threat and risk of earthquakes, tsunamis, typhoons and landslides. They also pioneered the development of notification and early warning systems that could provide advance notification to residents of an impending disaster. They had a robust risk management system in place. However, they did not have a “Plan C”: a well-organized catastrophic emergency management plan and a hierarchical structure from the national government through the prefectures to the municipalities that could respond to, coordinate and manage the consequences of a sequential failure of emergency safety systems.

The causes and consequences of the failures of the structures and systems at Fukushima Daiichi continue to be documented and assessed. An official report to the National Diet of Japan notes failures including a dysfunctional organizational and regulatory structure at TEPCO and regulatory agencies; resistance to implementing recommended risk reduction
measures; underestimation of the hazard and risk of earthquakes and tsunamis; location of and inadequate redundant power and control systems that would be flooded in a recurrent historic tsunami; and an “organization-driven mindset that prioritized benefits to the organization at the expense of the public” (National Diet of Japan 2012).

The disaster was the result of gaps in science; hubris by humans; over-reliance on the statistics of probability; and complex interactions between science, bureaucrats, regulators, engineers, disaster consequence managers and government risk managers, compounded by the largest earthquake ever recorded in Japan.

Increasing risk for compound disasters

The potential for compound disasters is increasing as urban and industrial development concentrates populations in and around older cities which lack the infrastructure to provide water, sanitation and safe housing to new residents. Increasing population and concentration of poverty have put ever greater pressure on aging infrastructure. In addition, the pressures for industrialization and efficiency have led to the development of complex logistics systems and “just in time” supply chains linking parts manufacture in Asia and Latin America with product assembly plants in North America. The potential for disruption is exacerbated by the concentration of parts manufacturing in regions vulnerable to earthquakes, typhoons and flooding, and communication and transportation interruption. These technologies are dependent on telecommunication, information and transportation systems that, if disrupted, can impact the world’s markets. Disasters in Japan, the People’s Republic of China, the Republic of Korea or Latin America can disrupt manufacturing continents away.

The damage and continued disaster at Fukushima Daiichi has raised a red flag about the concentration of aging nuclear power generating facilities in seismically active areas of North America and Asia. The simultaneous earthquake and tsunami, the resulting damage to nuclear generating and waste storage facilities, transportation and communications, and the need for rapid emergency response and evacuation from contamination zones presents a “doomsday scenario” for DRM. Rodriguez-Vidal et al. (2012) note the correlation of new and existing nuclear facilities in coastal areas of Japan, the People’s Republic of China and Taipei, China, vulnerable to local or distant tsunami inundation. It is no longer a hypothetical possibility for DRM or consequence managers. When a disruption of the infrastructure occurs, emergencies that could have been managed by local officials tip into disasters and compound disasters beyond their experience and capability to contain and manage. For most local jurisdictions and many nations, large disasters are infrequent or have not occurred within the careers or memories of current populations and officials.
Managing compound disaster risk

Managing the risks of compound disasters is dependent on managing the potential disaster risks associated with various physical, social and economic features that compose communities: their structures, housing, infrastructure, health, education, social services, and business and industry. The critical elements of that risk management are effective land-use and development regulation, the application of best practices in architectural and structural design, fostering a culture that supports government regulation and building a capacity to respond systematically to disasters when they occur. The foundation of planning and construction based on risk is a consistent and comprehensive multi-hazard risk assessment of the Asia-Pacific region conducted by member nations and the development of disaster scenarios as a basis of joint response planning.

Educate the public, agency and elected officials

Key to understanding the potential for compound disasters is the knowledge of the probabilities of individual elements of risk and having systems in place to abate, contain and respond to each component risk element. Public officials need to support science-based risk assessments of potential natural and technological hazards, the implementation of regulatory environment that supports risk-based land-use and development practices, and architectural and structural design that provides a safe and healthy environment. Knowledge about natural and technological hazards should be incorporated into the primary and secondary science education curriculum to ensure risk awareness and an informed constituency that will support safe development and construction practices. Turning a hazardous environment to one that is risk free is a multigenerational process stretched over decades. Therefore education and constituency building must start with primary education. There should be a tradition or statutory right of residents to be informed about the hazards and risks in their community. “Community Right-to-Know” laws provide risk information to community residents, enabling informed advocacy for DRM.3

Create a regulatory framework for land-use, development and construction practices

Numerous factors differentiate an emergency, a disaster, a compound disaster and a catastrophic disaster. These include contextual issues such as the overall capacity of government and the regulatory environment to manage development. Is there a regulatory framework and the legal and cultural support for limiting the use of private property? Is there support for identifying and assessing possible hazards? Is the public made aware of the potential risk of existing and new development? Are there effective pre-disaster development controls and risk mitigation? These factors can limit the potential for disasters and prevent emergencies and disasters from compounding.
Risk-based land-use planning, development policy and regulation

The common and central element of DRM is the integration of science-based disaster risk assessment and management into all development, redevelopment and economic expansion decision making. A core tenant of land-use planning is the protection of the public health and welfare that results from avoiding geologically hazardous or flood-prone areas, the provision of adequate infrastructure, the separation of conflicting land uses and the separation of hazardous commercial and industrial land uses from residential areas.

Land-use policy and regulations prescribe location, use and density; limitations of use; separation of industrial, commercial and residential activities reflecting relative hazard; provision of community facilities including educational and government uses; open space for recreation; and environmental protective buffers, transportation and reserves for future growth. The general location of development is directed to areas of lower risk. Specific threats are identified, including floodplains, geologic hazards including ground failure, earthquake faulting, volcanic hazard zones, interface fire zones and areas where previous unregulated development have contaminated land or groundwater. These types of regulatory environments are common in the United States, Japan and Western Europe but may not be acceptable in the other countries in the Asia-Pacific region.

Specific locations, separated from residential and commercial uses, are set aside for hazardous commercial and industrial processes. Specific development regulations require buffers from other uses and provisions for on-site containment of hazardous processes and materials. Additional regulatory requirements for specific industries such as petroleum processing and hazardous chemical manufacturing may apply that require on-site release prevention and response capabilities. There are also requirements for communication, alert and warning, and evacuation procedures for communities adjacent to potential hazards, including petroleum and chemical processing and nuclear power generating facilities.

Development founded on public safety and risk management criteria would base decisions on scientific assessments of hazard and risk and would guide construction into areas that are not exposed to natural or technological threats. Where there are limited location choices to avoid risk, risk reducing conditions can be applied that would provide separation and buffering between uses to reduce potential for propagation of a disaster’s impacts. Separation of potential hazards both provides a barrier to spread and compounding and provides time to initiate consequence management actions. These buffers can be in the form of setbacks between uses, aligning of transportation and open space as separations or the construction of “hardscape” barriers such as blast or flood walls, levees, swales or containment berms, as well as early (rapid) warning systems to alert the public to take protective actions. The land development process should also provide an adequate number of strategically located community facilities that would include schools and open-space areas for safe refuge from fires, flooding and collapse of structures. Creating “buffers” prevents individual disasters from merging and morphing into a larger, multi-hazard disaster. Buffers can be in the form of
physical separation of land uses and of the regulation of development and construction in areas of hazards or adjacent to hazards in order to protect community residents.

*Promote adoption of consensus-based safety standards*

Standards (industry specific and International Organization for Standardization, or ISO) for safety of industrial processes have been developed by industry and government to provide containment and redundant control systems and to protect facilities from exposure to adjacent hazards including geologic hazards, transportation accidents and flood inundation. Where preexisting hazards occur within development, government regulatory processes can require containment and abatement of hazards and mitigation of hazard impacts, including removal of contaminated soil and groundwater.

*Develop redundant critical lifeline systems*

Compound disasters can evolve from the failure of an essential lifeline infrastructure system (communications, power, transportation); loss of emergency management capacity; progressive collapse of structures including dams and protective civil works; and delayed consequences resulting from disruption of health or water and sanitation infrastructure that result in pollution, disease and degrading of the environment. The inability of the public to receive critical information about hazards, necessary response and evacuation instructions or availability of resources and assistance can also compound the impact of the disaster and exacerbate the damage to lives, community and the economy of impacted regions. Redundant structural, water, communication and power systems with independent backup power generators are critical to maintaining the integrity and capacity of safety, containment and response infrastructures, enabling rapid and effective response. Preventing progressive failures and compounding of disaster impacts requires the ability to sustain operational control and lifeline systems.

*Recognize that a government and private-sector investment priority should be lifeline facilities critical to risk and consequence management*

Facilities essential for response, core community functions and life safety – such as schools, hospitals and designated community shelters – and structures containing hazardous materials or processes should be provided with redundant power and other lifeline support capacity essential to sustain their operations and their ability to contain hazardous processes. Where water is essential for critical operations or maintaining cooling of industrial or nuclear facilities, redundant supply systems, with multiple redundant power sources, should be provided to ensure continued operations.
Create a culture of government oversight to ensure safe construction practices

Architectural and structural design have evolved in most countries to provide for protection from natural and technological threats. Engineers, government regulators and industry advocates develop consensus-based building codes and standards that reflect requirements for resistance to natural and technological hazards and threats, including earthquake, floods/tsunamis, wind and hurricane/typhoon forces. Special, enhanced building codes for design and construction of essential facilities such as schools, hospitals, fire and police stations, emergency operations centers and facilities that process hazardous materials are common. Unfortunately, even in countries where international standards and building safety codes are available, they may only be applied to major construction projects in the most urban areas, leaving the majority of buildings to be constructed based on practices that do not provide protection against fire, earthquakes, floods or winds. (Note: The reluctance of having government intervening in construction practices is not unique to developing countries. In parts of the central and southeastern United States, several states prohibit the application of mandatory building safety codes as they are viewed as an infringement on personal property rights.) It is not possible to create safe communities if individual structures are not designed to withstand the forces of the environment. Indeed, debris from buildings damaged by earthquakes, floods, tsunamis and wind can compound hazard impacts with additional battering and impact damage and can damage infrastructure and block transportation and access. Risk-guided building design that reduces structure failure will enhance protection of occupants, provide protection of hazardous processes, provide containment and prevent release of hazardous materials and control disaster propagation.

Require the peer review of design and construction of critical facilities

In order to ensure the most reliable design, construction and process regulation, significant structures and construction projects (high-occupancy facilities, unique designs, transportation systems and facilities, essential facilities including hospitals and schools) are rigorously peer- and third-party-reviewed to ensure designs meet performance standards appropriate for the occupancy of the structures.

Improving the regulation, oversight and construction of buildings will require a change in the culture of many bureaucracies and can only occur if there is a culture of professionalism and safety that is not influenced by corruption. Recent disasters in the garment industries in south Asia illustrate the challenge. Buildings were designed for a low-risk use and were then converted to high-risk occupancies without structural review or permits. Floors and heavy machinery are added to structures that were not designed for the additional height or the additional
loads. The author fears that the spontaneous collapse of the Rana Plaza could be repeated in hundreds of locations in the Asia-Pacific region if there were more than just the force of gravity acting on the structure.

**Implement regional threat alert and warning systems**

Regional alert and warning systems linked to national and international meteorological, seismic and environmental monitoring networks are essential to alerting businesses, industries, transportation operators and the general public to approaching threats. A few minutes’ warning of the arrival of earthquake shaking, intense winds and precipitation, or flood inundation would enable industries to power down hazardous industrial processes, erect flood barriers, prepare disaster management staff and notify the general population to evacuate to refuge locations. Shutting down hazardous processes would reduce the risk of injury and chemical releases, enabling containment. Earthquake early warning (EEW) during the Tohoku-Oki earthquake and tsunami provided notification to thousands of residents and resulted in the safe shut-down of the Shinkansen before strong ground motions arrived.

After the 2004 Indian Ocean tsunami, the Japan Meteorological Agency (JMA), UNESCO Intergovernmental Oceanographic Commission (IOC UNESCO) and the US National Oceanographic and Atmospheric Administration Pacific Tsunami Warning Center (PTWC) initiated a tsunami warning to provide notification of populations fronting the Indian Ocean.

Effective alert and warning requires a sustained investment in education and training to maintain public readiness and the maintenance of dissemination mechanisms to ensure system effectiveness.

**Identify and organize critical roles for national governments and the international community before a disaster**

As the frequency and severity of compound disasters increases, there is an increased need for international collaboration and enhancement of the disaster management capabilities at the national and local levels of government.

The role of national government would include establishing collaboration mechanisms among nations and regional alliances for the assessment of hazards and risk at the multistate region level. International collaboration could provide publication and dissemination of data, maps and education materials. To facilitate international assistance and collaboration they will need to negotiate protocols for response including communications, transportation debris movement, identification and sharing of technical expertise and specialized equipment, and planning for regional relocation of evacuees. Where there is limited experience or skills in compound disaster management, international consortia could form “centers of expertise” to provide technical assistance in mapping, remote data interpretation, creating databases for victim tracking and coordination on the delivery of international response, relief and recovery assistance.
Adopt and implement standards for emergency/consequence management

Critical to the building of a hierarchical network supporting compound disaster consequence management is the creation of a common, standardized emergency management system adapted to the unique needs of individual nations. The ISO has developed, through a collaborative international dialogue, standards that address both risk management (prevention) and emergency management (consequence management). ISO 31000 – Risk Management and ISO 22320 – Societal Security and Emergency Management could become the basis for national capacity building and international cooperation and collaboration. Other examples of standardized hierarchical emergency management systems include the National Response Framework, National Incident Management System, and Incident Command System in the United States based on the National Fire Protection Association (NFPA) 1600, Standard on Disaster/Emergency Management and Business Continuity Programs (NFPA 2007; FEMA 2007, 2008).

In addition to a common structure that would facilitate communication and collaboration, there must be a mechanism for training and validation of emergency management skills. Unfortunately, public official awareness and knowledge of disaster management are not keeping pace with the increases in disaster risk or our understanding of the complexity of large and compound disasters.

Understand the potential for compound disasters – modeling disaster risk

Efforts in the United States, Japan and Taipei, China have resulted in the development of risk modeling tools that comprehensively describe the impacts of complex disasters including floods, earthquakes and hurricanes. The effort was viewed initially as a tool to focus on estimation of economic losses but evolved into a geographic information system (GIS) based methodology and software program to estimate damage to residential, commercial and industrial structures, transportation facilities, hospitals and other essential services. It also quantifies casualties, fire ignitions, direct and indirect economic losses, homeless and short-term demand for sheltering. The software, HAZUS (FEMA-HAZUS MH 2012), was developed to support local and national preparedness, mitigation and consequence management actions. The input for the initial loss model was a hypothetical earthquake epicenter and magnitude that was converted into fault rupture and ground motions, which “shook” the estimated building inventory. The inventory is classified by occupancy, use and construction type. For 30-plus building types, fragility curves were developed that determined the state of collapse that would result from the input ground motions. Data from the building damage state was used to determine injury and casualties for each building type and to determine the probable number of fire ignitions. As the model was refined, investment in dense seismic networks in the western United States provided near real-time records of ground motions and ShakeMaps (USGS 2013b), ground motion maps
from actual earthquakes. Improvements in computer processing speeds, real-time telemetry of seismic data and refinement of the loss estimation software continued through 2012 with the development of flood, hurricane and wind loss methodologies in addition to the earthquake module, able to run estimates of disaster losses in near real time from either actual records of ground motions for earthquakes (where networks and building inventory data is available) or from the input of wind and flood data for the flood, hurricane and wind modules. Hypothetical scenarios for potential future disasters can also be run in HAZUS to provide a basis for planning, mitigation and training for risk and disaster managers. A map of expected ground motions for a M7.8 earthquake on the southern San Andreas Fault in California is illustrated in Figure 5.6.

The limitations of HAZUS and other estimation software are the costs and difficulty of developing building inventory data, occupancy models and fragility

*Figure 5.6 Sample scenario ShakeMap*
curves and defining the interrelation of damage, casualties and fire ignition in the building inventory. Similar software has been developed in other countries.

A second system that estimates the impact of earthquakes in near real time is Prompt Assessment of Global Earthquakes for Response (PAGER), a product of the United States Geological Survey (USGS) National Earthquake Information Center, with support from the Global Earthquake Model (GEM) of the US Agency for International Development Office of Foreign Disaster Assistance (USGS 2013a). PAGER uses data from the Global Seismic Network (GSN), LANDSCAN satellite data on population and Munich Reinsurance data on built environment exposure to estimate impacts of earthquakes throughout the world within minutes of occurrence. Neither HAZUS nor PAGER provide an exact picture of the disaster event, but they do provide an order of magnitude estimate of impact that can trigger strategic national and international response actions.

Tools such as HAZUS and PAGER offer promise in understanding the interaction of elements of a complex disaster, can support disaster scenarios for training, building public and official awareness, and help set priorities for strategic response to large compound disasters.

Adapting DRM tools to the Asia-Pacific region

The examples of government and industry regulations and standards listed in this chapter are the essential ingredients for reducing primary and compound risk. Yet, almost exclusively, they are the exception rather than the norm in developed, let alone developing, nations. The pressures for development outweigh the risk of unfettered and unregulated development. Many more countries have little or no engineering of structures, no building or construction codes and no land-use regulation and are, as a result, burdened by spontaneous and indigenous construction that poses daily threats to the lives and livelihood of residents.

Alternative approaches to a Western-oriented regulatory environment need to be explored. A January 2013 article in The Guardian describes the plight of Kathmandu, Nepal. In the period between the last M8.4 earthquake to strike the city in 1934, collapsing 80,000 buildings and taking 8,500 lives, the city has grown from 200,000 to 2.5 million residents, expanding across the Kathmandu valley. The national government is a weak constitutional democracy still recovering from a Maoist uprising in the last decade and is financially dependent on remittances from Nepalese working abroad. The article notes the Nepal Risk Reduction Consortium, as an innovative partnership among humanitarian, development organizations and financial institutions to focus on sustainable disaster risk management. The international initiative includes the UN, the Red Cross Movement, the World Bank and the Asian Development Bank, joined by the United States, United Kingdom, Japan, Australia and other governments and NGOs. The initiative has established five priorities for investment: school and hospital safety; emergency preparedness and response; flood risk management; community-based disaster risk management; and strengthening of institutions and risk management policy (UNNIP). The Nepal initiative is an ideal case study to determine which of the
previously identified risk reductions methods are appropriate and acceptable and would reduce losses in high-risk countries.

Invest in local risk and consequence management capabilities, creating a hierarchical disaster risk management/disaster consequence management approach

Lastly, there are the factors related to the capacity of the civil infrastructure to respond, the duration of the period of the event and resulting disruption, the availability of response and relief resources and the ability of the post-disaster environment to recover and support inhabitants. Most compound disasters evolve from smaller events when consequence management resources are not capable of isolating and containing the incipient threat. The risk of a compound disaster is therefore an aggregation of the risk posed by individual expected and unforeseen component disasters and the interaction of risk elements.

At all levels of government there is a need for a mechanism to provide context for understanding disasters that are beyond experience – a framework that addresses risk assessment for individual hazards, potential for cascading failures, compounded disasters or multiple simultaneous events (natural and manmade), and the sharing of knowledge and experience, particularly for low-probability but historic disaster events. However, there needs to be more than a “framework” for disaster risk management to be successful, and a discussion of approaches such as the Hyogo Framework for Action (UNISDR 2005), ISO 31000 – Risk Management, ISO 22320 – Societal Security and Emergency Management and the NFPA 1600, Standard on Disaster/Emergency Management and Business Continuity Programs (NFPA 2007) would be an appropriate beginning. Each of these documents suggests incorporation of disaster risk management into the development planning process (Hyogo Framework for Action - Strategic Goal #1); a hierarchical structure of the disaster risk and consequence management (DRM and DCM) structure that reaches from the neighborhood level through local and state government to the national government (Hyogo Framework for Action - Strategic Goal #2); and a systematic risk management approach that incorporates risk assessment, education and public warning, and enhanced response capabilities. The HFA emphasizes these concepts with specific recommendations for action. The recommended implementation strategies are enumerated in Table 5.2.

Create a hierarchical system to support DRM/DCM

Numerous frameworks for DRM/DCM recognize the need for a tiered approach to management that acknowledges the essential role of local capacity and action, supported by regional, national and international resources. Local structures recognize the cultural uniqueness of communities and can respond rapidly to events. Regional, national and international institutions can provide a broader base of
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<th>HFA Strategic Goals</th>
<th>HFA Priority Actions</th>
<th>Recommended Implementation Strategies</th>
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<tbody>
<tr>
<td>1 Integration of disaster reduction into sustainable development policies and planning</td>
<td><strong>Governance:</strong> ensure that disaster risk reduction (DRR) is a national and local priority with strong institutional basis for implementation</td>
<td>1 Include DRR as core element of training for government officials</td>
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<td>2 Make DRR a condition for investment by international development banks</td>
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<td>3 Develop and promote governance model for tiered implementation</td>
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<td>4 Provide technical assistance to national and local governments in developing DRR strategies.</td>
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<td>5 Provide audits and Certification of ISO Risk Management compliance</td>
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<td>2 The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, to build resilience to hazards</td>
<td><strong>Risk Identification:</strong> identify, assess and monitor disaster risks and enhance early warning</td>
<td>1 Establish a standard methodology for risk identification and assessment</td>
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<td>2 Establish regional clearinghouse for hazard and risk data and mapping</td>
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<td>3 Provide annual assessment of DRR status and achievements</td>
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<td>4 Develop case studies of DRR</td>
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<td>5 Support enhanced hazard monitoring networks and integrate alert and warning technologies into cellular telephony data systems</td>
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<td>3 The systematic incorporation of risk reduction approaches into the implementation of emergency preparedness, response and recovery programs</td>
<td><strong>Knowledge:</strong> use knowledge, innovation and education to build a culture of safety and resilience at all levels</td>
<td>1 Establish a Centre of Excellence in DRR to advance knowledge and innovation. Support with fellowships and research grants</td>
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<td>2 Create education “modules” on DRR for primary, secondary general education and for college and professional technical</td>
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<td>3 Training institutes. Provide advanced training fellowships for practitioners and government officials</td>
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<td>4 Support wide dissemination of simplified public information about DRR at local level through schools, NGOs, faith-based organizations (FBOs)</td>
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### Table 5.2 (Continued)

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<th>HFA Strategic Goals</th>
<th>HFA Priority Actions</th>
<th>Recommended Implementation Strategies</th>
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| **Reducing the underlying risk factors in various sectors** | 1 Focus investment on reducing poverty, eliminating corruption, strengthening culture of land use and building regulation and risk management throughout government.  
2 Enhance the capability of local governments to expand the capability of the NGO, FBO and community sector to expand services to vulnerable populations. | |
| **Strengthening disaster preparedness for effective response** | 1 Professionalize and standardize emergency management (EM) through common training and collaboration across sectors (public/private) and levels of government (local, national, international).  
2 Expand and systemize mutual aid among local governments and through government hierarchy.  
3 Convene regional threat monitoring system and collaboration to recognize insipient catastrophic compound disasters at early stages and organize mechanism for international “surge” of resources and expertise.  
4 Expand EM to train and integrate neighborhood, community and NGO organizations and resources in hazard identification and assessment process and response. | |

*Goals and priority actions from HFA, implementation strategies recommended by the author.*

Experience and expertise with large disaster events and resources but are constrained by time, distance, access and a lack of knowledge of local cultural values and needs. For example, the response to the Tohoku-Oki earthquake and tsunami was initially by local residents, followed days later by prefectural and national logistic resources and inter-prefecture mutual aid, and transportation and debris clearing equipment provided by the Japan Self Defense Force with support from the US military under Operation Tomodachi (Stars and Stripes 2011). Too
frequently the capabilities of local residents are not included in the formal emergency management and first response hierarchy and not incorporated in response plans and organizational structures.

The response to the Fukushima Daiichi reactor damage included regional, national and international expertise and resources. Some countries have a framework for accessing and integrating these extraterritorial resources, but others do not. In Haiti, before the country was confronted with a catastrophic earthquake, the dysfunctional civil government did not have the capacity to assess risk, mitigate hazards or prepare to respond, leaving response and relief efforts in the hands of local and international NGOs.

Managing compound disaster risk, within Kawata’s definition, would necessarily focus on the prevention of individual, single-hazard disaster events from merging or their consequences propagating. In both developing and developed regions, expanding development is a local as well as a national priority. Economic development is a key element of expanding opportunity; it is seen as a primary source of personal and national wealth and a source for support of social services and support for impoverished populations. Too often, any constraint on “unbridled” development is seen as challenging a landowner’s, a corporation’s, a community’s or a country’s attempts to improve their well-being. In countries where there is neither a tradition of protecting the health, safety and welfare of the citizens nor mature government regulatory processes for managing growth and development, development proceeds on the most convenient, least costly and most vulnerable land. The regulation of land uses for the public good and respecting environmental fragility and risk are not universally appreciated.

**Build CDRM from the neighborhood level**

As noted earlier, many frameworks and standards for DRM/DCM advocate a hierarchical structure from the local to the state, from the state to the national government. In nearly all disasters, the first response is from the family or neighborhood residents, performing search and rescue and fire suppression and providing initial relief services. In the United States, these disaster response behaviors have been incorporated into preparedness guidance provided to local governments. Community emergency response teams (CERTs) and neighborhood emergency response teams (NERTs) are organized by local government fire and police departments as dual-function activities providing neighborhood watch crime prevention as well as disaster response. Training is provided to neighborhood residents in fire suppression, light search and rescue and first aid. NERT/CERT organizations are usually the first to respond to emergencies, and their rescue of trapped victims and suppression of incipient fires may be able to prevent the progress of fires into conflagrations. They also provide an intelligence gathering function during disasters for local government response agencies.

Japan traditionally had a strong neighborhood structure, much like an extended family that would care for residents. At the end of World War II, these organizations faded in function as industrialization and urbanization moved residents into
central cities. After the great Hanshin Awaji earthquake in 1995, residents of Kobe resurrected the concept of the “Bokomi,” or neighborhood association, for a role in disaster preparedness and response. Organized around the neighborhood primary school, the Bokomi helped residents to identify hazardous materials and processes in their community such as dry cleaning businesses, paint stores and lumberyards. They created registries of the elderly and those with disabilities who would require assistance to evacuate during earthquakes, tsunamis or fires, and identified residents who could assist those in need. Bokomi also were trained by the local fire department in rescue and fire suppression with the hope that residents would put out small fires, preventing large urban fires. In Kobe city, the Bokomi post neighborhood maps indicating where firefighting equipment is located, local evacuation refuge areas and evacuation routes. Unfortunately, more than 15 years after their rebirth, the Bokomi have been difficult to sustain.

Integrate the community level into a hierarchical DRM structure

Every 17 January, 3 March and 1 September, respectively the dates of the great Hanshin Awaji earthquake in Kobe, the Tohoku-Oki earthquake and tsunami and the great Kanto earthquake in Tokyo and Yokohama, Japan commemorates the disasters, keeping the memory of the disasters in the public’s mind. Ceremonies include memorials to the victims and demonstrations of local government and citizen emergency services.

In many communities, the neighborhood organizations coordinate with and report to the local government emergency operations center and provide information and neighborhood-level situation reports to government responders, expanding the coverage of information gathering and provision of emergency services. In addition to these neighborhood organizations, community- and faith-based organizations and other NGOs attend to the needs of the most vulnerable residents, providing safety net social services to the homeless, elderly, single parents and those with physical and mental disabilities. Where they are linked to local social service agencies, they provide a network connection between government and individuals most vulnerable to disaster’s disruptions.

Make municipal/state-level governments the focal point for DRM

In the United States, local governments and community organizations are first responders, performing tactical response. Over the past 20 years, cities, states and the national government have professionalized the DRM/DCM services by standardizing organizations and functions through the application of the National Incident Management System (NIMS) for federal, state and local agencies and the Incident Command System (ICS) for field operations. The standard emergency management system comprises the standard organizational structure for all field and emergency operations centers, common terminology and descriptions of equipment and operations, and communications and reporting protocols. The standard system, training and responsibilities enable staff from one community to
work in another and expand the capability of local or state government in an
expanding disaster. In a developing compound disaster, the staff of an operation
can be enlarged as needed. The NIMS system also provides for access to scientists
and technical experts from the national government and augmentation of local
governments with mutual aid support from non-impacted jurisdictions. An
important element of standardization is the provision of peer review and assess-
ments of performance before and after disasters.

The primary role of state-level activity during large disasters is the management
of logistical support to local governments, finding personnel and resources
(mutual aid) from local and state agencies and the private sector, and managing
donations and volunteers. The state is also the interface with the national govern-
ment and is the conduit for acquisition of resources from the federal government
agencies.

It is important to recognize that this standardized system is hierarchical, with
command and control at the bottom level, vested in local government, and acquisi-
tion and provision of resources at the top. The logistics function (managing
transport of personnel and material) is jointly the responsibility of the state and
national government. NIMS incorporates the concepts and process of manage-
ment by objectives (MBO), defined authority for action, clarity of goals, account-
ability, agreed upon common priorities for action and continuous review of
performance.

Apply standardized management and organization tools
for multifunction and multinational DRM

The 2010 Deepwater Horizon (Gulf) Oil spill was the largest accidental oil spill
in history (4.9 million barrels of oil spreading over 10,000 km²); the blowout of
the Deepwater Horizon drilling platform released oil into the Gulf of Mexico,
devastating the coastal fisheries and communities in Texas, Louisiana, Mississippi,
Alabama and Florida. It was not, by conventional thinking, a catastrophic or a
compound disaster, but the response was extremely complex and illustrates the
importance of consequence management organization to effective risk manage-
ment. The physical damage to the coastal estuaries was distant from the release,
but it is still producing extensive environmental damage and economic losses to
the businesses that rely on fishing and tourism. The response to the Gulf spill was
massive from federal, state and local governments, the private sector and NGO
volunteers. The disaster provided an extremely complex human, environment and
political context for response that is illustrative of the type of emergency manage-
ment organization that can coordinate disasters occurring over a large area, across
multiple local, state, national and international boundaries, responding to com-
plex technical agents in a hostile environment.

To manage the consequences of the blowout, the US Coast Guard created a
unified command structure (FEMA Incident and Unified Command Systems); that
included all of the impacted state and local jurisdictions, environmental agen-
cies and private-sector responders. The Unified Command Operations Center did
not direct operational-level actions, but rather provided a forum for collaboration and coordination of all the public and private response activities and, by consensus, set overall priorities and resource allocation. The structure that was utilized – the unified command, area commands and incident management system – is the basic organizational response system used across the United States under NIMS and decentralizes command to the local level while ensuring coordination among governments and the private sector.

**Integrate national resources and expertise in disaster management in systematic approach to disaster management**

The national government should be responsible for providing funding to local governments for DRM, for disaster response planning and for DCM training, fostering standardization. Training is provided to state and local government personnel on how to access staff and material from national agencies, including the military. The national government also provides financial reimbursement to state and local governments for disaster response costs and for repair of government buildings. If international assistance is needed, the request would flow from the local government through the state to the national government for approval and action, relieving local first responders of the burden of coordinating acquisition of “foreign forces” and ensuring that local and national interests are a priority.

**Integrate disaster risk and consequence management**

Disaster risk management cannot sustain itself without a consequence management system that provides for the sharing of expertise and resources among public and private entities at the local community level and integrates support from the national governments, which are able to respond to disaster events that exceed local response capacity. This is especially critical for managing the consequences from compound, multi-jurisdiction or multinational disasters.

**Conclusion**

The potential for compound disasters is increasing as urban and industrial development concentrates populations in and around older cities which lack the infrastructure to provide water, sanitation and safe housing to new residents. Increasing populations and concentration of poverty have put ever greater pressure on aging infrastructure. In addition, the pressures for industrialization and efficiency have led to the development of complex logistics systems and “just in time” supply chains linking parts manufacture in Asia and Latin America with product assembly plants in North America. These technologies are dependent on telecommunication, information and transportation systems that, if disrupted, can impact the world’s markets. The potential for disruption is exacerbated by the concentration
of parts manufacturing in regions vulnerable to earthquakes, typhoons and flooding and thus communication and transportation interruption. The increases in risk have not always been accompanied by increases in mechanisms in the public and private sectors to manage or abate risk.

Managing the risks of compound disasters is dependent on managing the potential disaster risks associated with various physical, social and economic features that compose communities: their structures, housing, infrastructure, health, education, social services, business and industry. The critical elements of that risk management are effective land-use and development regulation, the application of best practices in architectural and structural design, fostering a culture that supports government regulation and building a capacity to respond systematically to disasters when they occur.

Compound disaster risk management cannot be separated from the broader context of disaster risk management. The core element of CDRM is the integration of a science-based risk assessment and planning processes for existing and new development. CDRM is also the aggregated sum of the component DRM at the local, national, regional and international levels. Numerous frameworks for disaster risk management, particularly the HFA and ISO standards, recognize the need for a comprehensive and collaborative tiered approach to risk management that values the essential role of local capacity and action, supported by regional, national and international resources. Investing in and strengthening local risk management will build the capacity at the community level, where investment is most effective.

Promoting science-based risk assessment and land development policy, coupled with a long-term investment and commitment to abating the risk posed by existing hazardous facilities and structures, will begin a decades-long transition to safer communities. Building standardized collaborative disaster consequence management capabilities at local, regional and national levels of government is also risk management and must be a counterpart to long-term abatement of hazards. The adapting and adopting, through national standards organizations, of ISO 31000 – Risk Management and ISO 22320 – Societal Security and Emergency Management will provide guidance for the development and promotion of increased capacity for risk assessment and management and disaster consequence management among nations in the region.

**Recommendation 4**

*Reduce the risk of compound disasters through a science-based risk assessment, land-use planning and construction oversight process for existing and new development; and prepare to manage the impacts of compound disasters through enhanced consequence management capabilities at the local, national and international levels.*
Notes

1 Koshino-san, Incident Commander, Iwate Prefecture, 5 March 2013, to a briefing of field survey team from the 3 International Conference of Urban Disaster Reduction, Morioka, Iwate.

2 EPA, 1986, Emergency Planning and Community Right-to-Know Act (EPCRA), United States Environmental Protection Agency, www.epa.gov/emergencies/content/epcra/index.htm. “The Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986 (EPCRA) was created to help communities plan for emergencies involving hazardous substances. The Act establishes requirements for federal, state and local governments, Indian tribes, and industry regarding emergency planning and ‘Community Right-to-Know’ reporting on hazardous and toxic chemicals. The Community Right-to-Know provisions help increase the public’s knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities, working with facilities, can use the information to improve chemical safety and protect public health and the environment.”

3 ISO, 2009, ISO 31000 – Risk Management, www.iso.org/iso/home/standards/iso31000.htm. “This provides principles, framework and a process for managing risk. It can be used by any organization regardless of its size, activity or sector . . . However, ISO 31000 cannot be used for certification purposes, but does provide guidance for internal or external audit programmes. Organizations using it can compare their risk management practices with an internationally recognized benchmark, providing sound principles for effective management and corporate governance.” ISO, 2011, ISO 22320 – Societal Security and Emergency Management – Requirements for Incident Response, www.iso.org/obp/ui/#iso:std:iso:22320:ed-1:v1:en, This document “. . . outlines global best practice for establishing command and control organizational structures and procedures, decision support, traceability and information management. Interoperability amongst involved organizations is essential for successful incident response. The standard also helps ensure timely, relevant and accurate operational information by specifying processes, systems of work, data capture and management. It also establishes a foundation for coordination and cooperation, ensuring that all relevant parties are on the same page during a disaster, minimizing the risk of misunderstandings and ensuring a more effective use of the combined resources . . . The standard encourages community participation in the development and implementation of incident response measures, to ensure a response that is appropriate to the needs of the affected population as well as culturally acceptable.”

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Managing the risk of compound disasters


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6 Financing and risk financing disaster risk reduction in Asia and the Pacific
Experiences and innovations

Reinhard Mechler

Introduction

The aspect of financing for disaster risk management has received substantial interest over the last few years, yet discussions have focused on the role of risk financing and generally remained in a sort of “insurance silo”, lacking lead-ins into a holistic perspective on risk management. Therefore this chapter explores the range of financial options that are available to governments and international bodies as one of the threads that link the chapters of this study. Some of the risk financing tools, such as insurance, are well established, but other innovative solutions are outlined. Another theme of the study is the role of national governments, who can use the mechanisms described to great effect.

The challenge: a need for up-scaling disaster financing and risk financing

Disasters have the potential to disrupt hard-earned developmental achievements. Financing is a key resource for tackling and coping with disaster risk in order to avoid such disruptions. Financing mechanisms can be used (i) after events to fund relief, recovery and reconstruction, and (ii) pre-event to support the implementation of disaster risk reduction (DRR). For the pre-event stage, two very different types of mechanisms can be distinguished: financing and risk financing instruments. Figure 6.1 illustrates these in conjunction with a stylized development cycle. The diagram suggests that improvements in developmental outcomes are intricately linked to investments into technology, human capital and other assets, which are funded by savings and credit. As elaborated in the introduction, disaster risk is a key threat to this cycle but can be tackled by DRR measures, such as risk reduction, preparedness and risk financing. A key factor (and gap) for implementing DRR is finance, which in a development context is often provided by donors, governments and multilateral development banks (MDBs).

The two mechanisms examined in this chapter address very different needs and questions but overall contribute by providing sorely needed financial means for dealing with disasters. The mechanisms are linked, as risk financing by way of a premium payment comes at a cost, which in principle should lead to enhanced efforts to reduce this cost by increasing DRR efforts.
This chapter is on financing and risk financing for (pre-event) disaster risk management. Both types of mechanisms need more attention in the Asia-Pacific region and globally. To this effect, there are four overarching questions pursued in this chapter:

- **How can one shift the financing balance towards more support for pre-disaster activity?**
- **What lessons can be learned from recent experience regarding such mechanisms?**
- **How are incentives provided for DRR?**
- **What are innovative mechanisms helping to support this agenda?**

Specifically, the chapter discusses how governments, donors and MDBs can help enhance the implementation of DRR measures before events strike as well as increase the provision of risk financing options in the Asia-Pacific region, in particular in Asian Development Bank (ADB) borrowing countries. Being one of the key threads for the study overall, a substantial part of the following discussion is on innovative solutions, which many times are being created and shaped in the Asia-Pacific region. In line with the rest of this volume, the discussion emphasizes the role and importance of pre-disaster risk reduction. The chapter specifically provides context and detailed discussion regarding mechanisms for bolstering economic safety nets (that need to be closely aligned with social safety nets) in order to help cushion against the adverse impacts arising from disasters, which is generally identified as a need in Chapter 4 (“The Social and Economic Challenge”). In terms of the overall messages of the volume, the chapter primarily deals with two concerns as highlighted in the introduction: (i) applying and integrating a rich diversity of tools for dealing with the financial aspects of disaster risk
management in the Asia-Pacific region; (ii) emphasizing the pivotal roles governments play in tandem with donors and multilateral development banks.

The discussion is organized as follows: after the context is set out in the next section, the mechanisms are outlined in the following section, which leads into the assessment of experiences and lessons learned in the financing and risk financing sections. The last part of this chapter derives a small set of final conclusions and recommendations.

**Defining the context: key issues in financing and disaster risk financing**

Two issues are fundamental to understanding the context for the discussion: (i) gaps in funding for DRR, and (ii) gaps in commercial insurance and lack of cover for the vulnerable and at-risk.

**Gaps in funding for DRR**

While there is a lack of both post- and pre-event financing, the bulk of spending on disasters is dispensed for post-disaster aid. As one example, of global spending on official development assistance (ODA) between 1980 and 2009, about US$91 billion was allocated to disaster-related activities, which is 2 per cent of total development assistance. Of this, about 96 per cent went into ex post facto response and relief and only about 4 per cent into pre-event risk management activities, which overall amounts to only 0.07 per cent of total development assistance (Kellett et al. 2013).

In the Asian region and for development assistance activities supported by ADB, the situation looks more favorable. As one example, 21 per cent of ADB loan and grant funding was found to predominantly support disaster risk reduction, and another 36 per cent partially supported DRR activities as well as general development interventions, while 41 per cent was spent ex post facto over the period 1995 to 2011 (Figure 6.2).

![Figure 6.2 ADB financial support for pre-DRM and post-event disaster management](Source: ADB (2012).)
Despite these more favorable indicators compared to the global perspective, a recent evaluation by ADB’s Independent Evaluation Department considered this level of preventive effort “less than responsive to Asia’s needs”, while it considered the degree of activities on disaster recovery management “highly responsive to needs” (ADB 2012). As recovery seems to receive sufficient and adequate attention, more is to be done in the region on pre-event attention. We discuss financing instruments that may help to shift this balance towards a stronger focus on pre-event measures.

**Gaps in commercial insurance coverage for the vulnerable and at-risk: a need for safety nets**

Risk financing is part and parcel of disaster risk management. As the recent IPCC SREX report holds, effective risk management portfolios involve sound risk analysis, risk reduction, preparedness and risk financing as well as governance. In terms of risk financing, the report suggests,

> Risk sharing and transfer mechanisms at local, national, regional, and global scales can increase resilience to [climate] extremes (medium confidence). . . . These mechanisms are linked to disaster risk reduction and climate change adaptation by providing means to finance relief, recovery of livelihoods, and reconstruction; reducing vulnerability; and providing knowledge and incentives for reducing risk. Under certain conditions, however, such mechanisms can provide disincentives for reducing disaster risk. Uptake of formal risk sharing and transfer mechanisms is unequally distributed across regions and hazards. (IPCC 2012)

This global expert review, which also examined the experience with risk financing measures in DRR, thus suggests key issues are affordability and the incentive link to risk reduction, which we will further examine in this chapter. Globally, insurance penetration for disaster risks varies substantially. As a matter of fact, insurance can be considered a luxury good, as coverage increases over-proportionally with per capita income. As shown in Figure 6.3, in the United States, parts of Europe, Oceania and Japan, average spending on premiums for non-life insurance (which includes disaster risk insurance) exceeds US$1,000 (in the United States more than US$2,000) annually compared to Africa and parts of Asia with less than US$10 in per capita premium. The averages, however, hide large differences in these regions. In Africa, for instance, there is virtually no coverage at all in a number of countries compared to a per capita premium in South Africa of up to US$500 (Munich Re 2006).

The insured share of economic losses has risen globally from approximately 10 per cent in the 1970s to about 30 per cent in 2011; yet the overall penetration for many hazards remains relatively low. Globally, storm risk, since it is often bundled with property insurance, has the greatest penetration with about 50 per cent of losses currently absorbed by insurance, followed distantly by flood
Insurance groups:
- Highly insured countries (> US$1,000)
- Well-insured countries (US$101–1,000)
- Basically insured countries (US$11–100)
- Inadequately insured countries (< US$10)
- No data

Figure 6.3 Global distribution of non–life insurance premiums per capita

Source: Munich Re NatCatService.
coverage at less than 10 per cent. Other hazards, such as earthquake, wildfire and lightning, exhibit even smaller coverage ratios. As recent experience with major disasters shows, even in high-income countries, households and businesses rely extensively on public assistance. After the 1995 Kobe earthquake, where only about 4 per cent of damaged or destroyed homes were insured despite a national public-private seismic insurance system, the government provided extensive assistance (IPCC 2012).

Insurance is a luxury good, yet on the other hand it provides high potential also for those who cannot normally afford this kind of luxury. As discussed in Chapter 4, there is a dire need for bolstering economic and social safety nets to absorb the impacts of disasters, and there are indications that without an economic safety net to fall back on, households and businesses may be stuck at low levels of income and in poverty traps, which they are unable to escape from with their own means (see Barrett et al. 2007). Overall, risk financing instruments contribute to DRR via the following direct and indirect channels. The instruments directly lead to DRR as they: (i) provide timely financial compensation after events for recovery for a premium payment pre-event, and thus reduce the follow-on consequences of disasters by an infusion of cash; (ii) share risks pre-event and, by taking out systemic risk, permit better resource-allocating decisions; (iii) also indirectly lead to DRR as the premium (which is proportional to the risk) by taking action. On the other hand, insurance-related mechanisms may also lead to disincentives (moral hazard) if agents rely on the financial security provided and relax preventive efforts, which thus may lead to increases in risk over time.

Thus a dilemma is how to help provide affordable risk financing/insurance coverage to those who cannot afford it but are in dire need of safety nets. As well, there is a trade-off between efficiency and equity: charging risk-based premiums to provide incentives versus subsidizing premiums to render insurance affordable. A report by the World Bank and the UN (2010) suggests that disaster insurance provides a positive contribution only if it is risk based (i.e. premiums charged are in line with the risk that the insured are faced with), thus in principle providing a price for the risk accepted. Others are suggesting that this leaves out issues of equity, and after all it is government’s role to provide compensation. Given these issues, it comes as no surprise that there is a wide spectrum of national insurance systems, which range from full private responsibility (UK) to publicly arranged and supported national insurance systems (Japan, Spain, France) to full public compensation (Netherlands). Thus salient questions for any deliberations on insurance systems are how to insure the uninsured (in a wider sense) and how to build in incentives for DRR while keeping equity consideration intact.

**Discussion of mechanisms**

When discussing the financing perspective on DRR, the incentive aspect is key. Agrawala and Fankhauser (2008) overall distinguish the following policy instruments relevant to managing risks: (i) insurance schemes (more broadly called here
risk financing instruments), (ii) financing schemes, and (iii) regulatory measures. Financing and risk financing instruments, the focus of this chapter, can be considered as economic instruments, as they can incentivize behavior for risk management through the loan and premium cost. Yet, as it will be demonstrated, the incentive effect is often not large, or may actually be nonexistent. These instruments are further introduced in the following sections before they are assessed in terms of the experience made and lessons learnt for the region.

**Financing instruments**

Financing instruments can be further broken down into financial instruments and subsidies. These mechanisms fall into the categories of loans and grants as well as price supports and guarantees (subsidies). Loans are financial tools to provide project funding, often combined with grants or guarantees. Loans are repayable debt where the creditor additionally receives a margin consisting of the interest and administrative costs. Loans can be combined in different ways with grants, so-called blending, either by charging interest rates below market level or by directly awarding payments for the investment or its implementation. Traditionally, the scope of financial instruments as policy tools is limited to projects that are financially viable but not bankable. Hence, projects generally are supposed to generate sufficient income to repay a loan (Bräuninger et al. 2011).

In the context of DRR, a particular challenge is that many DRR activities are not designed to create revenue at all. While some provide additional revenue – e.g. using drought-resistant seeds leading to higher yields, or reducing water consumption and cost through either different types or varieties of crops – many do not, such as building dykes, reinforcing structures or building resilience through enhanced preparedness. Subsidies are defined as “direct payments, grants, tax reductions, price supports or the equivalent thereof from a government to an entity for implementing a practice or performing a specified action” (Gupta et al. 2007). While subsidies have been criticized as inefficient policy instruments that lead to rent seeking by interest groups, which eventually reduces economic competitiveness (Porter 1990), public opinion and political decision makers have been more favorable towards this instrument (Sikora 2005). Thus subsidies have retained an important place in the catalogue of public policy instruments. Subsidies could be used to induce any type of proactive investments and behavioral changes. Subsidies can be differentiated by (i) direct payments, and (ii) indirect payments including tax reductions and price support. Grants constitute the purest form of a subsidy. Tax reductions belong to the group of indirect subsidies (or subsidies in a broader sense). They reflect a (partial) exemption from the obligation to pay a tax.

**Risk financing instruments**

Distinct from financing instruments, there are mechanisms for financing disaster risk. Generally, any discussion on risk financing instruments usually quickly leads
to a discussion on insurance. This review takes a different turn and starts more broadly by differentiating between post- and pre-event financing options in order to better lay out the whole spectrum of options available.

**Post- and pre-event options for dealing with disasters**

Table 6.1 exhibits the wide range of instruments available for dealing with the financial burdens imposed by disaster events. The spectrum of mechanisms helping to build economic safety nets is broad (see also Chapter 4). At the most general level, we distinguish mechanisms used *post-disaster* and *ad hoc* to cover the losses and financial impacts of events from those implemented *pre-disaster* and *deliberately*. The most usual course is to raise needed capital after a disaster strikes: individuals take out emergency loans from family, micro-credit institutions or money lenders; sell or mortgage assets and land; or rely on public and international aid. Likewise, governments raise post-disaster capital by diverting funds from other budgeted programs, borrowing money domestically, or taking loans from international financial institutions (see Murray et al. 2012).

These post-event mechanisms are useful and used, but as a general proposition they lack deliberate planning. While many of these ad hoc and locally based

<table>
<thead>
<tr>
<th>Table 6.1 Instruments for covering the financial burden of disasters</th>
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<tbody>
<tr>
<td><strong>Type of risk covered</strong></td>
</tr>
<tr>
<td>Post-disaster financing arrangements (post-disaster)</td>
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<tr>
<td></td>
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<tr>
<td>Pre-disaster financing arrangements (pre-disaster)</td>
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Note: Options marked in bold provide risk financing services

*Source*: Linnerooth-Bayer and Mechler (2007); Linnerooth-Bayer, Hochrainer-Stigler and Mechler (2012); Murray et al. (2012).
funding sources (for example, borrowing from neighbors or family) appear to work reasonably well for small and localized events, they are problematic for catastrophes that lead to covariate impacts, which affect large regions and whole communities at the same time, generally leading to a crunch of financial and other resources (Cohen and Sebstad 2003). Notable exceptions are extremely large-scale events that raise a lot of international attention and willingness to support. Although in the wake of recent mega-disasters – such as the Indian Ocean tsunami of 2004 and the Pakistan (2005) and Turkey earthquakes (1999) (see World Bank and UN 2010) – substantial amounts of donor and government support were received by the affected, these instances remain the exceptions rather than the rule. Catastrophic covariate events without heavy media attention generally test and overburden community resilience (see Freeman et al. 2003). As a general proposition, the experience also highlights the fact that there is no rightful claim for receiving support, which may be contingent on the size of events as well as media attention. This overall suggests it is not wise to build reliance (solely) on community support as well as national and international assistance for covariate events.

The spectrum of risk financing instruments

There is a wide variety of risk financing instruments implemented before disaster strikes. The spectrum is equally large and reaches far beyond insurance. Instruments comprise (combinations of) kinship arrangements, micro-savings, voluntary mutual arrangements specifying the extent of support to be provided after an event by neighbors and peers and, food storage. As well, governments set up budget reserve items to deal with the financial aftermath. The following box provides some insight into how formal and informal protection mechanisms are combined in Samoa to deal with disaster risk.

Samoa – combining formal and informal social protection

As a small island country, Samoa is highly vulnerable to disasters and global economic crises. It is one of the five most vulnerable states on the Commonwealth Vulnerability Index. To address such vulnerabilities, Samoa has both formal and informal mechanisms for social protection. For those in formal employment the government provides a National Provident Fund and a worker’s compensation scheme – with voluntary participation by those working in the informal sector. The government also provides a pension for everyone older than 65. But Samoa also provides support through traditional and customary practices: fa’a Samoa. This is based on the matai system of heads of families and the traditional obligations of the extended family to provide both social and financial security and protect the vulnerable. Communities collect cash and food which the matais allocate...
according to individual needs or for village enterprises, the church and ceremonial activities. Finance is primarily received from wages and remittances. The matai system is also embedded within national politics and government. Matais take almost all the parliamentary seats. This facilitates a strong combination of formal and informal social protection mechanisms (ESCAP 2013).

**Insurance-related instruments**

Going further, risk financing instruments can be purchased/organized by persons or a community at risk purposefully and in anticipation of risk affecting a certain place and region. Risk financing through key tools such as insurance shares risks before a catastrophe occurs and requires the use of pre-disaster arrangements in which the risk cedent incurs a cost in return for the right to receive a potentially much larger amount of money after a disaster occurs. The essence of these mechanisms is to hedge against covariate risk by spreading it beyond the confines of the community and often country, as well as spreading it over time. Households/businesses and farms can purchase property or crop insurance, which spreads risk both temporally and spatially. Insurance can be provided by micro-insurance programs, which are distinguished from other types of insurance by their provision of affordable coverage to low-income clients. Like individuals, governments can also spread risks temporally and spatially (Linnerooth-Bayer, Hochrainer-Stigler and Mechler 2012).

Risk financing through insurance and other hedging instruments spreads and pools risks, thus lessening the variability of losses, but does not directly reduce risk. By providing indemnification in exchange for a premium payment, insured victims benefit from the contributions of the many others who are not affected, and thus in the case of a disaster they receive a contribution greater than their premium payment. However, over the long run, insured persons or governments can expect to pay significantly more than their (expected) losses. This is due to the costs of insurance transactions and the capital reserved by insurance companies for potential losses (or reinsurance), as well as the financial return required for absorbing the risks. The “load” can be significant, as much as 500 per cent of the pure risk (expected losses) (Froot 2001; Mechler 2004). Still, people buy insurance, and justifiably so, because of their aversion to (large) losses – i.e., their concern about the volatility of the possible outcomes. Insurance and other risk-transfer instruments are thus justified by the concept of risk aversion, and it is because of aversion to large risks that people are willing to pay for insurance.

Many risk financing modalities are conventional, yet some, most notably intergovernmental risk pools, index insurance and catastrophe bonds, are novel and have been made possible by new developments in modeling risks and financial transactions (see Gurenko 2004). Whereas conventional insurance is written against actual losses, index-based (parametric) insurance is written against physical
or economic triggers. Index-based insurance is against events that cause loss, not against the loss itself. For example, crop insurance may be based on measures of insufficient rainfall at key points in the growing season or a loss index determined by the correlation between historical weather events and crop yields in a region. The insurer will pay out if rainfall measured by a rain gauge falls below a specified level regardless of crop damage. The major advantage of index-based insurance is the substantial decrease in transaction costs, which, particularly for developing countries, has impeded the development of insurance mechanisms. Risks of adverse selection and moral hazard facing conventional insurance systems are absent in the case of index-based programs. The major disadvantage is basis risk, which is the lack of correlation of the insurance trigger (signaling a payout) with the loss incurred. If the rainfall measured at the weather station is sufficient, but insufficient for isolated farmers, they will not receive compensation for crop losses.

As another novel insurance mechanism, a catastrophe bond is an instrument whereby disaster risks are packaged (securitized) in the financial markets (they can be parametric or indemnity-based). The investor receives an above-market return when a specific catastrophe does not occur in a specified time but sacrifices interest or part of the principal following a disaster event. Disaster risk is thus transferred to the international financial markets that have many times the capacity of the reinsurance market. Another advantage accrues to investors. By adding catastrophic risk to their investment portfolios, needed diversification is increased since natural catastrophes are not correlated with stocks and other investments tied to economic performance. There are also risks to this and other novel financial instruments, especially if they are not subject to national or international regulation and oversight (Linnerooth-Bayer and Mechler 2007).

Contingent credit arrangements do not transfer risk, but spread it inter-temporally. In exchange for an annual fee, businesses or governments obtain the right to take out a specific loan post-event with fixed conditions. The disadvantage is that the exercise of the right creates new debt, which can constrain future development (Mechler 2004). The Inter-American Development Bank and the World Bank have recently been pioneering work on this instrument.

Risk financing, risk reduction and incentives

As risk financing instruments are part and parcel of risk management, a key question pertains to what risks to cover by what kind of options. A key principle to observe here is that of risk layering, which means instruments are differentially applicable to different risk layers, segmented by the return period of events.

Figure 6.4 shows the range of options for risk financing as compared with risk reduction, with shading indicating effectiveness (the options in this chart accrue to governments, yet the same principle and elaboration would apply to households, farmers and business generally). Risk reduction is generally highly effective for more frequent risk. For less frequent yet more catastrophic risk with the potential to strongly affect government finance and the economy, a risk
Financing and risk financing

1 in 500 years

Extreme events
1 in 100 years
1 in 50 years
1 in 10 years

Frequent events

Return period of events

- Poverty reduction
- Health improvements
- Livelihood diversification
- Mainstream risk management into development
- Building codes and retrofitting
- Defensive infrastructure and environmental buffers
- Land-use planning
- Catchment and other ecosystem management
- Incentive mechanisms for individual actions

Donor assistance
- Risk transfer
  - Sovereign insurance
  - Catastrophe bonds
  - Intergovernmental risk pools
- Contingent loans
- Risk retention: budget funds

Regressing risk

Figure 6.4 Effectiveness of risk financing as compared to risk reduction

acceptance threshold may be passed. Beyond this threshold options such as contingent credit, sovereign insurance, catastrophe bonds and intergovernmental risk pooling become effective. By spreading risk across hazards and regions, regional, national and (potentially) global pools for public- and private-sector risks can greatly reduce the cost of risk bearing. Not all risk can be reduced or financed, and donor assistance will need to continue covering extreme risks.

In light of the significant costs of DRR risk financing instruments, the challenge is to identify how best to cover the different layers of risk and find an appropriate balance between instruments covering frequent risks and those covering residual risk. This includes also identifying a risk acceptance threshold and the lowest cost/risk solutions as well as better identifying links to risk reduction. Scaling up of support will be key and, as discussed later, external involvement of governments, donors and MDBs is required for supporting communities and local institutions, building risk culture, reducing transaction costs in terms of bringing the products to the people (e.g. by providing support for mobile phone infrastructure) and paying or subsidizing premiums.

As discussed earlier, risk financing instruments and DRR are intricately linked, and incentives and moral hazard are two sides of the same coin. Moral hazard and adverse selection have contributed to the reluctance of private insurers to enter many catastrophe markets, most notably flood risk, and motivated governments to form public-private insurance systems (Kunreuther 1998). Moral hazard can be countered with measures that provide incentives for insurance clients to take protective measures. Besides setting premiums to reflect individual risks, insurers can set high deductibles and otherwise fashion contracts that share responsibility
Reinhard Mechler

(e.g., co-insurance). Even in developed countries, however, insurers are understandably reluctant to invest heavily in monitoring risk behavior, preferring to rely on the government to regulate risk reduction measures.

Experiences in the Asian region with financing instruments

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Loans and grants, social funds, tax reductions.</th>
</tr>
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<tbody>
<tr>
<td>Experience</td>
<td>Regular delivery channels are MDB loans blended with grants to member countries. Tax reductions have not been used directly to incentivize DRR. Social funds extended to communities are receiving increasing interest.</td>
</tr>
<tr>
<td>Lessons learnt</td>
<td>Loans and grants have been important sources, yet as loans constitute new debt and DRR rarely directly provides revenue, there are some limits to the acceptability and affordability associated with lending for DRR projects. Mainstreaming of DRR with revenue-generating projects has occurred. Social funds target communities and have been considered effective, transparent and comprehensive in terms of contributing to building social safety nets.</td>
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</table>

ADB as the principal regional development bank in the Asia and the Pacific has been dealing with disasters throughout its provisions of development assistance and relief. While the historical focus has been on relief and recovery, ADB has been increasingly been addressing DRR since its Disaster and Emergency Assistance Policy (DEAP) was introduced in 2004. The DEAP essentially laid the foundation for mainstreaming DRR into ADB’s portfolio of development loans and projects, encouraging development planners to include risk reduction activities in their projects and programs.

A recent evaluation by ADB’s Independent Evaluation Department (IED) reports a significant number of loans and grants taken up in terms of pre-disaster projects vis-à-vis post-disaster project funding (ADB 2012). The breakdown reported between spending on disaster risk reduction projects versus disaster recovery has been 57 per cent/43 per cent in favor of financial support for pre-disaster activities, with 21 per cent predominantly allocated to risk management (see Table 6.2). According to the IED, of the DRR-related projects, the majority have been conducted to support flood risk management, and this more holistically as part of water resource management, irrigation and drainage efforts (see Figure 6.5).
integration may explain why the share of preventive loans is a magnitude higher as compared to the global evidence, which counts only direct spending on DRR. Overall, DRR projects supported by ADB have grown in actual volume from an average of US$0.2 billion over the period 1995–1999 to US$0.4 billion over 2005–2009, and to more than US$0.5 billion over the two-year period of 2010–2011.

Yet there seems more need for supporting pre-disaster activities, and overall the ADB review suggests there has been a lack of supportive instruments and processes to implement DRR in the ADB portfolio. A newly established Canadian-funded ADB Integrated Disaster Risk Management Fund (IDRM) offers a new form of support for DRR for Southeast Asia including links to climate change. Yet, as the

Table 6.2 ADB portfolio for disaster management\textsuperscript{12}

<table>
<thead>
<tr>
<th>Purpose of loan and grant</th>
<th>Volume (bn US$)</th>
<th>Volume (bn US$)</th>
<th>Share in ADB portfolio overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall DRR</td>
<td>6.0</td>
<td>57%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Predominantly supporting DRR</td>
<td>2.2</td>
<td>21%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Partially supporting DRR</td>
<td>3.8</td>
<td>36%</td>
<td>1.1%</td>
</tr>
<tr>
<td>Disaster recovery</td>
<td>4.5</td>
<td>43%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Emergency assistance loans</td>
<td>4.3</td>
<td>41%</td>
<td>1.3%</td>
</tr>
<tr>
<td>Non-emergency assistance loans</td>
<td>0.2</td>
<td>2%</td>
<td>0.1%</td>
</tr>
<tr>
<td>TOTALS</td>
<td>10.5</td>
<td>100%</td>
<td>3.1%</td>
</tr>
</tbody>
</table>

Source: ADB (2012).

Figure 6.5 Breakdown of DRR and recovery projects according to hazard type

Source: ADB (2012).
review also concludes, given the scale of disaster risk in Asia, there is a need to think about additional avenues for support. To add, as discussed earlier, DRR loans will often not (directly) lead to increased revenue, and it is thus unlikely that simply raising the amount of available loans (and the grant element) will also raise demand for such DRR-related projects. Given that it may be unsustainable in the long term to offer a large grant element in loans, which means a severe drain on ADB resources, integration of DRR with revenue-generating projects, such as water resource management, is essential. It is also important to look further outside of the box and examine other innovative mechanisms beyond loans and grants, such as social funds and using tax-based instruments.

Social funds as targeted grants to build community disaster resilience

Social funds are block grants provided to communities in order to enhance community assets, such as community facilities and infrastructure, as well as services such as microfinance and micro-insurance. The key defining factor is that these grants, extended by MDBs as a response to community proposals and channeled through government vehicles, are provided to communities who take local ownership and thus can decide locally where and how to enhance community resilience. Such an approach thus strongly provides for enhanced transparency and accountability in the local decision-making process. The World Bank is a key provider of such funds, and there has been massive growth of resources over the last few years (O’Donnell 2009).

To date, these grants seem to have been used in disaster management mostly for reconstruction and recovery activities, such as by the Kecamatan Development Program (KDP), which is implemented by the Government of Indonesia with support from the World Bank. This program provides block grants directly to Kecamatan (administrative sub-districts) and villages for small-scale infrastructure and social and economic activities. Originally planned as a post-conflict activity, after the Indian Ocean tsunami it became refocused on recovery needs. While it generates local employment, implementation overall also progressed more quickly than in other projects, and 1500 such projects have been carried out in the affected Indonesian area of Banda Aceh (O’Donnell 2009).

A few years back, a World Bank report evaluated social funds overall as very flexible and particularly innovative lending instruments for responding to natural disasters as they support building community disaster resilience. Additional key reasons stated for the positive evaluation results of such projects were cost-efficiency of the implementation, helping to institutionalize community-based disaster risk management, sound interaction with state and federal agencies on locally needed areas of interventions and also the potential for considering smaller scale hazards that often evade attention of more top-down oriented approaches (World Bank 2006). It may be surmised from this evaluation that social funds can be a key mechanism to help build enhanced social safety nets by strengthening community-based disaster management systems with internal support mechanisms (see also Chapter 4).
Tax reductions

Although tax reductions have not been well studied or documented for tackling disaster risk, they may be another tool to incentivize the uptake of DRR. For example, exemptions on value added taxes (VAT) could be granted for sales of drought- and heat-resistant crop seeds in agriculture. Another option would be to partially exempt sales revenues from corporate taxation. Households and businesses might be allowed to reduce taxable income by costs covered for disaster-proofing of buildings – again through VAT exemption or exemption of revenues from corporate taxation (see Bräuninger et al. 2011). Tax reductions are often rather easy to administer. However, there are basic arguments against tax reductions: they have equity implications, they add to the complexity and opacity of tax systems, their budgetary consequences can be difficult to estimate and they are prone to lobbying before implementation. All these aspects have to be carefully judged before introducing tax reductions (OECD 2010). Tax reductions can promote DRR in cases where the adaptive action is not undertaken or the desired action is greater than the actual position. The decisive factor is whether the tax reduction actually sets the incentive correctly. Therefore, this instrument needs to be designed carefully. On the one hand, the signal has to be strong enough. On the other hand, windfall gains by taxpayers for actions they would undertake anyway and large revenue losses by the government have to be avoided. Besides, the positive effects of (additional) DRR have to be weighed against the distortions created by tax exemptions. While the potential is there, there are no specific cases and lessons learnt documented in the literature.

Lessons learnt and perspective

Loans and grants have been used to support DRR mainstreaming in project implementation in Asia, leading to a fair share (when compared to the global evidence) of DRR-related projects as compared to recovery-focused activities. There is further need for up-scaling, but the fact that loans are repayable debt means that demand may never be massive. Another lesson derived is to link DRR projects with revenue-enhancing projects such as flood risk reduction with water management. Social funds provide an interesting and novel avenue for delivery and receive increasing interest. Tax-based instruments may have merit but have currently not been explored in DRR specifically.

Experiences in the Asian region using risk financing instruments

As discussed earlier and exhibited in Figure 6.6, building disaster resilience by using risk financing instruments can be broken down into providing coverage for public (sovereign) risk and private risk (property, agriculture and micro-insurance coverage for smallholders).13

Disaster risk insurance penetration in the Asia-Pacific region is rather low as compared to the United States and Europe. At the same time, heterogeneity
within countries is important as well, and there is a particular gap in terms of covering poor farmers and households, as well as governments and, for different reasons, megacities. These groups are unlikely to be covered by commercial insurance, and institutional innovations particularly in Asia are the key to covering these gaps. We discuss how commercial and alternative risk financing options currently provide financial coverage and further identify four kinds of innovations implemented and discussed in Asia: public-private insurance pools for commercial risks, micro-insurance covering poor households and small farmers, intergovernmental sovereign risk pooling and disaster insurance for megacities.

**Commercial property and crop insurance: removing barriers to market development**

**Instruments**
Commercial insurance for property and crops.

**Experience**
Gaining traction in the region, yet key market gaps include insurance culture, know-how and reinsurance capacity.

**Lessons learnt**
Need to build viable national public-private pools with the support of governments and international institutions.
Non-life insurance penetration in Asia is low overall at 1.5 per cent of GDP as compared to Europe (3 per cent) and the United States (4.5 per cent). Of course, there is strong heterogeneity in the region, with this indicator amounting to 2.1 per cent in Japan and Singapore at 1.6 per cent, yet Cambodia at 0.2 per cent and India at about 0.7 per cent (GFDRR 2012). As shown in Figure 6.7 for the ASEAN countries, it is well understood that insurance is a luxury good, and it can be expected that commercial insurance including property insurance uptake and supply will increase over time, as average incomes are expected to rise.

When using premium share as an indicator, the Asia-Pacific non-life insurance market is dominated by nine economies, with Japan and Australia covering the bulk (Figure 6.8).

With rising income, markets will expand, yet there are a number of key gaps and barriers that need attention. There has recently been a push by the insurance sector in the region, counterintuitively owing to some extent to the heavy losses over the last few years, to engage in the Asia-Pacific region, including building the requisite infrastructure, enlisting partners and setting up distribution networks. Overall, however, uninsured losses continue to grow, and, as suggested by ADB (2013), market players and governments seem to believe that there is a need for more holistically tackling commercial insurance as part of disaster risk management in order to address some of the primary barriers and gaps: inadequate insurance infrastructure, limited risk awareness, lack of solid risk management techniques, lack of insurance regulation and disaster laws, and a scarcity of solid information on losses as well as risks. Another key factor mentioned has been the high costs related to modeling risk as well as accessing reinsurance due to a lack of supply of reinsurance in the region (ADB 2013). Many of these market gaps and barriers require joint solutions across private and public sectors, and

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Figure 6.7 Non-life insurance coverage in ASEAN countries correlated with per capita income

Source: GFDRR (2012).
governments and donors already play important roles to remedy those, which will be discussed further.

One way to work around market barriers and gaps in low- and middle-income countries is to set up national public-private pools with large coverage. A key design question here is how to achieve maximum participation and avoid the problem of adverse selection. This can be achieved by making insurance mandatory, which, however, raises important questions of affordability and acceptability. The Turkish Catastrophe Insurance Pool (TCIP), providing coverage for earthquake risk, launched in 2000 in the aftermath of the large-scale Marmara earthquake of 1999, was the first of its kind to tackle the problem of insurance affordability in a middle-income developing country (Gurenko 2004) (see the following box).

**The Turkish Catastrophe Insurance Pool (TCIP)**

In response to high seismic risk, earthquake insurance policies are obligatory for all property owners in Istanbul and other high-risk urban centers. Property owners pay a premium based in part on their risk (but not their risk reduction measures, such as retrofitting their apartment buildings) to a privately administered public fund. The system does not apply to most of Turkey’s very poor households, exempting property owners in rural areas. To reduce premiums and thus make the system affordable to urban dwellers, the World Bank absorbs a pre-specified part of the risk by providing

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*Figure 6.8* Premium share for Asia and the Pacific (as per cent of premiums for the region)

a contingent loan facility with highly favorable conditions and contingent on the occurrence of a major disaster. In other words, if the fund cannot meet claims after a major earthquake, the World Bank provides low-cost capital to the pool (Ghesquiere et al. 2006). By making policies mandatory and risk based, and by providing for commercial and donor backup capital, TCIP designers attempted to avoid the problems of insufficient penetration and moral hazard experienced by the US flood and French all-hazards systems, respectively. The ambitions of the designers, however, have not been fully realized. Enforcement of compulsory policies has been weak, and penetration at about 20 per cent is far from universal. Even full penetration would not include the large number of illegal dwellings in Istanbul. Nor are premiums fully risk based, and some critics argue that the system should have been more closely linked with public spending for retrofitting high-risk apartments. Despite these serious issues, the TCIP is a first demonstration of a nationwide disaster insurance system in a middle-income developing country (Linnerooth-Bayer, Hochrainer-Stigler and Mechler 2012).

As another example, building to some extent on the Turkey model, in the Philippines a public-private earthquake insurance pool is under development to upscale domestic capacity to insure catastrophic risk.

**Towards a Philippines public-private earthquake insurance pool**

Despite significant exposure of the economy to natural disasters, insurance penetration in the Philippines is very low. In 2000, the non–life insurance premium collected was US$458 million, which amounts to only 0.6 per cent of GDP. It is estimated that less than 10 per cent of all residential property policies cover natural perils. The total number of fire policies with endorsements for catastrophic perils is estimated at less than 50,000, which appears to be extremely low for a nation of 80 million people. As a result, the cost of disasters is largely borne by government and homeowners. While no single factor can explain such a low insurance penetration for natural hazards, the underdeveloped state of the insurance market and low demand for insurance products seem to be key factors. The Philippines non–life insurance market is known to suffer from excessive fragmentation, fierce competition, low capital base, and, as a result, excessive dependence on international reinsurers for claims paying capacity. The market is currently served by 98 domestic and 12 foreign-controlled direct insurance companies. As a result, competition has led to low primary rates in almost all classes and underpricing of risk. Yet the low risk-bearing capacity of the local market makes it heavily dependent on international reinsurance, with the result being that tremendously volatile premium
Rates are charged to local consumers. In 2002, the hardening of the international reinsurance market prompted vigorous discussions among local insurers about the creation of a catastrophe reinsurance pool which over time could build up a surplus and thus reduce the dependency of the Philippines’ insurers on global reinsurers for catastrophe coverage. In order to strengthen national private insurance companies’ ability to underwrite new policies on catastrophe risk and enhance their capacity to proactively manage and transfer risk to international reinsurance companies, currently a public-private earthquake insurance pool is being explored with support from ADB, covering middle-class residential and small and medium-sized business property owners. The pilot, following similar models, such as that implemented in Turkey, will demonstrate the options for domestic insurance companies to expand available scope to cover private residential and SME earthquake risk and for the government to offset potential liabilities (World Bank-NDCC 2004; Varkay 2013).

**Lessons learnt and perspective**

With increasing income, disaster insurance markets are bound to expand, yet gaps, barriers and questions regarding efficiency and equity mean in practice that there is a huge variety of insurance market systems and different levels of coverage across countries and hazards. Insurers, governments, donors and MDBs are eager to more holistically tackle commercial insurance as part of disaster risk management and to seek joint solutions. One option following the Turkey model is to set up national public-private pools in order to maximize insurance penetration and increase access to and bargaining power with reinsurers. One key design question bringing affordability (equity) and adverse selection (efficiency) to the fore is whether to make such systems mandatory or voluntary.

**Micro-insurance: South Asia as the laboratory for disaster micro-insurance**

**Instruments**

Stand-alone or coupled micro-insurance for poor farmers and households.

**Experience**

Wide implementation across Asia, some still in pilot stages or yet to be “tested” by big events.

**Lessons learnt**

Provide coverage for many clients; tentative evidence of links to risk reduction. Mechanisms building economic safety nets are intricately linked to social safety nets.
Low-income households and farmers cannot easily afford commercial insurance to cover their risks. Without insurance culture, or support from family or the government, disasters have the potential to lead to a worsening of poverty as post-disaster the affected may take out high-interest loans (or default on existing loans) or sell assets or livestock. It has also been observed that farmers engage in low-risk, low-yield farming to lessen exposure to extreme events, which leads to reduced developmental outcomes. Heltberg et al. (2012) identify a number of erosive strategies in coping with the financial aftermath of events that may lead into a vicious cycle of poverty (see Table 6.3).

Distinct from non-erosive strategies, such as selling excess livestock and drawing on remittances or existing savings, livelihood erosion may occur with (i) selling productive livestock such as working or breeding animals, (ii) mortgaging or selling land, (iii) borrowing money at very high interest rates and (iv) over-exploiting natural resources (see also Barrett et al. 2007).

The intent of micro-insurance is to tackle livelihood erosion and to service low-income markets by offering limited coverage and greatly reducing transaction costs (Mechler et al. 2006). Until recently natural hazards have not been explicitly considered as a niche for micro-insurance because they impact large regions with multiple and simultaneous losses and thus are more uncertain and have higher potential losses than other types of insurance. The covariate or systemic nature of the risks – and the large capital reserves necessary to avoid insolvency – distinguishes catastrophe coverage from health, accident and other forms of micro-insurance. Given the challenges for providing micro-insurance for natural disasters, it is notable that programs have been emerging over the last decade with the support of governments, NGOs and international donors (see Mechler et al. 2006). Two types can be distinguished: stand-alone micro-insurance (usually for crop risks) and bundled insurance, which is coupled with loans and savings (see Table 6.4). As also evident from the examples that follow, these economic disaster safety net mechanisms are often provided by NGOs and microfinance institutions (MFIs) in an effort to closely integrate economic with social concerns.

### Table 6.3 Erosive and non-erosive strategies for coping with disasters

<table>
<thead>
<tr>
<th>Erosive</th>
<th>Non-erosive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selling productive livestock</td>
<td>Selling excess animals</td>
</tr>
<tr>
<td>Reducing food consumption</td>
<td>Consuming less-expensive or less-preferred food, or gathering wild foods</td>
</tr>
<tr>
<td>Selling agricultural or fishing</td>
<td>Drawing on kinship transfers of food or money, or reciprocal labor exchange</td>
</tr>
<tr>
<td>Mortgaging or selling land</td>
<td>Migration and remittances</td>
</tr>
<tr>
<td>Borrowing money at very high interest rates</td>
<td>Casual local work or temporary migration</td>
</tr>
<tr>
<td>Over-exploiting natural resources</td>
<td>Drawing on existing savings</td>
</tr>
</tbody>
</table>

*Source: Heltberg et al. (2012).*
**Table 6.4** Types of micro-insurance schemes covering disaster risk

<table>
<thead>
<tr>
<th>Type of schemes</th>
<th>Affordability</th>
<th>Financial robustness</th>
<th>Contribution to risk reduction</th>
<th>Government, client and donor participation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bundled insurance for credit and/or savings (e.g. Proshika in Bangladesh)</td>
<td>Mandatory if farmer or household takes credit or engages in savings arrangement</td>
<td>Relatively stable, but to a large extent protecting MFI/NGO operations</td>
<td>Contributes to reducing the financial burdens, some with disaster management plan</td>
<td>Less donor support necessary; insurance component not transparent for clients</td>
</tr>
<tr>
<td>Stand-alone micro-insurance for crop risks (e.g. BASIX in India)</td>
<td>Premiums low to some extent due to compulsory pro-poor regulation (such as in India)</td>
<td>To be tested by events, upscaling phase; increasing interest by insurers</td>
<td>Quick payouts reported; incentive for risk reduction inherent in index-based schemes</td>
<td>Donor involvement in initial technical phase, product development with clients</td>
</tr>
</tbody>
</table>

*Source: Author’s compilation.*

**Micro-insurance/microfinance schemes**

A number of schemes couple insurance to loans and savings in a mandatory arrangement if the farmer or household takes credit or engages in a savings arrangement. As one example, the micro-insurance program offered by Proshika in Bangladesh illustrates the *community-based* model, where local communities, MFIs, NGOs and cooperatives develop and distribute the product, manage the risk pool and absorb the risk, with no involvement on the part of commercial insurers (see the following box).

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**Insuring livestock with Proshika in Bangladesh**

Proshika in Bangladesh is one of the largest NGOs and MFIs in the world, with more than two million clients, and offers a number of micro-insurance schemes. One scheme is the Participatory Livestock Compensation Fund (PLCF). The PLCF was introduced in 1990, and it covers the loss caused by sudden death of farm animals and poultry, specifically cattle, goats and chickens. Each group of borrowers contributes 3 per cent of the purchase value of the animals to this fund, and in case of death the whole purchase value is compensated. This scheme experienced large-scale defaults in the massive 1988 floods that affected 73 million people, more than half the population of Bangladesh. As a response to the disaster, in 1991 a natural disaster management program was established, and since 1997 compulsory
group-based insurance is included. Under this program 2 per cent of the savings balance is annually transferred to a fund, which will pay twice the amount of the savings deposit in the case of property damages due to disasters, while savings stay intact. In the life policy component, a minimum of twice the savings balance will be paid out depending on the years of membership in the savings scheme (the outstanding loan will be recovered). With more than two million clients in 20,000 villages and 2,000 slums in 57 districts of the country, this insurance fund has wide geographic diversification. It covers 10 per cent of the whole population of Bangladesh for the property insurance and 25 per cent for life insurance. (Sharma, Hochrainer and Mechler 2010; Mechler et al. 2006).

If insurers with limited capital reserves choose to indemnify large covariate and recurring risks, they must guard against insolvency by diversifying their portfolios geographically, limiting exposure or transferring their risks to the global reinsurance and financial markets. With its lack of geographic diversification, it is not clear if the Proshika scheme can survive another massive flood or other catastrophic loss, as large areas of the country can be affected by disasters. Since the scheme operates without reinsurance or donor support, and without stringent Bangladesh regulations for insurer reserves, its financial viability is questionable. The Proshika scheme is not alone in this respect. A review of micro-insurance throughout Asia and Latin America showed little transparency or commonalities in the financial backup arrangements of private market providers (Mechler et al. 2006). The sustainability of the Proshika scheme and others like it has led many observers to recommend the partner-agent model, where commercial insurers play an important role (Linnerooth-Bayer and Mechler 2007). The Afat Vimo all-hazard insurance program sponsored by the All India Disaster Mitigation Institute (AIDMI) illustrates this model and is further discussed in the following box.

Covering households and small business with Afat Vimo, Gujarat, India

Since 2004 the NGO All India Disaster Mitigation Institute (AIDMI) has been offering a disaster insurance program, Afat Vimo, covering households and small businesses for 19 different types of disasters – including floods, earthquakes, cyclones, fires and riots – and covering close to 10,000 clients in Gujarat, India, mostly men and women running small enterprises. The micro-insurance scheme covers about 1,700 clients and is backed by two public insurance companies, which collaborated closely with AIDMI in designing the product, setting premiums, determining cover and underwriting the risk. On average, premiums are approximately 0.5 per cent of
the clients’ annual income. They are kept affordable by relying on voluntary help from the NGO and support from donors in the form of post-disaster and post-conflict interest-free loans to assure solvency. Because of the pro-poor regulatory requirements in India, the public insurers also subsidize premiums of their low-income clients from insurance in more lucrative markets. Finally, premiums are kept affordable by limiting coverage, leading some observers to claim that the main benefit of Afat Vimo has been to limit the debt that can quickly arise out of a disaster, but not necessarily to provide the poor with needed capital to fully restore their livelihoods (Sharma, Hochrainer and Mechler 2010; Mechler et al. 2006).

This partner-agent scheme appears to be both affordable to poor clients and, with backup capital from public insurers and donors, relatively resilient to large catastrophes. An important feature contributing to its expanding client base, according to its sponsors, is the long-standing relationship and trust with the communities it serves (Sharma, Hochrainer and Mechler 2010).

Index-based crop and livestock insurance: insuring the uninsured to promote development

As discussed, traditionally, insurers have paid claims based on actual losses (indemnity-based insurance), which requires extensive networks of claims adjusters who assess individual losses following an event. To avoid the high transaction costs of indemnity-based insurance systems, index-based or parametric schemes make payouts contingent on a physical trigger, such as rainfall measured at a regional weather station, thus circumventing expensive claims settling. In the case of weather derivatives, farmers collect an insurance payment if the index reaches a certain measure or trigger regardless of actual losses. These schemes may offer a less costly and thus more viable alternative to traditional indemnity-based crop insurance. Because of the physical trigger, there is no moral hazard; to the contrary, farmers will have an incentive to reduce potential losses, for instance, by diversifying their crops. Because they can access higher yield and higher risk crops, the insurance theoretically should promote cost-effective higher risk activities.

India has been the laboratory for such approaches, and in Asia currently, index-based insurance arrangements have also been implemented in Indonesia, Philippines, Thailand, Viet Nam and Mongolia (GFDRR 2012).

Index-based crop insurance in the BASIX scheme

BASIX in India set the pace for development in this arena. It was launched by a rural microfinance organization in the Indian state of Andhra Pradesh, which provides cash payouts – albeit to middle-income
The BASIX insurance program covers non-irrigated farmers in Andhra Pradesh against the risk of insufficient rainfall during key parts of the cropping season. The policies are offered by a commercial insurance firm and are marketed to growers through microfinance banks, which are linked to the apex microfinance entity known as BASIX. Claims are based on an index of precipitation, which is closely correlated with crop yield. The BASIX scheme owes its existence to international technical assistance provided by World Bank. The BASIX system has remarkably increased its penetration from only 230 farmers to over 10,000 over only a few years (Hazell et al. 2010).

Mostly index-based micro-insurance covers crop risks, and livestock risk remains largely indemnity-based. One key exception is the Mongolian index-based livestock insurance. In 2006, this index-based livestock insurance (IBLI) program was introduced on a pilot basis in three Mongolian provinces, and in 2012 it became available nationwide. Because of lack of weather stations and the complexity of dzud events (the event covered, which is a harsh winter leading to mass starvation of livestock), the index is not based on weather but rather on the overall mortality rate of adult animals in a given district (soum) determined by a mid-year census. The insurance system is made affordable to herders and viable to insurers by a layered system of responsibility and payment. Herders retain small losses that do not affect the viability of their business. Another layer of losses is transferred to the private insurance industry through risk-based premium payments on the part of herders. The financing of the government’s potential losses during the pilot phase relies on a combination of reserves and – as another layer – a contingent credit provided by the World Bank. As the pilot is nearing completion, deliberations are under way regarding follow-up. As a key consideration, the Mongolian government sees the insurance scheme as an integral element of DRR and seeks to motivate farmers to maintain herd size in keeping with the carrying capacity of the pastureland (DeAngelis 2013).

Experience with micro-insurance

There is limited empirical evidence regarding the impact of disaster micro-insurance. As one interesting example, a study by Sharma, Hochrainer and Mechler (2010) performed a client impact assessment across seven schemes in India, Bangladesh, Sri Lanka and Nepal in terms of impact on livelihoods, affordability, financial robustness, contribution to risk reduction and governance. The micro-insurance products assessed covered natural hazards and consequent risks specifically for tropical cyclones, floods, earthquakes, tsunamis and landslides/mudslides/debris flow, as well as fluctuations of extreme temperature and rainfall. A wide variety of assets were covered by the schemes ranging from savings and
loans to more traditional life, property and contents, and finally crops, for which two schemes used index-based crop insurance.  

Figure 6.9 shows responses of micro-insurance clients and the control group regarding their need to sell livelihood items post-disaster, as well as the take-up of risk reduction measures. As the chart shows, in four out of five schemes, the insured indicated less need for selling key livelihood items post-disaster as compared to a control group composed of uninsured. This can be taken to suggest that micro-insurance has helped to avoid livelihood erosion post-event in the majority of schemes.

Also, regarding the incentives provided for disaster risk management, the review recorded that for non–crop insurance schemes, reinforcing of homes seems to be undertaken significantly more often in two out of three schemes (right panel). These results are clearly tentative but suggest there is potential in further targeting such arrangements in order to support physical and financial risk reduction for exposed households and farmers.

**Lessons learnt and perspective**

There is wide institutional variety across micro-insurance systems, which are providing low-cost coverage for disasters to low-income households, businesses and farmers. These schemes, which are helping to build economic safety nets, are often intricately linked to efforts building social safety nets in terms of strengthening community-based systems and internal support mechanisms. While the potential for up-scaling is large, a challenge is to create economic safety nets – potentially backed by international expertise and capital – that can sustain major events and at the same time provide coverage to those who cannot afford risk-based premiums. To serve developing country clients who can afford sufficient coverage, the challenge is to create favorable market conditions by putting into place the requisite regulatory bodies, such that private insurers can operate in non-subsidized markets. Early experience with index-based crop and livestock insurance suggests that it can be a cost-effective alternative to indemnity-based agricultural insurance and

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**Figure 6.9** Impact on erosion of livelihoods items (left) and uptake of risk reduction measures in non–crop insurance schemes (right panel) for insured and non-insured respondents

*Source:* Bhavnani et al. (2010).
help to avoid moral hazard and adverse selection. The challenge is to design sys-
tems that can operate in countries with weak financial and regulatory institutions
that minimize moral hazard and promote public trust.

**Sovereign insurance and intergovernmental risk pooling: accessing fiscal liquidity in times of crisis and intergovernmental risk pooling**

<table>
<thead>
<tr>
<th>Instruments</th>
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</thead>
<tbody>
<tr>
<td>Sovereign insurance to protect the governments’ balance sheets. Intergovernmental risk pooling for fiscal liquidity support.</td>
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</table>

<table>
<thead>
<tr>
<th>Experience</th>
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</thead>
<tbody>
<tr>
<td>Many governments fiscally planning for disaster risk. Intergovernmental risk pooling established for Pacific Island countries following the Caribbean risk pooling model set up in 2007.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Lessons learnt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance of risk pooling is high, as fiscal impacts of disaster are potentially large. Integration with risk management and fiscal planning to happen. Incentives for risk reduction are low if there is a lack of integration.</td>
</tr>
</tbody>
</table>

A substantial part of disaster risk ends up in governments’ balance sheets due to
governments’ roles in providing public goods (public assets and infrastructure)
and public assistance for relief and recovery. Larger countries can generally well
absorb the impact of adverse natural events since the affected areas can be subsid-
dized by savings and revenues from unaffected areas, or tax revenue is employed
to provide support. This type of geographic distribution of risk is not possible for
many smaller, less diversified or fiscally less resilient states (Mechler 2004). Many
vulnerable countries have begun to think about using risk financing instruments
to hedge against disasters’ fiscal repercussions. As one example in the region,
almost all ASEAN countries budget and plan for disaster risk, and a number of
states engage in contingent credit (taken up by the Lao People’s Democratic
Republic, Philippines and Viet Nam), as well as take out insurance of public assets
in Brunei Darussalam, Indonesia, Myanmar, Philippines, Singapore and Thailand
(see Table 6.5). Yet while processes and procedures are being implemented, the
budgeted amounts remain very small and inadequate for tackling the increasing
burden from disaster risk (GFDRR 2012).

A limitation facing countries intent upon transferring their risk is that they pay
international prices subject to wide fluctuations. For example, the Caribbean
country of Barbados experienced a tenfold increase in insurance premiums after
Hurricane Andrew in 1992 despite the fact that the island does not lie in a major
hurricane path (Linnerooth-Bayer and Mechler 2007).
Partly to avoid this and other limitations, suggestions for intergovernmental risk pooling are gaining traction, with the role model being the Caribbean Catastrophe Risk Insurance Facility (CCRIF) established in 2007 to provide the Caribbean Community (CARICOM) governments with limited, but immediate, liquidity in the event of a major hurricane or earthquake. Early cash claim payments received after an event are foreseen to help to overcome the typical post-disaster liquidity crunch (Ghesquiere et al. 2006). With a number of caveats, the CCRIF experience seems to indicate that the experience has generally been favorable and acceptance among member countries high (World Bank 2012).

An obvious candidate for government risk pooling has been the Pacific Island region, which is heavily exposed to disaster risk. In order to support the process of tackling disaster risk including risk financing, recently the Pacific Disaster Risk Financing and Insurance Program (PCRAFI) was jointly established by the Secretariat of the Pacific Community (SPC/SOPAC), the World Bank and ADB, with funding extended by the Government of Japan and the Global Facility for Disaster Reduction and Recovery of the World Bank (GFDRR).

The mandate of PCRAFI is to reduce Pacific small island countries’ financial vulnerability to natural hazards through setting up a regional catastrophe insurance fund for Pacific governments designed to disburse payouts quickly when a policy is triggered. These funds will be used to finance the immediate post-disaster recovery, giving the affected government time to mobilize additional resources for longer-term reconstruction activities and avoid diversion of funds from other programs of work. The insurance is parametric, meaning payouts are made on the basis of instrumental observations (e.g. earthquake or storm magnitude and location), not according to the actual amount of loss caused by the event. The expectation is that losses will have occurred once trigger points are reached. While the facility will pool risk, it will also transfer a portion of risk to the international

<table>
<thead>
<tr>
<th>Country</th>
<th>Ex post</th>
<th>Ex ante</th>
<th>Risk transfer</th>
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</thead>
<tbody>
<tr>
<td>Brunei Darussalam</td>
<td></td>
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<tr>
<td>Cambodia</td>
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<td>Indonesia</td>
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<td>Lao PDR</td>
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<td>Malaysia</td>
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<td>Myanmar</td>
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<td>Philippines</td>
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<td>Singapore</td>
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<td>Thailand</td>
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<tr>
<td>Viet Nam</td>
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Source: GFDRR (2012).
financing and risk financing

through reinsurance, to limit its risk of insolvency from peak claims. The effort, including technical work on risk modeling, has been supported by ADB, the World Bank and SPC/SOPAC with financial support from the Government of Japan and the GFDRR. The World Bank has since taken on a role as intermediary between the island nations and a consortium of insurers and reinsurers providing financial cover (Jha and Stanton-Geddes 2013).

The strategy builds on an integrated, three-tiered financial strategy against natural disasters: (i) self-retention, such as a contingency budget and national reserves, to finance small but recurrent disasters; (ii) a liquidity mechanism for less frequent but more severe events, such as contingent credit; and (iii) a disaster risk insurance to cover major natural disasters. The strategy is supposed to be an integral part of comprehensive national disaster risk management and climate change adaptation planning, integrating the fiscal and the physical dimension of disaster risk management activities in the Pacific Island states. Based on the development of a comprehensive catastrophe risk information system (including geospatial information and risk modeling), pilot disaster insurance policies have been offered in January 2013 to the Marshall Islands, Samoa, Solomon Islands, Tonga and Vanuatu against earthquake and tropical cyclones using index-based triggers with technical assistance extended by the World Bank. 18

Lessons learnt and perspective

Insurance and alternative risk financing instruments can be used and are already providing security to vulnerable governments. There is significant potential for these instruments to supplement international assistance in assuring sufficient and timely capital for the recovery process. In light of the significant costs of these instruments, the challenge is to identify the appropriate layers of risk to transfer and the lowest cost/risk solutions. By spreading risk across hazards and regions, regional, national and (potentially) global pools for public- and private-sector risks can greatly reduce the cost of risk bearing. A challenge is to develop unified risk estimation procedures and a common risk culture for the regions and countries involved, as well as make a conclusive fiscal case for risk management.

While PCRAFI is in its planning stages, some lessons learnt from reviewing the CCRIF may be informative. Over the five years of its existence, CCRIF has clearly shown to be very relevant: member states are vulnerable to major economic losses from disasters and desire quick liquidity post-event, and there is no alternative insurance option. Stakeholders acknowledge CCRIF makes a timely contribution in “kick-starting recovery” (World Bank 2012). CCRIF also has had some impact, yet a key lesson learnt is that while it has helped members to understand their risks better, there is a lack of integration of CCRIF with fiscal planning and DRR in member countries. This lack has been a barrier to a more effective contribution to development by CCRIF and made it difficult to exactly assess its contributions. The generation of country risk profile of CCRIF’s participating countries is a good step towards this integration, yet an assessment of fiscal and economic benefits will be another integral step. It seems the PCRAFI
is explicitly and early on tackling this challenge by integrating the fiscal and physical dimensions of disaster risk.

**Megacity risk pooling: insuring infrastructure as the engines of growth**

<table>
<thead>
<tr>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pooling of megacity risk across the Asian region; focus on infrastructure as “engines of growth”.</td>
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<table>
<thead>
<tr>
<th>Experience</th>
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<tbody>
<tr>
<td>In planning stages; a recent conference developed first ideas.</td>
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<table>
<thead>
<tr>
<th>Lessons learnt</th>
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<tr>
<td>To be available once projects are implemented.</td>
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The last few decades have seen the rise of increased urbanization and the birth of megacities. According to some estimates, 2006 marked the year when for the first time, more people were living in urban areas than in rural areas, and this trend is predicted to continue (United Nations 2004). Megacities are the most extreme manifestation of this trend. Urban areas in Asia are among the world’s fastest growing and are expected to house 55 per cent of the estimated five billion Asians by 2030. By then, the 12 Asian megacities will house 10 per cent of the Asian population (ADB 2009). Disaster risk is a key threat to such dense urban spaces, as evidenced by events in the recent past. The Kobe earthquake of 1995 affecting the Kobe/Osaka conurbation resulted in 6,000 fatalities and more than US$100 billion in direct economic losses. The Tanshan earthquake in the People’s Republic of China (PRC) in 1976 represented one of the largest urban disasters in the 20th century. Death toll rates are reported to have been between 250,000 and 500,000 (Wenzel et al. 2007).

Predicted risk to a number of megacities is high. Other megacities are exposed to tropical cyclones (various cities in Japan and the PRC), earthquakes (for example Tehran and Tokyo) or urban flooding (Mumbai). Sea-level rise and therefore climate change are another key issue for megacities; out of the PRC’s estimated urban population of 400 million, 130 million live in coastal cities that are vulnerable to sea-level rise (World Bank and UNISDR 2008). Currently, 8 out of the 10 most populous cities in the world, including Metro Manila and Jakarta, have moderate to high earthquake hazard. Similarly, 8 out of 10 of the most populous cities are located on the coast and are vulnerable to storm surge and tsunami waves (ADB 2009). A risk index developed by Munich Re shows that there is dense concentration of at-risk mega conurbations in the Asian region (Figure 6.10).
Figure 6.10 Megacity risk according to Munich Re’s Risk Index

Accordingly, urban and, particularly, megacity disaster risk has risen in importance on the international agendas; megacities and disaster risk were systematically addressed already as a high-priority issue during the UN-sponsored International Decade for Natural Disaster Reduction (1990–1999), and lately climate change policy has been increasingly focusing on the role of cities and mitigation as well as adaptation to natural disasters (World Bank and UNISDR 2008).

As part of generally promoting the application of the disaster risk management paradigm (consisting of risk assessment, risk reduction, preparedness and risk financing as well as risk communication) to megacities’ stakeholders and decision makers, recently interest by city governments and the private sector has been voiced to explore whether megacity disaster risk may be suitable for a regional risk pooling scheme, broadly similar to the CCRIF.

Yet there are key challenges. Megacity disaster risk in developing countries is highly dynamic and difficult to assess, often comprising substantial amounts of informal settlement risks. This may limit insurance applications considerably, but a primary risk opportunity may relate to thinking about insuring public-sector liabilities for infrastructure, liquidity support and relief to population, similar to government risk pooling. Infrastructure can be considered the “engines of growth” and thus provide for a decisive impact when insured. A missing link identified in the current deliberations has been a gap in catastrophe modeling for megacities in terms of being state of the art. Also, in order to motivate insurance, a case needs to be made for risk aversion of megacities, which would entail better assessing channels and magnitudes of megacity-disaster follow-on impacts, supposedly affecting whole countries and regions (Hochrainer and Mechler 2011). While a good case still needs to be made and a pilot project started, MDBs, including ADB and donors, would have key roles to play in terms of technical assistance for risk modeling and transfer, identifying opportunities and identifying needs for entering into such efforts.

Debating the balance between equity and efficiency in supporting risk financing

All innovative risk financing schemes going beyond traditional commercial insurance discussed here are (or would be) supported by government and donor assistance to a lesser or greater extent. Roles for public-sector actors might thus take one or many of the following forms: (i) providing improved information (e.g. assistance in conducting risk assessments); (ii) fostering market institutions (e.g. insurance regulations) and market infrastructure (e.g. weather stations); (iii) assisting in the delivery and administration of insurance and risk financing contracts; (iv) reducing the price of high layers of risk (the low-probability, very-high-impact events) but maintaining the “pure risk price” on lower levels (e.g. by providing low-cost reinsurance or directly absorbing these risks) (see Linerooth-Bayer and Mechler 2007; ADB 2013). The following box provides a selection of key entry points for MDBs and governments as proposed by ADB (2013).
The role of multilateral development banks and governments in risk financing

MDBs and governments play important and synergistic roles in increasing the effectiveness of risk financing options. Synergistic roles are to:

- develop and improve systematic databases on hazard information, loss data and risk models to reduce start-up costs in disaster risk financing product development;
- provide leadership in the development and implementation of comprehensive and innovative DRF strategies and instruments;
- provide leadership to establish common methodologies, definitions and metrics for assessing exposure and losses – nationally and regionally.

Governments are fundamental for filling out the following roles:

- encourage and implement legal, regulatory and institutional reforms to allow developing country insurance markets to interface competitively with global insurance and reinsurance markets;
- take ownership of disaster-related public contingent liability;
- establish preconditions for ensuring access to quality reinsurance, such as a system of risk-based premium, sound capital requirements and rigorous insurance regulation and enforcement;
- engage with the private sector and international community to share data, draw on technical expertise and leverage resources.

MDBs, given their dual roles as financial institutions and development organizations, have a unique opportunity to act as catalysts and provide leadership to:

- mediate between governments and private insurance markets as part of a broader effort to develop closer partnerships between government disaster risk management agencies and global risk-transfer markets;
- lay the groundwork for regional DRF solutions, engaging in consensus building, assessing disaster risk, assessing technical capacity, supporting risk pools and assisting governments in accessing global reinsurance markets;
- access reinsurance markets directly to leverage MDBs’ own DRF capability (ADB 2013).
A key question is the rationale for engagement. Despite obvious benefits, the appropriate role of donors, NGOs and other international organizations with respect to their support of insurance in the developing world is controversial. The arguments can be roughly characterized as follows (see Linnerooth-Bayer and Mechler 2007; Linnerooth-Bayer, Hochrainer-Stigler and Mechler 2012).

Against outside assistance

Financial and other types of donor support for enabling insurance, especially if in the form of direct subsidies, will lower premiums and therefore lessen incentives for reducing vulnerability. Support for public-private systems risks crowding out private capital necessary for fledgling insurance markets. Donor institutions seldom make long-term commitments, thus jeopardizing the sustainability of insurance programs dependent on their support. For all these reasons, donors should restrict their assistance to correcting market failures, e.g. information deficits and the private provision of public goods.

For outside assistance

There are compelling reasons for investing in risk-transfer programs. By sharing responsibility with individuals and the state, donors and governments leverage their limited budgets and substitute a calculable annual commitment to a financial risk-transfer system for the unpredictable granting of post-disaster aid. What makes donor-assisted risk-transfer programs attractive are thus the mutual benefits to developing countries and the donor community in reducing the long-term need for assistance. Commercial insurance will not cover poor households and farmers unable to pay the (full) price, and the disaster insurance market is not fully efficient even without subsidies. Support for insurance is an alternative to post-disaster aid, which is characterized by even greater inefficiencies than subsidized insurance programs, as well as being ad hoc and undignified. Insurance as opposed to post-disaster aid can create a favorable environment for investment.

Overall, there are many issues of effectiveness, equity and efficiency both for and against donor support for insurance, and a middle way forward between those positions may be conducive. This might entail avoiding excessive support that distorts market prices and crowds out private capital but would enable highly exposed poor communities and governments to access risk financing. Donors may want to focus on sustainable, incentive-compatible insurance programs that serve clients not reached by the commercial markets, as well as to foster the development of sovereign risk-transfer instruments. One intervention that seems noncontroversial is providing comprehensive and robust data that can be used as a basis for risk financing transactions. As in many other regions, there is a sore lack of reliable, standardized and relevant information with many players engaged in data gathering, such as national and subnational governments, universities, insurers and reinsurers, government agencies and donors. Currently the community is seeing a big push towards open-source risk modeling, and examples include the
CAPRA platform hosted by the Inter-American Development Bank, the World Bank’s “Understanding Risk” Efforts, the UN’s global disaster risk model and report, and the Global Earthquake Model (GEM), among others. These efforts have already led to intense collaboration among key stakeholders on an improved risk data infrastructure that can be put to many uses including risk financing, which importantly demands data in probabilistic data format (probability in terms of return period and related losses).

Summary

This review and discussion has shown that in Asia interesting disaster financing and risk innovations are being implemented and provide important lessons for further fostering disaster resilience. In terms of risk financing, Asia is providing key examples of innovation particularly in terms of micro-insurance instruments. With increasing income, commercial insurance markets for disaster risk are developing across the region, potentially giving rise to regional or global reinsurance, which provide opportunities for effectively diversifying risk across the region and globally. Similarly, the emergence of strong financial markets offers additional options for insuring risk. Governments have important roles to play in terms of regulation and facilitating market development. However, given that commercial insurance will not cover poor household and farmers as well as governments and megacities, there are important novel institutional arrangements implemented and under way for building alternative economic safety nets that help absorb the adverse impacts from disasters.

The review demonstrates that risk financing instruments exist at all scales, serving households, low-income groups, farmers, small business and governments (while megacity risk pooling is being concretely debated). These economic safety net instruments, often closely linked to efforts strengthening social safety nets, demonstrate potential for protecting individuals, businesses and governments against weather shocks in many different contexts. Index-based systems insuring the event, not the loss, appear promising due to low transaction costs and the absence of moral hazard, yet, on the other hand, basis risk is a key concern. Innovation regarding financing and risk mechanisms is important, whereby innovation may relate as much to social innovation (setting up innovative group-based organizations, linking community-based organizations to microfinance and micro-insurance application) as well as technical breakthroughs (such as in terms of index-based insurance). All schemes surveyed receive support from governments, donors, MDBs, NGOs (via technical assistance, product delivery, premium subsidy and reinsurance), and there is debate as to finding the appropriate balance between solidarity (equity) and providing the right set of incentives (efficiency). One desirable feature of risk financing is a concrete link to risk reduction, for which some tentative evidence was found; yet more incentive compatibility will be desirable to work towards reducing risk as well as financing residual risk.

In terms of financing instruments, by way of assessing ADB’s project portfolio, we identified significant DRR mainstreaming activity in terms of both project loans and funding provided for financing DRR, which is significantly larger than
the global average. Yet, checked against the region’s needs, this has been considered insufficient, and it will be important to continue thinking outside of the box. Another lesson learnt is to link DRR projects with revenue-enhancing projects such as flood risk reduction with water management. A relatively new instrument, social funds, provides an interesting and novel avenue for providing sorely needed financial support helping communities to build resilience. Tax-based instruments may have merit but have currently not been explored in DRR specifically.

Overall, this chapter has discussed that effective portfolios of risk management involve the close integration of disaster risk financing with disaster risk reduction and preparedness, as well as financing instruments. Further, as generally discussed in Chapter 4, this chapter has shown that mechanisms for bolstering economic safety nets are intricately linked to efforts for enhancing social safety nets. Yet the financing of DRR seems underdeveloped, and it is important to “look outside of the box” to economic instruments governments usually divest, such as taxes, as well as further examine alternative grant funding, such as social grants extended to vulnerable and poor communities. In addition to further providing loans at favorable conditions, the mainstreaming of DRR into general development assistance projects (such as integrating flood risk reduction with water management) seems a useful way forward, as such project have the potential to raise revenue for paying back loans, which for purely DRR-focused projects is rarely the case. Also, schemes linking loans and savings with disaster (micro-)insurance have been shown to be widely used, particularly in South Asia. To this effect, it may well be interesting to consider integrating social funds with community-based disaster micro-insurance arrangements.

Scaling up of current risk financing systems is a key concern for the public and private sector, and MDB and government involvement is required for supporting institutions, building risk culture, paying or subsidizing premiums and helping to strengthen such instruments in both technical and social aspects for greater linkage to explicit risk reduction. In the ongoing debate regarding an appropriate balance for incentive compatibility coupled with financing support for risk financing schemes, a middle ground may be most helpfully defined, which may mean for donors and governments to further focus on (i) providing improved information regarding disaster risk, including developing open-source risk models; (ii) supporting processes that help to build community resilience with financial safety nets (e.g. through community-based organizations); (iii) reducing transaction costs in terms of bringing the products to the people (e.g. by providing mobile phone infrastructure support); (iii) absorbing high loss layers, which will bankrupt any scheme; and (iv) support the pooling of independent disaster risks across the region.

Recommendation 5

Support innovative financing and insurance-related instruments throughout the Asia and Pacific region, providing sorely needed financial resources to tackle disaster risk. Strengthen such instruments in both technical and social aspects for greater linkage to explicit risk reduction.
Notes

1 These data only include targeted DRR spending from development assistance and do not trace spending on development that builds disaster resilience, such as through enhanced infrastructure, schools and hospitals. While the numbers also do not include national spending on DRR by governments and the private sector, they nevertheless indicate the current strong emphasis in ODA on response and relief rather than prevention.

2 Projects qualified for partially supporting DRR if at least one component of the project was mentioned to support DRR activities based on a list of 21 disaster activities.

3 A luxury good is a good for which demand increases more than proportionally as income increases, which contrasts with normal goods, for which demand increases less than proportionally with rising income.

4 Insurance and other risk financing mechanisms are based on the Law of Large Numbers, which holds that with an increasing number of observations, the probability distribution can be estimated more precisely and the variance around the mean decreases.

5 Households or investors are averse to risk if they are willing to pay an extra price to reduce the risk rather than bear risk and pay for the losses from savings or out of pocket.

6 *Adverse selection* refers to the common fact that only those at high risk choose to insure, leading to an unbalanced insurance portfolio.

7 *Moral hazard* is the disincentive provided to those insured (or with reasonable expectation of government support) to take further action to reduce risk.

8 This instrument is also often termed a catastrophe deferred drawdown option (CAT DDO).

9 One also speaks of residual risk for such layers.

10 Projects including dedicated DRR projects as well as other projects that incorporate and support building resilience.

11 Loans and grants (as well as multi-tranche financing and technical assistance) have been lumped together into a kind of blended instrument and were not separated out further.

12 Some 264 natural disaster–related interventions were identified, made up of 104 loans (US$8.6 billion), 67 grants (US$1.3 billion), 6 multi-tranche financing facility projects (MFF) (US$415.7 million) and 87 technical assistance operations (US$96.8 million).

13 This also includes coverage for commercial risks.

14 Non-life insurance includes disaster insurance by way of property and crop insurance but also covers other insurance types such as health insurance.

15 Brunei Darussalam is an outlier due to specific regulatory requirements.

16 The impact assessment covered the following organizations: BASIX (India), Self-Employment Women’s Association (SEWA, India), All India Disaster Management Institute (AIDMI, India), Yasiru (Sri Lanka) and Proshika (Bangladesh). One disaster product was surveyed for Yasiru, AIDMI and SEWA, while two different products were surveyed for BASIX and Proshika, bringing the number of products evaluated to seven.

17 A total of 2,171 surveys were completed with 1,640 client evaluations and 531 responses from non-insured clients.

18 See www.yokwe.net/index.php?module=News&func=display&sid=3132

19 Standardly defined to house a population exceeding 10 million.

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Financing and risk financing


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Part 4

Governance structures for disaster risk management
7 Disaster risk management at local and community levels

Rajib Shaw

Introduction

This chapter introduces Part 4 of this study, which explores the theme of governance of DRM and CCA at varied levels. This is one of the main threads that link the various chapters as they highlight the pivotal role of national governments in promoting sustainable risk reduction policies and practices. A further specific theme of this chapter concerns the application of innovative solutions, where seven models are described of DRM being applied creatively at local, community levels.

It is argued in substantive literatures that disaster risk management is important and essential at the local level. Almost 25 years ago, Maskrey (1989) made strong arguments for a community-based approach in disaster management. After that, different literatures and cases of disasters documented, argued and advocated for risk management to be undertaken at the local level (Victoria 2003, 2009; Shaw and Okazaki 2003; Delica-Willison 2005; Kafle and Murshed 2006; Shaw 2012a). Local governments and communities are often the first responders after the disasters. Also, they are possibly the last entities to remain in a place after the external assistance is withdrawn. Thus, it is of utmost importance that the links between the local community and local government are strengthened through the policy environment.

Many development agencies have been proactive in implementing community or local DRM. In the recent Global Platform for Disaster Risk Reduction (GPDRR) in Geneva in May 2013 (UNISDR 2013), participants strongly urged that the future need is to implement the Hyogo Framework for Action (HFA) at the local level. The chair’s summary especially emphasizes the need for “leading at the local level.” It mentions,

Disasters happen locally and solutions are to be found locally. This does not relieve national governments of their responsibilities to establish a framework and enabling environment for local action. However, municipalities and local authorities are in unique positions to lead and create opportunities for local partnerships and to take risk-informed decisions that protect the continued potential for economic and social development. Sound urban development
and spatial planning, including attention to informal settlements, migration, safe housing, infrastructure and social services, were called for. Focus was placed on efforts to ensure that all schools and hospitals are built to resilient standards, that all necessary school and hospital preparedness measures are in place and that attention has been given to the needs of persons with disabilities.

Community-based disaster-related activities are termed differently over time. More than 100 years ago, before the existence of most of the states, people or communities were taking care of themselves through collective actions during the disasters. After the formation of the state, government-based disaster risk reduction programs started, which failed to serve the needs of the people and communities. Over the last 20–30 years, we are now again talking of the need for community-based disaster risk reduction. Thus, a community-based approach is not new. Rather, we are going back to the old, traditional approaches of risk reduction. Community-based disaster management (CBDM) was a popular term in the late 1980s and 1990s, which gradually evolved to CBDRM (community-based disaster risk management), and then to CBDRR (community-based disaster risk reduction). CBDRM and CBDRR are often used with similar meanings, with enhanced focus on “risk”; however, there still exists a thin line of distinction. While CBDRR focuses more on pre-disaster activities for risk reduction by the communities, CBDRM focuses on a broader perspective of risk reduction–related activities by communities, during, before and after the disaster (Shaw 2012b).

With the preceding context, this chapter focuses on the local DRM approaches with attention to policies and practices. In the next section, a few primary issues are discussed to emphasize the need for DRM policy at the local level. A few cross-cutting issues are described which are considered possible entry points of DRM policy. Several examples from the Asian region are provided to exemplify some of the issues and challenges described in the earlier section, and finally a set of recommendations are provided for effective implementation of policy on local DRM. The key theme of the chapter is to develop innovative solutions at local levels, which can be linked to the national and local (city- or province-level) governance system to provide a holistic approach to risk management. This chapter will have close links to the social and economic challenges reflected in Chapter 4 (“Social and Economic Challenges”), which also illustrates that the key impacts of social and economic challenges are often faced at the local and community levels. Innovation is the key to community-based disaster risk management, and this is reflected in the next part of the chapter.

Primary issues

This section describes a few primary issues which show the need for the local DRM policy. These issues can be in a natural context (location and nature of hazards), social context (like diversity of community), institutional context.
Local and community levels

(related to the national and international priorities and sustainability issues) and so forth.

Changing nature of disasters

The nature of disasters, especially the hydrometeorological disasters, is changing and becoming more of a local phenomenon (especially in terms of rainfall pattern). In the last several years, catastrophic rainfall has been causing serious damage in urban areas. In 2005, the city of Mumbai, India, had a downpour of more than 944 mm; rain began in the afternoon, when Mumbai City, the suburban areas and the entire region were struck with a heavy storm, and lasted for 24 hours, forcing the city to a standstill. In the afternoon, Mumbai City, the suburban areas and the entire region were struck with a heavy storm. More than 780 people lost their lives, and the direct economic loss was calculated at US$120 million (UNESCAP 2009). Similarly, unprecedented rainfall of around 750 mm devastated otherwise dry areas of Barmer, in the state of Rajasthan, India, causing the loss of more than 200 lives. This is regarded as a once-in-200-years flood and the first in the recorded history of Barmer.

In Jakarta, Indonesia, in 2007, a total of 750 mm of rainfall caused huge economic losses and severe impacts on the people and their livelihoods. In Japan, in 2011, there was catastrophic rainfall in the Mie and Wakayama prefectures, and one typhoon event brought 1,400 mm of rainfall, almost 80 per cent of the average annual rainfall of the area. These are some instances of shock events (like typhoon, catastrophic rainfall etc.). The same phenomenon is also observed for stress events (like drought). In their book on Asian monsoon drought, Shaw and Nguyen (2011) pointed out that the concept of drought in the Asian monsoon region is very much local. This is more a water management issue, rather than the perennial drought found on the African continent. Drought is occurring in parts of Bangladesh, Viet Nam and Cambodia, the countries known for their regular annual flooding. Thus, the local nature of disaster is becoming quite prominent due to changing patterns of rainfall, which is often related to the climatic changes. This indicates the increasing need of local capacities (at the government, nongovernmental and community levels) to cope with these disasters.

Diversity of communities

It is a well-accepted fact that the community varies from place to place and its perception of and ways of responding to disaster also varies. Therefore, it is important to decentralize the policy and to customize it based on the local needs and priorities. For a large country in Asia like the People’s Republic of China, India or Indonesia, individual provinces have different cultural, socioeconomic and ethnic contexts. Thus, the risk reduction activities also need to be customized based on the local context. A comparative analysis (Ochiai and Shaw 2009) of the 2004 Aceh tsunami and the 2005 Yogjakarta earthquake shows that Yogjakarta had a unique community participation culture (locally called Gotang Royang or mutual
help), which was very effective in the recovery process. Thus, the role of housing facilitators was different in the case of Yogyakarta (housing facilitators were used in technical problem solving) than that of Aceh (where a housing facilitator were used for social problem solving). Thus, the community character defines the level of community involvement and participation. Even within the same city, an analysis of the situation reveals that the social capital changes from place to place (Nakagawa and Shaw 2004). In Kobe, in the district of Mano, the social capital was properly used in the recovery process due to a strong community leadership, which helped provide faster decision making compared to other areas of the same city. A similar observation is also found in the case of the Gujarat earthquake recovery (Nakagawa and Shaw 2004), which showed relatively faster and better quality recovery with a specific community group as compared with others.

**Evidence from past disasters**

There is increasing evidence from the recent disasters that the well-aware and well-prepared local governments and local communities can minimize the impacts of disasters. A classic example is Japan, which has had a tradition of a central-government-dominated disaster management system. However, in the case of the Kobe earthquake of 1995, it was the local communities and neighbors which helped 98 per cent of the survivors, and the remaining 2 per cent were rescued by the formal rescue operations. After the Kobe earthquake, Japan’s focus was not only to enhance community preparedness but to make networks of local governments in the form of alliances, to help each other in times of disaster. An outcome of the alliance was that the neighboring cities and prefectures helped the city of Toyooka after the 2004 typhoon disaster to overcome the disaster debris and waste (UNEP 2005). After the 2011 Great East Japan Earthquake and Tsunami, the Union of Kansai Local Governments (Kansai Union) provided support for the dispatch of experts and personnel, provision of emergency relief goods and temporary accommodation of affected populations. Kansai Union is composed of seven prefectures (Osaka-fu, Kyoto-fu, Hyogo-ken, Wakayama-ken, Shiga-ken, Tokushima-ken and Tottori-ken) in the Kansai region.

Similar observations were also found in many disasters in developing countries. The famous Cyclone Preparedness Program (CPP) of Bangladesh focuses on the capacity building of local residents as the volunteers, keeping in mind that the local communities are always the first responders. In 2005, in the South Asian earthquake, it was the local communities who made the majority of search-and-rescue operations, since most of the roads were damaged due to earthquake-induced landslides, thereby affecting the access of the formal search-and-rescue team.

**Increasing global awareness of local needs**

Over the past two decades, there has been increasing global and regional awareness of the effectiveness of local needs and priorities. Most of the global and regional frameworks, including the HFA, urges local capacity building and policy
making. The Report for the HFA Mid-Term Review (UNISDR 2011a) admitted that there was still an insufficient level of implementation of the HFA at the local level. In addition, the 2011 ISDR Global Assessment Report (GAR) mentions that the central role of local governance in disaster risk reduction (DRR) and DRM is acknowledged by most countries, and also added that a failure to strengthen local governments and make progress in community participation means that the gap between rhetoric and reality is widening (UNISDR 2011b). This gap is being targeted through international initiatives such as the ISDR World Campaign for DRR, “Making Cities Resilient 2010–2015” (UNISDR 2010), which promotes local governments from around the world taking action in implementing DRR activities.

Sustainability and proactive expansion issues

Community involvement often faces the problem of sustainability over a longer period of time (Shaw and Okazaki 2003). Government, nongovernmental and international organizations implement various programs before and after the disasters. Many of them are very successful during the project period; however, some of them gradually diminish as the years pass. There are many reasons for the gradual decrease of people’s involvement in a project. The most common elements are partnership, participation, empowerment and ownership of the local communities. Unless the disaster management efforts are sustainable at the individual and community level, it is difficult to reduce the losses and tragedies. While people should own the problems, consequences and challenges of any mitigation or preparedness initiative, it is necessary to see people’s involvement in a broader perspective, which is related to policy and strategy. Continuation of community activities over a longer period of time needs a policy environment at the local level, as well as local institutions to continue the activities. Thus, even though the initiatives are started with NGO interventions (as most of the community-based activities in Asia are observed to be), it is important to link them to the local government activities and incorporate them into policies to ensure sustainability and replication of innovative efforts to other disaster-prone areas.

Enhancing DRM through local/national linkages

Needless to say, community or local DRM is not independent of national-level activities. In fact, there has been increasing awareness both in the country and in international institutions that the local DRM should be strengthened with the institutional support from the national governments. However, the major challenge is limited capacity of local governments where local capacity does not match local government responsibilities. Thus, the national and local issues are discussed in the context of two perspectives: the HFA and legal and institutional dimensions.

Capacity building of DRR by local governments is the key area to enhance local DRR actions and to address challenges (UNISDR 2011b). What are the major
elements and obstacles in terms of capacity of local governments? It was pointed out that they are challenges due to the priority issues at local levels (McBean and Rodgers 2010). The primary goal of any politician is re-election. In the process of ensuring political success, however, preventative and preparatory measures are often underemphasized because they may not provide immediate results (McBean and Rodgers 2010). Due to this priority issue, budget allocation is one of the challenges local governments face regarding DRR.

It was noted in the mid-term review of the HFA that a number of countries had passed laws assigning local governments legal responsibility for DRR management without passing budget allocations for this responsibility. Thus, the problem of local-level action for DRR remains a serious concern (UNISDR 2011b). Progress in HFA implementation is monitored by UNISDR through the two-year reporting cycle for the HFA national progress report by countries (Matsuoka et al. 2013). During the reporting cycle of 2009–2011, 133 countries participated and 82 countries submitted their national progress report to UNISDR by May 2011 (UNISDR 2011b). Initial data from the 2009–2011 HFA reporting cycle indicated that only 20 countries reported dedicated budget allocations to local governments; these included most Caribbean countries. While there are a few examples of budget allocations to local governments, many countries (65 per cent of all reporting countries and 80 per cent of lower-middle-income countries) report that local governments have a legal responsibility for DRR management. However, some governments, especially of high-income countries or those with very decentralized systems, may not have reported budget allocations to local governments because local administrations have independent revenue sources from direct taxation and receive limited amounts of funding from the national level (UNISDR 2011b). In the absence of a fiscal grant system that explicitly puts DRR on the agenda of local governments, it is unlikely they will achieve the mainstreaming required for effective action unless local voices are sufficiently strong to advocate for a prioritization of resources at the local government level in favor of DRR.

Decentralization also affects DRR by changing funding arrangements, which in turn affect the overall level of finance available for DRR. In order to mainstream DRR, it makes sense to incorporate it across all areas of a local budget, rather than concentrating DRR finance within a particular fund. However, evidence from Mozambique, South Africa and Colombia shows that un-earmarked funds for DRR are frequently diverted to other areas that have a higher political profile or where there are apparently more pressing needs (Scott and Tarazona 2011). The policy literature tends to assume that decentralization automatically increases participation, which, in turn, is inherently beneficial. There is little empirical evidence to support this view, and it is increasingly being questioned by decentralization experts. In relation to DRR, the presence of decentralized governance systems does not automatically lead to participatory DRR. Effective decentralization of DRR can be constrained by low capacity at a local level (Scott and Tarazona 2011).
The other key element for local DRR capacity is the coordination on DRR activities. Issues of implementation of the HFA at the local level, or lack thereof, and the capacity of governments to coordinate it with other efforts, such as local-level socioeconomic development plans, were also raised consistently throughout the mid-term review. Legal provisions have helped in certain levels to link the national and local issues on DRM. The recent Disaster Management Acts of different countries (India, Pakistan, Indonesia, Philippines and Bangladesh) focus on the issues of a legal framework for local DRM. It calls for capacity building of local authorities, enhancing funding for local institutionalization and creating partnerships among different stakeholders at the local level.

The brief review of national-level progress suggests that action at the local level was consistently noted as in need of improvement (UNISDR 2011b). As DRR is a cross-cutting issue, it is crucial to have a multi-stakeholder consultation among relevant sections and divisions within a local government to serve as a comprehensive approach. Social demand for DRR, especially at the local level, is closely linked to an effective use of truly multi-stakeholder consultative mechanisms and the involvement of community organizations. Limited capacity of local governments on DRR is the central issue to be addressed in this chapter, with a specific focus on two major challenges within their capacity in terms of budget allocation and coordination.

One of the frameworks considered promising is the Paired Assistance Program developed in the People’s Republic of China. It was established by the PRC government to promote efficient recovery from the 2008 Wenchuan earthquake, in which 19 provinces or cities under the direct control of the central government of non-affected areas were paired up with municipalities in the stricken area, bearing the responsibility to support restoration of the respective municipality. Almost all of the restoration projects of the program have been completed within three years of a specified duration. The Paired Assistance Program can basically be regarded as a framework suitable for other mega-disasters with certain refinement based on the local context. A few advantages of this framework are as follows. First, pairing with a fixed counterpart tends to secure sustainability of the support required for long-term disaster recovery. Second, fine-tuned support is possible by utilizing the distinguished features of municipalities or expertise of organizations that provide support. Third, it tends to raise a sense of involvement of the whole country by involving municipalities very far from the stricken area to provide support. Fourth and finally, it tends to realize equality in the sense that the support can extend to all the affected areas and the burden of support providers can be made even.

Critical issues

Some of the critical issues of and ways to implement DRM in the local context are reviewed. Five specific issues are chosen, which have direct linkage and significance with the local DRM: habitat (housing), health-related issues (including sanitation), livelihoods, education, and environment and natural resource
management. Although it can be argued that infrastructure (especially road and bridges) plays an important role, most of the responsibility belongs to the provincial or higher-level authorities rather than the local stakeholders.

**Housing**

The housing sector is one of the key issues at the local level, and it needs attention in terms of vulnerable housing. In the post-disaster context, shelter construction has been a major area where specific aspects of the local DRM can be implemented. Several good and bad practices exist on this issue after major disasters (Davis 1978; Jha 2010; IRP 2008). While minimum standards of shelter reconstruction have been laid out in the Sphere Standards, such efforts are still grossly inadequate in delivering housing that people want to live in. Numerous agencies work in the affected areas for shelter provision in the aftermath of major disasters. Different approaches are adopted in different areas, with varying materials, sizes and processes. There are, however, certain basic guiding principles for immediate shelter after disaster that must be followed, whatever the approach taken (Sharma 2009).

**Health**

There are several complex issues under the broad umbrella of health components in DRM. It varies depending on post-disaster or normal time. While it is important to focus more on issues of sanitation and waterborne disease in most of the developing countries (some of them are considered a result of climate change), the focus on medical teams in the post-disaster rescue and relief (both of physical and mental health) is also an important health-related aspect (UNFCCC 2009; Kien and Shaw 2009). Adverse effects often appear because of the traumatic experience caused by the disaster. These reactions include hyperarousal, re-experiencing the event and avoidance. Healing spontaneously within one month from such a state is called acute stress disorder (ASD); if the symptoms persist for more than one month, it is called post-traumatic stress disorder (PTSD). In contrast, stress responses during a disaster appear not only in victims but also in the relief workers, who are referred to as “hidden victims” (Isayama and Shaw 2014).

**Livelihoods**

It is evident that the local economy is affected when a natural hazard or a disaster strikes. The disasters are detrimental not only to the lives but also to the source of livelihoods and productive assets. Disaster impacts in developing regions are potentially grave as they affect agriculture, sanitation and lack of water and food supplies, and the consequent loss of living space and livelihood could lead to the migration of people towards “safer” places. Direct economic loss of disaster is obvious and much talked about. However, in this section, emphasis is given to the small-scale livelihoods, where people find it hard to recover from the mental
Local and community levels

The damage is maximum for self-sustaining small-scale industries relying on indigenous infrastructure (Srivastava and Shaw 2012).

Education

Local DRM needs to be strongly linked to formal and non-formal educational systems. Realizing the crucial role of DRR education, there is a need to focus on implementation of DRR education in terms of safer schools, enhancement of resilience capacity and reduction of losses from disasters. As the inherent attribute of education lies in the interrelation of the management level of policy makers and school managers and the practice level of students and communities, it is important to develop a comprehensive approach to promoting DRR education at both policy and school levels. Besides, when considering DRR education, integration of DRR into education curricula only is not enough to bring about meaningful risk reduction. It should also include related issues such as structural and non-structural safety, legislative basis, management mechanism, qualified human resources, sufficient funding, strong collaboration, proper warning system and risk assessment, among others (Gwee et al. 2011; Thi et al. 2012).

Natural resources

With the increasing dependence of local communities on natural resources (especially in the rural and semi-urban areas), the local DRM needs to be linked to sustainable use. Environmental conditions may exacerbate the impact of a disaster, and vice versa: disasters have an impact on the environment. There are many adverse effects of the environmental degradation on human vulnerability and disaster: deforestation, forest management practices, agriculture systems and so forth exacerbate the negative environmental impacts of a storm or typhoon, leading to landslides, flooding, silting and ground/surface water contamination (Tran et al. 2009). Therefore, a sound local DRM should be linked to the local environment and natural resource management policy (UNEP 2005; Uy et al. 2012; Tran and Shaw 2012).

One of the key challenges here is to integrate CBDRM issues across these issues, which are often dealt with by different entities in local governments. The approach needs to be linked to the local practices, not necessarily always in the name of CBDRM, but involving local communities in the respective issues as stated above and providing ownership of the process. Risk reduction needs to become a thread linking all these different issues.

Key examples of local DRM

Based on the discussion in the previous sections, this part provides a few examples of implementing local DRM from the Asian countries. As described previously, the key theme of CBDRM is its innovative approaches. Every community is
different and needs to deal with the local culture and context. The following section provides examples of some of these innovative models. The examples are characterized as follow:

- Locally institutionalized model linked to governance system
  - Philippines example of using calamity fund as a part of barangay DRR council
- Local indigenous model
  - Gujarat, India (link to indigenous practices)
- Youth-led DRR model
  - Philippines SK (youth council)
- Risk communication model
  - Indonesia (with faith-based groups)
- School-based model
  - Da Nang, Central Viet Nam, and Saijo, Ehime prefecture, Japan
- Welfare-based model
  - Kobe, Japan, Bokomi (welfare and DRM)
- Governance-based model (local compliance system)
  - Post-disaster Aceh reconstruction, Indonesia

Local institutionalized model linked to governance system

In the Philippines, the government has emphasized the key role and exercise of leadership responsibilities of local government units (LGUs) since 1978. This was reinforced with the passage of the Local Government Code in 1991, which devolved most of the national government functions to LGUs. The community level is considered to be the appropriate level for disaster preparedness intervention, where community members experience different degrees of access to community institutions and resources (depending on social status and social capital), which is reinforced by substantial social pressure to abide by rules and norms embedded in the community structure (Allen 2006).

In 2010 the Philippines Disaster Risk Reduction and Management Act (Republic Act No. 10121) was finally enacted. The new law provides for the development of policies and plans and the implementation of actions and measures pertaining to all aspects of disaster risk reduction and management, including good governance, risk assessment and early warning, knowledge building and awareness raising, reducing underlying risk factors and preparedness for effective response and early recovery.

At the local level, a Local Disaster Risk Reduction and Management Fund (LDRRMF) is appropriated amounting to not less than 5 per cent of the estimated revenue from regular sources as mandated under the Local Government Code of 1991 to support DRM activities such as, but not limited to, pre-disaster preparedness programs including training, purchasing life-saving rescue equipment, supplies and medicines, post-disaster activities and the payment of premiums on calamity insurance. In the same way as at the national level, 30 per cent
<table>
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<tr>
<th>No.</th>
<th>Model</th>
<th>Country/City</th>
<th>Key points</th>
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<tbody>
<tr>
<td>1</td>
<td>Locally institutionalized model linked to governance system</td>
<td>Philippines</td>
<td>• Local Disaster Risk Reduction and Management Fund is institutionalized as per the Disaster Management Law</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Enhances sustainability and local capacities</td>
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<td>2</td>
<td>Local indigenous model</td>
<td>Gujarat, India</td>
<td>• Post-disaster recovery experiences</td>
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<td></td>
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<td></td>
<td>• Validation and utilization of local knowledge in housing reconstruction, and linked to mason training by local governments</td>
</tr>
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<td>3</td>
<td>Youth-led DRR model</td>
<td>Philippines</td>
<td>• Youth council as the institutionalized base of risk reduction with specific budget and annual work plan, from city to sub-district (barangay) level</td>
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<td></td>
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<td>• Linked to the science clubs at school level</td>
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<tr>
<td>4</td>
<td>Risk communication model</td>
<td>Indonesia</td>
<td>• Faith-based group (for Islamic religion) plays an important role in the risk communication</td>
</tr>
<tr>
<td></td>
<td></td>
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<td>• Country-wise network, and presence of mosque and its leader at village and neighborhood level makes its reach to the grass-root levels</td>
</tr>
<tr>
<td>5</td>
<td>School-based model</td>
<td>Da Nang, Viet Nam</td>
<td>• Linked to local education board for its sustainability (disaster education conducted in each school of the city)</td>
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<tr>
<td></td>
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<td></td>
<td>• Included in the teacher’s training (in-service and pre-service) for its sustainability</td>
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<td></td>
<td>Saijo, Ehime Prefecture, Japan</td>
<td>• Linked to the non-formal education system in every school</td>
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<td></td>
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<td>• Formation of teacher’s group for promotion of disaster education in city’s risk reduction strategy</td>
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<tr>
<td>6</td>
<td>Welfare-based model</td>
<td>Kobe, Japan</td>
<td>• DRM is linked to the health and welfare system of in the neighborhood level through formation of community groups</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Provides city supports and volunteer supports to ensure sustainability</td>
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<tr>
<td>7</td>
<td>Governance-based model</td>
<td>Aceh, Indonesia</td>
<td>• Provides a compliance system in the post-disaster recovery process</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Ensures quality control of the product (infra or housing) and process</td>
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of the amount appropriated for the LDRRMF is allocated as quick response force. Before 2010, most of the remaining fund was used for post-disaster activities. With the enactment of the disaster risk reduction and management law, it is now specified that 70 per cent of the LDRRMF can be allocated for pre-disaster preparedness activities. This shift indicates that the government is heading towards a more risk-reduction-oriented agenda.

Local indigenous model

During the aftermath of the Bhuj earthquake in Gujarat, India, in 2001, an innovative project called PNY (Patanka Navjivan Yojna, or Patanka New Life Plan) was launched, a joint endeavor of a number of organizations (led by SEEDS, an NGO in India, and supported by the United Nations Center for Regional Development [UNCRD]) in India and Japan. The project was implemented in the village of Patanka, in the district of Patan, a neighboring district of Kachchh. There were two major components of the initiative: reconstruction and rehabilitation of the model village, and training and confidence building through shake-table demonstration testing. The characteristic feature of the initiative was to focus on the holistic approach of rehabilitation, where specific attention was given to the improvement of livelihoods. The other aspect of the initiative was to establish a model of cooperation among different stakeholders from government, nongovernmental, academic and international organizations. The emphasis was on formulating a strategy for effective disaster reduction that could be applicable to a wider geographical area with different cultural and socioeconomic conditions. The key point is the adoptability of safer building practices and their application.

Traditional Gujarati housing has two basic attributes, namely, spatial planning and building systems. Both these aspects are products of evolution over hundreds of years. As a result they both are optimized for the prevailing local context. Spatial planning takes care of the lifestyle of the people, which is primarily that of agriculturist. It also helps to conform the life to the local environment. The building system, on the other hand, protects the house against the elements such as rain, wind, sun and other climatic elements. It has been observed that damages to these buildings are mainly due to failure of the walls and roofs. The heavy weight of the roofs causes much damage to the structure. The walls are not jointed properly, and therefore, each wall behaves differently during shaking, resulting in the failure of the structure. Also, sometimes smaller fragments of stones are used to infill the walls, which have usually two bigger stones for inner and outer walls. These smaller stones often fail to retain cohesion, and the wall thus separates into its component pieces. Apart from these traditional buildings the damaged structures also include those made of stone with cement mortar and those made of bricks in mud and cement mortar. All these features point out that the building practices need improvements. One obvious solution
is to give training to masons and engineers in safer building practices. A field shake-table test was performed to provide confidence in people regarding the seismic improvement of houses; showing the difference between normal construction versus improved construction is one way.

This example of a recovery program emphasizes a few aspects of local DRM learning: 1) working closely with local government and local communities enhances sustainability and up-scaling of the initiative; 2) the recovery program needs to be embedded in local cultural, climatic and socioeconomic contexts; and 3) linking the recovery program to livelihoods is an important contribution to local economic uplift.

**Youth-led DRR model**

The Filipino youth have been highly encouraged to participate in politics and governance, and the Philippines is the only nation in the world that has a mechanism of involving the youth sector in governance, through the *Sangguniang Kabataan* (Youth Council, or SK). As a case in point, the Philippines Disaster Risk Reduction and Management Act of 2010 encourages the youth to participate in disaster risk reduction and management activities, such as organizing quick response groups, particularly in identified disaster-prone areas, as well as the inclusion of disaster risk reduction and management programs as part of the SK programs and projects (Fernandez et al. 2012).

Through the SK, young people between the ages of 15 and 21 can directly participate at all levels of governance: *barangay*, municipal, city, provincial and national. There are around 41,995 youth councils all over the Philippines, corresponding to the total number of villages. Each SK has its own annual budget, which is 10 per cent of the total *barangay* budget (Fernandez and Shaw 2013). The SK chairman automatically sits in the *Sangguniang Barangay* (Village Council) as ex-officio member and as chairman of the Committee on Youth and Sports, one of the standing committees in the village council.

Examples of recent autonomous SK involvement in DRR include the comprehensive “Training/Workshop on Integrating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) into Local Development Planning,” organized by the SK Provincial Federation of Quezon province in July 2011, in coordination with the Philippine Rural Reconstruction Movement (PRRM) (Fernandez and Shaw 2013); the SK participation in the “Life Boat Handling and Rescue Operations Training,” organized by the municipality of Famy, Laguna, from June to July 2011 (Fernandez et al. 2012); the training on the basics of disaster risk reduction and management of 28 SK presidents from the municipality of San Jose, Antique, in May 2011 (LGRRC 2011); and the SK participation in a one-day disaster preparedness seminar and earthquake drill organized by Yes Pinoy Foundation (YPF) on 15 April 2011 (Gonzaga 2011). Among the youth organizations that require a membership fee, some of the most popular are the Red Cross Youth councils and science clubs. The Red Cross Youth (RCY) is one of the six major services of the Philippine National Red Cross.
activities are an excellent example of how to supplement formal disaster education in the classroom (Shiwaku and Fernandez 2011).

Given their wide distribution across the country and their ability to integrate DRR into their activities, the SK, RCY councils and science clubs can contribute enormously to building a culture of safety and enhancing youth participation in CBDRM. Young people need organizations such as these three that provide positive, supportive environments. The youth need to have opportunities to contribute to society. Young people have great promise in addressing environmental concerns like DRR because of their energy and passion.

Risk communication model

Civil society organizations (CSOs) can be found in Indonesia and are mostly working with the grass-root level; they have access to vast human resources and have great influence on bringing the change within the community. In Indonesia, these CSOs includes women’s groups, youth groups and faith-based or religious groups and can be considered an effective media of risk communication (Mulyasari and Shaw 2012). Their current status has shifted from the implementer (the extended hand of local government) to the conception/creator and mainstreamer of community development activities. Their contributions to the communities are varied: the family planning campaign, health and sanitation education, women empowerment, organizing national independence commemoration event, public religious education and volunteering. Their efforts in supporting the government’s attempts to reach the wider public have been recognized, and they can be labeled community educators, intermediaries and community facilitators.

Many religious organizations or groups are forming within Indonesia; some of them have a strong and long historical background, dating from the old colonial times. Many of them were established as a means of promoting social welfare as well as education of their members, as an alternative to those provided by the colonial ruler. Several of them have strong roots among the population spread over most parts of the country. In many cases they have charismatic, respected leaders, which represent informal leadership within the communities and often act as the counterpart of the government officials in the daily social and political activities. They are often considered as having a strong potential power to implement disaster reduction awareness programs among their followers. Implementing CBDRR activities among their communities can be thought of as an attractive challenge, as many of them have been involved in disaster relief and recovery activities during disaster situations. Partnered with an academic or research institution that can act as their technical support, these organizations can develop their capacity for conducting and implementing CBDRR programs.

Another type of faith-based or religious organization is DKM (Dewan Keluarga Masjid/Mosque Council), that can be found at any major mosques at the sub-district and ward level. These Mosque Councils are independent yet have an organization structure that is headed mostly by an older person or community
leader. Their activities are mainly fundraising for the poor and organizing religious events, such as providing religious materials, educating children and holding a men’s and women’s forum not only for conveying and discussing religious matters but to address social issues as well.

**School-based model**

At the time of typhoons no. 21 & no. 23 in 2004, the mountainous area of Saijo City (Yoshida et al. 2009) was especially damaged. After the disaster, Kyoto University started a program with the Saijo City education board to enhance the linkage of school and communities through participatory neighborhood watching. For these reasons, mountain watching was implemented in Saijo City. Mountain watching is just like town watching, only it is conducted in the mountainous area. The main target was children, but residents in the mountains, teachers, municipal officials and forest workers were also involved. The working field was the upper area of a river alongside the school. Participants watch the site damaged by the typhoon in 2004 and hear the stories of victims.

At the same time, town watching was implemented in the plain area. The main target was students and teachers, parents, Jichikai (neighborhood association) and municipal officers. They walked around the school zone and searched for dangerous places, useful facilities in case of disasters and favorite places which they don’t notice otherwise in daily life. At first, town watching was implemented in five elementary schools and mountain watching in three junior high schools as a “disaster education program,” which was an activity of 12-year-old Education Project. The project started in 2005 and continued till 2007. From 2008 onward, the city education board took a leading role in continuing the process in the implemented schools and also expanded it to all primary and secondary schools in the city.

In a similar approach, an NGO named SEEDS Asia implemented a school-based disaster risk reduction program in Da Nang, in Central Viet Nam, in cooperation with the local education board. The project mobilized local university students to form a team with the schoolteachers regarding school disaster education, conduct a disaster management plan with students, and promote awareness in communities with students. The team especially emphasizes the importance of “climate-related disaster” to the schools and the communities. The university program can be an internship program or a field-visit program. After developing a handbook with the teachers from four pilot schools, the second phase of the project developed core schools in all seven districts of the city, where all the primary and secondary schools participated.

The prior two examples show that to institutionalize disaster education, it is very important to work with the local education board. It needs to start as a pilot project with selected schools. The involvement of the teachers in the process should be high so as to ensure ownership. The linkage with the education board must be strong. The second part of the process is to disseminate the experiences widely to all the schools through the educational system in the city.
or municipality. The process described here is to incorporate local DRM into the educational system.

**Welfare-based model**

After the devastating great Hanshin Awaji earthquake on 17 January 1995, which left heavy traces of destruction on various infrastructures and resulted in the loss of more than 6400 human lives, the voluntary support of many surviving residents in Kobe in rescue operations highlighted the potential of well-functioning communities. The inherent characteristics of communities provide a network among people, strengthening their social capital and ability to respond to potential disasters (Shaw and Goda 2004; Nakagawa and Shaw 2004).

From the Hanshin Awaji earthquake, it is obvious that the age group of the over-65 cohort is one of the most vulnerable groups, in particular living in high-density areas with old houses. Learning from these findings, the Kobe City government has been conducting an important initiative for developing Bokomi with the aim of building its communities’ resilience against disasters. Bokomi is short for “Bousai Fukushi community” (disaster preparedness and welfare community), where the disaster preparedness is linked to the daily welfare of the people. It was understood that the need of the aged community is daily welfare. Therefore, it was necessary to link the disaster preparedness activities to welfare activities.

After the pilot phase in 11 districts, the Bokomi concept was formalized in 1997 according to the mayor’s decision and mainstreamed in all the school districts of Kobe City. Bokomis are established based on municipal elementary school districts in Kobe City (Matsuoka et al. 2012). The total number of municipal elementary schools is 191. The number of Bokomis steadily increased and reached 100 per cent coverage in 2008. The reason why Bokomis are based in elementary school districts is because “welfare-community” groups were already established in each elementary school district and, thus, disaster prevention activities could be integrated into these existing groups. In addition, elementary schools are designated as evacuation sites for communities in emergencies in Japan.

Main activities by Bokomis have two perspectives: disaster prevention and risk reduction activities and welfare-related activities. These activities are combined and carried out together. Disaster prevention and risk reduction activities by Bokomi include:

- disaster drills and training
- a DRR education program with schools
- Bokomi junior team (fostering children’s teams to lead and work on DRR activities)
- a public awareness event
- a first-aid seminar, checking emergency materials and equipment
- town watching and preparation of community safety map, risk reduction activities with rescue workers and firefighters (identification of evacuation route, removal of objects blocking these routes, fixing furniture etc.).
Combining with welfare activity, they also offer the following:

- regular communication within communities to foster unity so that they can take action when an emergency/disaster happens, considering the needs of vulnerable groups such as older people and people with disabilities
- learning how to support people with special needs during disasters (older people and people with disabilities).

The key aspect of this example is to link the community-based disaster risk management activities to local daily needs like health and welfare activities. The example shows that Bokomis were formed in all 191 school districts in Kobe and is still continued, even 18 years after the disaster.

**Governance-based model**

One salient feature of the rehabilitation work in Aceh and Nias after the Indian Ocean tsunami was the availability of multiple channels for submitting complaints. The government and many of the agencies working in the rehabilitation effort recognized the importance of grievance mechanisms and instituted their own systems for activities under their supervision. The Asian Development Bank’s (ADB’s) Extended Mission to Sumatra found that the grievance mechanism needed a full-time grievance focal point, a person familiar with local norms and institutions who speaks the local language, to support the units involved in complaint handling and to follow up on cases referred to executing and implementing agencies. The Multi Donor Fund (MDF) made the complaint mechanism an integral part of its overall communications strategy to inform communities about MDF projects and contact points for inquiries or complaints.

A clear lesson from these experiences is the importance of starting early to implement complaint-handling systems (ADB 2009). The complaint-handling unit should be established when the project begins. Early issuance and dissemination of construction standards and guidelines to partner organizations and communities help to avoid complaints about variations in the quality of construction. Complaint-handling systems need to be built into standard operating procedures or made an integral part of a project’s field manual. Careful planning is essential: limited planning and social preparation in some sectors enabled an earlier start but resulted in huge delays and protracted conflicts during implementation. Planning that is community-based will help ensure success. Where communities were involved in design and monitoring of house construction, ownership was increased and conflicts and problems minimized. Targeting rehabilitation activities that were identified as priorities in the community created goodwill, an invaluable asset, and helped build relationships with stakeholders. Planning should include an understanding of the social interactions and relationships among the people in the village or area; a complaint-handling system can empower a community and give people the courage to ask questions and be more critical.
Conclusion

The chapter explains a few cross-cutting issues, such as links to habitat, health-related issues, livelihoods, educational systems, and environment and natural resource management. The chapter also provides a few key examples of institutionalization of local DRM, incorporating local and indigenous practices in local DRM through governance and budget systems as well as through the educational process, involving youth and faith-based organizations in local DRM, and sustaining the local DRM by linking it with welfare and daily needs activities.

The key issue is that the local DRM requires a strong legal and institutional basis. Providing specific provisions in the local government’s budget system to utilize a certain amount of the development budget for DRM activities is of the utmost importance. A national law or regulation can provide this type of policy support. Thus, local DRM needs to be closely linked to national policies and priorities. Specific activities like regular training, capacity-building programs or awareness-raising programs need to be budgeted properly at the local level. This should be part of the legal commitment at the national level. Similar issues are discussed in Chapter 4, where emphasis has been on building social safety nets at the micro level for the poor and vulnerable. This needs a strong system support, which can be provided by enhancing the linkages of national and local governance.

It is always a challenge to continue the DRM activities at the local level for a longer period of time. This sustainability issue is often discussed and analyzed. There are several models of local DRM sustainability: linking it to the local communities, or providing ownership to the communities, or relying on the local leadership. After the disaster, community-based DRM becomes popular, and after a few years, the initiative gradually diminishes. Thus, to sustain the local DRM over a longer period of time, it must be linked to the daily needs, like welfare, health, sanitation, environment etc. The nature of the community or local context defines the specific entry point for sustainability of DRM activities. For example, in the case of urban areas in developing countries, environmental entry points like solid waste management, sanitation and water issues are possible areas where the local DRM can be linked. For the rural communities, the health and welfare activities are possibly appropriate entry points for local DRM.

Since each community is dynamic, and there are changes in these communities, it follows that the local DRM needs to be dynamic as well. The approaches may be the same but need to be customized based on the local changes and context. The technology and governance systems must be adjusted accordingly. Also, the traditional knowledge has to be transferred over different generations and contexts. The link with the local institutions is important for sustaining the knowledge base of local DRM. The local university can be a resource to provide technical expertise to the local governments and communities, thereby making a sustainable knowledge management system. It is often argued that the data acquisition and data quality at the local level is rather poor. This can be upgraded with the link to the education and research agency at the local level and by providing
support to the capacity building of those agencies. More South–South collaboration is required for enhancing capacity building at the local level, especially linking the local institutions within countries and across the region.

**Recommendation 6**

Local DRM needs to be linked to development issues such as health, education and sanitation and should have a legal framework of responsibilities, capacities and resources.

**Bibliography**


——. 2013. Chair’s summary on fourth session on the GPDRR, Resilient People, Resilient Planet. Geneva: UNISDR.
Introduction

A central theme of the entire study is the \textit{pivotal role of national governments} to ensure that disaster risk management (DRM) and climate change adaptation (CCA) are given a place as a priority concern. This thread runs through all the chapters but is particularly significant in this chapter. The complexity of governmental functions, sectors and levels can prove an obstacle to risk management, but the chapter picks up another underlying thread: the need to weld different factions and sectors into a fully integrated \textit{holistic approach}, often adopting \textit{innovative solutions}.

National governments are expected to play a pivotal role in DRM. The governments in Asia and the Pacific region have developed a wide range of innovative solutions at the national level. This chapter reviews trends and patterns in developing governance and institutions in DRM and recommends necessary actions to establish risk governance for developing countries, including mainstreaming DRM into development plans and policies.

Building DRM into national development strategies, programs and projects is needed to protect these developments and make certain that new developments do not exacerbate disaster risks. Thus, each developing country is required to (i) place DRM as a core element within the structure of government; (ii) legally define its mandate, status and coordination role with line ministries and a focal point agency; and (iii) establish supporting mechanisms to local governments.

The chapter examines models of the focal point agency of DRM at the national level in the region. It was found that there is no \textit{“one-size-fits-all”} model for the agency because of the intrinsic variety of disaster scale and type, socioeconomic conditions and geography. Three models of the agency are in place: (i) the focal point for DRM is designated as a coordination agency \textit{without} any implementation role; (ii) it is located in parallel with other line ministries in the government; and (iii) it is developed from implementing organizations.

The chapter examines practical mechanisms of coordinating government organizations and relationships between national and local governments. While the local governments should have the primary responsibility in DRM, the national government should support the local governments by providing technical and
financial assistance at normal times and by coordinating organizations concerned and deploying specialized teams to respond to disasters.

What institutions and policies do developing countries need?

Developing countries need to place DRM as a core element within the structure of the government to mainstream DRM into development policies and operations. The structure and quality of governance need to be improved at all levels from national to local governments by legally defining mandates and status. Also, public involvement is critical in all aspects of DRM.

Governance is key to reducing risk

Governance is widely regarded as the key to reducing disaster risks (Ahrens and Rudolph 2006; Castanos and Lomnitz 2008; UNISDR 2011a; and Wisner et al. 2004). Many developing countries need responsive, accountable, transparent and efficient governance structures in DRM (Davis 2011; UNDP 2010). Governance is defined as an exercise of political, economic and administrative authority in the management of country’s affairs. Governance influences how income and assets are distributed to the people and determines how the people protect themselves from hazards and how they access support in recovery (Turnbull et al. 2013). Since many developing countries lack the administrative, organizational, financial and political capacity to effectively cope with disasters, the poor become particularly vulnerable. Low-income countries have suffered only 9 per cent of the disasters since 1980 but suffered 48 per cent of the fatalities (World Bank 2012c).

DRM in the government structure

The developing countries need to place DRM as a core element within the structure of the government. Countries with well-established institutions can decrease the number of affected people and economic losses from natural disasters, while mortality is increasing in countries with weak governance capacities (Cannon 2008; Raschky 2008). The Hyogo Framework for Action (HFA), which was adopted at the World Conference on Disaster Reduction in Kobe in 2005, defines “development, and strengthening of institutions, mechanisms and capacities to build resilience to hazards” as one of the strategic goals, and it emphasizes the action of ensuring DRM as a national and a local priority with a strong institutional basis for implementation (UNISDR 2005). In Japan, the Disaster Countermeasures Basic Act, which was legislated in 1961, stipulates the DRM framework. The framework covers (i) the roles and responsibilities of national and local governments and communities; (ii) the details of disaster management plans, institutions and countermeasures; and (iii) platforms at national and local levels.
Mainstreaming DRM into policy and programs

Each country should mainstream DRM into policy, planning and management in all relevant sectors. Mainstreaming DRM has important implications for the growth and development agenda, since disasters are regarded as serious obstacles to socioeconomic development. The principal strategic goal of the HFA is to effectively integrate disaster risk considerations into sustainable development policies, planning, programming and financing at all levels of government. As recommended in Chapter 3, governments should develop a range of innovative programs to prevent increasing vulnerability in the course of the development process. For example, Bangladesh’s Outline Perspective Plan, produced by the Planning Commission, integrates DRM and CCA into national development strategies (UNESCAP and UNISDR 2012). In Japan, the government is reviewing DRM approaches by learning lessons from the Great East Japan Earthquake (GEJE) in 2011 and will mainstream DRM further in all relevant sectors by assessing risks and vulnerabilities and by allocating necessary resources to prepare for disasters (Committee on Promoting Disaster Management of Central Disaster Management Council 2012).

Coordination of DRM

A wide range of stakeholders must be coordinated, since DRM is everyone’s business. DRM requires a multi-sectoral approach, which covers urban development, infrastructure, water, education, health and many other sectors. Single-sector development planning cannot address the complexity of problems caused by disasters, nor can such planning build resilient societies (World Bank 2012b). For example, DRM plans should be linked with urban planning and DRM education at school, which are effective measures to decrease disaster casualties and damage. Since no single organization can have the ultimate responsibility for managing disaster risks, various stakeholders should share the responsibility. In addition to governmental organizations, private sector and civil society play crucial roles in DRM (IRP 2009). The private sector can contribute to mitigating disaster damages in a wide range of areas, such as logistics of relief goods, payment of insurance claims, rehabilitation of works of damaged infrastructures and continuation of banking services. Civil society organizations (CSOs) can support locals in efforts to respond to various needs of affected people at a grassroots level. As Chapter 4 pointed out, the governments and CSOs can play strategic roles in creating safety net systems to protect vulnerable groups from disasters.

Coordination platform

Each country should create a platform to coordinate various organizations at different levels.
Inter-sector coordinating mechanisms are needed to properly design and implement DRM strategies. UNISDR defines the national platform as a nationally owned and nationally led forum or committee of multi-stakeholders. The national platforms require a number of elements – (i) political, (ii) technical, (iii) participatory and (iv) resource mobilization components – to promote DRM (UNISDR 2007; Gopalakrishnan and Okada 2007). As the complexity of society increases, different institutions and formal or informal groups can be effectively involved in DRM. As Chapter 7 has emphasized, national governments should strengthen the linkage with local governments to guide and support local governments in the promotion of DRM on the ground. Also, the local governments should create coordination mechanisms at a local level in line with national policies.

**Focal point agency**

The focal point agency is expected to play a leading role to promote DRM at the national level.

The agency should have authority to formulate a vision, develop national policies, allocate budgets for government organizations, demand compliance and define actions for the organizations. For example, the agency functions as the secretariat of a DRM committee, which usually consists of ministers concerned, is chaired by the prime minister or president and formulates national strategies and DRM plans through coordinating with line ministries and other organizations concerned. South Africa’s experience shows the importance of involving various stakeholders of governments, the private sector and CSOs in developing and implementing national DRM policies (see the following box).

**Coordination by focal point agency**

The focal point agencies must strengthen coordinating functions, but this is a complicated and challenging task. Concerned organizations do not necessarily have a common interest or background. A further complication comes where there are horizontal disconnects between various government plans and policies at the national level (ADB 2013). Also, there are often wide gaps between policy and institutional arrangements at the national level and community needs at a local level (Pasteur 2011). The case of the GEJE shows the importance of coordination between structural and non-structural measures. In this disaster the tsunami waves exceeded all expectations and predictions and destroyed over half of tsunami dikes in the Tohoku region (Central Disaster Management Council 2011; Ishiwatari 2012b). This disaster graphically demonstrated that exclusive reliance on structural measures will ultimately prove inadequate and ineffective, and these must be supplemented with non-structural measures under close coordination among concerned organizations.
Legal framework in South Africa

The Disaster Management Act in South Africa, which was enacted in 2003, is regarded as the best international practice in DRM legislation. The act was developed under close examination of existing international laws in order to devise a comprehensive legal framework. Broad stakeholder consultation and policy configuration were conducted during the 1990s. This included government organizations, the private sector, CSOs, community-based organizations, research institutions and academia, and all these bodies are participating in the National Disaster Management Advisory Forum. Cross-party political leadership and international organizations were needed to support the reform process. The act established the forum as a consulting and coordinating body, and institutions were developed based on widely accepted theories. The Intergovernmental Committee on Disaster Management was established as the national platform, and the National Disaster Management Centre (NDMC) was established as the focal point agency. An implementation plan was created during the development of legislation. The National Disaster Management Framework outlines appropriate policy for the country and guides the development and implementation of the disaster management concept.

While the National Disaster Management Centre was required to be positioned in a strong ministry, the center is placed in the Department for Co-operative Governance and Traditional Affairs, which is perceived as having a low political profile and status. Also, it is pointed out that links between the NDMC and local governments should be strengthened.

Sources


International support

An important role of the international development agencies is to help focal point agencies to strengthen the capacity of leading disaster preparedness and response (IEG World Bank 2011). The long-term strategic framework of the Asian Development Bank (ADB), called “Strategy 2020,” calls for mainstreaming DRM and supporting disaster recovery (ADB 2012). The World Bank and the Japanese government jointly organized the Sendai Dialogue as a special session during the Annual Meetings of the World Bank and International Monetary Fund in 2012. Finance, national planning and disaster management ministers and heads of international financial organizations attended to discuss how to mainstream DRM. The Joint Statement of the dialogue asks international development agencies and
national governments to mainstream DRM into development policies and investment programs (Ministry of Finance 2012). The main mission of the Global Facility for Disaster Reduction and Recovery (GFDRR) is to mainstream disaster reduction and climate change adaptation in country’s development strategies (GFDRR 2010). The Japan International Cooperation Agency (JICA) has supported developing countries, such as Nepal and Indonesia, as they create organizations and specific budget lines for DRM and strengthen organizational capacity. The scale of annual budgets can be an indicator of the commitment of governments to mainstream DRM. Thus, JICA evaluates the progress of mainstreaming DRM in Indonesia in the context of a budgetary issue (JICA 2010). The Regional Consultative Committee of the Asian Disaster Preparedness Center (2006) identifies agriculture, infrastructure, housing, education, health and financial services as priority sectors.

**How have countries improved institutions and policies?**

Countries in Asia and the Pacific have substantially improved institutions and policies in DRM. Mega-disasters, such as the Indian Ocean tsunami, Cyclone Nargis and the GEJE, became opportunities to strengthen risk governance in affected countries.

**Development of risk governance**

Various countries have developed risk governance by creating focal point agencies, establishing national platforms and promoting legislation. These steps are taken in line with the HFA. The number of national platforms is increasing globally: from 38 in 2007 to 73 in 2011. More countries have been adopting or updating legislation (UNISDR 2011b). Legislation can establish new agencies or empower existing agencies with new responsibilities as well as create budget lines and policy responsibilities (Pelling and Holloway 2006).

Changing DRM institutions and policies is attributed to various factors: the transformation of governance, such as globalization and devolution, poses substantial challenges for DRM institutions. The Federal Emergency Management Agency (FEMA) in the United States moved from a limited form of direct service delivery to a complex, network-based approach in the 1990s that stretched from the federal government into state and local governments and the private sector (Kettl 2000).

**Evolution of DRM institution**

Mega-scale incidents profoundly change the DRM institutions. Many economies have been continuously strengthening national DRM systems based on lessons learned from disasters within and outside the countries (Amini-Hosseini and Hosseinioun 2012; Ikeda 2014; Nishikawa 2010). The terrorist attacks of 11 September 2001, generated a major governmental reorganization within the United States and created the Department of Homeland Security. Further changes in emergency management in the United States followed the catastrophic hurricanes
of 2004 and 2005. In Taipei, China, Typhoon Morakat initiated a change to national institutions. The National Fire Agency was transformed to the National Disaster Prevention and Protection Agency through the Disaster Prevention and Protection Act, expanding the agency’s functions to include comprehensive counter measures. Japan enacted the Disaster Countermeasure Basic Act in 1961 after a high-tide disaster in Nagoya in 1959, which left a death toll of over 5,000. The main driver of the latest version of the national DRM plan after the GEJE is the need to account for low-probability, high-impact compound disasters. The governments need to develop mechanisms to collect disaster data and put in place more evidence-based policies in DRM, as recommended in Chapter 2.

Countries in Asia and the Pacific have subsequently taken legislative actions to establish the focal point agencies within their central government structures and national platforms. Of the 61 countries and areas, 30 have enacted national or central legislation that specifically deals with DRM in Asia (UNESCAP and UNISDR 2012). Following the Indian Ocean tsunami in 2004, affected countries strengthened the focal point agencies. Sri Lanka established the disaster management ministry by creating a disaster management center and merging a meteorological agency and a building research institution. Thailand strengthened the coordination roles of the disaster management department. Indonesia created a national disaster management agency and has created local agencies throughout the country. Myanmar is planning to establish a new agency and to enact national disaster management law after learning lessons from the Cyclone Nargis disaster in 2008. Viet Nam and the Philippines, which are major disaster-prone countries in Asia, have strengthened existing legislation and institutions. Most countries in the Pacific have created national disaster management offices as stand-alone agencies (Hay 2009).

How should the focal point agencies be positioned within the governments?

One of the most crucial issues is how the focal point agencies should be positioned within the governments to coordinate and lead various organizations. There is no sole model of institutions, since each country has developed its own institutions according to disaster scale and type, socioeconomic conditions and geography.

Model for focal point agency

There is no “one-size-fits-all” model for the focal point agency because of the intrinsic variety of disaster scale and type, socio-economic conditions and geography. It was found that the agencies vary considerably in positions within the governments, in mandate and in roles across Asian countries (Table 8.1). Each country has developed institutions and policies in DRM based on historical backgrounds of disasters and disaster management. For example, floods are historically a major disaster and have often threatened national security in the People’s Republic of China, Japan and Viet Nam. These countries have accumulated
Table 8.1 National platform and focal point agencies in selected Asian countries

<table>
<thead>
<tr>
<th>National Platform (Chair)</th>
<th>Focal point agency</th>
<th>Related act</th>
<th>Model, Original mandate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>South East Asia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brunei Darussalam</td>
<td>–</td>
<td>–</td>
<td>(i)</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Nat. Com. for DM (PM)</td>
<td>Nat. Com. DM General Secretariat</td>
<td>Sub-decree No. 35 ANK DM Law (i)</td>
</tr>
<tr>
<td>Indonesia</td>
<td>–</td>
<td>Nat. DM Agency</td>
<td>DM Law (i)</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>Nat. DM Com.</td>
<td>Nat. DM Office, Min. Labor &amp; Social Welfare</td>
<td>(iii) relief</td>
</tr>
<tr>
<td>Thailand</td>
<td>Nat. Dis. Prevention &amp; Mitigation Com. (PM or Deputy PM)</td>
<td>Dep. of Disaster Prevention &amp; Mitigation, Min. of Interior</td>
<td>Dis. Prevention and Mitigation Act 2007 (iii) S&amp;R, Fire</td>
</tr>
<tr>
<td><strong>South Asia</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bangladesh</td>
<td>Nat. DM Council (PM)</td>
<td>DM Bureau, &amp; Directorate of Relief and Rehabilitation, Min. of Food &amp; DM</td>
<td>DM Act, 2008 (iii) relief</td>
</tr>
</tbody>
</table>

(Continued)
Table 8.1 (Continued)

<table>
<thead>
<tr>
<th>National Platform (Chair)</th>
<th>Focal point agency</th>
<th>Related act</th>
<th>Model, Original mandate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhutan Nat. Com. for DM (Cabinet Minister)</td>
<td>DM Division, Min. of Home &amp; Cultural Affairs</td>
<td>Nat. DM Act</td>
<td>(i)</td>
</tr>
<tr>
<td>India Nat. DM Authority (PM)</td>
<td>Nat. Institute of DM, Min. Home Affairs</td>
<td>DM Act 2005</td>
<td>(i)</td>
</tr>
<tr>
<td>Maldives</td>
<td>DM Center, Min. of Defense</td>
<td>Dis. Relief Act 1982</td>
<td>(iii) relief</td>
</tr>
<tr>
<td>Nepal Central Nat. Dis. Relief Com. (Home Minister)</td>
<td>DM Section &amp; Nat. Emergency Operation Centre, Min. of Home Affairs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pakistan Nat. DM Commission (PM)</td>
<td>Nat. DM Authority</td>
<td>Nat. DM Ordinance 2006</td>
<td>(i)</td>
</tr>
<tr>
<td>Sri Lanka Nat. Council for DM (President and PM)</td>
<td>DM Centre, Min. of DM</td>
<td>DM Act 2005</td>
<td>(ii)</td>
</tr>
</tbody>
</table>

**East Asia**

<table>
<thead>
<tr>
<th>People’s Republic of China Nat. Commission for Dis. Reduction (Vice Premier of State Council)</th>
<th>Nat. Dis. Reduction Center, Min. of Civil Affairs</th>
<th>More than 30 laws and regulations</th>
<th>(iii) relief</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan Central DM Council (PM)</td>
<td>DM Office, Cabinet Office</td>
<td>Dis. Countermeasures Basic Act</td>
<td>(i)</td>
</tr>
</tbody>
</table>

Com.: Committee; Dis.: Disaster; Dep.: Department; DM: Disaster Management; Man.: Management; Min.: Ministry; Nat.: National; PM: Prime Minister; S & R: search and rescue; (i): designation as a coordination agency without implementation role; (ii): located in parallel with other line ministries in the government; (iii): developed from implementation organizations.

*Source:* author’s elaboration
experience in flood management and established strong institutions and developed countermeasures to mitigate flood damages (Ishiwatari 2010). Communities have prepared mainly for the floods as major disasters. The experts in flood management have led policies and countermeasures in DRM, including other disasters. In other Asian countries that have conducted primarily relief activities following disasters, relief organizations have become leading agencies within the governments. In Singapore, the focal point agency, Civil Defense Force, has the main mandate of managing fire disasters and other urban disasters, and it is unlikely to need drastic institutional reform such as changing to a body that coordinates all organizations. This is because this island city-state has rarely suffered from natural mega-disasters, such as floods from major rivers and earthquakes, and has prepared for mainly human-made disasters in urban areas.

Three models of focal point agency are in place in Asia and the Pacific (Figure 8.1): (i) designated as a coordination agency without implementation role, (ii) located in parallel with other line ministries in the government, and (iii) developed from implementation organizations. Characteristics of these models are summarized in Table 8.2.

Model 1. Designated coordination agency

The focal point agency is designated as a coordinating and leading agency under a leading national agency, such as a prime minister or president office (Figure 8.1 (a)). The agency does not implement projects and relief activities. The agency reports to the head of state and coordinates and leads policy formulation, disaster management and other key countermeasures. This case covers Indonesia and Japan.
Table 8.2 Characteristics of focal point agencies

<table>
<thead>
<tr>
<th></th>
<th>Designated coordination agency (i) and (ii)</th>
<th>Developed from implementing organizations (iii)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Background</strong></td>
<td>Newly established or strengthened coordinating body</td>
<td>Long history of implementing agency in disaster management, such as fire management, relief or engineering</td>
</tr>
<tr>
<td><strong>Staff</strong></td>
<td>Limited number and experience</td>
<td>Large number and experiences in related field</td>
</tr>
<tr>
<td><strong>Budget</strong></td>
<td>Limited</td>
<td>Budget for project implementation</td>
</tr>
<tr>
<td><strong>Sustainability</strong></td>
<td>Difficult without donor support</td>
<td>Sustainable</td>
</tr>
<tr>
<td><strong>Institutional development</strong></td>
<td>Often established as a new organization from scratch</td>
<td>Can utilize existing institutions and staff</td>
</tr>
<tr>
<td><strong>Activity</strong></td>
<td>Fair</td>
<td>May overlook one or more key variables of original mandate</td>
</tr>
<tr>
<td><strong>Coordinating power</strong></td>
<td>Need authority, such as chairmanship of state heads</td>
<td>Can utilize original mandate as leverage</td>
</tr>
</tbody>
</table>

Source: Author’s elaboration

Neutral coordination

The agency is expected to neutrally coordinate various organizations and key stakeholders. This model is the most desirable, if properly formed. This is because the agencies have no implementation roles and can function without bias of interests. This agency needs strong political commitment and legal basis to be established and function as planned. In Cambodia, the focal point agency faces difficulty in coordination because of weak integration into the national administrative and budgetary structure of the government (ADPC 2007).

Limited capacity

The agencies usually have limited internal capacity in financing and staff, and often face difficulties in coordinating and leading organizations concerned within the governments.

The agencies are established from scratch or developed from weak organizations. New management and staff must be employed, and legislations and facilities must be developed when new offices are created. Some line ministries, which have a longer history, more capable staff and a larger budget than the focal point agencies, tend to independently conduct projects without proper coordination with other organizations.
The agencies need to be located under leading organizations in the governments, such as president and cabinet offices. In Asia, some agencies are situated in home affairs or defense ministries. The agencies with considerable political influence can promote effective DRM programs (World Bank 2012c). With reporting to the state heads, the agencies can coordinate other line ministries. Central ministries, such as finance and economic planning ministries, can promote effective coordination and prioritization of DRM policies and programs as well as resource allocation across different ministries (World Bank 2012a). However, in practice, these ministries rarely play a principal role in DRM.

**Sustainability**

Agencies in developing countries find it difficult to remain sustainable. This is a particular challenge for organizations in developing countries without the injection of continual foreign assistance. The international development organizations often support the developing countries’ establishment and operation of the agencies. Since DRM is not necessarily high on the agenda in these countries, the agencies would face difficulties in securing budgets for operation and even staff salaries once supports from other countries or international organizations end.

**Model 2. Located in parallel with other line ministries in the government**

The agency is located in parallel with other line ministries in the government (Figure 8.1 (b)). The agency, as a stand-alone coordinating body, does not have the authority or capacity to influence policy decisions for DRM at the highest level (World Bank 2012c). The case of Sri Lanka falls under this model.

Coordinating powerful ministries is a major challenge. Timor-Leste, for example, failed to promote DRM in line ministries because of the relatively isolated and weak position of the National Disaster Management Department (UNISDR 2011a). One of the important lessons from the 1995 Great Hanshin Awaji earthquake in Kobe is that the national government needs strong leadership in disaster management. It was found that the focal point agency must establish a strong network to promptly collect damage information on the ground from line ministries, to timely report situations to the prime minister and to coordinate various ministers for effective response. Japan moved a disaster management office from a coordinating agency to the Cabinet Office and created a Disaster Management Minister to strengthen coordinating power. In the Maldives, the Disaster Management Center was moved from the housing ministry to the defense ministry, with a higher profile in the government to
strengthen capacities in reporting to the president and in coordinating with other ministries.

**Model 3. Developed from implementing organizations**

The agency has been developed from implementing organizations, such as fire management and relief response organizations (Figure 8.1(c)). The agencies have expanded their functions to coordinating policies and countermeasures at a pre-disaster phase. This case covers Bangladesh, Thailand and Viet Nam.

**Risk of bias**

There are risks that the agencies are biased with original mandates in coordination. While the agencies have expertise, budgets and experts in some areas related to DRM, such as fire management, engineering and logistics, it is difficult for these agencies to promote areas in which they have limited knowledge and experiences. For example, these organizations naturally put a higher priority on their original mandates for requesting foreign assistance in capacity building than other functions. Disaster management in most countries that fall into this group started from a disaster response of providing people affected by disasters with relief goods and conducting search and rescue. Bangladesh was the first South Asian nation to establish a disaster management ministry (ADPC 2007).

**Difficulty in expanding roles**

The agencies cannot easily expand their roles to coordination and holistic policy formulation at a pre-disaster stage, or to promote DRM investment. Coordinating and leading other organizations is completely different from the original mandate. The agencies originally aimed at effectively delivering and managing relief goods and search-and-rescue teams in devastated areas at the response phase. The functions of DRM at the pre-disaster phase include a wide range of policies and measures, such as infrastructure, urban development and early warning, and need to involve more agencies and stakeholders in process. Institutions have uniquely evolved in Viet Nam. The Disaster Management Center of the focal point office is located in the department of dike construction under the Ministry of Agriculture and Rural Development, which has the major mandate of constructing and maintaining river and coastal dikes. This is because the major serious disasters are floods and high tide in the country. Most staff of the center are engineers in flood control. The ministry is upgrading the center to a department level to provide a higher authorization for coordination. If they can succeed in promoting a holistic approach including non-structural measures and community-based activities, the country will become a good example showing that an engineering-oriented organization can holistically manage disaster risks. Engineering organizations are predisposed to focus on structural measures and often to slight the non-structural measures.
How can the focal point agency coordinate other organizations?

There are common practices that coordinating organizations needs legislation, a national platform, and disaster management planning. Each country has made efforts to strengthen coordinating functions. It is important to seek political support for promoting DRM. In addition, the practical methods of coordination should be established. Major practices that other countries can apply are given here.

**National platform**

A national platform functions as the highest decision making body. Many countries have established the national platforms, usually chaired by heads of state or leading ministers and consisting of various public organizations. High-profile leadership is a prerequisite for coordination. The platforms decide policies, draft acts and formulate long- and medium-term plans as well as coordinate response activities in emergency. This practice is widely shared among countries in Asia and the Pacific.

**Sub-committees**

Sub-committees under the national platforms play important roles in coordinating specific issues. In Sri Lanka, various committees coordinate issues at different levels in the government. In addition to the National Council chaired by the president, the Disaster Management Center (the focal point agency) has established committees to practically coordinate DRM measures. The National Disaster Management Coordination Committee, chaired by the Secretary of the Ministry of Disaster Management, consists of 73 organizations and 127 members of government organizations, development agencies, NGOs and private companies to coordinate DRM countermeasures. Under the committee, three sub-committees and the Inter Agency Disaster Management Committee were established. Also, technical committees were created to produce building codes and disaster management guidelines of road maintenance and of anti-seismic facilities. These technical committees consist of the officers of governmental organizations, international organizations, the private sector and academia. In Japan, the Cabinet Office can establish expert panels, such as the panels of reviewing countermeasures at the GEJE and assessing risks and damages of potential mega earthquakes. The recommendations and outputs from these panels guide line ministries to promote policies and measures.

**Political commitment**

Political commitment should be secured in coordinating mechanisms. In Indonesia, the National Disaster Management Agency, the focal point agency, is reporting DRM situations to the president. In Japan the cabinet submits an annual report of the white paper on DRM to the National Diet (parliament). The white paper covers the status and issues of DRM and specifies the budgetary allocations for the DRM
programs of line ministries. The National Diet forms a special permanent commit-
tee for disaster management in both its lower and upper houses to monitor govern-
mental DRM initiatives.

Budget allocation

The focal point agencies in the national governments should have mandate to
allocate DRM budgets to line ministries. The agencies can coordinate and lead
DRM policies through allocating budgets to line ministries, but rarely have such
mandate. As exceptional cases, the focal point agencies in Indonesia and Malaysia
have the authority to allocate emergency budgets to government organizations
concerned in emergency cases. Also, the Office of Civil Defense in the Philippines
is managing an emergency fund for response and rehabilitation activities.

Drills and training

The focal point agencies can utilize drills and trainings as opportunities to
strengthen coordinating capacities and networks. A wide range of organizations,
such as military, civil society organizations, public works organizations and educa-
tion ministries, are usually involved in conducting drills and training. Through
preparing and conducting training and drills, the focal point agencies can
strengthen communication and networks with other organizations.

Coordinating power

The focal point agencies can strengthen coordinating powers. This can be
achieved by receiving staff seconded from line ministries or recruiting staff expe-
rienced at these ministries. In Japan, staff – including those at the management
level of the disaster management office in the Cabinet Office – are seconded from
line ministries. Through these staff members, the Cabinet Office can coordinate
with other line ministries.

How can national and local governments
establish relationships?

Since local events are the fundamental feature of natural disasters, local govern-
ments and communities hold a good position to be the first responders and to have
the principle responsibility of DRM. National governments fill various roles in sup-
porting local governments to prepare for and respond to disasters. During normal
times, the national government can provide financial and technical support to local
governments in promoting DRM. The national governments are required to sub-
stantially support local governments when the local governments cannot manage
large-scale disasters. Decentralization is required for the local governments to
promptly respond to disasters on the ground. However, power and budget should
be gradually devolved to the local governments, considering their limited capacity.
Support to local governments

The national government can support local governments in strengthening DRM during normal times. The national governments guide the local governments to establish DRM mechanisms by enacting new laws and budgetary systems. In Japan, prefecture and municipality governments have the primary responsibility for DRM, while the national government has responsibility for developing large-scale DRM infrastructures, such as dams and embankments for managing floods and droughts in major rivers. The national government does not have the local offices. This is because the local governments and communities have developed capacities by coping with disasters as local events through their history. The Indonesia government has supported the local governments in efforts to create DRM offices in all 33 states and around 400 prefectures or cities since 2008. The national government is establishing tsunami warning systems with local governments.

Financial subsidy

The national government can leverage financial subsidy to the local governments to promote DRM at a local level. The local governments likely do not put a high priority on DRM among various development areas because of limited financial capacity. A national subsidy mechanism is useful to promote countermeasures as a minimum requirement throughout the country (Ishiwatari 2012a). For example, retrofitting schools and hospitals that are crucial in disaster management operations needs financial support from the national government. Budgets and authorities are often devoted to local governments in the education and health sectors. The local governments tend to put a higher priority on allocating budgets for constructing new buildings or purchasing equipment than retrofitting existing buildings to prepare for unpredictable earthquakes.

Local office and secondee

Some national governments have established local offices or seconded their staff to the local governments to promote capacity development, and to guide and support DRM at the local levels. Sri Lanka has created new offices of district disaster management coordination units at the local level. Myanmar has seconded officers to local governments. In Viet Nam, the national government dispatches staff to support and guide the local governments in emergency response.

Support at large-scale disasters

The national governments’ support is required, when the local governments cannot properly respond to large-scale disasters. Local governments may not be able to respond to large-scale disasters. Various government agencies can mobilize experts, including search-and-rescue teams, medical teams and engineers to devastated areas using national networks. Also, the national government provides meteorological and
hydrological services and disaster information, such as monitoring and warning of typhoons, floods, tsunamis and earthquakes. By refereeing disaster information created by the national government, the local governments issue evacuation orders to the public. In the GEJE, many municipalities suffered serious damage to their office buildings and incurred considerable staff losses, which hampered their disaster response timing and effectiveness. The national agencies of the police, fire departments, infrastructure, medical facilities and self-defense forces had prepared specialized teams by compiling rosters and conducting training during normal times and could start deploying these teams on 11 March 2011, the day of the disaster.

**Decentralization**

Powers and budgets in DRM should be gradually devolved from the national governments, considering limited capacity of the local governments. Decentralization is required to promptly respond to disasters on the ground. In developing countries, however, limited capacity at the local level is a common issue. Since DRM is a relatively new mandate for the local governments in developing countries, it takes some time for the local governments to accumulate experiences and develop capacities and institutions.

**Conclusion**

Countries in Asia and the Pacific have substantially developed risk governance by creating focal point agencies, establishing national platforms and promoting legislation in line with HFA. Mega-disasters, such as the Indian Ocean tsunami, Cyclone Nargis and the GEJE, became opportunities for making these improvements. The designated coordinating agency with a high profile in the government is theoretically required to neutrally coordinate and to lead concerned organizations, but this has not been easily realized. In some countries, implementing agencies have expanded their mandates to coordination. The focal point agencies have made various practical efforts in coordination, such as formulating technical committees.

While devolution to local governments is needed to effectively respond to the needs of people affected by disasters on the ground, the local governments face difficulties in receiving power and budgets devolved from the national government because of limited capacity. The national governments have established local offices or seconded staff to the local governments to promote DRM at a local level. The national governments have provided the local governments with financial subsidy and technical support to guide DRM measures at the local level.

**Guidance for developing countries**

Place DRM as a core part of national development strategies and programs to mainstream DRM in the following ways.
First, by strengthening the coordination role of national government through an enhanced legal framework.

- Having the designated coordinating agency with high-profile status in the government should be the ultimate goal of establishing the focal point agency at the national level. This agency has authority to formulate a vision and national policies, to allocate budgets for government organizations and to demand compliance and actions for the organizations.
- Since it is quite difficult to form such an agency in practice, a stage-wise approach should be taken. A coordinating body would be newly established as the focal point agency. Otherwise, an existing organization of disaster management, such as fire management or relief, should expand its functions to coordinate other organizations at the pre-disaster stage.
- The focal point agency should be situated under a leading ministry in the government, such as a cabinet office, president’s office, home affairs ministry or defense ministry. The coordination needs a high-profile status inside the government.

Second, by building up a flexible cooperation system among concerned organizations and with local governments.

- The focal point agency should develop practical methods of coordinating other ministries and local governments. These include receiving seconded staff from line ministries and seconding staff to local governments.
- Decentralization is required to promptly respond to disasters on the ground. However, power and budget should be gradually devolved to the local governments, considering their limited capacity.
- National governments should provide financial and technical support to local governments in promoting DRM at the local level. When the local governments lose their disaster management capacity in mega-disasters, the national governments need to mobilize resources throughout the country to respond to the disasters.

Recommendation 7

DRM needs to become a core element in national development strategies and programs in order to mainstream DRM into government commitments. This requires a four-pronged approach:

1. Strengthen the DRM coordination role of national government.
2. Develop an enhanced legal framework.
3. Establish a DRM focal point.
4. Build a flexible cooperation system among concerned organizations and all levels of government.
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Introduction

Since hazards have no respect for the political boundaries of countries, it is essential for DRM and CCA policies to be developed with a strong regional perspective, leading to close patterns of regional cooperation. This relates to the theme of governance as one of the threads of this study. This chapter describes a wide range of regional initiatives that rely on innovative solutions being adopted within a holistic approach that links national governments, regional organizations, diverse sectors and public and private bodies.

Frequently it is the occurrence of a disaster that propels the essential roles of governance into wider public awareness, often with unflattering results. If a disaster is large in scope and causes great loss, then its effects will be felt beyond the country where it occurred, with economic consequences extending throughout a region or internationally. Yet ironically the most critical governance structures having any effect on a crisis situation or hazardous threat are determined and realized long before any disaster risks materialize as a crisis or become a disaster.

In anticipating and responding to catastrophic disasters, the key positions of national government ministries need to define and coordinate responsibilities among themselves. There is much work that needs to be done in DRM in what should become established routines and responsibilities across ministries, agencies and institutions. Typically a primary focus is given to known or familiar hazards, but much less attention is devoted to identifying and minimizing prevailing conditions of vulnerability and the changing nature of public exposure. The avoidance of underlying socioeconomic dimensions of vulnerability and physical exposure or an official willingness to tolerate the creation of new risks in government-sanctioned growth and development strategies remain major impediments to sound DRM commitments by governments.

Despite often theoretical acknowledgment of DRM principles, this is in stark contrast to the crucial pivotal role governments should be fulfilling in designing effective DRM strategies and implementing programs. This is routinely interpreted widely to include responsibility for all aspects of exercising authority and providing coordination to ensure public safety. Governments’ capacities to manage disaster risks are critical in terms of prevention, preparation, response,
recovery and reconstruction, yet in practice emphasis is concentrated on efforts to reduce the impacts of hazards when disasters occur. The leadership and political decisions needed to reduce vulnerability and exposure prove to be much harder and have few short-term political payoffs. Without a grasp on this challenge, as societies become more complex and human habitats become more concentrated with greater demands on infrastructure and the environment, existing risks will worsen and new threats will emerge. A changing climate and more competitive global economic practices will only increase disaster consequences beyond individual national capabilities.

In these conditions, despite governments’ primary roles managing disaster events when they occur, the abilities needed to accomplish definitive reduction of disaster risk factors associated with vulnerability and exposure are often determined by wider enabling environments. These include other elements of a society such as educational systems, technical institutions, regulatory procedures, professional skills and even local community activities. It is these combined elements that provide the potential for a holistic approach to addressing DRM within a society. These often less visible, but decidedly more sustaining, features of DRM are composed of various policies, enforcement of standards, capable institutions, qualified staff and dedicated associates.

As disaster risks expand or new threats emerge, these resources need to be distributed across an area wider than only individual countries. Populations and their livelihoods become more exposed because of complex infrastructure systems and economic interdependencies, so better information and more specialized abilities are necessary. With able direction and a common sense of purpose to engage actors with a regional perspective, creative relationships can produce the innovative solutions that are increasingly required to implement effective DRM strategies.

Chapter themes

Under these conditions, expanded DRM capabilities are crucial attributes wherever they can be established. They are necessarily buttressed by many supporting functions and involve actors who are engaged in their daily professional and personal pursuits. As one considers the routine functioning, growth and well-being of a society, these many additional technical and human resources need to be more explicitly associated with each other as part of the wider development agendas of all countries.

Patterns of governance

As discussed in previous chapters, governance needs to be informed and competent at all levels of official responsibility and in the relationships between jurisdictions and among countries. Information networks and reliable data need to be commonly available to foster productive associations. Moreover, public involvement is essential in all aspects of DRM planning, with local communities as well as through civil society institutions.
The modern world has shrunk through advances in information and transportation, so no country is immune to the wider social, economic and political influences that condition the changing circumstances of DRM. As environments change, climate becomes more variable. Cities grow, and as more people move to them, they alter the very nature of risk. People are threatened by new and more uncertain hazards. Storms and climate do not reflect political boundaries, while pandemics or wildfires can spread within a tight, close-knit community. As risks expand, disaster risk management expectations extend beyond the capacities and geographies of individual countries.

Regional institutions

Under these conditions it becomes imperative for the national governments and the inhabitants of local communities to both depend upon and profit from wider regional influences, which have a bearing on managing their prevailing risks. This requires more professional involvement, and additional institutions become essential. Geographically, these wider supporting functions and resources exist regionally, often in enterprises that have not always been associated specifically with disasters.

The globalized economy links all countries in some respects, so disasters no longer have to occur in one’s own country; they can have serious consequences halfway around the world. The experience of Toronto, Canada, facing a combined public health and economic crisis from exposure to Severe Acute Respiratory Syndrome (SARS) that originated in Asia in March 2003 is one such example. It demonstrated that effective communication of risk requires an understanding of how “global cultural flows have reshaped public events within far-reaching and complex chains of causality” (Drache and Feldman 2003, p. 3). Global trade, which enriches economies and has been a driver of growth for many Asian countries, also imposes wider risks that can increase the needs of many other countries.

Regional coordination

The multi-stakeholder dialogues conducted by UNISDR leading up to the post-2015 arrangements for DRM have highlighted the importance of trans-boundary issues (UNISDR 2013c). This implies more attention to regional and subregional policy commitments and joint activities. A specific recommendation was made to create subregional platforms as an integral part of successor HFA arrangements (HFA2). They are needed to establish regional coordination mechanisms, to strengthen information sharing and to promote risk reduction measures and collaborative response for trans-boundary hazards. Additional suggestions were made to increase joint studies and to consider these expanding risks to lives, property, economies and the environment in broader political and development contexts. These actions will encourage improved coordination.
among intergovernmental organizations that combine collected views and interests of neighboring and geographically associated countries.

These combined influences can empower effective efforts to manage disaster risks across Asia and the Pacific, even though there is no single political sovereignty or any collective government jurisdictions that prevail across the entire area. As disasters do not acknowledge political boundaries, this chapter illustrates some of the influencing factors and institutions working across Asia and the Pacific that contribute to disaster risk governance through their policies and practice. They all need to be more widely acknowledged and supported in the crucial roles they play for making individual societies safer.

Attributes of regional disaster risk management

These background conditions illustrate that more innovative means and better sustained regional structures are necessary for implementing DRM and managing regional disaster risks. Cultural affinities and shared geophysical conditions of Asia and the Pacific are positive attributes for advancing applied DRM activities that transcend individual country policies. These shared interests are particularly relevant in subregional geographical areas exposed to common hazards or that support similar types of livelihoods and associated vulnerabilities. Weather forecasting and early warning systems are by their very nature subregional in focus as is routinely demonstrated in the Bay of Bengal when cyclones threaten Bangladesh, India, Myanmar and Sri Lanka. Geophysical conditions and potential hazards are common throughout the Himalayan region regardless of countries’ political boundaries. This was dramatically demonstrated by the similar socioeconomic conditions and vulnerabilities of people living in the mountain villages affected by the destructive Himalayan earthquake of October 2005. In another shocking case, it was only after 350,000 deaths from the 2004 Indian Ocean tsunami that the value of a regional Indian Ocean tsunami warning system was understood and installed by international organizations and beneficiary countries.

Southeast Asian states share an exposure to the annual tropical cyclones that sweep across their territories and the routine monsoon floods they all experience. Yet the extent and consequences of the 2011 floods in Thailand were as surprising as the challenges caused by political uncertainties in early decision making. The consequences of a flood may be similar in neighboring countries when a river forms a boundary between them, such as the Mekong River, but the resulting needs also can be very different. Physical flood barriers do not work well if they are constructed on only one side of a river. In other cases where a river traverses neighboring countries as in the Ganges and Brahmaputra River basins, there are numerous disaster risk conditions that exceed interests and concerns of individual countries. Despite the small and often isolated local populations in Pacific island countries and territories, strong social and cultural ties have enabled collective DRM commitments regardless of national policies.
Regional institutions are a foundation for disaster risk management

Individual regional institutions provided a foundation for DRM in Asia and the Pacific even before some countries extended their national strategies beyond emergency relief and civil protection roles. When they are well conceived they can be instrumental in bringing together the technical knowledge of specialists, opportunities for applied or “action” research, analytical abilities to understand human and geophysical relationships, and the occasion for interaction among various stakeholders involved with disaster risks in different dimensions of a society. In providing such a professional, policy-defining and public basis for DRM in various subject areas, institutions can be key to cementing the multiple interests of governments, communities and professional structures around matters of public risk awareness and disaster risk management.

Once established with professional regard and sustained by country ownership and support, regional institutions are important for maintaining momentum in DRM accomplishments. They also should serve as a repository for documented experience, data acquisition and analysis, and learning experience that provides essential recall and advance for future generations. Additionally, they serve as an intersection for the wider dissemination of international thinking and for advancing combined development agendas. They provide opportunities for policy makers and technical practitioners from different countries to meet, share experiences and be exposed to new approaches for applying DRM. For these numerous reasons, institutional facilities deserve more sustained cultivation and support than they often receive.

These opportunities transcend individual national interests and over time have built strong professional relationships and distinctive subregional associations. They offer a tangible role for scientific study but more importantly a means by which scientific knowledge and practical experience can be combined through wider public interest and local involvement. In some instances and particularly as practiced in the Pacific with a strong commitment to consensus, subregional or localized views are consolidated. This provides a stronger voice for the subject in global forums and in all likelihood addresses contentious future global issues such as climate change and green development strategies.

These institutions have seeded the region with professional DRM expertise over the years with their consistent motivation, progressive advocacy of DRM policies and abilities to conduct joint activities, practical training and extensive sharing of Asian and Pacific DRM experience. The extent to which countries have sought to benefit from this existing expertise by consolidating the availability of trained personnel, the development of strategic DRM programs and national political commitments to the subject varies. Their attributes for DRM are easily overlooked as they seldom have “disaster” attached to their names. However, regardless of an individual country’s current level of engagement, the recognized standing of these institutions with their inclusive orientation serves to provide a collective platform for DRM subjects. This remains the case even as countries inevitably encounter some limiting circumstances in their official policies or vacillating interests of successive governments.
Future Earth

Future Earth is a 10-year international research initiative “to develop the knowledge for responding effectively to the risks and opportunities of global environmental change and for supporting transformation towards global sustainability in the coming decades.” Begun by the International Council for Science (ICSU), it is an example of the new forms of interdisciplinary involvement, knowledge dissemination and motivated associations between scientists and policy makers to address future global challenges. In this respect it mirrors the emergence of disaster risk management as a core element of resilience and sustainability.

While the concept has grown out of the United Nations Conference on Sustainable Development Rio+ 20 held in Rio de Janeiro on June 20–22, 2012, it serves as a timely example of how multiple interests and diverse abilities can be brought together in common purpose, including efforts to reduce disaster risks. Future Earth is intended to be a global platform to stimulate human interaction to meet development challenges through

- applied research for sustainability in the face of environmental change;
- interdisciplinary collaboration among natural and social sciences, economics and technology to solve complex problems;
- information for policy makers to support global and regional integrated assessments;
- participation of government officials, academic and business interests, and other sectors of civil society to work in partnership on research agendas and knowledge development; and
- building capacities in science, technology and innovation, especially in developing countries, to foster the involvement of a new generation of scientists.

Such an initiative addresses the wider issues of DRM through global risks, challenges and opportunities. Crucially, it also reflects the expanded range of resources that exist to mainstream disaster risk management into other development interests and sector responsibilities by looking beyond the constraints of disaster consequences. Like Future Earth, successful DRM can only be realized through sustained growth in awareness, interest, investment and engrained capabilities in future generations.

Source: www.icsu.org/future-earth. Additional and later topical information about Future Earth is available at www.futureearth.info.

There are several types of regional institutions that have contributed to the growth in DRM capabilities. Historically, there were few institutions specifically identified with disaster and risk management interests; other associations focused on improved
emergency or humanitarian response cooperation. As the concepts of DRM became more widely expressed through international frameworks such as the Hyogo Framework for Action (HFA), they also have become more closely associated with the shared interests of climate change adaptation, green development, environmental awareness, business or enterprise continuity management and community resilience.

As international discussion intensifies over the underlying principles for global development after 2015, there is considerable scope for fostering more strategic institutional networks to advance DRM. Beyond the official responsibilities of national governance, the institutional capabilities of regional organizations are likely to become more influential in advancing DRM practice across Asia and the Pacific.

However, this can result in drawing more of a distinction between other international initiatives which feature more specific humanitarian intervention activities, joint combined military-emergency preparedness exercises or more narrowly conceived hazard-specific contingency scenarios. While such emergency preparedness responsibilities certainly are a justifiable aspect of DRM explicitly considered in the context of the fifth HFA priority for action, it is important that the distinctions of emergency management and risk management not become blurred or, worse, understood to be one and the same.

The following organizations provide a sample of DRM expertise and regional institutions within Asia and the Pacific. They suggest regional resources that combine holistic approaches and innovative solutions that can be welded into a more commanding Asian and Pacific network for DRM to meet expanding risk management requirements.

**Disaster preparedness and risk management institutions**

The Asian Disaster Preparedness Center (ADPC) was established in 1986, originally at the Asian Institute of Technology near Bangkok, Thailand, to provide professional training for all aspects of disaster and risk management specifically focused on Asian and Pacific needs and requirements. While still providing a wide range of more specialized and increasingly sophisticated training in its current role as an independent organization, ADPC has greatly expanded its activities to include research, advisory and policy promotion roles to advance DRM in pursuit of its mission to be “a leading regional resource center for the realization of disaster reduction for safer communities and sustainable development in Asia and the Pacific.” In this respect, it is particularly committed to “promoting disaster awareness and the development of local capabilities to foster institutionalized disaster management and mitigation policies”.²

Created in 1998 in Kobe, Japan, with the support of the Government of Japan, the Asian Disaster Reduction Center (ADRC) has played an important role in enhancing disaster resilience for its 29 member countries. It works “to build safe communities, and to create societies where sustainable development is possible”.³ It also supports practical disaster reduction activities to build resilient communities and seeks to foster networks among countries through programs including personnel exchanges, training and technical assistance cooperation.
Created as a consequence of the regional needs for better early warning collaboration among countries following the 2004 Indian Ocean tsunami, the Regional Integrated Multi-Hazard Early Warning System for Africa and Asia (RIMES) reflects the maturing of technical institutions devoted to DRM. As an international intergovernmental organization focused on regional needs, RIMES was established in 2009 to be owned and managed by its member states. It currently has 13 members, of which 12 are Asian or Pacific countries, and has 18 more collaborating countries, with 11 in Asia or the Pacific. It works to integrate risk information at various scales to meet the early warning needs of diverse users. It provides a technical interface between specialized organizations and national or local institutions, which allows new and emerging technologies to be evaluated or extended in their use. In these respects RIMES marks the emergence of a new form of a mutually supporting partnership grounded in regional needs to invest in building collective capacities that can address common concerns. It also advances the shaping and sharing of technical abilities and advanced communications resources for collective benefits in their application.

**Geographically focused technical development organizations**

A different type of regional organization is easily overlooked because “disaster” is not specifically included in its name. These organizations are technical or geographically defined and engaged in wider development objectives that necessarily involve human exposure and vulnerability to disaster risks. As they are concerned with improving human conditions in local habitats, they are interested in the environmental conditions on which people depend. Two examples are cited, although there are others associated with these environment-, development- and community-based subject areas that relate to public exposure to disaster risks.

Several multidisciplinary institutions in Asia and the Pacific combine their interests in human development needs with geophysical and natural environmental risks. They are grounded in scientific research, influence national policies and are governed through intergovernmental arrangements. These attributes are extended through resourceful information management, which make the institutions effective examples for applied DRM and sustainable development practice. In this respect they display a beneficial blend of government interests, diverse staffing in functional structures, pursuing policies for extended community use and relevance.

The Mekong River Commission for Sustainable Development (MRC) provides integrated management of water and related resources through its basin-wide cooperation, regional planning and shared technical abilities. As an intergovernmental organization it has contributed to the development and progressive implementation of DRM strategies among Cambodia, the Lao People’s Democratic Republic, Thailand and Viet Nam since 1995.

The International Centre for Integrated Mountain Development (ICIMOD) is an intergovernmental education institution that combines its interests in fragile mountain environments and the livelihoods of mountain people. It is concerned with the impacts of globalization and climate change affecting its eight members.
The work of the institute addresses development opportunities in the Himalayan region with a full consideration of the physical, social and economic vulnerability of its inhabitants.7

Another type of key technical institution crucial for DRM practice on a regional basis is often organized around subregional needs. One example is the World Meteorological Organization’s Regional Climate Centers. Their work shapes the policy elements of international DRM frameworks to more specific regional or national emphasis. They also provide technical training opportunities, support institutional capacity development and are a source of specialized technical services, information and data. Two specialized regional climate centers were established in Beijing and Tokyo in 2009 to provide long-range forecasts and to make products in support of regional and national climate activities. In 2013, a third North Eurasian regional climate center was established in the Russian Federation, and a fourth was begun in an initial demonstration phase in India.8

These are examples of important technical resources situated throughout the region, often with a geographical or development focus, which are not limited to the circumstances of specific disasters because they address wider development interests of multiple countries. UN agencies and international organizations like the International Federation of Red Cross and Red Crescent Societies (IFRC), UNDP, UNICEF or WHO routinely have regional offices based in Asian cities such as Bangkok, Kuala Lumpur, Manila, New Delhi or Tokyo and elsewhere. They all provide a broad policy familiarity while supplying additional technical resources suited to DRM, even though they are not always so readily identified with ongoing DRM roles because their routine work is associated with national development activities.

**Regional organizational linkages to advance disaster risk management**

The absence of any sovereign political authority in the Asia-Pacific region or within subregions provides latitude for targeted investment in principal institutions that can advance applied DRM practices across risk-defined areas or zones and for the collective benefit of participating countries. Multiple benefits can be gained by developing associated or linked education, research or applied technical institutional networks dedicated to DRM. These combined professional linkages would be well placed to provide complementary DRM services benefiting from established international organizations or framework support while focusing on the disaster risks of particular relevance to Asian and Pacific country interests.

**Engaging higher education institutions in the region**

The composite academic and technical requirements for effective DRM implementation provide a compelling reason for regional and international organizations to establish more consciously devised and better supported higher education capacities to advance DRM in the region. The continuing need for technical and
human resources is a common theme in many countries’ reporting on their challenges to implement HFA priorities (UNISDR 2013b). Despite a longer period of return on education investments, there are few better alternatives to achieve sustainable DRM. Yet it remains surprising how few joint initiatives or regional education facilities pursue DRM subject contexts. By drawing on the individual institutional and technical abilities that exist within individual countries and linking them more explicitly through DRM-affiliated regional networks, more effective use could be made of scarce professional resources. The Chair’s Summary of the Fourth Session of the Global Platform for Disaster Risk Reduction cites that globally there is “an unmet demand for data, tools, methods and guidance on implementing risk reduction and a shortage of specialists educated and trained for the task,” and “integrating disaster risk management into education at all levels including higher education should be a priority” (UNISDR 2013d).

Bilateral and multilateral support have contributed to cost-effective academic research, multidisciplinary technical education and information management activities with regional emphasis. There are notable individual research and teaching facilities throughout Asia and the Pacific, but there are frequent expressions of need for more researchers, better shared documentation and greater networked access among institutions. These institutions provide opportunities for DRM study and have archived experience to serve students from throughout the region.  

Despite individual courses of study, there is not yet an established Asian consortium for joint higher education teaching, research and applied community outreach specific to DRM, such as the exemplary consortium Periperi U. in Africa. The Network for Social Sciences in Disaster Prevention in Latin America (LA RED) is another network of academic researchers and practitioners created in 1992 to provide concerted research and training on disaster risk management, realized particularly within and by local communities across the countries of Latin America. While there are various communities of practice that share DRM information and experience across Asia, or otherwise are motivated by leading academicians, there can be value for investing in a structured Asia and Pacific network of linked higher education academic and research institutions dedicated to the different facets of DRM learning and applications. A model can be found in the initial joint academic research and learning commitments made to address world hunger through the Consultative Group for International Agricultural Research (CGIAR) since the early 1970s, so the concepts and demonstrated benefits are well-known.

A proposed regional complex risk management institution

It may be timely to consider a common structure working within an Asia and Pacific environment to advance communication and collaboration related specifically to the complexity of large and compound disasters. The creation of an Asian and Pacific “complex risk management institute” or network of distributed institutions could promote and support the identification of combined hazards and their extended impacts. It could further address means for managing the risks by drawing on collective technical and operational abilities spread across the region.
Many elements of disaster risk and consequence management need to be unified either in a single location or networked through institutions sharing a common purpose. Data need to be collected, archived and disseminated about evaluating combined risks, mapping and individual risk assessment findings. Regional benefits would result from compiling existing work, projects, best practices, guidance and expertise. There is a further need to advocate for standardized methodologies and management structures to promote collaboration, shared information and professional networking. The provision of technical resources and assistance brought together under a regional institutional facility or structured relationships would create a primary source for supporting common standards.

The initiative could bring together experts in specific types of disasters and aspects of complex response strategies to assist national governments, commercial enterprises and local authorities in their joint efforts to manage the unforeseen consequences of compound disaster events. Its responsibilities would include using methods and consolidated data for identifying and then assessing organizational capabilities and professional skills of existing risk management organizations in various countries. Regional collaboration to provide training would increase individual competence and foster agency networks for professional mutual aid.

A goal of such an Asian and Pacific facility would be to motivate and support individual national emergency management systems working to meet certified standards applicable to compound disaster events. This effort could also assist in lessening a significant gap that currently exists between government policies and corporate business continuity practices, which often operate in parallel contingency planning contexts. The emphasis should be on complex events that are likely to influence more than single countries, and particularly those with wide regional commercial implications.

Such a regional facility or structure also would provide an overarching set of relationships for the various government and international agency efforts to promote, advocate and support risk management. An Asian and Pacific complex risk management institute would bring together the activities of the UN system, international financial institutions and other bilateral or multilateral agency initiatives addressing portions of the subject across the region. While there are many technical, research and development institutions, at present there are none singly or in combination addressing these multiple factors essential for advancing strategic risk management requirements on a regional scale.

Regional cooperation

Regional cooperation assumes distinctive forms that contribute to improving certain aspects of disaster risk management. However, the different political, economic, institutional, and crisis management characteristics of subregional cooperation exert various influences on policy and governance in countries. Even though there are partial and sometimes episodic occasions for joint associations in Asia that extend beyond bilateral technical assistance programs into joint DRM activities, they often remain focused primarily on emergency response for major disaster events. There
have been examples of shared subregional experience and the formulation of agreements that express solidarity for DRM principles and policies.

Beyond these expressions of common intent and some joint exercises, more tangible activities for advancing DRM policy and joint practice in managing risks are still to be fully realized. The UNISDR Progress Review of the HFA in Asia and the Pacific from 2011 to 2013 provides information about both accomplishments reported and challenges that continue to be faced by the intergovernmental organizations: the South Asian Association for Regional Cooperation (SAARC) in South Asia, the Association of Southeast Asian Nations (ASEAN) in Southeast Asia and the Secretariat of the Pacific Community Applied Geoscience and Technology Division (SPC-SOPAC) in the Pacific (UNISDR 2013b).

Of the examples cited, it is in the Pacific where these various influences are most closely aligned in a common subregional expression of commitment to a shared understanding of DRM needs and priorities. The additional international attention focused on climate change consequences and especially on rising sea levels has provided impetus for Pacific island countries and economies to pursue joint benefits of regional solidarity. The growing political influence of the Small Island Developing States bloc in both political and international development forums has further encouraged a collective approach to addressing the particular needs of disaster risks in small island human and ecological habitats. This characteristic of strongly shared common commitment to DRM purpose in the Pacific has not yet been fully realized in other Asian subregions.

Regional humanitarian and emergency response cooperation

Historically, in terms of humanitarian and emergency response cooperation, there have been examples of regional cooperation in disaster management policy development, joint operational abilities and specialized emergency training. At times of crisis, regional organizations can represent wider collective interests when bilateral country engagement or physical access may be difficult. In this respect, ASEAN was instrumental in channeling humanitarian assistance into Myanmar following Cyclone Nargis in 2008. The ASEAN Regional Forum (ARF) was established between the 10 ASEAN countries and 17 other regional and partner industrialized countries in 1994 as a forum for security dialogue in Asia and the Pacific. It later began to address practical cooperation measures in disaster relief activities. The Philippines and the United States organized the first ARF disaster relief exercise in the Philippines in 2009; Indonesia and Japan jointly organized the second exercise in Indonesia in March 2011 after the Great East Japan Earthquake (GEJE).12

In specific operational terms, ASEAN has conducted other regional disaster emergency response simulation exercises annually since 2005. As a consequence of these, the ASEAN Coordinating Centre for Humanitarian Assistance (AHA Center) was established in 2011 to facilitate cooperation among countries’ emergency services with the United Nations and other relevant international organizations. Standard operating procedures for regional standby arrangements and
The Program for Enhancement of Emergency Response (PEER) is an example of beneficial collaboration in training for disaster preparedness and response capabilities. Established in 1998 with programs in four countries, PEER has continued for 15 years with the support of USAID and the American Red Cross (ARC) and now conducts activities in nine Asian countries. The program is a good example of the shared use of regional training resources for a common purpose, and it also applies its cumulative experience to specific countries’ operational requirements. The program has been conducted at times by both the National Society for Earthquake Technology (NSET) in Kathmandu, Nepal, and the Asian Disaster Preparedness Center in Bangkok, Thailand. Currently they both implement the program jointly with USAID and the ARC by drawing on each institution’s particular strengths and abilities. Investment in more collaborative training programs such as PEER would be a definite asset for the region.

In South Asia, there has been less evidence of formal intergovernmental cooperation in joint humanitarian and emergency relief assistance. The foreign ministers of the SAARC countries signed the Agreement on Rapid Response to Natural Disasters in 2011. While the intention was to provide for a coordinated subregional response mechanism and prior planning for relief and humanitarian assistance, those expectations have not yet been realized. The agreement suggests future opportunities to enhance trans-boundary disaster preparedness and response cooperation, although it awaits ratification by all SAARC member states before they can be implemented.

In the Pacific the available resources for joint humanitarian assistance are quite limited, although the Pacific island countries and territories share their disaster relief requirements and experiences with wider working association with development and donor organizations through the annual Pacific Platforms for Disaster Risk Management. Considering the population distribution across the Pacific and the many small communities, Pacific countries and territories have focused their attention and resources on building resilience and risk reduction in local communities.
Recurring Asian regional DRM conferences such as the Asian Ministerial Conferences on Disaster Risk Reduction are another form of cooperation for governments, regional organizations and professionals engaged in implementing DRM. They serve to endorse countries' commitments, share experience and consolidate future priorities. They also played a key role in multi-stakeholder dialogues conducted through UNISDR efforts leading up to the Fourth Session of the Global Platform for Disaster Risk Reduction on May 21–23, 2013. It is expected that they will motivate similar involvement leading to the successor arrangements of the HFA after 2015, which will be decided at the Third World Conference on Disaster Risk Reduction to be held in Sendai, Japan, in March 2015 (UNISDR 2013c). The Sixth Asian Ministerial Conference on Disaster Risk Reduction in June 2014 presented another strategic opportunity for building regional consensus on HFA2 as the last intergovernmental meeting in the region before the Third World Conference.

At an operational level and with more of a concentration on implementation, similar benefits are obtained from the mostly annual Regional Consultative Committee meetings sponsored by ADPC and corresponding annual meetings for the member countries of ADRC. These meetings provide strong regional focus and demonstrate the value of maintaining DRM political commitments and solidarity, at least in principle. However, without increasing the corresponding national commitments and allocation of sustaining resources to applied DRM implementation, these meetings run the risk of becoming more rhetorical than substantial. Therefore there is a growing need to determine and apply specific targets and to increase accountability for tangible outputs of accomplishment against the expression of frameworks, roadmaps and blueprints for success. There are clear indications that such accountability mechanisms will be central to the negotiation and agreement of HFA2 to influence future DRM (UNISDR 2013c, 2013d).

Subregional intergovernmental organizations

Subregional intergovernmental organizations in Asia and the Pacific have been proponents of DRM for some time, although with the exception of longstanding engagements in the Pacific, tangible actions to further DRM beyond supportive declarations date mostly from the past five years. The 10 member states of ASEAN adopted the ASEAN Agreement on Disaster Management and Emergency Response (AADMER) in July 2010 to confirm their commitment to the HFA. It was the first legally binding agreement related to the HFA and serves as a common regional platform in responding to disasters. The Comprehensive Framework on Disaster Management was adopted by SAARC in 2007. As it was similarly aligned with the HFA, it has become the guiding framework for the South Asia subregion. In November 2011 the SAARC member states further adopted the National Disaster Rapid Response Mechanism agreement discussed on page 264. The Applied Geoscience and Technology
Division of the Secretariat of the Pacific Community has a long association with the development and management of Pacific commitments to DRM governance and policy development. It has worked closely with 21 Pacific island countries and territories since 1995 to develop and implement comprehensive regional policies for DRM.

Southeast Asia subregion

Beyond the framework documents cited above and the joint emergency response cooperation described previously, in Southeast Asia ASEAN has proceeded to develop other instruments to advance DRM. The ASEAN Committee on Disaster Management adopted a work program to run from 2010 to 2015 to implement activities under the subregion’s foundation document, AADMER. The comprehensive activities cover such areas as improved risk assessment using satellite-based monitoring systems, GIS-based information platforms and community-based DRM. As part of this program the Regional Roadmap for Disaster Risk Assessment has been adopted and a series of capacity development activities is being provided to member states in such areas as standardizing disaster loss databases. The GIS-based Disaster Monitoring and Response System is being implemented by the ASEAN Centre for Humanitarian Assistance and similarly aims to upgrade essential data quality and access for improved decision-making capabilities.

These initiatives represent programs grounded in multiple interests and various degrees of political or economic motivation. Conceptually they can be well considered, but the requirement for assured resource allocations and sustained policy commitments are seldom guaranteed. In the absence of a regionally recognized authority or institution dedicated to advancing disaster risk management across the region and able to engage the various national officials, international organizations and regional bodies involved, such initiatives can become short-lived, narrowly focused or marginalized.

South Asia subregion

In South Asia subregional initiatives to advance DRM beyond traditional emergency assistance were stimulated in SAARC primarily following the Indian Ocean tsunami in 2004. The SAARC member countries approved the Comprehensive Framework on Disaster Management and Disaster Prevention in 2007. It refers to generic priority areas for attention such as improving early warning systems and increased sharing of information. A subregional SAARC Disaster Management Centre became operational in 2007 to share knowledge, to provide technical advice to governments and to conduct research and capacity development leading to improved coordination in terms of more comprehensive DRM policy development and practice. In addition, a South Asia Disaster Knowledge Network was created in 2009 to serve as a network of networks for scientific, technical, research and practicing organizations.

While there have been advances within some of the individual countries in the subregion in these primary areas of interest, progress has not been uniform or
even smooth. A variety of complicated geopolitical relationships, national concerns about key natural resources and a hesitancy to share what is considered in some quarters to be sensitive data have combined to frustrate earlier intentions of more harmonized regional DRM policies and practice. There have been limited commitments by some member states, competing priorities and a more general failure to provide adequate resources, so while the instruments and institutions exist, their current relevance is modest (Ishiwatari 2012).

**Pacific subregion**

The Pacific countries and economies demonstrate a strong historical commitment to regional cooperation, consensus decision making and environmental sensitivity. Regional political and technical institutions have provided solid foundations for DRM for nearly 20 years since the Pacific Forum leaders adopted the Pacific Regional “Madang” DRM Framework in 1995. Exemplary and productive relationships have been developed beyond conferencing in the combined development, climate, environment and disaster risk activities pursued collectively in the Pacific. Common efforts are a hallmark of the regional development strategies, which involve a respected regional political body, technical institutions, international organizations and most technical assistance agencies working through a common Pacific structure.

SPC-SOPAC continues to provide technical advice and policy support for the region through the Pacific Disaster Risk Reduction and Disaster Management Framework for 2005–2015, approved by Pacific leaders in 2005. It coordinates activities with other SOPAC technical programs and among regional or international development partners such as those related to the Pacific Islands Framework for Action on Climate Change, 2006–2015. Among the 16 Pacific countries that submitted HFA national progress reports in the 2011–2013 cycle, fully 13 of them have climate change policies that specifically include DRR issues. Twelve countries link disaster risk reduction policy commitments in their national development plans (UNISDR 2013b).

A recent development suggests the growing sophistication of joint Pacific commitments to apply DRM instruments in practice for subregional benefits. With the support of SPC-SOPAC, the World Bank and ADB launched an innovative Pacific Catastrophe Risk Assessment and Financing Initiative as a pilot risk transfer program with commercial insurance companies. The combined initiative provides countries with tools to understand, model and assess their exposure to natural disasters as essential prerequisites to access risk financing.

**The Asia-Pacific economic area**

The Asia-Pacific Economic Cooperation (APEC) intergovernmental body is primarily dedicated to fostering business and trade relationships and opportunities, but it has also demonstrated an awareness for the wider implications of disaster risks throughout Asia and the Pacific. APEC has had an Emergency Preparedness
Working Group (EPWG) since 2005, when it was begun as a virtual task force to coordinate and facilitate emergency and disaster preparedness among member countries. The concept and focus was expanded in 2009 to include wider human security issues, and particularly efforts to reduce disruptions to business and trade in the area. Recognizing the importance of the work, APEC upgraded it to a working group in 2010.

The association shapes its interests to address the primary needs of its members so it concentrates on supporting the region to prepare for and respond to disasters. As with other organizations focused primarily on crisis and contingency management, APEC also seeks to reduce the risk of disasters and encourages business and community resilience. By spanning multiple interests of its members, it can support countries in refining and giving voice to their common concerns, conveying a collective view to UN agencies, international organizations and financial institutions, or bilateral assistance organizations. Although it is not widely considered in international DRM contexts, it could become a more influential actor.

Unfortunately, without strong motivation, such internally conceived intentions driven by trade policy and business interests can easily remain separate from national DRM policy formulation and practice. They tend to proceed in nearly parallel organizational environments, ministries and professional networks with different audiences. As the 2011 Bangkok flood and the Great East Japan Earthquake and Tsunami and the Fukushima nuclear crisis demonstrated serious commercial consequences throughout Asia, they could stimulate more of an impact of APEC on DRM in the future. The breadth of APEC’s membership also may encourage the organization to become a useful forum to address supply chain disruptions and interruptions to production systems. If motivated to do so, APEC can address these issues with a scope that exceeds the capacities of its individual members.

APEC leaders issued an important declaration in this respect in December 2012, when they stated, “Recognizing the vulnerabilities of our economies to natural and anthropogenic disasters, we reaffirm the importance of enhancing preventative measures, emergency preparedness, disaster resiliency and fostering of scientific and technical cooperation among APEC economies, communities and businesses in this regard” (APEC 2012).

The organization’s commitment to meeting future needs through partnership was expressed in comprehensive terms as the statement continued:

In view of high economic costs incurred by many APEC economies due to natural catastrophes in recent years, we note the timeliness and the importance of strengthening our resilience against disasters through the development of disaster risk management strategies. We recognize that integrated disaster risk financing policies are part of overall disaster response preparedness. In this regard we recognize the value of knowledge exchange within APEC and beyond and appreciate the joint efforts of the World Bank, the OECD, the ADB and other bodies’ joint efforts to elaborate practically applicable guidelines for financial authorities’ responses to natural disasters with due regard for the work undertaken by the G20. In developing these policies,
attention should be given to advance planning and preparation measures by financial authorities.

(APEC 2012)

This is a commitment that needs to be capitalized upon and not allowed to remain simply a political declaration. Governments and international and regional organizations working in Asia and the Pacific need to embrace such explicit regional initiatives.

**Regional information access, exchange and data requirements**

There is much information available about DRM activities in Asia and the Pacific as well as within all of the countries concerned. The PreventionWeb portal allows information searches by region, country, activities, organizations or subjects. Its Asia home page has direct links to 20 regional organizations engaged with DRR and has contacts for 1392 other organizations working throughout Asia; it lists 305 entries in Oceania for the Pacific subregion.

The UNISDR website for Asia and the Pacific provides even more focused material (http://unisdr.org/asiapacific). The Asian Disaster Preparedness Center has initiated a website portal to record DRR projects across the region and to share their experience and reference materials. More extended discussions about the risk trends and current status of DRM practice in Asia and the Pacific are available in the biennial Asia-Pacific Disaster Report published in 2010 and 2012 (UNESCAP and UNISDR 2010, 2012).

In the specific area of regional technical information development and dissemination, advanced technologies offer promise for future advances in DRM. One example is Sentinel Asia, a program initiated by the Asia-Pacific Regional Space Agency Forum (APRSAF) in 2005. It involves regional technical and institutional partners to expand the use of information and communication technologies (ICT) and space capabilities to improve the speed and accuracy of disaster preparedness and early warning. It combines the interests of ASEAN, Asian and Pacific ICT and space agencies, the Asian Institute of Technology, the United Nations Office for Outer Space Affairs (UN-OOSA), UNESCAP, and ADRC to apply advanced remote sensing and web-based GIS technologies to support disaster risk management requirements.

Yet with all this experiential information being shared across Asia and the Pacific, there is a serious need for much better consolidated data and analysis to make the financial and corresponding political justification for investing in DRM. This requirement is referred to frequently in national reporting on the HFA Monitor, and it has emerged as a key issue and proposal in most of the multi-stakeholder dialogues proceeding towards 2015 (UNISDR 2013c). Many of the national reports from the region cited the need for improved data to ensure that decision making is based on evidence. The absence of data is particularly acute at local levels, and a widespread lack of guidelines, methods and standards is noted
repeatedly, especially for risk assessments. Countries also expressed limitations in obtaining or analyzing data, which have implications for better availability and developing more analytical capacities through education.

When considered in strategic terms and relative to previously identified regional or subregional DRM agendas, a networked system of DRM professional institutions could contribute to the foundation for a regional DRM data development and management system. This would encourage improved data acquisition, common standards, cost efficiencies and multinational engagement for shared regional benefits.

Critical consideration of regional production networks and supply chains

The recent growth of an intricate web of supply chains and production networks in Asia has important implications for DRM. The successful functioning of East and Southeast Asia’s finely constructed and balanced production networks and supply chains rests on the premise of there being no major disruptions to the system, including from natural hazard events. In the past two decades, pressures for economic growth and greater productivity have led to the creation of large industrial zones located in areas highly exposed to natural hazards. The Chittagong Export Processing Zone in Bangladesh (CEPZ) was constructed directly on the coastline adjacent to the mouth of the Karnaphuli River on the Bay of Bengal. While its proximity to the port of Chittagong is expedient for production and transportation services, the location is highly exposed to the frequent cyclones that batter the country. Producing exports valued at $2.1 billion and with annual investment of $134 million in the facility (2012–2013), one must speculate on the corresponding value of any appreciable risk management or reduction measures in place at the facility.

Modern production procedures demand minimal inventories with “just in time” supply chain systems linking parts manufacture, transportation and use with very limited margins for contingencies. These production economies equally rely on complex logistics systems throughout Asia, which extend to other continents. While based on cost-benefit efficiencies, these commercial procedures are dependent on telecommunications, information and transportation systems, which, if disrupted, can impact global markets. The world price of computer hard drives increased threefold following the 2011 floods in Bangkok, where 90 per cent of the world’s production was located (UNESCAP and UNISDR 2012).

Many industrial estates were constructed near Bangkok on former rice fields adjacent to the country’s largest river, which has a history of flooding. While the location was conducive to agricultural production dependent on annual floods, in 2011 it proved less suited for multi-million-dollar manufacturing plants protected by insufficient embankments and cement retaining walls. The commercial impact of the floods was greatest north and west of central Bangkok where land-use planning concentrated economic activities in risk-prone areas. The flood defenses around the industrial sites proved to be inadequate to various extents throughout
The regional level

The entire flood period. In all, seven industrial estates were flooded by as much as 3.4 meters of water, necessitating extensive losses and extended clean-up. The management of one commercial estate estimated that it would require 10 weeks to drain the 12 million cubic meters of water in its facility. Officials at another location expected that they would require 13 weeks to clean and rehabilitate the facility after the water had been removed and a further year to fully rebuild their extended operational infrastructure (Courbage et al. 2012).

The referenced documentation elaborates that the automotive industry was one of the most seriously affected sectors. The nine Japanese car manufacturers operating in Thailand were all affected in various ways that required them to suspend their operations in Thailand. This provoked other knock-on effects interrupting production elsewhere in such countries as India, Indonesia, Philippines and Vietnam. This was an ironic consequence for those Japanese companies that had already been affected by the GEJE months before and moved some of their operations into Thailand to avail of more assured energy access while also avoiding the negative influence of the strong yen. The negative impacts also extended to secondary parts suppliers which provided critical and sometimes unique assemblies required for production in Thailand and elsewhere. The effects extended even more widely, as the disruption in global supply chains for component parts disrupted Toyota car production in 22 countries extending as far as North and South America (UNESCAP and UNISDR 2012).

Major Japanese electronics companies such as Toshiba, Sony, Nikon and Nidec also suffered extensive flood damages to their production facilities in Thailand or endured interrupted procurement systems or parts shortages. These conditions had inevitable economic consequences that were reflected in annual reports. Sony reduced its full-year operating profit outlook by 90 per cent while also reporting a third-quarter loss of US$345 million. Sony predicted a US$1.2 billion annual loss for the year 2011–2012 (Courbage et al. 2012).

The 2011 GEJE (and the tsunami and nuclear accident that it precipitated) also caused enormous disruption to production networks and supply chains in the region and damaged the economies concerned. While direct physical losses resulting from the March earthquake and tsunami in Japan were estimated at $212 billion, compared to the direct physical losses resulting from the June–December floods in Thailand estimated at $40 billion, the full economic impacts of both of these disasters are likely to have been much higher. Through production networks, the impacts of a major disaster in one part of the region can now be felt across the length and breadth of these networks.

Similarly, the disruptions caused by the Thailand floods not only caused significant declines in Thai exports in electronics (−47.4 per cent) and electrical appliances (−21.9 per cent), in 2011 they also had significant effects on Japan, where the manufacturing production index fell by 2.4 per cent (from October 2011 to January 2012), led by a contraction in electrical component production of 3.7 per cent during the same period.

Disruptions in the supply of intermediary products following the Great East Japan Earthquake caused automotive and electrical components production in
Japan to contract by 47.7 per cent and 8.3 per cent, respectively, in March 2011, year-on-year. But contractions were also evident for several other economies in the region. For the automotive sector, reduced production soon spread to the Philippines (−24 per cent), Thailand (−19.1 per cent) and Indonesia (−6.1 per cent) during April–June 2011. For the production of electrical components, the highest contraction was likewise recorded by the Philippines (−17.5 per cent), followed by Malaysia (−8.4 per cent), during April–May 2011 (all percentages are year-on-year).

This brief indication of the impacts of two major disasters in 2011 on regional economies through disrupted production networks is only a slight picture of the full counting of the indirect costs involved. For industries in the private sector, ignoring the lessons of risk management multiplied their economic vulnerability. The stringent economics of global manufacturing supply chains ignore the reality that economies of scale are closely associated with increased risks. The smaller the number of plants, and the greater their concentration in areas of likely hazards, the higher the risk of business interruptions. The greater the distances between component suppliers, the fewer their numbers for critical parts and the smaller inventories are, the higher the risk of avoidable interruptions of supply chains. In view of the frequency of natural hazard events in Asia and the Pacific and the region’s increased economic vulnerability through supply chains and production networks, it is important that such impacts are closely studied on a regional basis.

The propagation of these economic impacts of disasters within and beyond the region could be reduced through greater recognition of the consequences of clustering production facilities or transportation services in locations particularly exposed to hazards, diversifying industrial locations for assembly and component suppliers, and ensuring the resilience of logistical support systems. In terms of making better use of recognized policies, there is considerable scope for the wider adoption of accepted business continuation practices by individual firms. At the very least, due consideration should be required either by regulatory means or more directly by corporate self-interest to ensure the use of proven risk mitigation practices. These should include accepted international risk management standards and established business continuity practices.

As cities become agglomerations of large-scale industries, the growth of commerce can create its own ecosystem where land is available, prices are lower and regulations are few or more relaxed. As these hubs grow and become linked through intricate supply chains spreading across and beyond countries, risks and contingent requirements can easily be overlooked. Eventually, a localized disaster can result in a macroeconomic impact on a regional scale.

It is therefore critical to identify systemic risks, of all types for all populations. This implies the importance of industrial policies considering such elements as settlement patterns, land use and their combined influences on increasing or creating new risks. It is equally important to analyze the extended impacts of disaster event scenarios, which include proper social and economic impact assessments. This foresight is needed to understand what types of social and recovery programs
are required for the affected area and population beyond the immediate concerns of commercial production values.

These improvements can be furthered by the mutual recognition of governments and business interests that there are shared benefits to be gained by combining their efforts to adopt effective remedial measures. It is recommended that this objective can be pursued by both government policies and business practices jointly working to incorporate explicit and established risk management practices and standards already embodied in business continuity practice into national strategic DRM policies, planning and programs. At present, there are few countries that recognize, much less require, that mutually reinforcing disaster risk management standards are coherently employed in national DRM strategies. With greater attention given to “making the business case for DRM,” there should be more political encouragement for bridging the current divide between the economic rationale for disaster reduction and the implementation of official policies for identifying, assessing and proceeding to reduce disaster risks (UNISDR 2013a).

Conclusion

This chapter illustrates how crucial the regional scale of engagement is for concentrating the common interests of individual government policy commitments to DRM while also supplementing countries’ own resources with expanded institutional relationships to energize a more sustained impetus to reduce disaster risks throughout the region. Regional attributes include the beneficial attention of distributed specialist technical, scientific and academic institutions that are motivated by interests beyond disaster concerns. They can be driven by capitalizing on collaborative relationships that incorporate combined political, economic, environmental and regional development interests. The high social value of education in the region can contribute to a more explicit involvement of civil society in reducing public risk through all levels of learning. These are all dynamic features in Asia, and they also have demonstrated how they bind distant localities for a common purpose across the Pacific.

The region has abundant material and technical resources, with a growing body of human capacities to direct abilities and techniques toward more sustained risk awareness. The subjects elaborated in this chapter encourage the further identification of innovative means to build public risk consciousness through ongoing professional and academic linkages. Broader perspectives such as those developed through APEC’s growing engagement in risk reduction are one example of how the subject can become more integral to established commercial activities. Rather than being driven by multiple or independent national policy initiatives alone, or only promoted as an international framework, a more explicit regional vision of collaborative DRM remains an unrealized opportunity. Because disaster hazards are pervasive across the region, the risks will grow as development prospers unless social vulnerability and public exposure can be reduced. Visionary relationships, joint government-institution-public collaboration, improved data and shared information, collective analysis, joint resource commitments and multidisciplinary
efforts that transcend geographic and sector boundaries will define the future effectiveness of regional DRM.

The following recommendation is considered to have the most effective holistic and long-term impacts to address these requirements for advancing DRM practice across professional interests dealing with expanding disaster risks in Asia and the Pacific.

**Recommendation 8**

*Invest in networked regional professional, technical and educational institutions to address regionally specific DRM research subjects and applied activities to nationally agreed and certified standards. This investment will depend on the prior creation of a regional DRM data acquisition and management network to support the collective needs of expanded regional DRM structures.*

**Notes**

1. Future Earth. www.icsu.org/future-earth
9. Examples include the Asian Institute of Technology in Bangkok, Bandung Institute of Technology and Gaja Mada University in Indonesia, National University of Singapore, Kyoto University in Japan, Beijing Normal University in the People’s Republic of China, Tata Institute for Social Science in Mumbai, BRAC University and Bangladesh University for Environment and Technology in Bangladesh, Roorkee (and other) Institutes of Technology in India and University of the South Pacific in Fiji.
10. Periperi U., or Partners Enhancing Resilience for People Exposed to Risks, is a consortium of 11 African universities which links multiple programs dedicated to trans-disciplinary DRM learning and practice located in 12 different faculties. Other than initial supporting grants from the United States Agency for International Development (USAID), the individual academic and research programs have received strong local support from the hosting institutions (See Periperi U., www.riskreductionafrica.org). A Periperi U. seminar addressing the methods of mobilizing higher education explicitly for DRM capacity development was conducted at the Fourth Session of the Global Platform for Disaster Reduction in Geneva, 24 May 2013 (www.unisdr.org/we/inform/events/32982).
11 Network for Social Sciences in Disaster Prevention in Latin America (LA RED). www.la-red.org
12 Association of Southeast Asian Nations Regional Forum (ARF). http://aseanregionalforum.asean.org/about.html
13 Program for Enhancement of Emergency Response (PEER). www.adpc.net/blog/
16 PreventionWeb. www.preventionweb.net
17 PreventionWeb Asia. www.preventionweb.net/english/countries/asia
20 The exposed location of the CEPZ between the coastline and the Karnaphuli River less than a kilometer away is evident from the map available at http://wikimapia.org/8320276/Chittagong-Export-Processing-Zone-CEPZ.
22 Preceding loss figures and the following percentages in reduced production are from METI (2011), as quoted in ADB and ADBI (2013).
23 Refer for example to such established standards as ISO 31000 for risk management and ISO 22320 for societal security. ISO publications are available from national standards institutes in member countries or at www.iso.org/iso/home/store/catalogue_ics.htm

Bibliography


10 International frameworks advancing disaster risk management

Terry Jeggle

Introduction

The final chapter of this study vividly demonstrates that expanding risks, one of the threads of this study, are being countered by a rich and varied set of international frameworks, organizations and initiatives. These provide essential support to the vital role of national governments in DRM. The chapter also weaves in the other threads of this study as it highlights a wide range of innovative solutions in the form of creative international frameworks. A characteristic pattern, as noted in earlier chapters, is the value of broad-based holistic approaches in lieu of narrowly defined methods.

The global awareness of disaster risk management (DRM) has grown significantly over the past 40 years. In not much more than a generation, countries and international institutions are facing the growing frequency and extraordinary social and economic costs of disasters. An earlier focus on what were commonly referred to as “natural disasters” and the humanitarian aspects of human conflict has expanded as economies have grown. Cities have expanded, and in response to the social and economic opportunities they represent, more people have migrated from simpler subsistence habitats. They now reside in often dense concentrations of population in natural environments threatened by various hazards and expanding risks. While some of these hazards are natural phenomena, a growing number of risks are resulting from human decisions and actions that have so far failed in substantially reducing people’s vulnerability.

Disaster risk management is a pressing concern for all societies. Beyond hazardous natural phenomena, the occurrence of technological and industrial disasters, biological threats, altered environmental conditions and compound disasters now represent costly consequences of combined natural and human-induced risks. No society in the world, regardless of its wealth or technological sophistication, is immune from exposure to disaster risks. Without sustained attention to assessing and managing risks driven by the pivotal role of national governments, and particularly their dedication to reducing socioeconomic conditions of vulnerability and physical exposure, the more prosperous a country becomes, the greater potential there is for serious losses when disasters occur.
The attributes of countries also have changed during this same time. Education, institutional capabilities, human and material resources and capital assets have all grown. These factors represent the important recognition of the policies, organizational structures and dedicated professional staff engaged in daily routine activities that provide the foundation for disaster risk management. Asian societies have proven to be economically vibrant and are historically innovative. They become increasingly important as the globalized world of the 21st century is more connected, but it also becomes more interdependent. The magnitude of unprecedented crises and many competing international disaster and development agendas compel both governments and local communities to be more attentive to the uncertainties, public exposure and economic consequences of unmitigated risks. Yet a holistic understanding and common approach to addressing risk management remains a challenge that is more easily analyzed and expressed in global declarations than actually applied through implementation strategies.

**Government needs and limitations**

Government efforts to provide human security have become more elaborate, even as there have been circumstances that blur important distinctions between human security and state security issues and methods. As a result, political motivations or competing economic interests can easily dictate that resources are spread too widely or inconsistently to achieve lasting benefits from DRM activities. These issues prevail within countries and can limit much of what is actually pursued in practice. To be serious about risk management, governments cannot continue to avoid confronting the drivers of risk discussed elsewhere in this study. National governments are central to realizing strategic commitments to DRM and are failing in their public responsibilities if they allow dated concepts of only responding to disasters to satisfy expectations of disaster “preparedness.”

**Combining capacities**

Previous chapters have discussed how DRM has grown and is being encouraged within local and national environments, with crucial relationships between those actors. The paramount importance of minimizing localized socioeconomic vulnerability, as well as the power of local participation if successfully motivated and encouraged, has been elaborated. Innovative financial mechanisms are reviewed and proposed. Regional contexts further establish the relevance but also the examples of expanded resources available through extended political, professional and organizational relationships. The international frame of reference discussed here provides an even wider and sustaining perspective to advance DRM understanding, policy development and practice if efforts actually are channeled into activities rather than deliberation.
Despite a larger scope of opportunity and command of uncounted resources, international influence is constrained by the absence of recognized political authority or sovereign instruments to require DRM commitments within or among countries. As a result political rhetoric can too easily displace official leadership or material investment in creating safer societies, while external persuasion also has its limits. There is therefore the startling irony that despite considerable aggregated resources and seeming influence, international entities wield correspondingly less power or authority than that which potentially exists within individual countries. A shockingly small percentage of international aid is dedicated to disaster risk reduction.

**Making and maintaining connections**

More focused imagination and institutional innovation is required to marry crucial political responsibility with professional anticipation that can minimize the effects of emerging and increasingly complex risk scenarios within countries. Because it is in local communities where people live and the consequences of disasters are painfully experienced that DRM actually needs to be accomplished, the efforts of dedicated and knowledgeable individuals – champions – are crucial elements to translate knowledge into experience. Material, financial and human resources also exist within all governments, if they were to be more decidedly allocated to safeguard human well-being and valued societal resources. This chapter discusses various types of international influence and expanded opportunities, which can be utilized more productively to shift DRM emphasis from advocacy to practice and accomplishments.

**The international context for advancing disaster risk management**

Promoting the social, political and economic rationale for DRM; defining its essential features; and channeling resources to implement effective activities within countries are primary international functions for reducing risk. These are less matters of governance than they are elements of influence realized through conscious and deliberate efforts. The forces of shared public and official recognition of “enlightened self-interest” need to be combined with efforts to link the essential features of government, the engagement of people’s own communities, and the organizational abilities and institutional processes to reduce disaster risks. The sustained commitment of resources can produce both a wider understanding of DRM values and the innovative solutions outlined in previous chapters of this study.

People involved politically and in practice have created global frameworks to distinguish DRM from the more dramatic international humanitarian actions covered by media following major disasters caused by natural hazards. There is now growing public understanding, if sometimes official consternation, about the causes of major disasters that occur internationally. The sensational humanitarian stories often pass rapidly while the more serious underlying risk factors continue
to beg for attention for years. Major events like the 2004 Indian Ocean tsunami, Hurricane Katrina’s destruction in New Orleans in 2005, the 2008 Sichuan earthquake in the People’s Republic of China (PRC) and the “failed development” behind the losses of the 2010 Haitian earthquake reverberate around the world, with lessons to be learned time and again.

The wide-ranging international economic consequences of recent industrial failures have focused further attention on DRM. Events such as the extensive environmental damage and corporate costs associated with the world’s largest oil spill in the Gulf of Mexico in 2010, or the 2011 floods in Bangkok, which halted industrial production around the world, have resulted in inquiries about the prior conditions of risk. The combined government and corporate failure to prevent nuclear contamination from the damaged Fukushima power plant in 2011 has stimulated an intense debate surrounding national energy policies in Japan and elsewhere. Despite the severity of these disaster consequences, the extent of their impact in advancing DRM is harder to judge.

The growing international effects of DRM further demonstrate that they do not result only from inadequacies or lack of attention in impoverished countries or poorly regulated emerging economies. The deaths of more than 1,100 workers in the collapsed garment factory building in Dhaka, Bangladesh, in April 2013 provoked a public outcry about the systemic failures nationally and multinational corporate tolerance for unsafe working conditions internationally as unacceptable public risks. The costly disruption and financial losses incurred from Hurricane Sandy in the New York City area in October 2012 further emphasize that DRM cannot be ignored politically or economically in any country. While each of these events occurred in a specific national locality, their repercussions and consequences have been global.

The cumulative effect of these events and others demonstrate the international impacts disasters have on societies. They also establish new professional horizons and illustrate the additional technical abilities countries need in order to implement effective DRM strategies. There is a lesson to be learned from the technical research of the 1997–1998 El Niño climate event, which documented its global social and economic significance. This originally unheralded international technical work pointed to recurrent consequences of climate variation to the extent that coupled marine and atmospheric data are now monitored on a routine basis through international scientific cooperation.

Human dimensions feature prominently in defining future expanding risks, regardless of the hazards concerned, but few governments have yet fully evaluated the social and economic drivers of risks. These features may come into better focus as international studies, researchers and educational institutions gain wider acceptance for their essential roles in influencing international practice of DRM.

Examples are cited in this chapter to suggest a wider appreciation of international frameworks than is ordinarily considered when identifying underlying associations and influencing factors driving DRM efforts and accomplishments. They will only increase in number as concepts like disaster risk reduction (DRR) proceed beyond being subjects of international advocacy and are rather pursued in tangible forms.
There are other important development subjects seldom identified explicitly with disasters, but which are highly relevant to politicized international policy agendas. Beyond a growing reliance on multiple interpretations of “resilience” in disaster management and development practice, these include specific interests in climate change adaptation (CCA) and “green development.” Both of these technically conceived concepts are closely associated with disaster risk reduction as expressed in *The Future We Want*, the outcome document of the United Nations Conference on Sustainable Development Rio+20 held in Rio de Janeiro in June 2012 (UNCSD 2012).

The subject of DRM is increasingly becoming linked in the public understanding and official concerns through often conflicting international issues. Disasters and development principles, public interests and private enterprise, and technical advances that alter traditional cultural attributes all define the contrasting modern challenges that affect the basic requirements of DRM. The subject also involves other conflicting development challenges such as built infrastructure displacing natural resources, or the mutually beneficial objectives ascribed to both national authorities and local communities as if they display similar interests. The complex conditions that characterize these subjects have most recently been reduced to calls for greater resilience and even more sweeping social transformation, even as few commentators can easily translate these assumed attributes into meaningful and practical activities.

These same policy choices advocated by international platforms also reflect tensions. They present difficulties for governments to respond to competing demands with limited resources and compromising trade-offs. Should political leaders pursue rapid economic growth with its cost-benefit judgments of capital development regardless of social consequences? Instead, can people demand more measured sustainable development with less risk, driven by social values of equity and justice? These issues are debated extensively in international forums, and they have a major influence on determining future risks of global importance. Meanwhile, few governments have taken bold steps to invest in comprehensive DRM strategies.

This chapter poses these challenges while it also seeks to identify beneficial resources that operate through official forms of engagement and professional practice to advance elements of DRM, if not yet comprehensive strategies. It reviews some of the influencing factors and institutional arrangements by which DRM has grown and can advance further to make societies safer. The preceding chapters about DRM motivation and practice in local communities and national and regional environments illustrate the largely enabling rather than implementing capabilities represented by international interests. DRM is driven in international settings by influence and advocacy while public demands for greater official responsibility and better public protection emerge from the escalating consequences of disaster events. Some of the international frameworks cited can contribute to bridging this current divide, but only to the extent that they are more explicit in their actions to advance risk management than in responding to disasters.
The value of accumulated experience

Since the 1980s, international organizations and external foreign assistance have provided much of the emphasis to present DRM in a global context. However, the extent that these programs have reduced people’s vulnerability to hazards or modified their exposure to risk is debatable. While there has been $862 billion in disaster losses in developing countries from 1992 to 2012 (equal to one-third of all international development aid), the international community spent only $13.5 billion (1.6 per cent of losses) on reducing the risk of disasters in the same two decades. This amounts to only 0.45 per cent of the overall international development aid of $3 trillion during the 20 years. Detailed analysis also concludes that the priorities of international financing are generally “not matched to either the needs or the capacity of recipient countries.”

These issues should signal that it is time to modify the dynamics and resource allocations for reducing disaster risks from international advocacy towards greater national implementation and implicit responsibilities at all levels. As this joint report of the Global Facility for Disaster Reduction and Recovery (GFDRR) and the Overseas Development Institute (ODI) makes strikingly clear, beyond the matter of relative levels of financing by either international or domestic sources, the crucial issues are ones of “complementarity, alignment, coordination and mutual accountability” (Kellett and Caravani 2013).

Because of international advocacy and the formation of definitive policy frameworks since 1990, more countries are aware of what critical DRM policy issues are for the future, but they continue to search for ways and means how to accomplish them in practice. Current international guidance in this respect is conveyed by both the Synthesis Report: Consultations on a Post-2015 Framework on Disaster Risk Reduction (HFA2) and the Chair’s Summary of the Fourth Session of the Global Platform for Disaster from April and June 2013, respectively (UNISDR 2013a, 2013c).

Partial successes have created a wider understanding of DRM in contrast to previous disaster management regimes, but governments need to adopt new approaches and allocate resources to implement comprehensive DRM strategies within countries. This was expressed in the Chair’s Summary of the Global Platform when among other important topics it specifically emphasized strengthening scientific and technical support, strengthening integrated risk governance, leading through the work of local authorities at the local level and involving communities (UNISDR 2013c).

These efforts will require the continued work of many people, professional organizations and the institutional capacities that are the foundation for implementing DRM and especially DRR activities. They require more public involvement over longer periods of time than in those more intense periods during a disaster assisting people in times of unexpected needs.

Networks of individual people

Many of the earliest foundation policies and lasting influence on DRM accomplishments can be traced back to the work and commitment of dedicated individuals. The roots of DRM have been firmly planted in science, engineering,
education and applied research since the 1970s. The people most intensively involved and who provided initial leadership were knowledgeable about hazards; more importantly they were dedicated to reducing people’s vulnerability to hazards and minimizing public exposure to risk. Their work influenced hazard studies, established institutions and defined the emergence of DRM policies. Extensive professional knowledge and the force of individual personalities are easily underestimated for the influence they have exerted on global advances in DRM.³

These people and others working today are seldom considered as composing an “international framework,” but collectively in terms of extended influence they represent one of the most vital instruments for advancing the subject. Their influence has been significant in terms of policy development, technical innovation and prodding official authorities or legislatures to commit to the value of advancing DRM in their individual countries and through international conventions.

Historically, few have been engaged in disaster or crisis management activities, but nearly all have taught many disaster management administrators by study, experience and example. They created academic programs, expanded networks and established professional centers that continue to influence DRM policies in multiple fields. Information and communications technology now provides easy global access to a rich archive of experience and innumerable resources in the natural and social sciences, engineering, education, health, public administration, economics, planning, environmental management and risk assessment to mention only some of the relevant disciplines.⁴

As in most successful endeavors, individual champions and role models led with their individual expertise but shared a common objective of translating established knowledge into newly understood practice. They developed vibrant and extensive relationships that spanned the world. They insisted on standards and persisted in making demands of governments. There is no shortage of knowledge or technical experience about how to do DRM, but it is greatly underutilized. Today’s champions deserve more support, but most importantly they deserve access to policy makers and serious regard by decision makers.

Organizational frameworks

Organizations that are able to combine public interest and risk management abilities expand governments’ opportunities to create an emerging “culture of protection.” As more development obligations obtain wider political credibility, they all touch upon uncertainties and therefore also influence public risk. The elimination of poverty, good governance, gender equity, climate change adaptation and community resilience all relate to DRM. Existing organizational mandates do not do sufficient justice to the future expectations of DRM governance. Managing shifting coalitions of interest to make combined contributions for achieving shared objectives could be the job description for the next generation of public risk managers.

If risk has become everyone’s business, as the UN Secretary-General has stated, then that can multiply available resources.⁵ This section briefly identifies some of the additional subject or organizational frameworks associated with managing
public exposure to risk, even if “disasters” do not appear explicitly in their name or mission.

Sustainable development

Since the Brundtland Commission first expressed the imperative for societies to pursue “development that meets the needs of the present without compromising the ability of future generations to meet their own needs,” sustainable development has been intrinsic to DRM. This essential relationship was recognized in the founding resolution of the International Decade for Natural Disaster Reduction (IDNDR) and another that later led to the creation of the secretariat of the International Strategy for Disaster Reduction (ISDR) (UN 1989, 2000). As the mandate for ISDR was elaborated further in 2001, the fundamental importance of socioeconomic development was highlighted and it continues to be central to any successful DRM initiatives (UN 2001).

In 2000, world leaders also adopted the United Nations Millennium Declaration to reduce global poverty by 2015, in part by countries implementing the Millennium Development Goals tied to primary development sectors (UN 1999a). The mounting demands of sustainable development and their relevance to DRM was again emphatically expressed in The Future We Want in June 2012 (UNCSD 2012).

DRM objectives need to be explicitly associated with international program objectives and implementation mechanisms engaged in poverty eradication, environmental management, climate change adaptation, economic growth and development. Different measures and roles are required in disaster relief, in social and economic recovery and through long-term development planning. Efforts to reduce disaster risks need to be implemented throughout national development strategies and need to be included in investment calculations. National government direction, local governance commitments and strong civil society participation are all essential if DRM is to be realized (UN 2012).

These expectations establish standards for DRM that few governments can yet demonstrate. They also require management skills and technical abilities that do not exist in most disaster management organizations. Resource commitments drawn solely from disaster-related contexts are woefully inadequate to fully address disaster risks, which extend across a society’s requirements. Successful DRM strategies need to accommodate functional operational relationships drawn from both disaster management and development sectors such as public health, education, land-use planning, natural resources and environmental management, public and economic infrastructure, and climate change.

Scientific, technical and professional organizations

There are other types of technical associations that can advance DRM. At least 120 countries have National Academies of Science, and there are more than 30 International Scientific Unions. These and other international scientific associations
are relevant networks for reducing disaster risks that threaten modern societies. Their members are some of the world’s most eminent thinkers who often have made a life of public service in teaching, research, innovation and acting on foresight.

These organizations comprise long-established technical associations that represent a cross-section of scientists, researchers, educators, planners, public officials, social activists, community leaders and others whose work blends DRM and development practice. The Earthquake Engineering Research Institute (EERI) is one such organization. It maintains highly regarded and far-reaching global influence with professionals and governments for improving the understanding of seismic hazards in local contexts. It routinely works with global partners to reduce human and physical losses from disasters through joint research, field experience and strong professional bonds.

Yet with some few individual exceptions such global technical and professional organizations seldom are involved in motivating wider commitments to DRM. In addition to the priority emphasis given to the engagement of scientific and technical organizations already referred to in the Chair’s Summary of the Fourth Session of the Global Platform in May 2013, the subject is also one of nine priority observations leading towards the next generation of risk reduction and resilience after 2015. There is “the need to achieve a more effective interplay of science, policy and practice in support of disaster risk reduction [providing] an opportunity for collaborative learning and action.”

There have been challenges in fully mobilizing scientific and professional organizations and resources in DRM strategies. Many already are working with public risk issues, the complex relationships of society or national development, but few are enlisted in structured leadership roles for DRM. Considering the many fields in which these people work with their own professional networks, each of them represents valuable resources for DRM (Basher 2013).

International development organizations

International development organizations and specialized agencies are expanding their programs to address public risk reduction issues, increasingly within the programmatic contexts of their established subject activities. Many are revising their approaches to DRM commitments by developing comprehensive program strategies that merge expanding public risks, sustainable development and disaster management on a continuing basis. While such “mainstreaming” has been encouraged through international policy statements for some time, it is only recently that some influential international organizations are now making DRM and DRR core program elements. These programs now strive to avoid being categorized as either disaster management or only development projects because they span socioeconomic, health, education, environmental and livelihood issues, which are all cast into greater degrees of uncertainty by changing climate conditions.

The United Nations Development Programme (UNDP) has supported DRM activities through its development programs since the mid-1990s. Its Bureau for Crisis Prevention and Recovery and regional bureaus have supported the
development of national management systems and technical capacities required to build national DRM systems and more specific disaster management capacities. Organizational programs often have spanned several years and demonstrated increasing levels of professional sophistication as countries' capacities increased. These activities have variously supported policy development, staff training, risk assessments, communications and information management systems, and operational field support to prepare for or to recover from disaster risks. UNDP has provided support for DRM programs in more than 60 countries, spending on average more than $150 million annually to increase resilience to natural hazards.\(^1\) Interest in these initiatives has grown in recent years especially from middle-income countries whose growing assets remain exposed to disaster risks that were not previously factored into earlier project designs.

Since 2011 UNICEF has intensified its organizational commitment to DRM. With an understandable focus on children, it has altered its previous emergency preparedness and disaster management program strategies by placing multiple hazard risks at the center of all of the organization’s programming. By applying risk assessment principles, it tries to reduce the causes of children’s physical, mental and emotional vulnerability. After DRM program specialists were placed in each of its regional offices, more than 40 countries reported child-centered DRM programs with a strong focus on local-level involvement (UNICEF 2011). These have involved program commitments to improve access and standards of education, health, water and sanitation and supporting possibilities for personal growth and development. In looking beyond 2013, UNICEF is proceeding to establish “risk informed programs” across all subject areas and throughout the organization.

The World Health Organization (WHO) has initiated an organization-wide process to develop comprehensive implementation strategies for emergency risk management that considers all hazards and takes account of the operational capacities of its members. Beginning in 2012, WHO embarked on developing a health emergency risk management framework influenced by the International Standard for Risk Management, ISO 31000 (ISO 2009). The organization intends to override earlier program distinctions between humanitarian action in responding to disasters and project efforts to improve the socioeconomic conditions that define vulnerability in development work. In this context WHO is conducting an extended international dialogue with its partners in other development sectors to establish operational guidelines better suited to managing risks (WHO 2012).

While the strategy is grounded in the health sector, WHO recognizes that effective health services must depend on the assured operational abilities of other service organizations such as transportation, dependable communications, utilities, education, structural and operational integrity of physical facilities and operational infrastructure. While these practices are commonplace in business or enterprise contingency planning, it is surprising how seldom such external dependencies are factored into disaster risk management awareness or planning. The wider use of globally accepted risk management standards by international organizations working with national counterparts may encourage a better acceptance of their value in practical terms.
The roles and global DRM responsibilities of the World Meteorological Organization (WMO), its specialized organizations and the global communication system that links the national meteorological and hydrological organizations (NMHOs) of its 182 member countries have grown enormously. WHO’s global telecommunications network provides unrivaled data, information, research and hazard analysis. Forecasting, early warning communications, hazard modeling, capacity development and archived data are only some of the organization’s technical functions essential for DRM strategies in any country. These services provide immeasurable economic value for many industries and also supply essential tools for national DRM policy development.

National meteorological agencies had not always been involved in national policy considerations for improved DRM strategies, but as global telecommunications have enabled much improved forecasting, more accurate warning capabilities and advanced climate change modeling, these services have become highly valued. NMHOs are now assuming much more active and supporting roles for expanded DRM activities internationally. WMO has adopted disaster risk reduction as one of its five organizational strategic priorities from 2012 to 2015. With the significant and highly uncertain consequences of climate change altering previous measures of disaster management, forecasting and early warning, the WMO Congress established a Global Framework for Climate Services in October 2012 and adopted an implementation plan in which DRR is a priority area for activity.

Civil society

There are many possibilities for civil society participation in DRM, but as with other segments of society much depends on people’s understanding of risk, their relative exposure to it and how effectively it can be managed. Teachers in all schools have an opportunity to instill risk awareness from lower grades through community motivation in secondary education. There are many academic courses that provide knowledge and teach necessary skills for DRM, yet there are few curricula that systematically discuss risk in local communities. Fortunately there are civil society organizations that play important roles in reducing vulnerabilities and motivating local participation in DRM.

One of the most familiar organizations is the International Red Cross and Red Crescent movement composed of 187 national societies. This international framework supports national societies as primary instruments to involve individual citizens and local communities in disaster preparedness and local risk assessment. In 2003 the International Committee of the Red Cross (ICRC) and the International Federation of Red Cross and Red Crescent Societies (IFRC) agreed on

fully integrating disaster risk reduction into national and international planning and policy instruments and implementing appropriate operational measures to reduce risks, and by implementing appropriate legal, policy and
operational measures to facilitate and expedite effective responses to disasters, in order to reduce the risks and effects of disasters on marginalized and vulnerable populations (ICRC and IFRC 2003).

The IFRC further elaborated a disaster management strategy in 2007 with a major emphasis on disaster risk reduction. National societies throughout Asia and the Pacific conduct DRM training activities for government officials, local leaders and national society staff. They publicize what communities are doing to avert crisis and to manage their localized risks. The IFRC World Disasters Report has been published annually since 1993 with a different risk or related development theme each year, frequently highlighting risk reduction measures (IFRC 2004, 2009, 2010). The Red Cross and Red Crescent Movement developed and has implemented the Vulnerability and Capacity Assessment methodology for nearly ten years as it has become a standard for mobilizing local participation to assess community risks and capabilities in both development and DRM programs (IFRC 2006).

Nongovernmental organizations (NGOs) and other local community organizations also have become primary motivating and implementing agents of DRM in high-risk areas. Some have grown from small beginnings in Asia motivated by a handful of people in the mid-1990s to become internationally recognized instruments for implementing DRM “one village or barangay neighborhood at a time.” The growth and recognized competence in drawing from international thinking to work effectively in practical terms at local community levels by using locally available knowledge, interest and commitments characterize local NGOs like SEEDS-India, SEEDS-Asia and the All India Disaster Mitigation Institute (AIDMI), among many others. Their informal but respected local leadership guides residents through crisis situations. There are thousands of local organizations that are, or can be, enlisted in DRM activities if there are policy mechanisms to accommodate and support them. As with the individual people and technical organizations referred to previously, all of these NGOs maintain extensive and vibrant networks. If they were to be purposefully identified and mapped they would describe another extensive “invisible” international framework dedicated to advancing DRM in local practices.

Among the larger multinational NGOs whose logos and humanitarian appeals are more familiar to international audiences, there have been surprisingly few agencies that have adopted strong corporate DRM strategies. Those that have considered expanding their involvement in risk-driven development programs have been tentative. Bilateral and international assistance contracts for crisis management and disaster recovery remain attractive incentives for humanitarian work. A researcher will look in vain for program budgets dedicated to DRM activities, in contrast to either the sizable disaster management or development program allocations. The expression of DRM intentions and language certainly has become more common in development discussions and conferences, and it is also cited as an objective of NGO training to professionalize humanitarian work. However, while NGOs have engaged in individual DRM projects, there is limited evidence
that DRM practice has yet been convincingly mainstreamed into larger NGO corporate program portfolios.

**Private-sector and commercial interests**

As primary economic engines of societies, commercial interests and industry are acutely aware of risks whether they are financial, political, corporate, natural or human-induced. Risk itself is the business of the insurance industry. With their economic resources and political influence, private-sector companies have been viewed as desirable collaborators by both development and disaster management initiatives. However, with some exceptions in engineering, loss modeling, telecommunications and logistics, business interests are mostly absent in international commitments to DRM except for emergency relief assistance or occasional corporate social responsibility publicity gestures. There are renewed calls that this should change as expressed in the Global Platform’s summary, which urges as a primary need the recognition of the private sector as both actor and partner. More specifically, the influence of this particular extended international framework should become more evident as it is “progressively aligning its risk reduction efforts with the Hyogo Framework for Action and is developing business practices that promote resilience and foster new opportunities for public-private partnerships as part of overall improved risk governance” (UNISDR 2013c).

The insurance industry and particularly the influential global reinsurers have been closely associated with international frameworks to reduce disaster risk since the earliest days of the IDNDR. Other commercial enterprises and all large businesses are committed to means that reduce their own risks and can insure their continued operations despite uncertainties or specific threats and hazards. The 2013 *Global Assessment Report on Disaster Risk Reduction* develops this rationale with extensive international justification and experience, as its subtitle is “From Shared Risk to Shared Value: The Business Case for Disaster Risk Reduction” (UNISDR 2013b).

The industry of business (or enterprise) continuity management was created by businesses to manage risks in their own competitive commercial environments. It is driven by analytics, risk assessments, actuarial probabilities, cost-benefit analysis and the science of risk management. It is highly technical, sharply focused and serious business. But it is not motivated by the same considerations of the UNISDR, nor does it represent the development principles expressed in *The Future We Want*. It is essentially a parallel system with little routine interaction and slight policy influence on national DRM strategies. As well developed and important as the discipline is in economic terms, it remains perplexing why the subject is so seldom incorporated or even associated with official national DRM strategies.

The World Economic Forum (WEF) with its international constituency of global finance, economic enterprise, governance and civil society interests has maintained working groups for both disaster management and risk management. In 2010, as part of a multi-year initiative on the financial impacts of global shocks it agreed to publish *A Vision for Managing Natural Disaster Risk: Proposals for Public/Private Stakeholder Solutions* (WEF 2011). It later created a WEF Global
Agenda Council on Disaster Management to “gather thought leaders on disaster risk reduction and response” (WEF 2012). The council has proceeded to develop a public–private model for community resilience with initial plans reported in June 2012 being sophisticated, detailed and insightful. This process illustrates the seriousness that the private sector extends to DRM, although it is proceeding in an entirely different context than other international frameworks and development agendas discussed in this chapter. There is considerable scope to rationalize and mutually associate these various parallel initiatives, bringing governments, communities and institutional structures together in the process.

International institutional policy frameworks for disaster risk reduction

Lasting change in people’s behavior depends on modifying their understanding about the subject as well as associating their views with the decisions and actions taken within individual countries. Efforts to forge closer relationships between governments and people’s communities should be the focus of DRM strategies, especially as one identifies examples of more effective implementation and successful DRM practices. However, as a more deliberate process of governance takes time to respond to change, the accumulation of international experience provides a lens for presenting and understanding the basic concepts of applied DRM practices. While international institutional policy frameworks may be evident to specialists working in the international humanitarian and development professions, they can also be far removed from the daily challenges for people to meet their basic needs, much less to be motivated for engaging in disaster reduction activities in their local communities.

International initiatives to create joint and mutually supporting institutional associations of governments, international organizations, technical resources and civil society (that is, populations) have been hallmarks of DRM principles to pursue common objectives. They combine political advocacy with building relationships among technical and other institutional partners to implement a broadly defined program of activities. International organizations have invested heavily in these frameworks to advance the knowledge and practice of DRM, as well as serving their own interests in the process.

These institutional frameworks aim to provide both policy and technical guidance as they manage opportunities to expand relationships. They encourage governments to tailor broad policy objectives to meet countries’ individual needs and circumstances. Frameworks have been important for conceptualizing and propagating DRM but also show more limited accomplishments in translating DRM policies into convincing or sustained actions. Tangible incentives are few and successful motivations remain challenging. Advocacy and advice are usually more evident than means to transfer resources to recipient countries, although there are some positive examples of financial support for countries’ emerging strategies.17

Broad gaps exist between the theoretical understanding of DRM, the formulation of official policies and the practical measures that are resourced and actually
taken in the course of routine existence. These critical transitional functions where ordinary people are exposed to disaster risks are easily assumed in the advocacy or promotion of DRM concepts, but they are much more difficult to realize in practice. DRM will not be accomplished unless and until sufficient incentives or motivations can be provided through creditable institutional or governance systems embedded within populations exposed to risks.  

After 25 years, it may be timely to reconsider the relative impacts associated with advocacy and conceptual design processes on a global scale in contrast to current needs required to implement and sustain national commitments to DRM practice.

International policy initiatives and their accompanying strategic policy frameworks, blueprints or roadmaps aim to shape possibilities and obtain resources for wider application, but they are seldom able to implement the subjects themselves. That responsibility depends on individual national acceptance of DRM values and ultimately the willingness to commit necessary resources to follow through with activities. At best, international institutional and policy frameworks can frame the issues, foster an expanding community of practice and seek potential investment of resources. However, how these necessary and useful functions relate and are able to apply to national conditions are more difficult concerns to expect from international designs. It is in this respect where regional familiarity and recognized national institutional capabilities may be more suited to motivating and supporting applied DRM within individual countries.

There are several possible options that governments can authorize and pursue, perhaps even too many. International organizations promote global agendas to foster government and national capacities for the elimination of poverty. They commit resources to achieve sustainable development, economic growth and balanced environmental management. Other programs encourage gender equity and social justice, as development initiatives promote transparent and accountable governance exercised with fiscal responsibility. Current development thinking advocates resilient communities and transformational policies to adapt to a changing climate with unknown dimensions and few universally accepted specific local effects.

As worthy as these objectives may be individually, they are more easily promoted by their advocates than they are all to be accepted and included among the many competing interests any government has to contend with. Much development practice is encouraged through participatory processes, even as the determination and management of the institutional process may be more “top-down” and internationally driven than is commonly acknowledged. Some of the attributes and challenges associated with these primary international institutional policy frameworks for DRM are reviewed briefly.

The International Decade for Natural Disaster Reduction created a legacy

Since the United Nations General Assembly declared the years from 1990 to 1999 to be the International Decade for Natural Disaster Reduction (IDNDR), countries have acknowledged the international dimensions of reducing disasters
However, the founding resolution also signaled a continuing restraint on IDNDR’s ambitions as all necessary international financing for it would be provided only through extra-budgetary means by willing countries. The absence of internationally agreed mechanisms to allocate explicit resources for DRM has remained problematic.  

The resolution defined a second persistent global problem for DRM. For more than 20 years, proponents of DRM have struggled internationally and within countries to develop the essential capacities required for reducing risks as something more than an auxiliary extension of disaster or crisis management. Advocates of DRM have expressed the need for international organizations and governments alike to “mainstream” or integrate DRM into strategic national development objectives and practice. There are few emphatic policies that do so in practice.

The achievements of the IDNDR were limited as its technically framed programs accomplished only modest results (UN 1999b). However, from a wider perspective, it provided a legacy for more attentive audiences as foreseen by the Final Report of the IDNDR Scientific and Technical Committee. The report concluded by stating, “Disaster prevention for the future, with a full appreciation of the economic and social consequences of risks and society in the future, must involve issues and abilities of sustainable development, environmental management, science and technology, commerce and industry, and the encouragement of participatory forms of governance that contribute to social well-being and security” (UN 1999c). In 2014, these challenges remain and represent even greater investment values.

The International Strategy for Disaster Reduction creates a global platform

As the successor to the IDNDR since 2000, the International Strategy for Disaster Reduction (ISDR) has developed and pursued a comprehensive strategy to maximize international cooperation to realize all aspects of DRM (UN 2000). The framework was designed to engage the energies and coordinate the resources of the UN system, governments, international organizations, technical agencies and civil society to reduce disaster risks. The budget for its secretariat, the United Nations Office for Disaster Reduction (UNISDR), for the 2012–2013 biennium to accomplish this mandate was $64.9 million. As with previous international funding for the subject, the UNISDR must rely on voluntary international contributions (UNISDR 2012).

UNISDR has succeeded in methodically designing the concepts, formulating standard policies and advocating an increasingly defined understanding of DRM. It has encouraged analysis to establish the subject’s political and economic justifications in many venues and provided guidance to all constituencies expressing an interest. The Chair’s Summary referred to the Fourth Session of the Global Platform in May 2013 as “the largest and most diverse to date, a sign that disaster risk reduction outreach has yielded results” (UNISDR 2013c).
In creating a coherent and productive global organizational framework, UNISDR has placed a high priority on using information and complementary endorsement of DRM values to advance UNISDR objectives. The secretariat has amassed an extensive archive of DRM experience keyed to specific subjects from around the world and disseminated it through countless publications and electronic means. This documentation has produced a catalogue of organizations, resource materials and relationships, which together define the DRM community internationally and, by extension, the subject’s growing institutional global profile.

UNISDR first published an international sourcebook for DRM and DRR in 2004 to lay the foundation and elaborate the basic concepts of DRM. *Living with Risk: A Global Review of Disaster Reduction Initiatives* drew on a wide selection of global experience to illustrate practical measures by which DRM and DRR were being implemented in government policies and through practical activities (UNISDR 2004). Later, in 2009, UNISDR initiated a biennial publication, the *Global Assessment Report on Disaster Risk Reduction* (GAR), produced since 2009, which reviews and expands DRM concepts while also tracking global accomplishments (UNISDR 2009, 2011, 2013). The GAR stimulates international DRM thinking through innovative research and monitors global progress on institutionalizing DRM practices. It projects emerging global DRM trends and conveys DRR experience, citing issues that either advance or can impede further DRM progress. Similarly, the biennial *Asia-Pacific Disaster Report* published jointly by UNISDR and UNESCAP tracks current status, growing concerns and future directions of DRM relevance in the region (UNESCAP and UNISDR 2010, 2012). The PreventionWeb database portal managed by UNISDR since 2008 provides far-reaching benefits through its electronic information management network.21

UNISDR and international organizations, governments and other international policy frameworks have invested heavily in both political conferences and technical meetings to deepen the DRM dialogue and to expand DRM participation. UNISDR organizes global conferences and has stimulated many more professional meetings to motivate governments, international organizations, technical specialists and civil society to engage in DRM activities. These international and regional conferences remain frequent and characteristic events to advance the political involvement and technical understanding of UNISDR’s objectives and are relied upon to increase understanding, share experiences and motivate the use of DRM policies and practice.

The World Conference on Disaster Reduction held in Kobe, Japan, January 18–22, 2005, amplified ISDR’s purpose and roles. The resulting *Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters* (HFA), adopted by the 168 governments participating, is the accepted international framework for implementing DRM until 2015. Since 2007, UNISDR has convened a biennial Global Platform for Disaster Risk Reduction in Geneva, Switzerland, with the Fourth Session concluding in May 2013. The Third World Conference for Disaster Risk Reduction will be convened in Sendai, Japan, in March 2015 at the conclusion of the HFA for international participants and national governments to commit to successor global arrangements for
advancing DRM and DRR into the next 10 to 20 years. An intense process has been under way since 2012 to prepare internationally agreed successor arrangements that will combine the interests and governance structures for DRM/DRR, CCA and “green development” after 2015 (UNISDR 2013a).

The Hyogo Framework for Action

The HFA expressed the essential elements for nations and communities to implement a comprehensive DRM strategy over an extended period. It remains the most comprehensive international statement of DRM roles and responsibilities and so retains a dominant global influence.

Some successful implementation practices have grown over a longer period from unlikely motivations. Governments adopted the HFA in 2005 with stated objectives and agreed guidelines but without specific targets. UNISDR designed a system of indicators keyed to HFA priorities. This country-driven HFA Monitor has grown into an articulate, if subjective, process and reporting program for monitoring DRM efforts.22 In the 2011–2013 reporting cycle, 36 Asia and Pacific countries submitted national evidence-based reports, with 16 of those coming from Pacific island countries. The process of internationally motivated but nationally focused self-assessment has become a useful measure of engagement and limitations. UNISDR’s regional offices continually work with countries and through regional workshops to increase strategic planning capabilities, but translating policies into solid practice ultimately needs to be driven by national interests and resource commitments.

Despite the structured guidance of what should be pursued, it is difficult for countries to address the more demanding social, economic and political issues that influence national behavior, and for this the HFA offers limited guidance. The necessary commitments can arise only from internal national willingness and governance arrangements to confront the political economy and power relationships that exist in all societies. They also carry large political rewards or costs depending on where a person’s responsibilities, their residence, business interests or motivations are situated. These are the real underlying issues, which can propel or constrain the implementation of DRM, and yet they have seldom been openly addressed in most international dialogues about implementing DRM in practice.

These are some of the most difficult points between international detailing of desirable DRM policies and the persistent realities of continuing public vulnerability to disaster risks. They often touch on politically sensitive matters of accountability or corruption, unequal power relationships and dominant economic interests, which may be at variance with effective regulatory processes. It is these fields of neglect or disregard within societies that DRM governance needs to confront and manage as they are beyond the diplomatic reach of internationally motivated institutional frameworks.

UNISDR recognizes this challenge that DRM faces, concluding, “Implementation of the HFA is accelerating in a great number of countries and its principles
have been widely accepted. However, there is still a gap between political commitment and actions on the ground which translate that commitment into meaningful impact for vulnerable communities exposed to disaster risk” (UNISDR 2012).

Evaluating frameworks: what determines progress and who charts the future?

UNISDR evaluated the progress of the HFA by conducting a midterm review during 2010–2011. The broad institutional effort included an external advisory group, outcomes from regional and national workshops, results from selected studies, a literature review and contributions from an on-line public dialogue.

UNISDR reported that the HFA played a decisive role in promoting the progress of DRR, but it also acknowledged that the implementation of the HFA was uneven, especially when viewed in institutional terms at national levels. Some HFA priority activities showed more accomplishment than others: the adoption of improved national legislation, establishing early warning systems and strengthening disaster preparedness and response showed more progress. Reported performance was lower in conducting systematic risk assessment, especially in terms of the social and economic dimensions of human vulnerability, and incorporating DRM into sustainable development policies, planning and activities (UNISDR 2011b).

The accomplishments cited for “ensuring that disaster risk reduction is a national and local priority with a strong institutional basis for implementation” (HFA priority 1) are the most relevant for DRM governance and policy development. Inadequate financial resources and limited local government and community participation in strategic DRM planning and decision making were areas of less accomplishment. At the time of reporting, only 20 countries (of 133 reporting) had established budgetary allocations for local governments to implement DRM.

For Asian and Pacific countries specifically, variations appear between countries and among functional achievements when the issues are studied more closely (UNESCAP and UNISDR 2012). For example, only half of the 61 Asia and Pacific countries reviewed had overarching national legislation that specifically referred to DRM. Twenty-three of the 30 legislative measures referred to specific policy commitments (HFA priority 1 interests) and disaster preparedness and response (HFA priority 5 emphasis). In 18 cases, legislation assigning responsibilities related to natural hazards was enacted before 2004.

The UNISDR midterm evaluation considered additional views from specific interest groups and partner organizations. One of the most important was a “grass roots” survey conducted by people in local communities to voice their views about HFA effectiveness in terms of outputs. An independent coalition, the Global Network of Civil Society Organisations for Disaster Reduction (GNDR), conducted the survey. Its report, If We Do Not Join Hands . . . Views from the Front Line, provides an important and nuanced understanding of the perceived
progress of implementing the HFA (GNDR 2011). The insight it provides for future implementation is particularly useful because conclusions reflect data disaggregated by gender, age, socioeconomic standing, rural or urban locations, and cultural or ethnic identification.

The GNDR survey magnifies important differences between the institutional reports and the perceptions of people most affected by disaster risks in local communities. For all HFA priorities the numerical scores of the Views from the Front Lines survey averaged nearly 20 per cent lower than those reported by the compiled official national reports. While these findings may be more indicative than definitive, they underline the importance of establishing future targets with measurable indicators to monitor actual outcomes. The Third Session of the Global Platform for Disaster Reduction held in 2011 emphasized this need when it called for an immediate start to develop targets and indicators to monitor the reduction of risk and implementation of successor arrangements (UNISDR 2011c).

UNISDR’s strategic considerations and final conclusions advanced in the midterm review are candid and forward-looking. Many challenge existing arrangements and suggest a radical realignment of relationships between international and national requirements if DRM is to be fully realized. International frameworks need to respond to the need for a comprehensive institutional reassessment about where and how DRM is addressed by international, regional and national organizations.

The political dynamics of international institutional policy frameworks can serve an important role in conceptualizing and developing global initiatives. However, as the subject grows in acceptance throughout the world and with wider association to other global political interests as the case is with DRM discourse approaching 2015, the individual originating frameworks may have their limits. With growing familiarity and acceptance in principle, the actual pursuit of activities needs to be accomplished in more specific and localized environments and realized through other means. As discussion about successor framework arrangements for DRM after 2015 become more emphatic about local implementation, the resulting needs are more likely to be advanced through dedicated resources than conference resolutions.

Applying lessons learned: disasters as policy makers

Disasters have consequences, and one of the most beneficial should be the extent to which they influence future DRM policies. A pressing question for DRM policy makers is why are there few if any existing international arrangements to examine prior circumstances that led to disasters? Recognized international mechanisms to provide objective and technically sound analyses of disaster causes for later policy revision would be an investment worth many times their cost, especially if the findings were actually to be applied.

There are many technical analyses of failure and research about how people respond to crises, but to what extent is this knowledge successfully applied to achieve lasting benefits? Seismic and civil engineering professionals have long studied
structural failures, learning from disaster experience. Afterward, they developed improved building standards and safer construction techniques. The National Society for Earthquake Technology (NSET) in Nepal has applied experienced-based learning to non-engineered, locally constructed housing in the highly seismic-prone Kathmandu Valley. Even with the many technically sound building standards that exist, the enforcement of building codes is ineffective in many countries. This is a failure of governance, not a technical deficiency.

Policy lessons are common but largely unused resources. “Lessons learned” are frequently noted in official reports, but it is rare if the recorded experience has a significant impact on later public policy related to reducing risks. Government policies seldom draw on authoritative reviews and thorough technical analysis of past disasters when considering future strategies. Data, experience and specialist analyses exist in the archives of many professional disciplines and in countless academic articles, but there is a continuing failure internationally to draw on these resources systematically. This needs to be remedied and it can be, considering that there are existing precedents that are unquestioned.

The public expects and governments demand investigative or forensic analysis to identify and understand the sequence of causes and underlying circumstances for any transportation or aircraft failures that result in deaths, injury or serious losses. International and national transportation safety boards are legally empowered to enforce government, industry and service standards to ensure safe transportation equipment, facilities and operating conditions. In another area of public exposure to risks, public health, governments rely upon epidemiological enquiry to investigate the source and transmission of disease in the public interest. Once the cause or source of an incident is identified, it is corrected regardless of the expense. Yet governments seldom investigate the underlying causes and circumstances when thousands of people die in a disaster. As discussed in Chapter 3 on page 90, only the Integrated Research on Disaster Risk (IRDR) program has established a Forensic Investigations of Disasters working group to begin an initial academic trial of disaster forensic analysis. Individual governments could easily pursue a similar mechanism, especially as many already have similar procedures to investigate transportation and public health crisis events.

Although the objective was different, the Tsunami Evaluation Coalition’s Joint Evaluation of the International Response to the Indian Ocean Tsunami provides a useful approach on how a collective disaster risk investigation could be structured and accomplished (Cosgrave 2007). The international process that led to conducting and publishing the Joint Evaluation of Emergency Assistance to Rwanda between 1994 and 1996, and the later consideration of the study’s influence on disaster management policies, also can be instructive (Borton 2004).

The socioeconomic and environmental loss assessment methodology developed by the United Nations Economic and Social Commission of Latin America and the Caribbean (ECLAC) is another established analytical instrument (UNECLAC 2003). It was employed effectively by most of the countries affected by the 2004 Indian Ocean tsunami and has become an international standard.
Neither international institutions nor national authorities have pursued or require forensic studies of disasters. Why do government authorities at the highest levels of responsibility not require nor the public demand full investigation of the multiple causes of disasters? Who was vulnerable, where and why? Were precautionary measures inadequate, or were unsafe conditions tolerated? If so, who or what authority was responsible and how can future failures be corrected? What authority is responsible for enforcing improvements? There are no options for airplanes to fly if they are not certifiably safe. Yet poorly constructed or fraudulently certified public facilities are routinely tolerated by governments and societies. It may be time to create an international disaster forensic authority or to develop national capacities that are prepared and able to investigate and publish objective and technically authoritative critiques of disasters resulting from unmitigated disaster risks.

Conclusion

There is a noticeable international momentum for increased DRM understanding, and governments are increasing their initiatives, although many are tentative or partial. The social and economic demands for implementing effective DRM strategies will increase as future risk scenarios expand, becoming more diverse and complex, driven by nature, climate, technology and human decisions or inaction.

Where it has occurred, progress in realizing DRM has advanced for several reasons. Exceptionally motivated people have pursued the subject with dedication and through their influence, teaching the next generation of disaster risk management professionals in the process. From the earliest academic studies and largely technical applications of physical mitigation, scientific and professional organizations have been central to creating an international archive of DRM experience. International institutional policy frameworks have progressively defined the subject and advanced basic policies. They have been advocates for its relevance and sought to expand global communities of practice through information and a variety of global relationships. Decision makers in most governments now acknowledge the value of these issues, at least tacitly.

After nearly 25 years, sustained international efforts have been successful in marketing the concepts of DRM, but investments have concentrated on building a movement and gaining adherents. Resources are distributed widely, but with scattered effects. There are now abundant human, technical and material resources for DRM when they are aggregated and considered in terms of sustained investments, rather than being treated only as expenditures for extreme problematic events. The proper allocation of essential relief materials has always been considered an important criterion for success in responding to a crisis, but critical national institutional resources still remain to be identified, inventoried and directed with strategic focus for DRM. These conditions require a major shift in international emphasis of DRM, from concentrating on advocacy propagated by international organizations to channeling those organizational capacities
and material resources to support sustained national investments in applying DRM in practice.

**Recommendation 9**

*Concentrate international investments in national capabilities directed towards action plans with resource allocations for their phased implementation. Focus investments on process and system capabilities to reduce public risk, targeting facilities and functions of high social value and productive returns such as schools, health facilities and primary infrastructure and within local communities.*

**Notes**

2 See Kellett and Caravani (2013).
3 One should note the lasting value of the accumulated work of such DRM pioneers as David Alexander, William Alexander, N. N. Ambraseys, William Anderson, A. S. Arya, Yasemin Aysan, Stephen Bender, Ian Burton, Omar Dario Cardona, W. Nick Carter, Louise Comforth, Susan Cutter, Corazon Alma de Leon, Claude de Ville de Goyet, Ian Davis, Russell Dynes, Mustafa Erdik, Maureen Fordham, M. Ghafouri Ashtiany, Tony Gibbs, Johann Goldammer, Robert Hamilton, Kenneth Hewitt, Ailsa Holloway, William Hooke, Vit Karnik, Tsuneo Katayama, Langi Kavaliku, Yoshiaki Kawata, Randolph Kent, Roman Kintanar, Alcira Kreimer, Fred Krimgold, M. L. Lechat, Franklin McDonald, Dennis Mileti, J. Kenneth Mitchell, Maria Mutagamba, Mary Fran Myers, Anthony Oliver-Smith, Frank Press, Raymundo Pungnobayan, E. L. Quarantelli, Pat Reid, George Ritchie, Kathleen Tierney, Brian Ward, Dennis Wenger, Gilbert White, Gustavo Wilches-Chaux and Ben Wisner among many others. Their professional fields varied widely, and while they worked within their own countries, they influenced the thinking, policies and implementation of DRM activities in many more places. Nearly every one of these people was or is an educator; many also established centers or institutions that remain primary contributors to international DRM practice. Their networked legacy continues as another generation of similarly dedicated people follows them working in DRM.
4 Examples of the many academic programs, networks and professional organizations working in DRM are available at www.colorado.edu/hazards/resources/centers/academic.html; www.colorado.edu/hazards/resources/centers/international.html; www.preventionweb.net/english/professional/trainings-events/academics/?pid:6&pif:3; www.preventionweb.net/english/professional/networks/?pid:6&pif:3.
5 See Secretary-General Ban Ki-Moon’s statement in Chapter 1 on page 3.
7 The evolution of the United Nations’ institutional commitment to disaster risk management with its various designations is explained in the *Factsheet on the Secretariat of the International Strategy for Disaster Reduction*, www.unisdr.org/2012/docs/whoweare/UNISDR_Factsheet.pdf


The United Nations Development Programme and the World Bank’s Global Facility for Disaster Reduction and Recovery are positive examples that have invested in national DRM institutional processes and systems development. The search for viable small-scale or individual incentives to engage in activities that reduce risk on more local scales continues. Investing more resources locally with their demonstration of efficacy at the time of hazardous conditions may be instrumental in motivating more local community acceptance of DRM principles.

This is evident in countries’ efforts to implement DRM measures reported in the HFA Monitor of country accomplishments. While there are examples of growing acceptance of the rationale and principles of DRM, there is frustration at the absence of technical, human or financial resources to enable their implementation. Views express a continuing uncertainty about how to proceed politically or institutionally given other competing national expectations or economic challenges, reflecting often fragmented efforts rather than a full commitment to national DRM strategies.

Many donor countries locate DRM responsibilities within ministries of foreign affairs, as an adjunct of international humanitarian assistance programs, or administer them through a domestic disaster management agency. There are some exceptions where national DRM responsibilities are located within a national development authority or in a non-ministerial structure distinct from emergency management agency capabilities, such as in Indonesia, Japan and Switzerland, but such examples are few.
1999 is an example of experience being linked to future policy development. The findings were reported in *Disasters by Design* (Mileti 1999), which proposed a strategic reorientation for future DRM research and national policies demanded by a changing risk environment. By drawing on many contributors focused on future risks, the Second Assessment process is a model that other countries could adapt to their own requirements.


26 There are notable exceptions, such as the acceptance following the 1988 Yellowstone wildfire in the United States, which demonstrated that stringent fire prevention only increased subsequent fuel buildup and more uncontrollable future fires. After nearly 50 years of scientific knowledge, the unprecedented flooding of the Mississippi and Missouri Rivers in 1993 altered the counter-productive public policy reliance on dikes and embankments as cost-effective structural mitigation measures for flood control. By contrast, despite repeated occurrences of deadly earthquakes in known seismic zones around the world, school buildings that easily could be reinforced and made more seismic-resistant continue to be poorly built and collapse with predictable student fatalities when later earthquakes occur.


**Bibliography**


Conclusions

The authors have five conclusions from undertaking this study:

**First, current DRM is inadequate.**

Given the current patterns of disaster risk that are described in this study, present risk reduction measures being adopted in the region are not adequate for the pressing demands.

The challenge is to counter the momentum of continuing increases in disaster risk with a holistic approach that addresses existing hazards and risk and creates a culture of risk management to guide new developments and construction by government and the private sector. We must also soberly acknowledge that disasters will not wait for the multi-generation risk reduction process to create safe and prospering communities. We must therefore ensure that governments and the private and NGO sectors are equipped to provide a rapid and effective response and recovery from inevitable future disasters.

**Second, the threats of disasters in the region are significant.**

The study has been a demanding exercise as we have engaged with a bewildering interaction of ideas, values, trends, processes, structures, policies and outcomes. Based on our rich collective exposure to disaster risk issues, we recognize that the region has to contend with very significant threats, some growing exceedingly fast and often outside the control of governments.

**Third, new policies and approaches are needed.**

We believe that the time has come for new policy initiatives and some policy reversals. The recommendations that follow capture the needs for bold innovative steps to be taken urgently. Recommendations include these: evidence-based policies are essential and long overdue, risk drivers can no longer be ignored, safety nets and innovative financing are needed to protect the vulnerable poor and the escalating threat of compound disaster risks requires radically enhanced risk management.
Part 4 of the study concerned with governance identifies a wide range of practical measures: establish developmental links at the local level, recognize the importance of legal frameworks in support of DRM, understand that the placement of DRM within government is of critical importance, and secure regional investments in vital research needs and international investment in national capabilities.

**Fourth, radical changes are needed in approaches to DRM and CCA.**

We believe that the close of HFA in 2015 and the publication of the IPCC Fifth Assessment Report in 2013 provide opportunities and an impetus for a radical new approach to risk reduction. *If* the offspring of the Hyogo Framework for Action (HFA 2) is just more of the prescriptive ‘sameness’, *then* it will have limited utility as just further advocacy talk that has been the salient message ever since 1991.

For example, in Appendix 2 of Chapter 1 we have listed no less than 15 parallel studies of DRM from international organizations, produced during 2012 and 2013 at considerable expense. The wasteful duplication within this set of documents raises the question whether the international humanitarian community needs this quantity of uncoordinated and overlapping studies.

We suggest that a rebalance of emphasis is required. Less talk is needed, fewer overlapping publications, fewer expensive international conferences and global platforms to discuss DRR and climate change that in themselves produce carbon from consequent air travel of delegates and a refreshing moratorium on declarations, targets and action plans. In lieu of such activities that have been continually applied since 1991 with limited success, the need is to fill critical gaps in current policies and for positive and intensely practical actions on the ground in support of national governments as they play decisive roles in risk reduction.

**Fifth, the region possesses some of the richest capabilities in the world to apply to DRM and CCA.**

There are many and rich capabilities within the Asia and Pacific region to counter the realities of enhanced risks. We recognize that the region is also a powerhouse of creative and innovative people, agencies, ideas and approaches that with strong political determination can be harnessed for ‘the common good’. Our confidence stems from our awareness that DRM approaches from the region have shaped disaster risk reduction initiatives globally, and the region possesses the knowledge, expertise, imagination, financial resources and energy to radically change the future through DRM and CCA.

We have high hopes that this study will inform and challenge decision makers within governments throughout the Asia and Pacific region to *reflect* and *apply*.

**Study recommendations**

Each chapter author proposed a recommendation to the readers of this study. They are repeated in full as follows.
Part 2. Trends and challenges

Chapter 2 Trends and patterns in disasters and their impact in the Asia-Pacific members of the Asian Development Bank

1 There is an urgent need to put in place more evidence-based policies for DRM. If effective data acquisition, storage and dissemination occurs, this can have a significant impact on the development of strategic and effective investment by governments in DRM and CCA.

Chapter 3 The vulnerability challenge

2 Give priority concern in HFA2 to expand the scope of risk reduction, considering and acting to reduce the ‘underlying causes of vulnerability’ (‘risk drivers’) rather than merely confining attention to the ‘consequences of vulnerability’.

Chapter 4 The social and economic challenge

3 Build safety nets, with special focus at the micro level, to ensure that the poor and most vulnerable people are protected from the direct and indirect economic and social impacts of disasters through their own strengthened resilience.

Part 3. Responding to Major Concerns in the Region

Chapter 5 Managing the risk of compound disasters

4 Reduce the risk of compound disasters through a science-based risk assessment, land-use planning and construction oversight process for existing and new development; and prepare to manage the impacts of compound disasters through enhanced consequence management capabilities at the local, national and international levels.

Chapter 6 Financing and risk financing disaster risk reduction in Asia and the Pacific: experiences and innovations

5 Support innovative financing and insurance-related instruments throughout the Asia and Pacific region, providing sorely needed financial resources to tackle disaster risk. Strengthen such instruments in both technical and social aspects for greater linkage to explicit risk reduction.

Part 4. Governance structures for disaster risk management

Chapter 7 Disaster risk management at local and community levels

6 Local DRM needs to be linked to development issues such as health, education and sanitation and should have a legal framework of responsibilities, capacities and resources.
Conclusions and recommendations

Chapter 8 Disaster risk management at the national level

7 DRM needs to become a core element in national development strategies and programs in order to mainstream DRM into government commitments. This requires a four-pronged approach:

1. Strengthen the DRM coordination role of national government.
2. Develop an enhanced legal framework.
3. Establish a DRM focal point.
4. Build a flexible cooperation system among concerned organizations and all levels of government.

Chapter 9 Disaster risk management at the regional level

8 Invest in networked regional professional, technical and educational institutions to address regionally specific DRM research subjects and applied activities to nationally agreed and certified standards. This investment will depend on the prior creation of a regional DRM data acquisition and management network to support the collective needs of expanded regional DRM institutions.

Chapter 10 International frameworks advancing disaster risk management

9 Concentrate international investments in national capabilities directed towards action plans with resource allocations for their phased implementation. Focus investments on process and system capabilities to reduce public risk, targeting facilities and functions of high social value and productive returns such as schools, health facilities and primary infrastructure and within local communities.

Overarching summary recommendation from the entire study

10 Within the Asia and Pacific region there are expanding risks to lives, property, economies and the environment. This requires holistic actions adopting innovative DRM and CCA measures, with governments taking a powerful lead.
The following books were in print in 2013, mainly at affordable prices, and many can be freely downloaded. They are written by leaders in the fields of DRM and CCA and contain knowledgeable advice for government and international officials.


Davis, I., Bender, S., Krimgold, F., and McDonald, F., eds. 2014. Reducing Disaster Risks: Progress and Challenges in the Caribbean Region (Environmental Hazards Series). London: Routledge. The following chapters appear in the above book and also in Environmental Hazards Vol. 10 No. 1, March 2011:

Collymore, J. Disaster Management in the Caribbean: Perspectives on Institutional Capacity Reform and Development, pp. 6–22.

Maskrey, A. Revisiting Community-Based Disaster Risk Management, pp. 42–52.

Krimgold, F. Disaster Risk Reduction and the Evolution of Physical Development Regulation, pp. 53–58.


Glossary

Note: These definitions are consistent with the terms used in:


Additional definitions have been drawn from:


**Adaptive Capacity**  The ability of a system (individual or community) to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities or to cope with the consequences (ADB 2013).

**Alternative Risk Transfer**  Any non-traditional form of insurance risk transfer, e.g. insurance offered by the financial markets through bonds linked to payouts post-event (catastrophe bonds) (ADB 2013).

**Capacity**  The combination of all the strengths, attributes and resources available to an individual community, society or organization, which can be used to achieve established goals (IPCC 2012).

**Catastrophe Bond**  An alternative form of disaster insurance involving insurance-linked security providing for payment of interest and/or principal to be suspended or canceled in the event of a specified disaster, such as an earthquake (ADB 2013).
**Civil Society**  The wide array of nongovernmental and not-for-profit organizations that have a presence in public life, expressing the interests and values of their members or others, based on ethical, cultural, political, scientific, religious or philanthropic considerations. Civil society organizations (CSOs) therefore refer to a wide array of organizations: community groups, nongovernmental organizations (NGOs), labor unions, indigenous groups, charitable organizations, faith-based organizations, professional associations and foundations (Turnbull et al. 2013).

**Climate Change**  A change in the climate that persists for decades or longer, arising from natural causes or human activity (ADB 2013).

**Climate Change Adaptation (CCA)**  In human systems, the process of adjustment to actual or expected climate and its effects in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate (IPCC 2012).

**Climate Change Effects**  Changes in the climate as a result of excessive emissions of greenhouse gas, including temperature increases on land and at sea; sea-level rise; the melting of glaciers and ice caps; and changing and irregular rainfall patterns (IPCC 2012).

**Climate Variability**  Variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability) or to variations in natural or anthropogenic external forcing (external variability) (Turnbull et al. 2013).

**Compound Disaster**  Events that are characterized by progressive or cascading failures, often the aggregation of multiple, unrelated, independent and near-simultaneous events that were collocated in time and space. These events often grow from an initial emergency or disasters and expand in scale and intensity and spawn secondary disasters that vastly exceed the initial event (Eisner, Chapter 5).

**Community-Based Disaster Risk Management (CBDRM)**  CBDRM is an approach which utilizes the community resources and different related stakeholders (including local and national governments) in addressing disaster risk management issues. CBDRM is often considered a locally customized process, where different key change agents (either persons or organizations) play crucial roles in facilitating community-based decision making (Shaw, Chapter 7).

**Deforestation**  The conversion of forest to another land use or the long-term reduction of tree canopy cover below a 10 per cent threshold. Deforestation implies the long-term or permanent loss of forest cover and its transformation into another land use (Turnbull et al. 2013).
Disaster  Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery (IPCC 2012).

A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources (UNISDR 2009).

Disaster Risk  The likelihood over a specified time period of severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery (IPCC 2012).

Disaster Risk Financing  Application of financial instruments as part of a systematic approach to managing disasters in order to anticipate, plan for, reduce, transfer and respond to natural hazard events. It is intended to capture various financial mechanisms and policy options that enable greater financial resilience to natural hazards (Mechler, Chapter 6).

Application of financial instruments that share and transfer risk pre-disaster and will generate financial resources post-disaster. The best-known example is disaster insurance (IPCC 2012).

Disaster Risk Management (DRM)  Processes for designing, implementing and evaluating strategies, policies and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life and sustainable development (IPCC 2012).

Disaster Risk Reduction (DRR)  Denotes both a policy goal or objective and the strategic and instrumental measures employed for anticipating future disaster risk; reducing existing exposure, hazard or vulnerability; and improving resilience (IPCC 2012).

Disaster Risk Transfer  A contractual process whereby the burden of financial loss (arising as a consequence of a natural hazard) is shifted to another party via the use of insurance or other financing instruments in return for a payment or premium (IPCC 2012).

Environmental Degradation  The reduction of the capacity of the environment to meet social and ecological objectives and needs. Degradation of the environment can alter the frequency and intensity of natural hazards and increase the vulnerability of communities. The types of human-induced degradation include
land misuse; soil erosion and loss; desertification; wild fires; loss of biodiversity; deforestation; mangrove destruction; land, water and air pollution; climate change; sea-level rise; and ozone depletion (Turnbull et al. 2013).

**Exposure**  The presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social or cultural assets in places that could be adversely affected (IPCC 2012).

**Gender**  The social differences between women and men, girls and boys, throughout the life cycle. These gender differences are learned and, though deeply rooted in every culture, are changeable over time and have wide variations both within and between cultures (Turnbull et al. 2013).

**Gender Inequality**  The equal enjoyment by women, girls, boys and men of rights, opportunities, resources and rewards; an equal say in the development process; and the same level of dignity and respect. Equality does not mean that women and men are the same but that they have the same power to make choices and the same opportunities to act on those choices (Turnbull et al. 2013).

**Governance**  The exercise of political, economic and administrative authority in the management of a country’s affairs at all levels. It comprises mechanisms, processes and institutions through which citizens and groups articulate their interests, exercise their legal rights, meet their obligations and mediate their differences. Governance encompasses, but also transcends, the state. It encompasses all relevant groups, including the private sector and civil society organizations (Turnbull et al. 2013).

**Hazard**  The potential occurrence of a natural or human-induced physical event that may cause loss of life, injury or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision and environmental resources (IPCC 2012).

**Insurance**  A financial mechanism that aims to reduce the uncertainty of loss by pooling a large number of uncertainties so that the burden of loss is distributed. Generally, each policyholder pays a contribution to a fund, in the form of a premium, commensurate with the risk he or she introduces. The insurer uses these funds to pay the losses (indemnities) suffered by any of the insured (ADB 2013).

**Land-Use Change**  A change in the use or management of land by humans, which may lead to a change in land cover. Land cover and land-use change may have an impact on climate, locally or globally (Turnbull et al. 2013).

**Land-Use Planning**  The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long-term economic, social and environmental objectives and the implications for different communities and interest groups, and the subsequent formulation and promulgation of plans that describe the permitted or acceptable uses (ADB 2013).
Livelelihood The capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (ADB 2013).

Resilience The ability of a system and its component parts to anticipate, absorb, accommodate or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration or improvement of its essential basic structures and functions (IPCC 2012).

Risk Assessment A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods or the environment on which they depend (ADB 2013).

Risk Transfer The process of shifting the burden of financial loss or responsibility for risk financing to another party, through insurance, reinsurance, legislation or other means (ADB 2013).

Sustainable Development Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (IPCC 2012).

Vulnerability The propensity or predisposition to be adversely affected (IPCC 2012).

The characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist and recover from the impact of a natural hazard (Wisner et al. 2004).
The authors of this study have all had long experience working in the Asia-Pacific region to reduce disaster risks. We come from varied disciplines and countries and in this study attempt to share our varied experiences and insights gained from being staff members in academia, in government service, with NGOs and international agencies. We also have consultancy, research and teaching experience that dates back to the early 1970s. In that decade disaster risk reduction (then called ‘prevention’) was barely recognized as an international priority concern, in contrast to its current growing significance as an international priority.

**Ian Davis**, the lead consultant, was one of the authors of a pioneering study of disaster mitigation in Asia and the Pacific for ADB in 1991 (Disaster Mitigation in Asia and the Pacific [ADB, 1991]) and became a member of the UK National Committee for Risk Reduction. This was one of the national bodies established to promote the International Decade for Natural Disaster Reduction (IDNDR) throughout the decade of the 1990s. In 1996 he received the UN-Sasakawa Award for his work on disaster prevention. Currently he is Visiting Professor in Disaster Risk Management in the Universities of Copenhagen, Kyoto, Lund and Oxford Brookes.

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Anshu Sharma has been the principal author of UNISDR’s studies on HFA implementation progress and review of national DRR platforms in the Asia-Pacific region. He was consultant author to the UNISDR study on urban risk reduction in the Asia-Pacific and lead author of Afghanistan’s National DRR Capacity Development Plan. Currently he is team leader of a World Bank–aided Government of India study on long-term capacity building for DRR in India.

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