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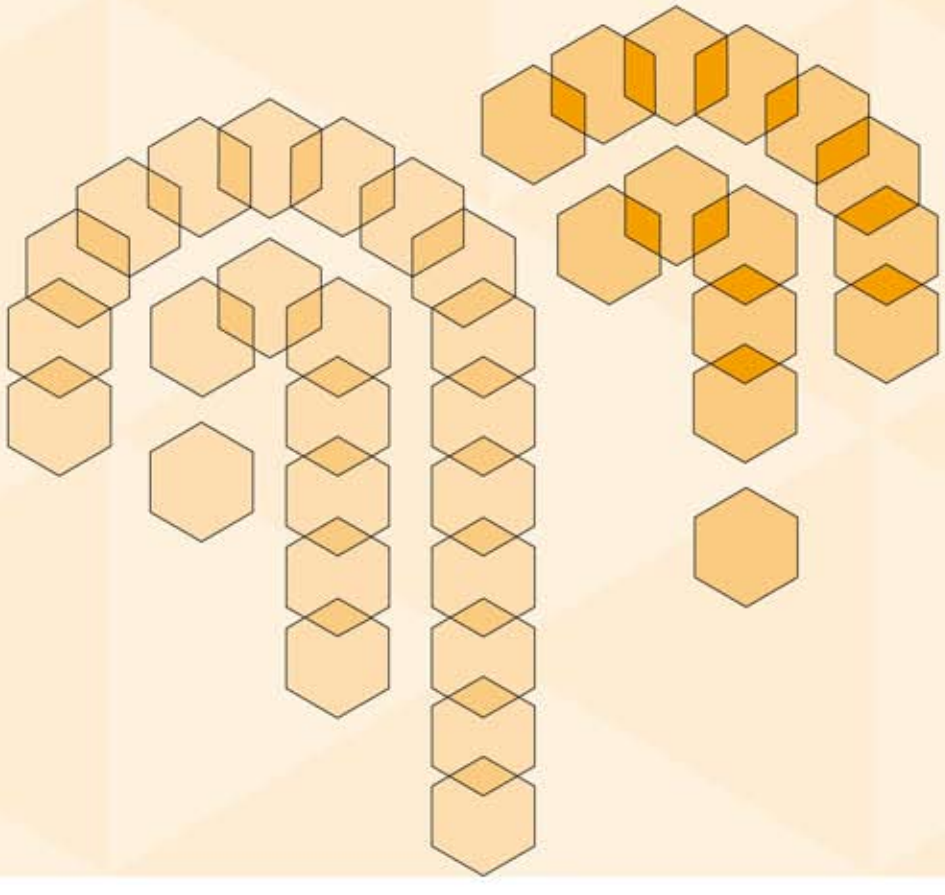
Disaster Risk Reduction and Climate Change Adaptation: Case Studies from South and Southeast Asia

Edited by Neysa Setiadi, Joern Birkmann and Philip Buckle



SOURCE

'**S**tudies **O**f the **U**niversity: **R**esearch, **C**ounsel, **E**ducation'– Publication Series of UNU-EHS

No.14/2010

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'Studies of the University: Research, Counsel, Education'

Publication Series of UNU-EHS

No. 14/2010

United Nations University
Institute for Environment and Human Security (UNU-EHS)

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Cover design by Gerd Zschäbitz
Layout: Andrea Wendeler
Proofreading: Katharina Brach

Printed at Druckerei Gerhards, Bonn, Germany
November 2010, 1000 print run

ISBN: 978-3-939923-42-8
e-ISBN: 978-3-939923-43-5

ISSN: 1816-1154

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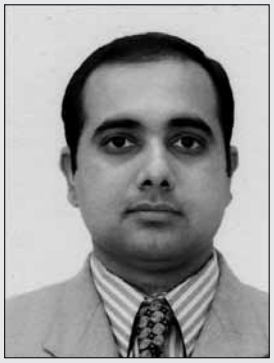

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Dr Shantana R. Halder

Acknowledgements

We would like to address our special thanks to all Workshop participants who have contributed a lot during the discussions in the Workshop and through their papers; also for their great cooperation during the development of this publication. We also thank the keynote speakers in our Workshop: Bach Tan Sinh, Sunarto and Fabrice Renaud, for sharing their scientific knowledge and practical experiences. We would like to appreciate very much our local collaboration partner, the Research Centre for Disasters, Gadjah Mada University (PSBA-UGM) in Yogyakarta, especially Djati Mardiatno and his team who strongly supported us in preparing and implementing the Workshop. We are deeply grateful to the German Academic Exchange Service (DAAD), which funded the whole international PhD workshop and the development of this publication. Through this programme, a platform for the young scientists and practitioners to build networks and exchange ideas on disaster risk reduction (DRR) and climate change adaptation (CCA) in the region of South and Southeast Asia was made possible. Lastly, we would like to thank Katharina Brach for proofreading and Andrea Wendeler layouting, Miriam Kugele for her support in proofreading, as well as Sonja Raupp for her great support in the preparation of the Workshop and the development of the publication.

Neysa Setiadi
Jörn Birkmann
Philip Buckle

Disaster Risk Reduction and Climate Change Adaptation: Case Studies from South and Southeast Asia

Edited by

Neysa Setiadi, Joern Birkmann and Philip Buckle

Outcomes of the DAAD/UNU-EHS International PhD Workshop on Disaster Risk Reduction and Climate Change Adaptation in Context of South and Southeast Asia

23 – 25 November 2009, Yogyakarta, Indonesia

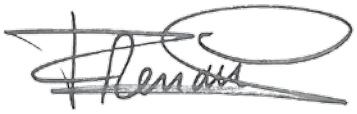
Foreword

Over the past years, DRR has become a very important concept which has considerably evolved with additions of new tools and methods and with an increase of focus on the vulnerability component. In the context of CCA, the role of DRR has become even more important. Experiences from recent extreme events such as the devastating Indian Ocean Tsunami in 2004, Hurricanes Katrina in 2005 and Nargis in 2008, and recent earthquakes in Haiti and Chile, as well as increasing flooding events in Vietnam, have proven that the impacts caused have overwhelmed the capacities of the humanitarian sector. More proactive and sustainable approaches are therefore needed. Within this context, reduction of vulnerability, especially of social groups who have few adaptation options, is a core issue to be addressed within the context of climate change related hazards and other hazard types.

Exploring threats to human security arising from natural and human-induced hazards and supporting policy relevant research, and capacity development relating to the broad interdisciplinary field of "risk and vulnerability" is one of the mandates of UNU-EHS. It was therefore a privilege for UNU-EHS to conduct the International PhD Workshop on Disaster Risk Reduction and Climate Change Adaptation, which served as a platform for young researchers particularly working in the region of South and Southeast Asia to exchange ideas and research findings on this topic.

This Workshop was funded by the DAAD and organized in close cooperation with the Research Centre for Disasters of the University Gadjah Mada, Yogyakarta. It brought together young researchers working on topics linked to vulnerability and risk assessment, CCA and disaster risk governance. They exchanged ideas as well as addressed concerns linked to DRR and CCA based on their current research works and interdisciplinary backgrounds. The active participation and engagement of the young researchers created a conducive atmosphere for learning from each other. Moreover, field activities and interactive discussions with some national and local stakeholders working on DRR and CCA in Indonesia brought additional insights to the workshop. The Workshop succeeded in identifying some common issues in promoting DRR and CCA particularly relevant for South and Southeast Asia.

In order to disseminate the summary of ideas, concepts and methods raised during the Workshop, the discussions during the event were followed up by joint papers written by some of the young researchers. These are compiled together in this SOURCE issue. Case studies and conceptual discussion papers presented in this publication intend to trigger new approaches, scientific discussions and increased attention on the existing DRR and CCA issues in the South and Southeast Asia.



Dr Fabrice Renaud
Director a.i. UNU-EHS

Foreword

Indonesia is one of the countries worst hit by natural disasters during the last few years and will most likely be confronted with very significant effects of climate change in the future. Against this background a Workshop on "Disaster Risk Reduction and Climate Change Adaption", which took place from 23 until 25 November 2009 at Gadjah Mada University, Yogyakarta, seemed to be appropriate and useful. DAAD, which financially supported the workshop would very much like to thank UNU-EHS, a research entity within the United Nations system, for its initiative in organizing this international PhD workshop for young researchers from Indonesia and other South and Southeast Asian countries.

With financial support to this Workshop, DAAD continues its commitment to help Indonesia and other countries to mitigate, respond to and overcome disasters. It is a fact, however, that natural hazards like the Indian Ocean tsunami catastrophe in 2004 cannot be prevented totally. But we can manage and limit impacts including loss of life, injury, loss of homes and loss of livelihoods; to give an example the tsunami early warning system (TEWS), and public education about DRR will help create safer communities. Therefore, the development of scientific concepts and strategies for DRR is very important and an increasing priority.

Since 2005, the DAAD Office Jakarta has been able to assist the Indonesian victims of the tsunami in December 2004 and to support the reconstruction of Aceh province and its universities. Among other assistance measures, the DAAD has granted almost 1,400 Sur-Place-Scholarships to students and graduates from the disaster areas who had lost their means of livelihood, in order to enable them to finish their studies. The scholarships were paid from public and private funds. DAAD has also awarded about 60 long-term-scholarships for Master or PhD studies in Germany to Indonesians who study in the fields of disaster prevention and disaster management. These scholarships were funded by the German Foreign Office. Additionally, DAAD supported the lecturers at the universities in Aceh with short-term research visits to Germany, equipment grants and supported exchange programmes with German universities.

The aims of the Workshop on "Risk Reduction and Climate Change Adaption" were to strengthen scientific exchange, to foster discussions on potentials of DRR strategies and to further establish scientific networking of young researchers in the area. About 20 participants, mostly PhD candidates and a few practice-oriented academics working in the field were involved in the three days Workshop. Furthermore, senior experts from the region were invited to give presentations on the overarching key questions. The Workshop widened the perspective and enhanced the ability to assess aspects of vulnerability, risk and adaptation for planning purposes. In sum, the results of the Workshop offered some theoretical and applied lessons in how to integrate DRR and adaptation in sustainable planning.

Dr Helmut Buchholt
Head of DAAD Office Jakarta

Foreword

Global climate change (and global environmental change, in general) has been an acknowledged global priority issue since the beginning of the 21st century. Global warming as a result of human intervention will result in some phenomena, such as snow melting at the poles and sea level rise (SLR). SLR a s a consequence of global warming has an impact on the increasing inundation on the coastal areas. The Intergovernmental Panel on Climate Change (IPCC) report revealed that SLR is considered one of the most serious problems facing coastal area. Referring to Nicholls and Mimura (1998), in general, mean sea levels rose 10 to 25 centimetres over the last century and are expected to rise about 0.5 metre by 2100. As a country which has more than 80.000 kilometres shoreline and 17.500 islands, Indonesia is one of the countries that will suffer from the SLR impact. There are some physical impacts due to SLR, i.e. coastal erosion, inundation and displacement of wetlands and lowlands, increased coastal storm flooding and damage, and increased salinity of estuaries and aquifers.

DRR is a key to reducing the impacts of hazards caused by climate change. It may be carried out by local adaptation and local coping capacity and should be explored and facilitated together with top-down programmes by the government. Local people have historically often adapted to hazards by undertaking risk reduction measures in order to protect their homes, belongings and livelihoods, such as by raising the floor level of homes in flood-prone areas. Local government (particularly illustrated in this volume by the field study case of Semarang city), has employed a range of structural and non-structural measures to address the problems related to hazard risks. In Semarang, for example, tidal flood risks are being mitigated by programmes, such as reshaping of the land surface, land reclamation along the beach area, improving the dyke, polder and drainage systems, coastal planning and management, and improving the organization for polder system management.

Junun Sartohadi, Prof., Dr. rer. nat.
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Editor´s note: background of the publication

In light of the recent and world-wide intensified discussions on the need to promote CCA, the developments in DRR policy and practice, and the mutual advantages to be gained by linking these two approaches to build resilient communities, the DAAD/UNU-EHS International PhD Workshop on Disaster Risk Reduction and Climate Change was held. The Workshop focused on South and Southeast Asia, which are areas characterized by developing countries that are rich in social, cultural and political diversity and that are exposed to a variety of imminent and long-term climate change impacts and natural hazards, as the Workshop's contextual background is in defining various disaster risks and climate change challenges.

The Workshop in context of South and Southeast Asia was held from 23 until 25 November 2009 in Yogyakarta, Indonesia, and was funded by DAAD as part of the DAAD Catastrophes Prevention, Crisis Management and Conflict Prevention Special Programme (CCC-/Tsunami). It was organized by UNU-EHS in close cooperation with the PSBA-UGM.

The main intention of the Workshop was to foster scientific networking of young researchers in South and Southeast Asia working on the topics of DRR and CCA, and to provide a platform for the exchange of ideas and research findings. This event brought together nineteen PhD students and practitioners from various backgrounds, including Geography, Sociology, Agricultural Science, Economics, Environmental Science and Engineering. The Workshop participants were drawn from India, Pakistan, Bangladesh, Sri Lanka, Vietnam and Indonesia, as well as involving participants from other countries who work in the region including the Netherlands, USA and Germany. The Workshop was designed as a combination of keynote presentations, poster presentations, panel and group discussions and field activities. This approach provided the Workshop participants with an overview of numerous issues in promoting DRR and CCA from the global as well as local perspectives. From the Workshop presentations and discussions, the following primary concerns were drawn:

- Various scientific concepts and definitions in DRR and CCA exist, which sometimes undermines and confuses a common understanding of concepts and application. Therefore, an agreed vocabulary is required to support further development in analysing the complexities and uncertainties in climate change policy formulation and programme implementation.
- Vulnerability reduction, capacity-building and community adaptation is often planned without clear statements of purpose and without sufficient consideration of the context of risks and vulnerable elements. Participatory approaches and an understanding of social contexts and local capacities are often omitted from such planning.
- DRR and CCA are profoundly political issues, with many vested interests. The potential of DRR analysis and management tools are under-appreciated in their utility for CCA. Moreover, low awareness and institutional weakness (especially in coordination, cooperation and communication) often hinder integration of DRR and CCA.

The papers and discussions presented in this publication neither aim to be comprehensive nor to cover all issues in DRR and CCA. Some of the case studies in this publication are also PhD statements of the young scientists, which is research in progress. This publication provides a platform for discussion of the ideas of the Workshop participants – the young scientists and practitioners – based on their research and case studies.

The introductory chapter provides the background and an overview of DRR and climate change issues globally, and in South and Southeast Asia specifically. Subsequent papers provide various case studies and conceptual discussions, which will be wrapped up in the final chapter (see Chapter 12). Instead of using a single methodological approach throughout the publication, various approaches are discussed and offer a range of backgrounds, disciplines and interests brought together by the partici-

pants in the Workshop. This mirrors the diversity of priorities and methods that currently exists in the policy, practice and research worlds on the topics of DRR and CCA. The ideas and topics of the papers in this publication are linked with each other, but they may be read as individual papers with perspectives and approaches independent from each other. Nevertheless, the discussion focuses on a number of common themes to be addressed in DRR and CCA as outlined in the following points:

- **Sustainable adaptation:** the participants discuss criteria for achieving sustainable adaptation and examples of adaptation measures as well as some lessons learned from adaptation strategies in the agricultural sector in chapters 2, 3 and 4.
- **Community participation in planning and managing DRR and CCA:** various case studies presented in chapter 5 show the importance of local involvement and the potential to contributions of women, children youth and other specific interest and special needs groups.
- **Vulnerability and risk assessment methods for adaptation planning:** some assessment methods relating to the identification of vulnerable areas, of vulnerable groups and of best adaptation strategies are presented in chapter 6.
- **Good governance and capacity-building:** case studies from Pakistan and Indonesia on the capability of local governments and interlinkages among government levels and agencies are presented in chapters 7, 8 and 9, while chapter 10 provides a reflection on incorporating good governance and capacity building in the context of DRR and CCA.
- **Linking DRR and CCA:** chapter 11 presents the potentials and challenges in linking DRR and CCA based on case studies in three countries: Indonesia, Bangladesh and New Zealand.

Table of Contents

1. Introduction: challenges in Disaster Risk Reduction and Climate Change Adaptation in South and Southeast Asia

Philip Buckle, Joern Birkmann, Fabrice Renaud, Neysa Setiadi, Bach Tan Sinh and Sunarto

This chapter gives an overview on the current challenges that climate change implies for South and Southeast Asia. Additionally, recent development in the scientific discussions and the challenges in linking DRR and CCA are discussed. The chapter is based primarily on the keynote presentations and also summarizes key points of the Workshop discussions.

1.1 Climate Change Impacts in South and Southeast Asia

Rapid, global and anthropogenically-driven climate change is occurring with measurable impacts and is likely to intensify extreme weather events and consequently increases disaster risk (McCarthy et al. 2001; Parry et al. 2007; Birkmann and Teichmann 2010). Climate change and associated hazards will affect many components of human security and will inhibit sustainable development in the areas of politics, natural and built environments, livelihoods, food security, individual and public health, personal security, community sustainability and culture. However, it is still a challenge to attribute climate change to single hazard events (see Birkmann and Teichman 2010).

According to the Fourth Assessment Report of the IPCC (Parry et al. 2007), changes in temperature and precipitation patterns in South and Southeast Asia have been observed, as described in Table 1.1 below.

Many extreme events have occurred in South and Southeast Asia, for example serious and recurrent floods in Bangladesh, Nepal and India in 2002, 2003 and 2004, increased occurrence

Changes in temperatures and precipitation

Region	Country	Temperature	Precipitation	Source
South Asia	*India*	*0.68°C increase per century, increasing trends in annual mean temperature, warming more pronounced during post-monsoon and in winter*	*Increase in extreme rains in north-west during summer monsoon in recent decades, lower number of rainy days along east coast*	*Kripalani et al. 1996; Lal et al. 1996; Lal et al. 2001b; Singh and Sontakke 2002; Lal 2003*
	Nepal	*0.09°C per year in Himalayas and 0.04°C in Terai region, more in winter*	*No distinct long-term trends in precipitation records for 1948 to 1994*	*Shrestha et al. 2000; Bhadra 2002; Shrestha 2004*
	Pakistan	*0.6 to 1.0°C rise in mean temperature in coastal areas since early 1900s*	*10 to 15% decrease in coastal belt and hyper-arid plains, increase in summer and winter precipitation over the last 40 years in northern Pakistan*	*Farooq and Khan 2004*
	Bangladesh	*An increasing trend of about 1°C in May and 0.5°C in November during the 14 year period from 1985 to 1998*	*Decadal rain anomalies above long-term averages since 1960s*	*Mirza and Dixit 1997; Khan et al. 2000; Mirza 2002*
	Sri Lanka	*0.016°C increase per year between 1961 to 90 over entire country, 2°C increase per year in central highlands*	*Trend to increase in February and decrease in June*	*Chandrapala and Fernando 1995; Chandrapala 1996*
Southeast Asia	*Regional*	*0.1 to 0.3°C increase per decade reported between 1951 to 2000*	*Decreasing trend between 1961 and 1998. Number of rainy days have declined throughout S-E Asia*	*Manton et al. 2001*
	Indonesia	*Homogeneous temperature data were not available*	*Decline in rainfall in southern and increase in northern region*	*Manton et al. 2001; Boer and Faqih 2004*
	Philippines	*Increase in mean annual, maximum and minimum temperatures by 0.14°C between 1971 to 2000*	*Increase in annual mean rainfall since 1980s and in number of rainy days since 1990s, increase in inter-annual variability of onset of rainfall*	*PAGASA 2001; Cruz et al. 2006*

Table 1.1: Changes in temperatures and precipitation. Source: Parry et al. 2007: 475

of flash floods in Vietnam, droughts associated with El Niño in Pakistan and India in 1999 and 2000, droughts in 1997 and 1998 causing massive crop failures, water shortage and forest fires in the Philippines, Laos and Indonesia, as well as a higher intensity of cyclones in the Bay of Bengal (Parry et al. 2007). Climate change can exacerbate disasters in this region, although it is important to note that disasters are a product of the interaction of the hazard phenomena and the vulnerability of societies exposed (Birkmann 2006).

On current trends climate change will negatively affect the agricultural and water resources sectors, as well as the coastal ecosystems in South and Southeast Asia, which characterize most countries in this region. In a longer term, the problem of SLR will impact millions of people living in coastal areas and force them to find a way to adapt or migrate to other areas. In some areas of Southeast Asia such as the Mekong Delta, more intensified inundation and tidal floods have occurred due to unprecedented prolonged and excessive rainfall (see Figure 1.1).

According to the IPCC (Parry et al. 2007), it is likely that climate change will impinge upon sustainable development of most developing countries of Asia. Especially in South and Southeast Asia, which is characterized by diverse political, economical and cultural aspects, there are persisting challenges of poverty and unsustainable development, pressures on natural resources and increasing problems due to rapid urbanization. These conditions will be exacerbated through the impacts of climate change and variability.

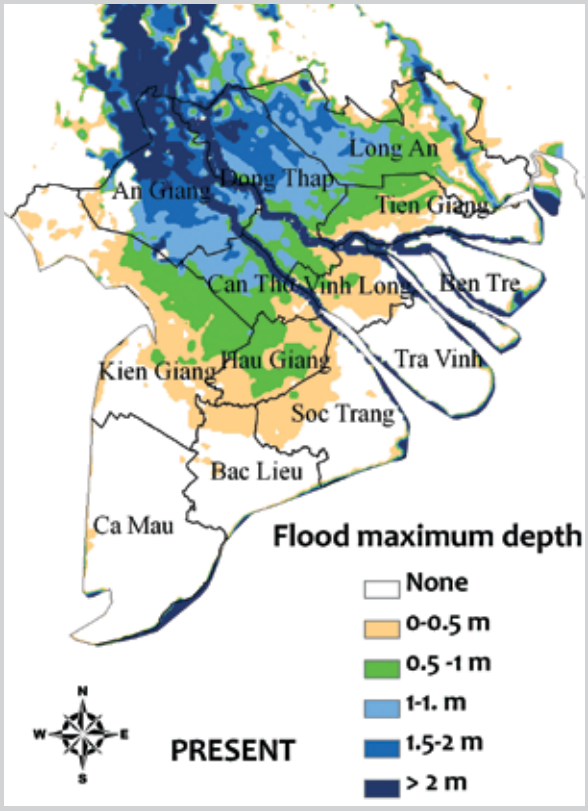
Given that the natural and built environments are mutually dependent, climate change is not only an issue for rural areas, but also for urban areas. The impacts and mitigation and adaptation responses in urban areas will be especially complex due to pre-existing development issues, such as uncontrolled urban growth, marginalized sub-groups and poverty, which all add to the exposure and vulnerability of urban communities (see e.g., Birkmann et al. 2010). Moreover, often ineffective policy and regulation, as well as institutional weakness in overcoming additional hazards associated with climate change will exacerbate the vulnerable conditions of urban areas.

Box 1: Tidal and land subsidence problems in the coastal City of Semarang, Indonesia

The coastal city of Semarang in Central Java Province, Indonesia, is one example of an urban area which is exposed to SLR. It already faces worsening problems of tidal inundation and land subsidence. Land subsidence and sea water inundation in Semarang have affected the coastal population and land use along the shore. The coastal areas of the city serve various important sectors, which include tourism, fisheries, industry, and they are also densely populated. The area exposed to land subsidence is predicted to increase from 362 hectares in 2010 to 1,377.5 hectares in 2015 and up to 2,227 hectares in 2020 (Marfai and King 2007). More than 72,000 people currently live in areas situated below mean sea level (Marfai et al. 2008) and are at increasing risk. Coastal flooding occurs regularly all year long and is worsened by accelerated land subsidence. The local people, as well as the local government, have been carrying out protection measures such as constructing dykes and lifting houses (see Picture 1.1). However, the current protection measures may not mitigate long-term climate change impacts. Moreover, the degree of impacts to livelihoods of various social groups varies, as well as their capacity to cope or adapt with the situation, e.g., in that low income households have constrained alternative measures, while the capacities of the local government to provide appropriate solutions is still insufficient (Marfai et al. 2008).

Picture 1.1: Permanently inundated settlement areas. Source: Setiadi 2009

Picture 1.2: Household adaptation measure. Source: Setiadi 2009



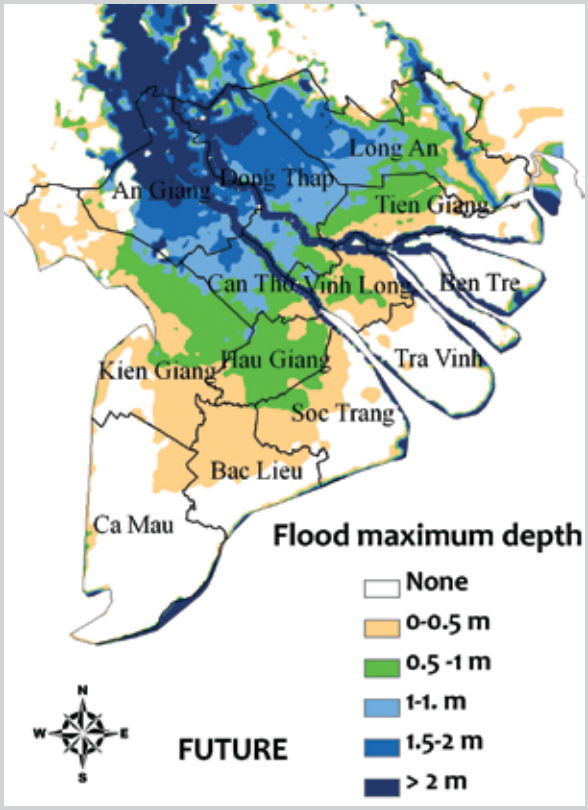


Figure 1.1: Flood-affected areas in Mekong Delta in 1980s and 2030s (simulated). Source: Tuan and Chinvanno 2009: 7

These examples provide some evidence of the climate change problematic and also show the importance of promoting effective and sustainable strategies for adaptation to climate change and DRR for climate change associated hazards.

1.2 Recent development of Climate Change Adaptation in South and Southeast Asia

Climate change has been recognized and discussed globally for 30 years (the World Meteorological Organization (WMO) first issued an authoritative statement on climate change in 1976) and with increasing intensity in recent years. In the political negotiations of the United Nations Framework Convention on Climate Change (UNFCCC) as initiated by the Bali Roadmap and Action Plan of December 2007, CCA is identified as one of the main pillars on which new policy options and agreements will rest, together with mitigation, technology and finance (Schipper and Burton 2008).

In the context of national responses to climate change in South and Southeast Asia, several countries including India (Government of India 2008), Bangladesh (Government of Bangladesh 2005), as well as Indonesia, Thailand and Cambodia, have developed National Action Plans or National Adaptation Programmes for climate change (Resurreccion et al. 2008), while Vietnam has prepared a National Target Programme to Respond to Climate Change. The degree of adaptation varies among countries and still needs to be assessed further. A study of climate adaptation in Southeast Asia (Resurreccion et al. 2008) argued that planning for adaptation is largely around the agriculture, water and to some extent infrastructure sectors. Adaptation is often considered as a technical response and not as a complex process of adjusted living arrangements to accommodate climate change, where people´s adaptive strategies are influenced and shaped by local climate and non-climatic factors. Existing adaptation measures, as well as adaptation research, is dominated by modelling and scenario building, which is biased towards the perspectives of biophysical and natural scientists. Similarly, much research in the region is of a technological nature, putting emphasis on technical fixes in response to the adverse impacts of climate change. Moreover, the issues of long-term climate change adaptation and policy are still treated separately from established disaster risk management strategies (Resurreccion et al. 2008; Birkmann and Teichman 2010).

1.3 Potentials of linking Disaster Risk Reduction and Climate Change Adaptation

From practitioner and policy perspectives it has been argued that adaptation to climate change should include adaptation to climate variability and extremes. This has generated recognition of a commonality of interests among those specialists and those agencies concerned with adaptation to climate change and those charged with the reduction of disaster risk (Schipper and Burton 2008).

The common interest between DRR and CCA has also been recognized in the IPCC Working Group II (2001) of the Third Assessment Report. It was mentioned that adaptation to current climate and climate-related risks is generally consistent with adaptation to changing and changed climatic conditions. Adaptation measures are only likely to be implemented if they are consistent or integrated with decisions or programmes that address non-climatic stresses. Vulnerabilities associated with climate changes are rarely experienced independently of non-climatic conditions (McCarthy et al. 2001, quoted in UNDP 2008: 21). Additionally, the IPCC is developing a special report which is named "Managing the Risk of Extreme Events and Disasters to Advance Climate Change Adaptation" that addresses the link between DRR and CCA in particular.

On the other hand, DRR also requires the development of social systems and adaptive capacities that enable populations to live with risk, as well as to enable societies to adapt in the medium and long run to environmental change (Birkmann and Teichman 2010). This involves, in essence, a largely similar set of capacities as those required for adapting to climatic variability and change. Strategies for responding to climate change, reducing disaster risk and alleviating poverty, as a result, are inherently intertwined (Moench 2008).

There have been some recent changes in DRR policy and frameworks. The Hyogo Framework for Action (HFA) 2005 – 2015 has largely gained global agreement on "ends and means" for national governments to achieve DRR. It also moves DRR away from a hazard management focus and sets it in a development context. Instead

of merely focusing on emergency response – the approach commonly used by the classical disaster communities – the whole disaster management cycle is considered, including mitigation/prevention, preparedness, response/relief and recovery. In this manner, the approaches have become more integrated (see Figure 1.2).

DRR is normally set up so that local government plays a critical role in planning and management. In developing countries, on the one hand, there are normally separate and independent DRR arrangements, often with strong local engagement and development focus, but separate from other areas of public administration. On the other hand, in developed countries there are internal emergency management arrangements, which are supported and supplemented by a strong social support structure and agreed principles of equity, access, transparency and proper governance supported by a sound legislative basis. Infrastructure, such as schools and hospitals, and services, such as public health systems, support emergency service activities in developed countries. In many developing countries it is more likely that at the local level friends and family deliver first support rather than the respective government. Either way, DRR has been embedded locally or community-based and has already built local engagement, which is also important in order to achieve sustainable adaptation to climate change.

Moreover, DRR has a range of tools and methods derived from programming and practice that are useful for climate change adaptation. These include established arrangements for resourcing, management and a legislated mandate, an understanding of the nature of risk and tools for assessing vulnerability and capacity. It is necessary to think further about how we integrate the approaches, methods and tools of DRR and CCA and apply them to complex, irreversible problems at scales from the local to the global, bearing in mind that both disaster risk and climate change are complex and that their dynamics change over space and time.

In light of the current global priorities on climate change, CCA also offers a sense of global urgency, increasing political commitment, resources and a robust scientific knowledge base. Potential links between both DRR and CCA domains exist in sharing knowledge, mitigation and risk reduction policies and management arrangements, risk assessment methods, practice areas, partnerships and funding sources.

However, a common failing in DRR as in CCA is to not state explicitly the desired outcomes in terms of the risks that exist, the desired "end state", and how we move from risk to safety in terms of mandate, knowledge, skills (managing transition, change, opinion, culture and history), resources and time scale. In addition, some conceptual challenges persist, such as clarifying and agreeing on definitions of key concepts, dealing with uncertainty, defining acceptable levels of risk and levels of spatial and temporal and resolution, and finally – but not least difficult – taking into account political and cultural aspects.

Due to these reasons, it is of crucial importance to develop a better understanding of the concepts of DRR and CCA, as well as of their relationship. In the following sub-chapter some

Figure 1.2: New approaches in Disaster Risk Reduction. Source: Buckle 2009 and Salter, pers. comm.

of the existing conceptual frameworks will be discussed, as well as the challenges in obtaining common concepts and approaches for both domains.

1.4 Conceptual frameworks of Disaster Risk Reduction and Adaptation to Climate Change

Understanding relevant concepts and definitions in DRR and CCA is important. In discussing both topics, the concepts of vulnerability and resilience are central. In the following section some key concepts and definitions, as well as their linkages, are briefly discussed:

Adaptation

In the Glossary of the IPCC Fourth Assessment Report (2007), the UNFCCC defines adaptation as adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

The concept of adaptation theoretically originated from the natural sciences, namely population biology and evolutionary ecology (Winterhalder 1980, quoted in Smithers and Smith 2008), referring to genetic characteristics, which allow individual organisms to survive and reproduce in the environment they inhabit. On the other hand, the concept of adaptation has also been applied and further developed in various fields of social sciences, such as human and cultural ecology, ecological anthropology, cultural geography, ecological economics and recently climate change research. This has led to distinct interpretations of the concept of adaptation, e.g., regarding its scale and dimensions (Smithers and Smith 2008).

As mentioned in sub-chapter 1.2, different actors in policy and practice may also frame adaptation differently, such as focusing more on technical measures rather than putting more efforts in the longer-term process of alleviating the underlying causes of vulnerability.

Vulnerability and risk

According to the United Nations International Strategy for Disaster Reduction (UN/ISDR 2009), vulnerability comprises the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard. Moreover, DRR is defined as the concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment and improved preparedness for adverse events. A comprehensive approach for DRR used across the globe is set out in the HFA 2005 – 2015 (UN/ISDR 2005).

In the IPCC Third Assessment Report (McCarthy et al. 2001), vulnerability in the climate change context is defined as the extent to which a natural or social system is susceptible to sustaining damage from climate change. Vulnerability is composed of the sensitivity of a system to changes in climate (the degree to which a system will respond to a given change in climate, including beneficial and harmful effects), its adaptive capacity (the degree to which adjustments in practices, processes or structures can moderate or offset the potential for damage or take advantage of opportunities created by a given change in climate) and the degree of exposure of the system to climatic hazards.

Looking at these definitions reveals that both attempt to address the same issue in that vulnerability constitutes the characteristics influencing or possessed by the elements at risk that determine the potential impacts of hazards, stressors or disturbance. In the context of climate change it comprises the additional component of adaptive capacity, which indicates the need to adjust to climate change in the longer-term, instead of only coping or conducting short-term responses to the existing hazards. However, there are also various different scientific concepts and definitions of vulnerability (see for example Birkmann 2006; Füssel and Klein 2006; Kelly and Adger 2008), as well as discussions on its scientific formulations that include whether to include exposure in vulnerability or to consider it separately as a function which links hazard and vulnerability (e.g., Gallopin 2006). Moreover, there are some conceptual and semantic ambiguities (Füssel and Klein 2006) in the definition:

- whether vulnerability is the starting point, an intermediate element or the outcome of an assessment

- whether it should be defined in relation to an external stressor such as climate change, or in relation to an undesirable outcome such as famine
- whether it is an inherent property of a system or contingent upon a specific scenario of external stresses and internal responses and
- whether it is a static or a dynamic concept.

The existing interpretations and applications, which differ from one another, complicate the operationalization of the concept into practice.

Moreover, in assessing vulnerability, it is crucial to specifically define who or what is vulnerable, how they are vulnerable (dimensions and factors) and to what (challenges, stresses, hazards) over what time period, while considering what other factors may reduce or increase risk and impacts. It also implies bringing various disciplines together and understanding the problematic within the whole socio-ecological system.

Resilience and the socio-ecological-system

As the other terms mentioned above, the term resilience also has different definitions. As an example, in the IPCC report resilience was assumed to be just the flip side of vulnerability (Parry et al. 2001, quoted in Renaud et al. 2010). One of the widely used concepts of resilience is the Turner´s model (Turner et al. 2003), its linkage to vulnerability, as well as its behaviour to external shocks such as climate change in the context of socio-ecological-systems (SES). A SES is defined as a system that includes societal (human) and ecological (biophysical) subsystems in mutual interaction (Gallopin 1991 and 2006), which is argued to be the natural, analytical unit for sustainable development research (Gallopin et al. 2001).

Holling (1973) first defined resilience as the amount of disturbance an ecological system can absorb before shifting to another stability domain; this definition provides notions of thresholds and of the speed at which variables change. Folke (2006) added to Holling's definition the capacity to self-organize and ability to increase the capacity of learning and adaptation (in socio-ecological systems). Further, Turner et al. (2003) look at resilience as a sub-component of vulnerability, which means the ability to "bounce back" and the capacity to maintain structure and function despite disturbance, taking into consideration the notion of thresholds, social learning and organization. Renaud et al. (2010) also describe resilience of socio-ecological systems facing potential change as caused by external shocks by using the aforementioned concept.

Facing external shocks, a SES will go through different states (see Figure 1.3). The system may compensate for the effects of the external shock

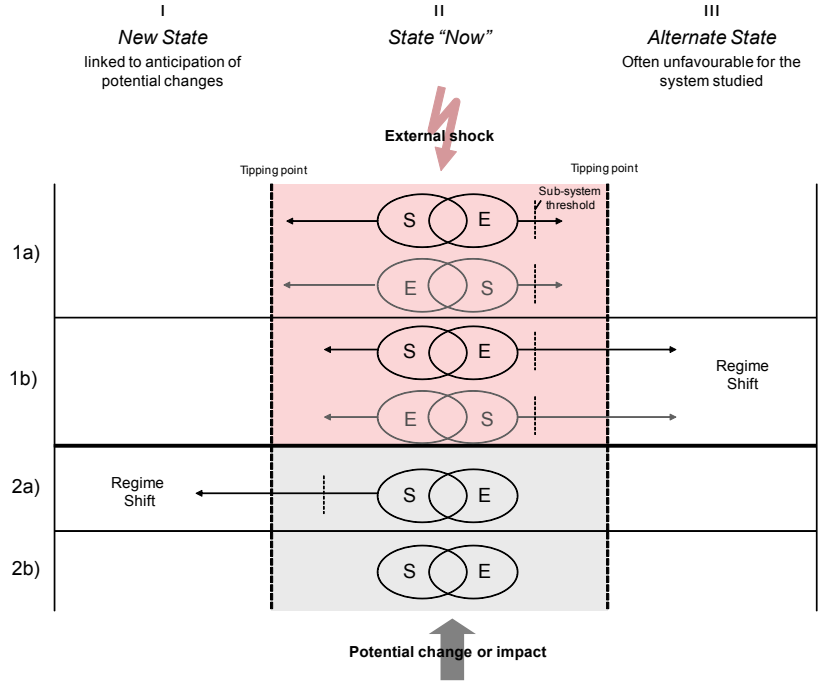


Figure 1.3: Different states of socio-ecological systems. Source: Renaud et al. 2010: 11

e.g., through measures termed here as reorganization, or provision of additional services (1a), or it can pass its threshold or tipping point and experience a regime shift, falling into unfavourable conditions (1b). There is other alternative, if the SES anticipates a potential change (i.e. climate change) by means of adaptation that moves the SES to a new state, even without an actual external shock (2a). Renaud et al. (2010) emphasize the necessity to understand how social and ecological systems are coupled and how to recognize the thresholds and states of the system. Adaptation implies fundamental changes (e.g., in land use practices), particularly within organizations and institutions, which ensure higher resilience and reduction of vulnerability.

1.5 Institutional challenges in the Integration of Disaster Risk Reduction and Climate Change Adaptation

Despite the existence of different concepts (and consequently methods and approaches), as discussed in sub-chapter 1.4, common objectives and components in DRR and CCA policy and practice have been identified. However, there has been a lack of effort by both national governments and international bodies to link DRR and CCA. The value of DRR arrangements and tools for CCA are not sufficiently recognized, and DRR has not been incorporating CCA systematically into regional, national and local risk assessments.

Thomalla et al. (2006) state that both policy and research domains of DRR and CCA have different points of view with regards to the nature and timescale of the threat (however, we argue that these are complementary). The DRR community focuses on a vast assortment of natural and man-made hazards, of which climatic hazards only represent one particular area. Vulnerability to current hazards and extremes is the main concern of the disaster community and in contrast the climate change community focuses mainly on longer-term changes in climate and extreme conditions (Thomalla et al. 2006). In spite of this difference, the increasing attention on addressing the existing vulnerabilities to climatic variability and extremes is recognized to be compatible with DRR objectives. Even so, Thomalla et al. (2006) suggest that both domains have failed to reduce the vulnerability due to ignorance in addressing the underlying cause and wider structural constraints that determine vulnerability.

In South and Southeast Asia, one of the major problems in linking DRR and CCA is the commitment to short-term civil protection, hazard management and emergency management in contrast to the need for additional long-term investment and planning for development and adaptation. Moreover, the difficulties are compounded by low awareness on the emerging impacts at local, national and regional levels, lack of an institutional framework for integration of DRR and CCA, limited awareness of the synergies between DRR and CCA and limited capacity especially in CCA at all levels. Research is needed to explore how to efficiently link DRR and CCA to sustainable development and to improve the coordination and synergies between DRR and CCA.

Another challenge to effective practice is the lack of community participation where governments are often still reluctant to consult or engage communities, especially for CCA, which is presently still top-down oriented. Community-based DRR (CB-DRR) is considered an appropriate and useful approach, however, the problem of lack of information on climate change effects on this level makes it difficult to operationalize this approach at local or community levels. There should be a forum for policymakers, communities and scientists in the DRR and CCA processes.

Learning how DRR and CCA is implemented (e.g., for Indonesia see Chapters 10 and 11), reveals such difficulties in assessing hazards associated with multiple climatic impacts and risk management where there is still a dearth of knowledge, especially at the micro-level, gaps between political willingness and scientific evidence, capacity and communication gaps between central and local government, as well as lack of human resources capacity to integrate climate change research and DRR capabilities. At present, existing CB-DRR approaches have still not fully integrated climate change responses and adaptation and it remains a challenge to meld the scientific concepts of DRR and CCA, as well as available information such as hazard maps, impact assessments at the community level. Also, the roles of the local communities and how to link voices from the community into development of policy is still unclear. The role of mass-media in disseminating information on DRR practices at the community level should be enhanced, and the issues of DRR and climate change should be

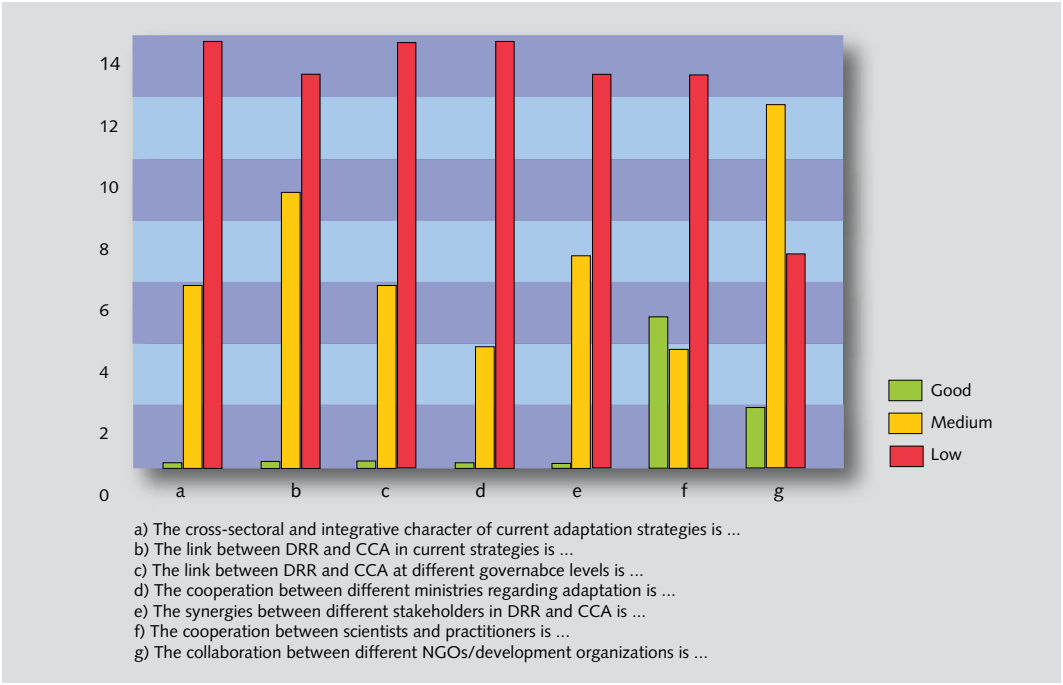


Figure 1.4: Cooperation between institutions and organizations regarding integrative strategies for DRR and CCA. Source: Birkmann et al. 2009: 32

integrated in the existing participatory development planning, which covers the lowest administrative units in Indonesia (Subagyo 2009).

In Indonesia and other countries in the region, the big challenges of lack of coordination and separate development of institutional frameworks, political processes and information exchange in both DRR and CCA hinder the integration process and hamper the development of synergies between DRR and CCA (see Chapter 11). Common perceptions and approaches in DRR and CCA need to be further promoted.

To further understand the perception of various stakeholders, a study by the German Committee for Disaster Reduction (DKKV) (Birkmann 2009) was conducted by means of semi-structured interviews with experts and practitioners from various countries. The results showed that climate change problems were mostly considered relevant in sectors directly linked with natural resources, such as water management and agriculture, whereas areas such as urban development (long-term cross-sectoral planning but not directly related with environmental services) did not receive much attention. Moreover, it was addressed that the degree of cooperation between DRR and CCA in terms of cross-sectoral cooperation, links in strategic planning and coordination among Ministries and various stakeholders were medium to low (see Figure 1.4).

As recommendations, some specific areas of work were identified as improvements for linking DRR and CCA more effectively, such as the promotion of cross-sectoral and multi-scale approaches, improvement of information and knowledge basis, development of coherent norms and assessment tools, more flexible funding structures, or the promotion of the potentials of DRR for CCA for long-term sustainability. Moreover, the disaster management phases of mitigation and prevention were suggested as particularly suitable to integrate long-term adaptation measures, whereby response and recovery phases can be used as "windows of opportunity" to integrated long-term strategies.

1.6 Cross-cutting themes from the workshop discussions

Considering the aforementioned issues, during the Workshop the young scientists addressed several cross-cutting themes related closely to their research topics and case studies that are important and need to be addressed in promoting DRR and CCA. The selected cross-cutting themes which are going to be further discussed

in this publication and that were core issues within the Workshop are as follows:

- Sustainable adaptation: adaptation to climate change requires a set of attributes that include being planned purposefully, anticipatory, proactively and strategically, as well as acknowledging different time and spatial scales in policy, planning and management. An issue that arose repeatedly from case studies presented in the Workshop was that the socio-economic and cultural contexts and local wisdom play a role in the sustainability and success of adaptation measures.

- Community participation in planning and managing DRR and CCA: this theme is to some extent a sub-component of sustainable adaptation, where the participation of local communities and interest groups, especially the vulnerable, is considered crucial for effective planning for sustainable adaptation. This is often neglected, especially where the approach is top-down and only considers the "outsider" perspective.

- Vulnerability and risk assessment methods for adaptation planning: Sustainable adaptation also requires appropriate assessment methodologies of the threats, risks, vulnerabilities and capacities to adapt successfully. There are various risk and vulnerability assessment methods used by various disciplines and for different purposes. It is very important to ensure that the method and variables selected are appropriate and clearly define who/what is vulnerable, to what, and with respect to what?

- Good governance and capacity-building: participation of various actors in planning adaptation to climate change requires knowledge, resources, expertise and access to power. Lack of knowledge and awareness of various actors and also institutional weakness were identified as two of the main problems for effective planning for adaptation and for linking DRR and CCA as part of the adaptation process. Besides the involvement of community and various sub-groups as discussed in the aforementioned topic of community participation in planning and managing DRR and CCA, capacity-building of local governments and coordination of linkages among government agencies was particularly highlighted. It is particularly important to focus on the government capacity at the local level, since they are closely linked with the grass roots and are confronted directly with the risks.

- Linking DRR and CCA: despite the recognized commonalities of DRR and CCA, especially in their efforts to reduce vulnerability and build resilience, there are barriers to linking these domains (see e.g., Birkmann and Teichman 2010). During the Workshop the participants identified and cross-referenced some common elements of DRR and CCA on issues of sustainable livelihoods, risk assessment, adaptation and coping strategies to climatic hazards and on their relevance to long-term development planning, as well as learned more from the example of Indonesia through discussions with some local actors regarding the challenges in linking DRR and CCA.

1.7 Conclusion

The occurrence of climate change is evident in South and Southeast Asia. This will hamper development and intertwine with existing problems in the region, such as rapid urbanization, unsustainable development and poverty. Disasters of higher intensity and changing hazard patterns will be worsened by climate change and it is of crucial importance to build an effective framework for DRR and sustainable CCA. Both policy and research domains have common objectives, which include reducing vulnerability and enhancing resilience.

However, in practice, effective application of DRR and CCA often fails. First, challenges remain in the scientific discussions, where various schools of thoughts with different concepts and definitions exist, which is a challenge in achieving a common understanding and putting it into sustainable practice. It is necessary to learn from the exiting practical experiences and case studies, what concepts and components should be integrated in the framework of DRR and CCA.

Second, a common failing in DRR as in CCA is to not state explicitly the desired outcomes in terms of what risks exist and what the desired "end state" is. Inclusion of the vulnerable,

as well as consideration of their social, cultural and political context is also often neglected. In addition, some conceptual challenges still exist, such as clarifying and agreeing on definitions of key concepts, dealing with uncertainty, defining acceptable levels of risk and levels of spatial and temporal and resolution, and finally but not least difficult taking into account political and cultural aspects. There is a need for development of a better understanding of the concepts of DRR and CCA.

Third, the institutional challenges, such as lack of awareness at all levels, low capability, communication, cooperation and coordination among various stakeholders still hinder mainstreaming DRR and CCA into sustainable development and achieving their common objectives.

To discuss these issues and challenges in more depth, several cross-cutting themes to be addressed were identified, among others sustainable development, community participation, vulnerability and risk assessment methods, good governance and capacity-building and integration of DRR and CCA in practice.

Having this as a background, the Workshop and this publication intend to put forward some ideas and research findings on the related topics in the context of the region South and Southeast Asia. The case studies presented in the following chapters only represent a small part of the whole problematic and developments in the region, but they show how the social, political and cultural diversity in the region shape both the problematic and the strategies for development in the region.

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2. Vulnerability and adaptation to salinity intrusion in the coastal province of Travinh, Vietnam

Nguyen Thanh Binh

This paper presents preliminary findings of a study on vulnerability and adaptation of households exposed to salinity intrusion in the coastal province of Travinh, Mekong Delta, Vietnam. The data was mainly obtained from focus group discussions and key informant interviews with stakeholders from provincial, district and village levels and shows that agricultural activities in the study site have been affected by water-related hazards, such as salinity intrusion, shortage of freshwater and tidal influences, especially in the dry season. To cope with and adapt to such hazards, the government of Vietnam and local people have developed strategies and measures (e.g., dyke buildings, crop calendar adjustments, groundwater exploitation). However, most of the measures proposed or in place do not take into account long-term climate change and so the current adaptation measures have limitations.

2.1 Introduction

The Mekong Delta is located in the south of Vietnam and has an area of approximately four million hectares including nearly 2.6 million hectares of agricultural land (about 65% of its total land area). It is one of the most productive and intensively cultivated agricultural areas in Asia (Hook et al. 2003; GSO 2007). The Delta's population is approximately 17.5 million of which about 13.8 million (nearly 80% of the population) live in rural areas and mainly obtain their livelihood from agricultural activities (GSO 2007). The Delta is a fertile alluvial plain with a tropical monsoon climate. Land elevation ranges from 0.3 to 4.0 metres above mean sea level, of which 60 per cent lie below one metre (Hoi 2005). The Delta hydrology is complicated because of its canal and river networks and because it is influenced by the Mekong River flow and two tidal regimes: the diurnal tidal movement of the East Sea and the semi-diurnal tidal movement of the Gulf of Thailand (Sanh et al. 1998; De 2006). Due to both the overflow from the Mekong River and heavy local rainfall, a large part of the Delta is inundated in the wet season (Hoi 2005; Tuan et al. 2007). However, in the dry season, the low discharge of the Mekong River keeps the water table below the field level and causes water shortage in the whole delta (De 2006; Tuan et al. 2007). Besides low river flow, overuse of water for irrigation and hydropower projects in upstream areas cause serious salinity intrusion and drought in the downstream region (White 2002; Nhan et al. 2007). In the dry season, seawater can penetrate into the delta, up to about 40 – 60 kilometres inland, so that about 2.1 million hectares (about 55% of total Delta areas) are affected by salinity (Miller 2003; Sam 2006). Potentially, within the context of global climate change – especially SLR – the Mekong Delta would suffer significantly (Dasgupta et al. 2007; Hanh and Furukawa 2007; Carew-Reid 2008).

In order to control salt water intrusion, both formal and informal adaptation options have been developed and implemented. They have shown many positive results for agricultural and economic development as farmers can grow two or even three rice crops per year. However, there are still many issues that need to be improved. This paper attempts to present preliminary findings of vulnerability assessment and to draw some lessons learned from adaptation strategies to salinity intrusion in the coastal province of Tra Vinh, Vietnamese Mekong Delta.

Box 2.1: Tra Cu district profile

Total area: 37,000 ha

Agricultural land: 31,200 ha

Land elevation:
0.4 to 0.8 m; along the sand ridges, higher than 2 m

Population density:
460 persons/km2

Poverty rate: 30.2%

Ethnicities:
Khmer (60%),
Vietnamese (39%),
and Chinese people (1%)

Source: TCSO 2009

2.2 Methodology

The research was carried out in Tra Cu district, located in the coastal province of Tra Vinh. Tra Cu's profile is presented in Box 2.1. The main reasons

for the selection of Tra Cu district for the study are: (1) the district has been affected by salinity problems and freshwater scarcity; (2) the district encompasses various socio-economic groups and different ethnicities (i.e. Vietnamese and Khmer ethnic, high poverty rate); (3) economic activities are diversified due to different ecological zones (i.e. freshwater zone for intensified rice farming, brackish water zone for aquaculture and brackish water zone for sugar-cane farming) (see Table 2.1). Therefore, data and information was collected and compared for the aforementioned three zones, as well as between different socio-economic groups. The data was mainly obtained from focus group discussions (FGD), key informant (KI) interviews with relevant stakeholders at different levels from province to district and village, and observations from the field visits between August and November 2009.

2.3 Preliminary findings

2.3.1 Hazard exposure

Before 1995, the district was strongly affected by salinity intrusion, which caused freshwater scarcity in the dry season (November to May) due to low flow from the Hau River (one of the Mekong River branches) and tidal influence from the East Sea. Since 1995, a series of embankments and sluice gates (see Picture 2.1) have been built in the district to prevent sea water intrusion under the South Mang Thit Sub-project (SMS) established with funds from the World Bank.

Picture 2.1: Sluice gate and dyke system under the framework of South Mang Thit Sub-Project. Source: Binh 2009

Based on hydrologic regimes, topological conditions and irrigation systems, as well as agricultural production activities, Tra Cu can be divided into three different zones. Each zone has particular activities and thus faces varying problems, which are summarized in Table 2.1:

	Characteristics of three different zones in the study site		
	Zone 1 (rice zone)	Zone 2 (sugar-cane zone)	Zone 3 (aquaculture zone)
Irrigation system	Freshwater during whole year Good irrigation system due to SMS (100% inside SMS)	1/3 freshwater during whole year (inside SMS) and 2/3 affected by brackish water in the dry season (outside SMS)	Brackish water in the dry season (100% outside SMS)
Main economic activities	2 to 3 rice crops per year Upland crops (maize, peanut, …) Cattle, pigs, poultry	Sugar-cane 1 to 2 rice crops per year Upland crops (maize, peanut, …) Less animal husbandry	Shrimp culture 1 rice crop in the wet season and 1 shrimp harvest in the dry season Less animal husbandry
Major hazards and problems	Freshwater scarcity in the dry season (especially from February to April) Drought, especially along sand ridges Brackish water leakage Whirlwind	Brackish water intrusion can destroy or reduce crop production Affected by tidal influence (flooding) Whirlwind Storm (seldom)	Shrimp diseases Brackish water can destroy or reduce crop production Freshwater scarcity Affected by tidal influence (flooding) Whirlwind Storm (seldom)

Table 2.1: Characteristics of three different zones in the study site. Sources: FGD and KI interviews 2009

In zone 1, brackish water intrusion has been controlled due to the SMS, which allowed agricultural development as farmers can grow two or even three rice crops per year. However, from February to April, low discharge from the Hau River and low regional rainfall have caused freshwater scarcity for crop irrigation and animal husbandry. Especially, along the sand ridges where land elevation is higher, the problem is becoming more serious. Besides, brackish water leakage during the closed-gate period has also been observed. In affected areas, the crop yields can be reduced by 20 – 30 per cent (KI interviews 2009).

In zone 2, sugar-cane farming is common. This zone is strongly affected by brackish water intrusion and tidal influences, especially at low land elevations and outside the SMS areas. The period of salinity intrusion is between December and May while tidal influence (causing flooding) affects the area from November to January every year. During the last 15 years, the salinity level was highest in 1998 and lowest in 2000 (KI interviews 2009). The maximum salinity concentration was recorded at Vam Buon station (around 30 km from the sea) at 13.9 parts per trillion (ppt) in April 1998 while it was 4.4 ppt in March 2000 (Sam 2006). Both brackish water intrusion and tidal influence are considered constraints for agricultural development in this zone. Such problems affect more than 500 hectares of sugar-cane and 300 hectares of upland crops production annually (KI interviews 2009).

In zone 3, due to its location, the salinity intrusion and tidal influences are greater than in zone 2. The maximum salinity concentration was recorded at 25 ppt at La Bang station (around 15 km from the sea) in April 1998. The rice-shrimp integrated farming system is popular in this zone. Farmers grow rice in the wet season based on rainfall and cultivate tiger shrimp in the dry season. If the rain stops early and salinity levels increase, the rice production is at risk of being lost.

Currently, salinity intrusion, tidal influence and freshwater scarcity in the dry season are severe problems for agricultural development in the study site. Zone 1 is less exposed to these hazards than zone 2 and 3 due to the dyke and sluice gate systems under the SMS. However, in view of SLR the whole area will be strongly affected because of its low topography. Besides, under climate change storms and whirlwinds, which are seldom in occurrence now, will increase in the future. Moreover, upstream interventions (i.e. deforestation, irrigation and hydropower development) change river flows and cause more vulnerability to downstream regions.

2.3.2 Susceptibility

Although Tra Cu has achieved considerable results in terms of agricultural and socio-economic development it is still one of the poorest districts in the Mekong Delta. Its susceptibility to hazards and climate change results from many factors such as poverty rate, proportion of ethnic Khmer, land property arrangements, education levels, income sources and market changes. Table 2.2 presents the characteristics of higher vulnerability and higher capacity groups in Tra Cu district.

The poverty rate is higher in villages with a high Khmer population. In 2008, the average poverty rate of Tra Cu was 30.2 per cent but in the Khmer population it was 70.5 per cent (TCSO 2009). Reasons include no or less land ownership, low education, an unskilled labour population, low agricultural production due to low technical application and investment, human diseases, many children per family and loans with high interest rates (outside the formal credit system) in the Khmer population (KI interviews 2009). The main income sources of the poor are unskilled off-farm and non-farm wage labour. The jobs are not regular but seasonal and provide only a low income. Therefore, the income flow is not constant during the year. In times of unemployment they have to borrow money from local lenders at a high interest rate. As result, the poor get poorer and the gap between poor and rich widens.

The income and livelihoods of people are highly dependent on agricultural production and market prices. In recent years agricultural production has not increased but higher product costs have occurred because of bad weather, crop diseases and high input prices. However, agricultural product prices have tended to decrease. As a result, the livelihoods are affected. In terms of risk, zones 2 and 3 are more susceptible to market changes as sugar-cane and shrimp prices are unstable comparing to rice prices. Besides, shrimp diseases and environmental pollution have become big issues for aquaculture in zone 3.

Characteristics of higher vulnerability and higher capacity groups in Tra Cu

	Higher vulnerability groups	Higher capacity groups
Ethnicity	Khmer	Vietnamese
Education	Low education, unskilled labour	High education, skilled labour
Job	Off-farm and non-farm, seasonal	On-farm, official, regular
Wealth ranking	Poor and medium	Better-off
Loan sources	From informal credit systems with high interest rate	From formal credit systems with low interest rate
Agricultural land	Landless or a small piece of land	Bigger areas
Income sources	Wage labour, fishing, agriculture	Agriculture, aquaculture, business, official salary
Dependency population	Higher, more children and ill people	Lower, less children
Social network	Few opportunities to build social network	More opportunities to build social network

Table 2.2: Characteristics of higher vulnerability and higher capacity groups in Tra Cu. Sources: KI interviews 2009

2.3.3 Adaptation

To cope with and adapt to salinity intrusion and related problems, the government and local people have many strategies and actions such as dykes building, crop calendar adjustments, crop changes, water storage and groundwater exploitation and migration to find new jobs.

Dyke buildings: besides "big projects" like the SMS, which was planned and built by the central government, many "smaller projects" have been implemented to prevent brackish water intrusion and tidal influence in Tra Cu. These smaller projects are funded by the province and/or district. At high risk areas, farmers have also protected themselves by building individual dykes around their fields (see Picture 2.2). These investments are very costly and suitable for the better-off groups while the poor groups cannot afford to install such options. Generally, the dyke systems have shown many advantages; however, they have also caused negative impacts such as reducing natural fish resources and increasing water levels outside the dyke areas.

Picture 2.2: Individual dyke to cope with tide. Source: Binh 2009

Picture 2.3: Integrated rice-shrimp farming. Source: Binh 2009

Crop calendar adjustments: based on experiences and the seasonal calendar from the Ministry Department of Agriculture and Rural Development, farmers have adjusted their crop calendar. For example, if the rain comes later they will seed later and vice versa. But this sometimes can put people at risk due to abnormal weather (i.e. a shorter rainy period, earlier salinity intrusion). Thus, it is necessary to improve the weather forecast system by using both modern technologies and indigenous knowledge.

Crop or species changes: these options are also popular. Instead of rice farming, farmers chose other crops, which need less water than rice such as maize, water-melon, etc. In aquaculture areas (zone 3), before the 1990s farmers grew only one traditional rice crop in the wet season but later on they introduced shrimp in the dry season (see Picture 2.3). In recent years, shrimp farming has faced diseases and environmental pollution. To cope with the situation, some farmers culture crabs or other fish species instead of shrimp. Integrated rice-shrimp farming is a suitable system in coastal areas (Binh et al. 2009). Therefore, it is important to do more research on this farming in order to diversify agricultural activities and utilize land and water resources in saline affected areas.

Water storage and groundwater exploitation: in the wet season, farmers harvest and store rain water in jars or small tanks in order to use it in the dry season, mostly for drinking and cooking. For other types of household consumption people use groundwater from individual drill wells or rural tap water supply systems (these systems are newly developed). Along the sand ridge areas, groundwater is also exploited for watering upland crops. In 1990s, many handle wells were drilled under a United Nations Children´s Fund (UNICEF) programme. According to the Department of Natural Resource and Environment, there are more than 14,000 drill wells in Tra Cu today. Currently, the use of groundwater is free of charge but research on the commercial groundwater market is necessary for better management of this resource.

Migration to find new jobs: before the SMS was built, natural fish resources were considered a source of income for local people, especially the poor. However, after the construction of the SMS, natural fish have reduced and this has had a negative effect on the poor who rely mainly on natural fish resources. Also, crop failures due to water-related hazards have caused many difficulties for local livelihoods. Local industrial activities

have not developed much but rural labourers are constantly increasing. Therefore since 1995, a significant number of young people have moved to cities (mainly Ho Chi Minh City and the industrial zones in the South East of Vietnam) to find new jobs. It is estimated that around 10 per cent of the total population have migrated out of the district (KI interview 2009). Most of them are the poor and unskilled labourers; therefore, the wage is low but it is regarded as a main income source for their families.

Adaptation of vulnerable social group: the poverty rate is higher in the Khmer population (TCSO 2009). Household livelihood activities differ between wealth groups. The poor rely much on unskilled off-farm and/or non-farm wage labour. Therefore, the adaptive capacities are lower in the poor and Khmer populations. The government has many policies to reduce poverty among such populations (for example the 135 Programme aims at improving infrastructure and living conditions in difficult villages, the 134 Programme aims at supporting land, houses and tapwater in the minority ethnic population); however, they do not seem to be very effective and stable due to their single disciplinary approach. The people who escape the "poverty line" often return to poverty if they face shocks such as crop failure. It is necessary to build up more effective measures and investments for rural poor areas (e.g., extension, education, micro-credit, job creation, health care programmes). The way to set up such programmes should change from the current "top-down" approach towards participatory and multi-disciplinary components in order to make them more useful and stable.

2.4 Conclusions

This paper presents preliminary findings of a study on vulnerability and adaptation to salinity intrusion in the Mekong Delta of Vietnam. The results from FGD and KI interviews show that agricultural activities in the study site have been affected by water-related hazards such as salinity intrusion, shortage of freshwater and tidal influences, especially in the dry season. Many adaptation strategies and measures have been developed by government and local people (e.g., dyke buildings, crop calendar adjustments, groundwater exploitation, etc.) to cope with and adapt to such hazards. However, current adaptation options have shown some limitations because they do not fully consider the differences in terms of ecological, social and economic environments. These sometimes lead to conflicts; for example, freshwater users for crop farming and brackish water users for shrimp farming benefit from dyke building since as land owners they can increase crop production, but building of dykes has reduced the natural fish resources which the poor farmers rely on. Besides, most of these measures proposed or currently in place do not consider climate change in the long-term. According to Dixon et al. (2001), diversification is a potential measure against bad weather and marketing risks. Lessons learned from adaptation strategies in Tra Cu showed that diversification of income sources including on-farm, off-farm and non-farm activities plays an important role in improving people's livelihoods. The main concerns here are what to diversify (whether on-farm, off-farm, and/or non-farm options) and how to deal with trade-offs between them in different ecological, social and economic conditions. Therefore, it is necessary to apply a suitable approach (i.e. holistic and multi-disciplinary approach) for future adaptation strategies that can benefit different social groups within the context of climate change.

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3. Do farmers use climate forecast information to respond to climate variability? Lessons learned from Indramayu, Indonesia

P. Raja Siregar

Farmers are facing increasing uncertainty in climate patterns in recent years, which causes difficulties in determining the planting calendar and which crop varieties to plant. The Government and experts see information on seasonal climate forecasts as a solution to the problem. A "Climate Field School" (CFS) was conducted for farmers in three villages in Indramayu District in 2003. In the following years, the project was replicated in about 100 districts. After participating in the school, farmers were expected to use the information as an input for their strategy on cropping patterns. A study was conducted in 2008 on farmers in two villages in Indramayu who had participated in the field schools. The study found out that farmers do not use the obtained information but rather maintain their old cropping patterns. There are complex practical reasons that shape the responses and cropping patterns of farmers.

3.1 Introduction

Farmers are facing increasing uncertainty in climate patterns in recent years. Frequent losses of rice crops occur, as rainfall ends prematurely while crops are still in need of water. Farmers are facing difficulties in determining suitable planting calendars and appropriate crop varieties. Farmers on rain-fed land are completely dependent on anticipated patterns of rainy seasons to plan farming strategies.

Rice farmers normally prepare seedlings and carry out land preparation several days prior to the rainy season, when the rainfall is still weak. The seedlings are transplanted from seedbeds to rice fields after 25 – 30 days. When the seedlings are transplanted, the rice fields must have been covered by water to at least five centimetres depth. Hence, a farmer must correctly predict on when regular and heavy rains will commence.

If regular and heavy rain does not follow the initial rainfalls of the season, then after the seedlings reach 30 days, the crops are endangered as seedlings that are too old will produce fewer tillers, which will lead to lower production. Some farmers have to prepare new seedlings again, which causes a delay in planting. Any delay in the first crop leads to a delay in the second crop cycle of the season. It increases the risk that the rainy season will end when a rice crop is still in need of water. Some farmers choose to continue with the old seedlings with the risk of having a low production. In order to avoid such miscalculation in the timing of the rainy season, as well as failure in seedlings or seed transplantation, seasonal climate forecasts are needed.

The seasonal climate forecast information was introduced to Indonesian farmers about three decades ago. It is normally provided to farmers through the extension officer before the planting season starts. The information contains estimates of rainfall intensity, the onset and duration of the wet season and recommendations on strategies of crop management in response to the forecast (BMG 2008a; Boer et al. 2003). It is expected that farmers use the information for adjusting their strategy on crop management. The government and experts believe that the format of information of the seasonal climate forecast is the main obstacle for its implementation. Translating the seasonal climate forecast into "farmer's language" is considered the main challenge to encourage farmers to use the information for setting up their crop management strategy (Boer et al. 2003; Roncoli et al. 2003; Indonesian Ministry of Agriculture 2007).

The Indonesian government and scientists have been searching for an effective mechanism to communicate the seasonal climate forecast information to farmers. Inspired by the Farmer Field School methodology, a CFS was conducted in 2003 with farmers in the Indramayu region of Indonesia to promote application of the seasonal climate forecast for improvement of farmers' strategy on crop management. A total of 90 farmers from Kandanghaur sub-district, Losarang sub-district and Juntinyuat sub-district participated in the School (Indonesian Ministry of Agriculture 2003). All of them were rice farmers working on rain-fed lands that frequently suffered from drought and flood. After participating in the School, farmers were expected to understand the information and to apply it in setting up their strategy on cropping patterns (Syafiuddin 2006).

A cropping pattern that follows the information of the seasonal climate forecast is the expected outcome of the School. The initiative was replicated in about 100 districts in Indonesia and in Ilo-Ilo District in Philippines. A module of 12 sessions of class meetings and outdoor exercises was prepared as a guideline for trainers to achieve the objective. It was designed to solve the problems in communicating the seasonal climate forecast to farmers, especially on terminologies and on the concept of "probability". Forecasting skill is defined by the percentage of accuracy in climate forecasting (Boer et al. 2003: 37).

3.2 Purpose of the study

This study is conducted to assess the impact of the CFS strategy on crop management of the farmers. It investigates farmers' application of the seasonal climate forecast information on crop management. The study should provide answers to the following research questions:

1. Does the CFS have an impact on crop management strategy of the farmers?

2. Why do farmers choose their strategy of crop management?

The objectives of the study are to improve our knowledge on interaction of scientific climate knowledge and people's knowledge by studying the impact of the CFS and the regular dissemination of climate forecast information on farmers' practices and to identify constraints and possible actions to respond to climate variability in crop farming in Indonesia.

3.3 Description of the study area

The study was carried out in two villages, Karang Mulya in Kandang Haur sub-district and Santing Village in Losarang sub-district, Indramayu, West Java Province Indonesia. Indramayu District is located at the tail-end of the irrigation system. The shallow ground water in this area has a high salinity level. In some part of the agricultural lands, the salinity level is not tolerable by crops. Most of the Indramayu topography is level land or areas with an average gradient of 0 to 2 per cent and lies between 0 and 100 metres above sea level. Such topography influences water drainage, so that some areas suffer from flooding during high levels of rainfall (Indramayu 2008).

Agriculture is the main source of livelihoods for Indramayu people. About 54.65 per cent of the population work in the agriculture sector, including the marine and fresh water fishery. The sector contributes 43.05 per cent of Indramayu's total Gross Domestic Product (GDP).

Indramayu District covers 204.011 hectares of land, comprising 110.877 hectares of rice field (54.34%) and 93.134 hectares of dry land (45.65%). Rice production reaches 762.951,76 tons, which is more than the consumption level of the population. Indramayu District is one of main rice producing areas in Indonesia. The majority of people (61.94%) who work in agriculture are not

	Land ownership on Indramayu agriculture		
No.	Land ownership	Total	%
1	Owner	110.626	16.52
2	Owner-Farmer	144.231	21.54
3	Farmer on rented land	115.977	17.32
4	Hired labour	298.831	44.62
	Total	669.665	100

Table 3.1: Land ownership on Indramayu agriculture. Source: Modified from Indramayu 2008: 6

the owners of the land (Indramayu 2008). The ownership of the lands in Indramayu is presented in Table 3.1.

About 65 per cent of the agricultural lands rely on irrigation systems and 17 per cent are fully rain-fed (Indramayu 2008). However, many farmers here do not receive water from the irrigation system. In the second and the third planting season (dry season) the water barely reaches lands at the tail-end of the irrigation system since farmers further upstream have used most of it. Competition for irrigation water is high during this period and farmers at the tail end of the irrigation system have to deal with water deficits for cultivating rice twice per year. Meanwhile, the irrigation water is abundant in the first planting season (peak of rainy season) and sometimes even causes floods.

In general, farmers at the upstream irrigated lands cultivate rice twice a year and even three times a year for those on agricultural lands near irrigation canals (or near dams). The planting schedule in irrigated land is developed by the local government after meeting with the Water Users Association and estimating the water level in the dams, which can be prepared long before planting starts. On the other hand, farmers on rain-fed land or at the tail-end irrigation system have to completely depend on the estimation of the rainy season to develop their planting schedule and cropping strategies. Almost every farmer in Karang Mulya and Santing Village uses a pump engine to support crops during the second planting season.

3.4 Methodology

Case studies were chosen as the research strategy of this study. Participating farmers were selected to represent different agro-ecological conditions for crop farming, especially water availability, and their level of commitment to record rainfall.

Primary data was gathered through interviews with farmers, government officers and experts and through participatory observation. Secondary data was gathered both from government documents and public documents. Semi-structured interviews were the main instrument to gather information from individual selected farmers, both the CFS participating and non-participating farmers. The research was conducted from July to September 2008, which is the dry season. It was the period between the end of the second planting season until the middle of the third planting season.

Picture 3.1: Beginning of planting time (left); water shortage on the second planting time (right). Source: Siregar 2009

A multi-visit interview format was employed, which allowed the researcher to clarify, to confirm and to confront the feedback given by interviewed farmers before. Interviews with climate experts who designed the module and government officers in Jakarta and Indramayu District were also conducted. The extended sample unit were several farmers of Karang Mulya Village and Santing Village who were neighbours of the participating farmers.

3.5 Findings

3.5.1 Utilization of climate forecast information

The information on seasonal climate forecasts is provided to farmers in Indramayu twice a year, before the first planting season and before the second planting season. The study finds that seasonal climate forecast information and extension officer's recommendations are not used by farmers as inputs for their strategy of crop management, neither for seeding time nor for crop selection. After participating in the CFS, farmers in the study area were found to not have used the seasonal climate forecast information for determining their seeding time. The following sub-chapter 3.5.3 provides an explanation why farmers do not use seasonal climate forecast information for their planting strategy.

Farmers waited for the first two or three rains as their indicator to start the seeding time, without knowing how the rainfall pattern would develop. For the second planting time, the information and recommendations provided by the extension officers, which were supposed to help farmers to decide on the appropriate cropping pattern (rice or less-water crops/secondary crops or no cultivation) were also ignored. Farmers directly started the second planting season after harvesting the first crop. The available water at that moment was used as the indication to decide on what crop and variety to plant. Whenever farmers are able to find water on canal or river in a considerable amount, they will choose to cultivate rice.

However, farmers whose lands are lower than the surrounding area have no other choice but growing a rice crop for the second time. Only rice crops are suitable for lands that are always submerged by water. If a farmer wants to plant other crops, he needs to dry out the water first. This requires energy and time. Hence, farmers would

prefer to plant a second rice crop for that type of land. However, quite often the land becomes drier in the following weeks when rains stop. Farmers then have to find additional water or the crops would be lost.

3.5.2 Exploiting the groundwater

The first attempt made by farmers to save a rice crop from dying is looking for excess water from another village. It is the role of the head of a village administration, or middle man, to bring additional water from the outside. If it is not available, farmers will use groundwater to irrigate their crops. For almost one and a half decades, some farmers of Karang Mulya have used groundwater to water the first and second rice crops when the rainy season ends and there is no water in the canal. Groundwater raised by pump engines became the main water source for secondary crops during dry seasons.

For rice crops, it is used mainly as an additional water source when the rice crop is nearly mature. Most farmers said they maintain the rice crop by using ground water if it is 60 – 70 days old. Farmers will think twice about maintaining the crop if it is younger, since it will consume a lot of fuel to run water-pump engines for a young rice crop. Every farmer will make different decisions based on the respective financial situation and level of confidence.

There could be a situation when farmers are not able to maintain the rice crop in the second season anymore. Increasing oil prices may render exploiting ground water to support a rice crop in the second season not economically feasible.

3.5.3 Constraints to adaptation

The study found there are social, technical and ecological constraints in the adaptation of cropping patterns to climate variability, which are requirements for collective action, crop preference, preference of the "influential" farmers, and farmers´ perceptions on the reliability of the seasonal climate forecast from the state meteorological agency (BMKG).

Cropping pattern is collective action: the cropping pattern of a farmer is influenced by the decisions of the majority of surrounding farmers. The main reason is the security of the crop of individual farmers. If a rice farmer starts planting earlier than the others, the crop will be mature earlier than others, which means that there is a greater risk that rats will attack the "standing alone" mature crop. Hence, every farmer tries to synchronize the planting time with the others.

Moreover, farmers share the common drainage, which makes it difficult to plant secondary crops if all others in the surrounding area are cultivating rice. Even when a farmer is aware that there will not be enough water for the second rice crop, he has no choice but to cultivate rice together with the others. Also farmers whose land is located lower than the surrounding area usually choose to cultivate rice in the second season.

Crop preferences: generally, farmers prefer to cultivate rice because it requires less time for cultivation. It is also considered less complicated compared to alternative secondary crops. Even though all farmers in Karang Mulya have experiences on secondary crops, which actually promise higher revenues, they would prefer to plant rice twice a year whenever water is abundant. Some farmers have combined one rice crop and a secondary crop in the second season, but the larger portion of the land is still occupied by rice crops.

"Influential" farmers with higher social status generally do not cultivate a secondary crop at all, and do not work at all during the dry season. Full-time and common farmers spend less time on social activities and have lower formal education compared to influential farmers. It was found e.g., that a farmer followed the suggestion of the influential farmer to grow another rice crop in the second planting season, despite his interest in an alternative crop.

Perception on reliability of the forecast: farmers have little confidence in seasonal climate forecast information. According to farmers, the forecasts were "sometimes accurate, sometimes not accurate". It indicates that they perceived the forecast to have an equal chance to be inaccurate. It is important to note that the forecast skills of the agency BMKG in Indramayu District and its dissemination of the information is better than that of other regions of Indonesia. Once the farmers followed the recommendation to cultivate a secondary crop, as a long drought in the second season had been predicted, but then their crops were damaged due to heavy rains. This bad experience is used to judge the reliability of the authority (BMKG). Although the CFS educated

farmers to appreciate the forecast based on percentage of accuracy, the research finding shows that the farmers' perception of accuracy is not built on quantitative measures, as is that of scientists.

Technical constraint for secondary crop: in order to shift from rice crop to another secondary crop a regular water supply is required e.g., from a water spring, small pond or groundwater. Secondary crops, like vegetables or fruits, consume less water than rice, however, they have to be irrigated regularly (almost daily). Moreover, it is not possible either to change the planting calendar to mitigate the impacts of frequent floods.

3.6 Conclusions

The study shows that the choice of a crop is the result of group work. The cropping pattern of a farmer results from the interaction of various aspects, such as the agro-ecological environment, preference, access to market and decisions of the majority of farmers. Therefore, adaptation to climate in terms of changing cropping patterns is not feasible at the individual level. Farmers require a strong institution to achieve agreement, commitment and to solve conflicts in applying a new cropping pattern in response to the climate variability. Therefore, it is necessary to raise awareness of the farmers to understand their problem and the need to conduct collective actions to change cropping patterns, before any initiative to apply climate adaptation starts.

It has to be considered that the institutional capacity of different groups is different. In this case, most rain-fed farmers have weak local institutions, even though most of them join a formal farmers organization. Except in some places where indigenous practices are still applied, rain-fed farmers rarely have traditional practices to discuss in a group meeting about planting time and to achieve a consensus on a cropping pattern. But farmers on irrigated land have stronger institutions and traditions to discuss such as when to start planting and how to solve conflicts on water allocation during deficit situations during the second planting season.

Changing a cropping pattern would take time: farmers must have full knowledge of the selected crops, such as access to markets, presence of local traders, financial assistance for the crop, range of technical aspect of the crop and impacts to social live. Crop patterns can be regarded as having inertia, as farmers stick to a crop that they have known well until they face an extreme situation e.g., price drop or environmental disasters.

Nowadays, farmers of Karang Mulya and Santing continue to cultivate rice crops in the second planting season even though they have suffered crop losses several times in a row after the year 2000. A series of crop losses has not yet disturbed the equilibrium state on this crop pattern. The rational thinking of a farmer in responding to climate uncertainty in a given climate situation is to deal with the direct impact – the availability of water. Instead of changing the crop pattern, the farmers' adaptation strategy is to look for additional water when they face water deficits (Karang Mulya), such as extracting groundwater with costly water-pumps, while farmers of Santing make arrangements with regard to the planting schedule so that rice plants are already tall enough, but not yet mature, when the flood arrives.

The case shows that scientists and governments have different perceptions of the problem and the solution than the farmers. For the farmers, obtaining accurate seasonal climate forecasts and adapting crops are not the main and only solutions to the problem, but rather to accept the seasonal uncertainties and to find solutions for the water availability while maintaining their old cropping patterns.

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4. Sustainable adaptation to climate change and Disaster Risk Reduction

Saadia Majeed, Bob Alexander and Shabana Khan

Sustainable Adaptation to climate change is the key to enabling substantial changes in the field of DRR and CCA. The unprecedented challenges posed by climate change can be reduced through integrated and planned adaptation measures. Based on a conceptual discussion and literature review, this paper outlines the necessity of sustainable adaptation. It also demonstrates existing methodological gaps in assessment and evaluation processes of vulnerability and adaptations and focuses on further research guidelines, which are required to cope with the existing inadequacy of knowledge on adaptation measures.

4.1 Introduction

Adaptation is a process through which societies make themselves better able to cope with an uncertain future. Adapting to climate change entails taking the right measures to reduce the negative effects of climate change (or exploit the positive ones) by making the appropriate adjustments and changes (UNFCCC 2007). This term refers to changes in processes, practices or structures to moderate or offset potential damages or to take advantage of opportunities associated with changes in climate. Sustainable adaptation offers a reduction of vulnerability of communities, regions or activities related to climate change and variability. The need for the development and assessment of planned adaptation initiatives to help manage the risks of climate change and the options for adaptation significantly varies between regions and countries. In most cases vulnerable communities exposed to climate change effects often have to deal with limited resources, technology, information, infrastructure and unstable institutions. For them, the conditions brought by climate change are a "downward spiral of deepening poverty and increasing risk" (PLOW 2007; Davies et al. 2008).

As climate change is expected to result in increasing frequency, intensity and variability of disaster events, it will also modify temperatures, evaporation rates, water availability and quality, soil moisture and the stages of agricultural crops. The effects of these changes in rural areas will be crop failure, deterioration of fisheries, environmental asset degradation, livestock loss and the overall loss of livelihoods (Ahmed and Chowdhury 2006). To prevent such losses, integrated and planned adaptations are required to ensure sustainability of livelihoods. For example, agricultural diversification, use of drought-tolerant crop varieties, crop insurance schemes, upgraded drainage systems, enhanced water use efficiency and enlarged reservoirs are presumed as good adaptation practices in risk management.

To date, DRR and CCA have evolved with independent agendas of risk management. Nevertheless, the key component of sustainability is resilience to both disaster and climate changes by adapting to better withstand impacts and to recover more quickly from them. As DRR deals with climate variability and is considered a first line of defence against climate change impacts (Mitchell 2008), it must further emphasize adaptation by incorporating future changes into analyses and thereby concomitantly consider both corrective risk and prospective risk (De Leon 2008). Current assessment methods seem inadequate to address both existing risks and the possibilities of new risks caused by both exogenous changes and endogenous development, as well as by short-term DRR actions.

4.2 Methodology

Based on a conceptual discussion and literature review, this paper outlines the necessity of sustainable adaptation. It also demonstrates existing methodological gaps in assessment and evaluation processes of vulnerability and adaptations and focuses on further research guidelines, which are required to cope with the existing inadequacy of knowledge on adaption measures.

4.3 Sustainable adaptation attributes and scales

Researchers dealing with adaptation science have proposed numerous types and forms of adaptation, which characterize its processes and attributes and have identified a variety of applications (Smit 1999). Hence, adaptations have been distinguished according to whether they are autonomous or planned, anticipatory or reactive, occur in natural or socio-economic systems, and take technological, institutional or behavioural forms (Smithers and Smit 1997). In Smit et al. (1999), common bases for characterizing and differentiating adaptation (see Table 4.1) to climate

change are described; on the basis of purposefulness and timing, spontaneous or autonomous adaptations take place during the reactive response to climate stimuli and occur without the directed intervention of a public agency, whereas planned adaptations are either reactive or anticipatory (see Box 4.1). Thus the processes and forms of adaptation are not independent, most of them are descriptive and intended to distinguish one type or form of adaptation from another. For example, attributes of performance are considered both descriptive and evaluative for prescribing adaptation options.

Along with these adaptation attributes, the impacts of changing risks are observed at several scales and levels in the community, therefore sustainable adaptation practice depends on initiatives taken at a number of social scales. For instance, in the report on Adaptation to Climate Hazard in Drought-Prone Areas in Bangladesh (Ahmed et al. 1999), climate change impacts in Bangladesh are characterized according to four scales: mega, macro, meso and micro. Using the example of SLR, the authors describe adaptation options at each scale. As the process of SLR occurs at the mega-scale with global effects, at the macro-scale the increase in surface water and groundwater therefore has the potential to similarly affect neighbouring rivers and flood plains in China, Nepal, India, Bhutan and Pakistan. Adaptation options at this scale depend on international economic and political structures and imply the need for decision-making regarding the use of technological resources and institutions at the national level. At the meso-scale, depending on location and physiographic characteristics of the area, the vulnerability of different communities varies within the country. Hence, at this scale location-specific adaptation options are considered. Finally, at a micro-scale, individual and family unit vulnerabilities are measured. Adaptation options at this scale deal with the vulnerability and adaptive capacity of individuals in terms of financial and socio cultural constraints. In New Zealand the Coast Care Dune Restoration Programme (see Box 4.1) encourages community volunteers to plant dune vegetation that improves the resilience of the beach from erosion and storms. This location-specific planned adaptation by the District Council is taken as a measure of risk management to avert the ecological vulnerability of that community. In contrast, the Cyclone Preparedness Programme in Bangladesh trains community volunteers on disseminating warning signals, evacuation, sheltering, rescue, first aid and relief operations to ensure the safeguard of coastal lives. This shows how the idiosyncratic nature of climate change related hazards may render some communities ecologically vulnerable towards a particular hazard, whereas lead others to be vulnerable in terms of lives and livelihoods. Also it is evident that the vulnerability and adaptive capacity of risk communities are multidimensional and differ not only by country but also by groups within a country. Consequently, the adaptation practices in different regions are generally chosen based on attributes and scales of adaptation options specific to the vulnerability and adaptive capacity of that community. But the current sustainable adaptation assessment methods lack coordination or consistency in systematically evaluating all vulnerabilities. Concentrating on this issue, Alexander et al. (2006) set a functional example of sustainable adaptation assessment (see Box 4.2) that links different types of vulnerability with adaptive social protection.

4.4 Sustainable adaptation assessment gaps

One subset of problems with assessing sustainable adaptation relates to an inability to find long-term solutions for sustaining livelihoods in communities because, despite rhetoric about mainstreaming disaster and climate change risk assessment methods, these are not adequately integrated into decision-making on sustainable development. Those that are driven by exposure maps of single hazards fail to address the combination of multiple hazards that impede the development of a particular community. Furthermore, if this focus is on low frequency, high consequence climatic events, the result is a myopic ignorance of the many high frequency, low consequence climatic and non-climatic events that cumulatively are the cause and effect of both livelihood vulnerability and the inability to invest in more secure livelihood options. Those that assume spatial covariate, vulnerability homogeneity within a community neglect sub-groups or individual idiosyncratic, vulnerability heterogeneity within a community. Finally, with dynamic changes to each of the above problems that may exacerbate each of them, those that only consider past and present information about effects

Picture 4.1: Dune restoration at Papmoa Beach, Bay of Plenty – before (left) and after (right).
Source: Environment Bay of Plenty 2010

Box 4.1 Coast Care Dune Restoration Programme in New Zealand

Climate Change poses a significant threat to coastal areas, so that island nations are particularly at risk. Even though New Zealand will face less severe impacts of climate change relative to other island nations, many of its coastal hazards such as flooding, erosion and storms are likely to intensify under the influence of climate change (MfE 2008b). The threats to urban areas located at the coasts are paramount (MfE 2009). However, the cost of reducing vulnerability through land use changes or other sustainable practices often overwhelm the noble values of sustainable adaptation.

One example of practicing sustainable adaptation in New Zealand is the "Coast Care Dune Restoration Programme" at the Bay of Plenty. This programme was started by the District Council of Bay of Plenty in collaboration with Coast Care BOP (i.e. local community volunteer group) and the Department of Conservation (MfE 2008a). Its objectives include the design and implementation of the dune restoration, dune management and promotion of a dune care ethic within the wider community by raising awareness and promoting participation leading to behavioural change (MfE 2008a). Under this programme community volunteers planted about 300,000 native dune plants that improved the resilience of the beach for both erosion and storms (MfE 2008a). Picture 4.1 not only shows the restored dunes but also highlights the negligible impact of cyclone Ivi that generated 10 metre waves, which may otherwise have eroded a significant portion of the coastal dune (MfE 2008a). At present, there are 30 Coast Care Groups in the Bay of Plenty that restore and maintain the dunes by managing vehicles and pedestrian access, removing weeds, controlling pests and monitoring the dunes (MfE 2008a).

One major challenge of sustainable adaptation is its acceptability at the local level, that require both public awareness and participation. A proactive public awareness campaign about both climate change and possible adaptation methods can motivate people to participate and work for the community goals. Such programmes are used as an essential tool for the dune restoration programme in the Bay of Plenty (MfE 2008a). They are not only cost effective, but they also allow for more community engagement for short-term and long-term development initiatives.

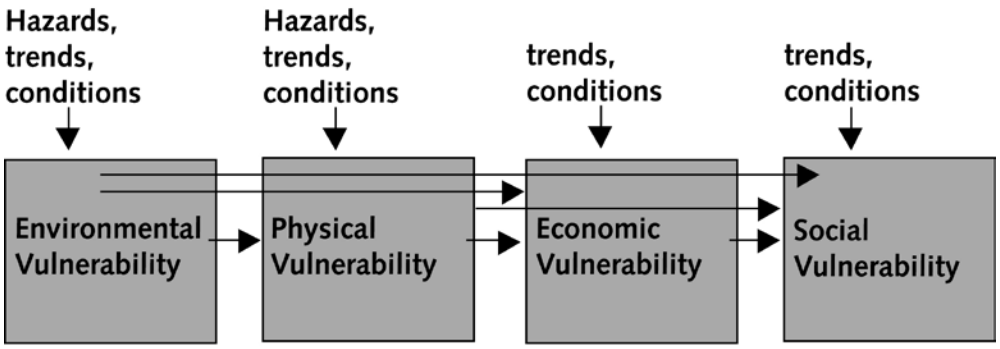

Figure 4.1: The flow of vulnerability. Source: Alexander 2009

Box 4.2 Analysis of sustainable livelihood considerations in Post-Tsunami Aceh, Indonesia

Livelihoods and self-protection are the link between poverty and vulnerability (Cannon 2003). As livelihoods enable a community to create the means for self-provision of its basic functions (Alexander et al. 2006), threats to the sustainability of these livelihoods arise not only from disaster risks to cause disruption but also from climate change risks to spur the evolution of underlying livelihood conditions and factors. Sustainable livelihoods models and applications have generally focused on replicating previous livelihood paradigms without consideration of these dynamic modifications. By focusing on livelihood adaptation within integrated dynamic disaster and climate change risk assessments, the transformation of livelihoods to protect and enable adaptation of all of a community's functions provides what Davies et al. (2008) call adaptive social protection.

Alexander et al. (2006) demonstrated the use of the sustainable livelihoods framework to assess issues that needed to be addressed in the recovery from the 2004 Indian Ocean tsunami in Aceh. By synthesizing the lost resources with the contextual changes after the disaster event, recommendations were made regarding the provision of natural, human, financial, and social, institutional, and cultural resources that would best reduce economic, social, and environmental vulnerability across multiple subgroups with idiosyncratic impacts within affected communities of the fisheries sector. Doing so met the aforementioned sustainable adaptation assessment criteria by being subgroup-focused, poverty-reduction oriented, and linking the different types of vulnerability. Not met, however, were the integrated and dynamic criteria of considering not only how the resources and context have been changed by the event, but also how they may be expected to change by development and climate change trends in the future.

In order to improve this assessment methodology to meet these criteria, the resource profiles could be assessed relative to scenarios of future changes. Depending on the time and resources available, a desired method could be chosen for development of future scenarios that would incorporate likely development trends and climate change trends that are likely to affect the resources and institutions employing them. By considering the dynamic effects of these changes, recommendations could be extended beyond required resource provisions for recovery to include suggestions for livelihood adaptation and resulting resources for such transformation. In this manner, the sustainable livelihoods method can be extended for usage even in a post-disaster situation to enable sustainable adaptation and adaptive social protection.

on livelihoods fail to incorporate the effects of climatic and development trends, as well as the effects of development decisions, that can all exacerbate or reduce disaster and climate change risks. As emphasized by Thomalla et al. (2006), the assessments of the processes and dynamics of exposure and responses relative to accurately assessed baselines are essential. In order to overcome these problems, sustainable adaptation assessment requires methods that are integrated into overall sustainable development decision-making to allow them to be multi-hazard and sub-group focused, development and poverty reduction oriented and dynamic.

Another subset of such problems is caused by an inconsistency between methods for assessing environmental and physical exposure and those for assessing economic and social vulnerability. Although a significant amount of time and money is allocated towards geographic-oriented mapping and related indices and indicators, these tools are only appropriate for indicating a broader and more macro-level covariate nature of communities' likely physical and environmental exposure to different hazard events (termed environmental vulnerability and physical vulnerability in Figure 4.1). In order to understand the more idiosyncratic nature of economic vulnerability and social vulnerability, the particular factors that make certain individuals and community sub-groups particularly vulnerable must be emphasized in research and practice. Although some methods are utilized for assessing economic and social vulnerability, the two types of assessments are often conduced in isolation so that, rather than being prepared in order to be passed along the continuum of vulnerability (see Figure 4.1), information from the exposure maps are not relevant for use in socio-economic assessments. In order to enable better use of such information, a bridging between environmental or physical vulnerability, and economic and social vulnerability is required.

Within these problems of integrating and bridging lies a particular problem of focus, in that specialized practitioners concentrate on a particular element of sustainability. Assessments that are specifically focused on only the environmental, physical, economic or social elements of sustainability are prone to miss the roles that each of these play in ensuring overall sustainability of the society and in better enabling that element to support others.

4.5 Issues to consider

Finding effective solutions for CCA requires consistency within existing policies, assessment criteria, development objectives and management procedures. Coast Care Dune Restoration Programme in New Zealand (see Box 4.1) is an example of successful pre-event sustainable adaptation practice that represents a conscious policy response of the government. This type of proactive response demands public participation and awareness along with other forms of adaptation attributes (e.g., institution, infrastructure and technology). Although developing countries are most vulnerable to climate change impacts, their development designs, policies and activities often neglect the urgent need for planned adaptation measures to meet the future impacts of climate variability. While climate change research is more focused on finding adaptation and mitigation options at the mega and macro levels, some research is being conducted on the roles and responsibilities of individuals, communities, private and public institutions, governments and international organizations for adaptation at the local level. Initiatives that lead communities to sustainable livelihoods and adaptive social protection can open new doors to potential adaptation measures (see Box 4.2). Existing knowledge on adaptation and adaptive capacity is still insufficient for a reliable prediction of climate change impacts on these local level human-ecosystem dynamics. As there are no fixed criteria to evaluate such adaptation measures, further research on identifying gaps in implementation procedures and processes of decision-making are required. Although a variety of specific adaptation options have been recommended for different sectors, individuals, communities and locations, they involve a number of key players (e.g., private, public or individuals) without any recommendations for their suitable coordination. Hence, we need more research and improved knowledge to identify constraints and opportunities for coordinating implementation of local-level adaptation measures.

4.6 Some final thoughts

There are numerous examples of successful adaptation measures that significantly contribute to the field of DRR and CCA. Substantial changes

can be achieved through the implementation of planned adaptation measures, especially in the most vulnerable communities. In the absence of planned adaptation, communities will adapt autonomously to changing climate, possibly resulting in additional costs and unnecessary damages to the natural system. Although societies and economies have adapted to a gradually changing climate for centuries, the advent of a paradigm of a more rapidly changing climate and resulting vulnerabilities could bring new hope for more effective, proactively planned adaptation measures if the gaps between vulnerability, assessment and evaluation processes can be bridged to enable anticipatory adaptation measures that incorporate the integrated ecological, economic and social effects of climate change and disaster risk vulnerabilities.

Bases for differentiating adaptations	
General differentiating attributes	Examples of terms used
Purposefulness	Autonomous ⟷ Planned Spontaneous ⟷ Purposeful Automatic ⟷ Intentional Natural ⟷ Policy Passive ⟷ Active Strategic
Timing	Anticipatory ⟷ Responsive Proactive ⟷ Reactive Ex-ante ⟷ Ex-post
Temporal scope	Short-term ⟷ Long-term Tactical ⟷ Strategic Instantaneous ⟷ Cumulative Contingency Routine
Spatial scope	Localized ⟷ Widespread
Function/effect	Retreated – Accomodate – Protect Prevent – Tolerate – Spread – Change – Restore
Form	Structural – Legal – Institutional – Regulatory – Financial – Technological
Performance	Cost – Effectiveness – Implementable – Equity

Table 4.1: Bases for differentiating adaptations. Source: Smit et al. 1999: 208

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5. Participation of the most vulnerable in Disaster Risk Reduction and Climate Change Adaptation decision-making and action

Bob Alexander, Cecile de Milliano and Chandra Sekhar Bahinipati

This chapter explores the extent to which the most vulnerable victims of natural hazards are or can be included in DRR and CCA decision-making and action. It draws lessons learned from case studies of the Maldives, Indonesia and India and focuses on the benefits of various modes of participation of vulnerable communities in DRR and CCA activities. In addition, analysis of the case studies from these South and Southeast Asian countries displays the importance of including the most vulnerable, such as the poor in general and youth and women in particular, as they have their own visions, experiences and capacities that can be a valuable contribution for DRR and CCA policy and practice. Subsequently, the chapter briefly discusses various revealed complex challenges encountered when striving to include participation of all stakeholders and some recommendations for addressing these challenges.

5.1 Introduction

Scientific evidence, including the Fourth Assessment Report (AR4) of the IPCC, asserts that climate change is now real and unequivocal (Parry et al. 2007). It is expected to pose unprecedented challenges to human society and ecosystems in the upcoming decades of the 21st century, especially in developing nations (Parry et al. 2007). More specifically, the already conventional group of vulnerable populations with the lowest income and/or with the lowest access, specifically women, children and the elderly in impoverished households in the Global South, are predicted to be significantly affected (Back et al. 2009; Parry et al. 2007; Save the Children 2007).

Increasingly, however, natural disasters are viewed as expected consequences of poor risk management and as the outcome of interconnected social and physical processes that can be mitigated or prevented through various DRR and CCA strategies. With the measures DRR allows for, it is increasingly argued that it should be an integral part of CCA, as well as mainstream development activities (Klein et al. 2007), as both poverty and climate stress are the significant threats to societies. Suitable and sustainable disaster preparedness strategies require a strong understanding of the affected communities and emphasize that they should build on the knowledge and experience of how these communities perceive and respond to hazards/risk (Ackermann et al. 2003; Twigg et al. 2007).

DRR is explained as "the systematic development and application of policies, strategies and practices to minimise vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impact of hazards, within the broad context of sustainable development" (UN/ISDR 2005). Disaster reduction policies have two-fold aims: to strive for communities to be resilient to natural hazards while ensuring that development efforts do not increase their vulnerability to these hazards (UN/ISDR 2004). Adaptation, on the other hand, is defined as "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" (UN/ISDR 2009).

The word participation has been subjected to various interpretations (Roger et al. 2007). Roger et al. (2007) have used it "in the sense of securing the active involvement of a broad range of stakeholders in decision-making and action". Through participation stakeholders, in general, share and also make decisions that influence policy and practice. In the local context, community change, social change and individual empowerment are seen to be key benefits of participation. Moreover, it is commonly acknowledged that participation greatly improves the effectiveness and sustainability of projects, programmes and processes (Bowen 2007; UNESCO 2000). Currently, it is acknowledged that participation greatly improves the effectiveness and sustainability of projects, programmes and processes. Through participation people themselves are enabled to address their causes of vulnerabilities in the context of both climate change as well as development, and to explore different priorities, which allow the problems to be defined correctly and the responsive measures to be designed and suitably implemented. In turn, it can strengthen communities to work together and build confidence, skills, capacity to cooperate, awareness

and critical appraisal, thereby increasing peoples' potential for reducing their vulnerability and enabling them to tackle challenges, individually and collectively (Bowen 2007; UNESCO 2000).

Since women, children, elderly and those with limited income and access are highly susceptible to the impacts of climate change, they are forced to adapt in order to reduce the potential impacts. Besides individual adaptation, community adaptation in these regions is increasingly viewed as having immense positive contributions in the context of mitigating climatic impacts. This chapter aims to highlight these potential contributions while illuminating the many complex challenges of enabling the participation of various stakeholders. After the case study analysis reveals modes of participation of the most vulnerable in different international contexts (e.g., "poor" people in Maldives, youth in Indonesia and women in India), a discussion of some of the challenges of participation leads to concluding suggestions for possible improvement. Although secondary data was employed, findings are based mainly on empirical data through case studies that employ various data collection methods. The key qualitative methods for primary data collection in the various communities were: FGD, participant observation and interviews and various participatory rural appraisal (PRA) methods. In the Indonesian case study the main research population was youth and therefore child-focused research methods and ethical procedures were adopted and employed that respect youth as research participants in their own right (James and James 2008).

5.2 Case studies of including the most vulnerable groups in Disaster Risk Reduction and/or Climate Change Adaptation in South and Southeast Asia

To illustrate the importance of the inclusion of the most vulnerable in DRR and CCA, three case studies in the Maldives, Indonesia and India are used. Respectively the case studies discuss various modes of participation of vulnerable community members (Maldives), youth (Indonesia) and women (India) in DRR and CCA decision-making and action.

5.2.1 The Maldives, learning from the most vulnerable

As further described in chapter 6, vulnerability identification discussions with sub-groups of people on hazard-prone islands in the Maldives resulted in empowerment to share the similarities and differences in vulnerability perceptions among them. By enabling such diverse participation, the wide range of issues affecting various groups on the islands could be considered as criteria when weighing potential risk reduction alternatives in subsequent CB-DRR and CCA decision-making.

In addition to climate change concerns on islands averaging an elevation of 1½ metres above sea level, islands of the Maldives have a significant exposure to tsunamis, submarine earthquakes, storm and tidal surges (udha), heavy rainfall-induced flooding, sea storms and pest outbreaks. On nine islands, targeted to receive influxes of transmigrated populations and related population consolidation investment (Viligili, Vilufushi, Funadhoo, Kudahuvadhoo, Feydhoo, Hithadhoo, Kulhuduffushi, Thinadhoo and Lammu Gan), FGD were conducted to determine both baseline vulnerabilities on the island and key differences in vulnerability among different sub-groups on the islands. Because of the limited time for such discussions, the competing goals in deciding upon participation resulted in getting representation of sub-groups. These included those likely to be least able to access basic societal functions and most vulnerable under normal yearly disaster risk, and future scenarios (including both climate change and island development and consolidation of investment trends), but those who also represented a large enough portion of the population to significantly constitute issues of the island as a whole. Thus, initial meetings were held with island government leaders and previously determined KI known to be knowledgeable about issues on the island in the question to determine who best met the above criteria. Where possible, these were based upon who was able to come at the time of the focus group meetings, as representatives of the identified island vulnerable groups that were further subdivided into male and female sub-groups for gender disaggregation.

On Viligili, Vilufushi, Feydhoo, Hithadhoo and Kudahuvadhoo groups represented relatively higher and lower access according to levels of wealth and income, dependents, houses per family, livelihoods and productive assets. Additionally, Feydhoo and Hithadho identified a vul-

nerable sub-group of women-headed households in which the woman was unable to generate sufficient income and had been left or widowed by the father of her children, while Kudahuvadhoo identified a specifically vulnerable group of new post-tsunami migrants from the islands of Vannee and Gemendhoo. Because the most vulnerable group of disabled household heads was too small and because income, wealth and land quality were not deemed to be disparate enough to create categories of differing access and vulnerability, migration was also key on Funadhoo, a previously uninhabited island that has experienced different waves of transmigration from different islands over the past 40 years, each resulting in different livelihood specialization that allowed for different vulnerability groups according to island of origin and main livelihood. In addition to a group representing households with elderly and disabled household heads, Kulhuduffushi also identified that those on the eastern side of the island were particularly vulnerable because of the covariate nature of how flooding affected the different parts of the island. Alternatively, as Thinadhoo's flood vulnerability was deemed to be idiosyncratic by household and unrelated to geographic location, sub-groups were stratified into the three categories of those who have average to high access and are relatively unaffected by flooding, those who have average to high access but are relatively more affected by flooding, and those who have low access and are relatively more affected by flooding. Finally, Lammu Gan's size and geographical dispersion, with differences in access and vulnerability in the different parts of the island, dictated that separate groups be held in the districts of Mathimaradhoo, Thundi, and Mukurimagu. Although some differences in access were apparent in all areas, time constraints determined the focus on only the most prominent of these differences with low access focus groups in Thundi and Mukurimagu. As they were also housing a new post-tsunami migrant population, people from the camps housing the migrants from Mundhoo and Kalhaidhoo constituted another sub-group.

Because of the significant differences in these islands' populations, societal functioning and vulnerability conditions, the aforementioned groups on different islands, who were empowered through expression of perceived vulnerabilities, were significantly different. Although many of the same concerns emanated from all groups, participating as separate interest groups allowed for discussions to reveal key differences. For instance, on the island of Vilufushi, the KI and the focus groups of people with average access did not perceive a problem with agriculture in either the current state or under the disaster scenario, but the low access men's groups specifically noted that inadequate access to land for agriculture was a currently barrier to everyday access to food and non-food essentials, whereas both the low access men's and women's groups perceived that they would have difficulty with the recovery of crops for a year under the disaster scenario. If only the KI or even the average access group had been asked to represent perceived vulnerability on the island, the potential issue of problems with agriculture for the poorest people on the island would not have been raised as a concern in need to be addressed. Perceptional differences from participation of differently vulnerable groups on all of the islands resulted in some enlightenment and some confusion, when results conflicted between groups along with the perceptions of the outside scientists and government leaders. It revealed that the inclusion of differing vulnerable groups is highly important for first allowing the different groups to participate. Moreover, it is important to ensure that somehow all risk perceptions are considered in determining appropriate solutions, as further described in the assessment methodology example of chapter 6.

5.2.2 Indonesia, learning from youth in the Pati Regency

This subsection draws on the findings of a study performed in Indonesia being a country, which is vulnerable to various natural hazards of which flooding is a frequent and disastrous event (Dewi 2007). The main research population are children in the phase of youth/adolescence, which is described as "a period of early adulthood where individuals embrace many characteristics of adults but are still not accorded all the rights and responsibilities" (Durham 2000 in Thorsen 2005: 3). Through various qualitative methods, such as participant observation, FGD, interviews and PRA methods, the youth's visions on the impact and manageability of the event were identified. Including youth's visions in DRR and CCA, decision-making and action will promote

the building of appropriate cultures of safety and disaster preparedness for youth.

The study area is "the Pati Regency", which is located on the North Coast of the Central Java Province (Indonesia, Southeast Asia). Data collection took place in two villages in the Province, namely Karangrowo (district Jakenan) and Babalan (district Gabus), since disaster risk assessments identify that these areas are highly susceptible to flooding (SHEEP 2008). Both case study areas are less-affluent rural villages, where agriculture is the main source of income and where the communities are highly vulnerable to chronic floods (SHEEP 2008).

Data collection, on the youth's vision of the impact of this annually occurring hazard, revealed a two-fold experience of the event. On the one hand, the main negative effects include the influence of the water on their personal and on their communities' physical and psychological health, by causing skin diseases, stomach-aches, diarrhoea, stress, etc. Due to flooding, the youth have limited access to clean drinking water and food, their personal and family belongings get damaged, they are unable to use their usual sanitary facilities, and they have limited social contact with friends and family since mobility becomes limited. The youth indicated that the severity of the impact of the hazard also depends on the extent to which the infrastructure of the village is destroyed and to what extent the flooding makes it difficult for them to perform their daily activities. For the majority of the youth, schooling is the main daily activity, which is affected by the flooding, and for some the floods disable them to go to work, which can lead to economic losses. On the other hand the youth also mentioned the positive impacts of flooding, which they described as the possibility to fish (so generating extra income and food) and the increase of solidarity between the villagers. The youth explained that the flood water often becomes an object for recreation, allowing them to be happy and have fun since they play in the water and have boat competitions. It also attracts people from other areas who come to their village for leisure activities.

In the research areas, youth play an important role in decreasing the risk of flooding in their community. They participate in various DRR-related activities, either formally through youth groups or informally by supporting various civil society groups. "Karang Taruna" is the main formal youth structure, which can be found in Indonesian villages and cities. Participation is voluntary and the age of participants is between 12 and 30 years (until one gets married). This social organization of youth is involved in various community (development) activities and performs also in some communities various flood-related preparedness, response and recovery activities. Youth also actively participate in various community activities referred to as „Gotong Royong" and „Kerja bakti". These traditions of solidarity and working together are strongly ingrained in Javanese societies. There are numerous examples of ways in which youth participate and play an important role in DRR-related community activities and these tasks often prove to be gender-related. The boys explained that they were involved in activities such as evacuating victims, cleaning up the village and in various activities to prevent future flooding. The girls indicated to take an active role in distributing food, helping in the public kitchens and giving social support to the victims during the flooding.

This case study presents some of the visions and experiences of Indonesian youth on the impact of flooding in their community and gives a few examples of the role they take to decrease the risk and impact of flooding. Given that children and adolescents aged below 25 years are currently more than half the world's population (UNICEF 2007), they are a dynamic part of the world's human resources and make tremendous contributions to society at all levels, so that acknowledging and including their action in DRR and CCA is important.

5.2.3 India, learning from women in coastal Orissa

After having explored the vision and role of the most vulnerable and the youth, this section briefly explores the importance of women's participation in DRR in "Krushnadaspur village", which is a remote village of "Singhagaon Gram Panchayat" under Pattamundai block of the Kendrapada District, Orissa. The main methods of data collection for this case study were secondary data collection and discussions with DRR groups in the ongoing Community Disaster Resilience Fund (CDRF) of both "UDYAM" and "APOWA". The six coastal districts of Orissa, India (Balasore,

Bhadrak, Kendrapada, Jagatsinghpur, Puri and Ganjam) are highly vulnerable to a wide range of hazardous events, but particularly to cyclonic and flood-related events (Kumar and Tholkappian 2006; World Bank 2008; Sharma and Patwardhan 2008). A high share of the population and their livelihoods, in coastal Orissa particularly, are strongly affected by these hazardous events because of factors including the high population density, poverty ratio and level of population dependence on agriculture as a basic livelihood in the rural areas. In the studied area of the Kendrapada district, 59.89 per cent of rural families below poverty line (per a 1997 survey) (GoO 2004), and 67.47 per cent of the district population are dependent upon the agricultural sector for maintaining their livelihood (GoO 2008). The people are therefore forced to adapt, not only to the current climate extremes and future uncertain events but also to the current socio-economic upheavals.

Proponents of the "entitlements based approach" (e.g., Sen 1986) have cited that women, in particular women-headed households, are highly vulnerable to the climatic chaos (e.g., for India with seasonal variation: see Agarwal 1990; for Orissa with super cyclone: see Ray-Bennett 2009). The environment particularly constrains livelihood opportunities and survival options for many women and elderly people. Besides their physical vulnerability, they have little access to government services and information, lack of economic opportunities and a poor infrastructure; the absence of organizational capacity further endangers them towards the highly susceptible situation.

Under the backdrop of the above discussion, it seems that most people, women in particular, are highly susceptible, which has forced them to implement planned adaptation strategies in the context of the sustainable livelihood approach in order to enhance their resilience capacity. On the other hand, the people with risk-averse behaviour have more willingness to participate in the community approach, which not only aims to address climatic impacts but also to eradicate development-related problems such as poverty. Therefore, there are three basic objectives of the CB-DRR or CCA:

- Develop community and grass roots level capacities in order to reduce climatic risks that link to a sustainable adaptation approach
- Generate awareness among the communities (to leverage mainstream resources) regarding government policies and programmes that they can demand through the local authorities
- Deepening governance and gender to be part of resilience in sum, empowers the women's community and increases their level of self-confidence.

At the preliminary stage, the purpose of DRR is to inform people regarding their level of vulnerability and its causes, so that they can plan in a sustainable future. The main objective of the DRR activity is to enhance resilience of the most vulnerable people. During DRR-related activities, the groups of women in Orissa are able to discuss the contextual vulnerability at the local scale. Physical risks are mapped and the availability of assets is discussed with them in terms of community infrastructure, establishing safety nets, drinking water facilities, village roads, telephone, television, radio, etc. Rather than forcing them towards different adaptation options, the DRR activities have given rights to the women's groups to decide on adaptation strategies themselves that do not only withstand climatic events but also address their development-related problems.

More specifically in this case study area, the women's groups also constituted "Hara Parvati Disaster Mitigation Committee" and decided to do pisci-culture, wall paintings in the school or Panchayat wall on different information about disaster and government policies, provide medicine in the time of emergency and supply different seeds immediately in the aftermath of a disaster. In the context of the sustainability and cost-effectiveness, they have been generating money by selling fish and crops in the market, and also charging nominal fees for giving medicine. Furthermore, they are now planning to take development-based projects through the local authorities, so that not only project efficiency is increased but also funding is generated to undertake more DRR activities. More importantly, they are creating awareness for other people in nearby

villages and learning from other communities in the context of how to strengthen their community.

Since the March 2009 formation of the committee in the study area, fruitful results have included the decline of vector borne diseases, as well as of the death rate due to fever and diarrhoea – particularly after disaster events. Additionally, the awareness among the people about different development-based activities of the government has increased and more importantly the communication gap among the people to withstand disaster events has decreased. By this year, they are expected to sell fish valued at around Rs 30, 000 (Indian Rupees) – approximately US$ 600 – and have planned to motivate other people in the nearest villages with regards to money and awareness. Apart from this, inter-group discussions are being held among the different groups that make them more enthusiastic to implement, as well as to learn or share with other groups. As a result, the women's groups, in general, have reduced the levels of vulnerability and prepared themselves to buffer against current and future disaster events.

5.3 Conclusions and recommendations for overcoming challenges concerning the involvement of the most vulnerable in Disaster Risk Reduction and Climate Change Adaptation

The three case studies utilized various qualitative methods to explore the visions and experiences of community sub-groups that are most vulnerable to climate change and disaster vulnerability in South and Southeast Asia and to present various modes of their participation in assessment and decision-making regarding reducing these vulnerabilities. The most vulnerable people's multiple and varying perceptions of the impacts of hazard events and of future trends became evident in the Maldives case study. In addition to inter-island differences, significant intra-island differences were revealed that emphasized the need to elicit responses from groups according to such differences as gender, societal functioning and geographical location on the island. The Indonesian case study provided insight into the youths' two-fold experience of flooding. Moreover, although often seen as passive victims, their active role in DRR and CCA actions in their community was illustrated. Finally, the case study from Orissa, India, exemplified the significant role of women in disaster and climate change risk reduction.

Although such participation of different vulnerable groups was demonstrated as important, the case studies also revealed that many complex challenges associated with power relations within and across various social systems, individual capacities or lack of public awareness hinder the most vulnerable from actively participating in DRR and CCA action and decision-making. An imbalance of power within a community often makes the most vulnerable suffer most, either from disaster or from climate change variability. Planning and working for equity within a community is therefore imperative. Individual capacities can be restricted by both physical and socio-economic vulnerability, which then act as a major barrier for active public participation. They not only influence the sensitivity and coping capacity but also affect communities' resilience and adaptive capacity in the face of climate change. Participation is likely to be less from the most vulnerable groups within a community that may include women, children, elderly, disabled, poor and others. The different kinds of vulnerability require attention for differential needs in the society. Therefore, planning for the needs and requirements for specific vulnerability groups and addressing contextual vulnerability at the local scale, rather than following top-down scenario-based impact models, are also essential. Finally, lack of public awareness about climate change impacts or methods to deal with them could act as a major obstacle to achieving active participation. Even though governments at the national level are actively involved in planning and preparing for climate change, communities at the local level may lack awareness about their changing susceptibility to various hazards along with possible and available response methods. Transfer of available knowledge across different spatial scales is therefore of great importance.

Overcoming participation challenges by planning and working for equity within a community, planning for the needs of the most vulnerable at the local scale and transferring relevant available knowledge across different spatial scales requires enabling the most vulnerable to voice their perceptions and expertise regarding what is needed and to communicate this with actors from outside the community. Among the tools to potentially

better overcome these challenges, the method for scenario-based iterative knowledge mapping that is described in chapter 6 could enable community sub-groups to voice their expertise about their vulnerabilities, while allowing these perceptions to be considered relative to one another and to those from outside the community. In this manner, risk perceptions could be better assessed across the different subgroups and thus enable community representatives and outside agents to consider the changing nature of hazards and climate in order to help ensure that the perceptions of all vulnerabilities are considered in DRR and CCA decision-making. By addressing these challenges, this tool and other such initiatives towards active involvement, participation and cooperation in DRR and CCA decision-making and action, should result in more effective and sustainable risk reduction and development outcomes.

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6. Integrated vulnerability assessment methods for Disaster Risk Reduction and Climate Change Adaptation

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The purpose of this chapter is to explore the cross-cutting challenges of determining appropriate adaptation assessment methods under an approach that integrates both DRR and CCA within sustainable development. Issues related to assessment methodologies as part of an integrative assessment approach are categorized within a discussion of the effectiveness of the assessment methodologies of the case studies in meeting the objectives of this approach. The results highlight challenges for research, policy and practice and include the encouragement of conceptual consistency and information clarity, the construction of realistic, scientifically verifiable and participatory indicators, indices and knowledge databases, and the incorporation of location-specific future trend information for short-term and long-term decision-making. This chapter is relevant to researchers interested in the development of applicable integrated DRR and CCA assessment tools and to practitioners in government and non-government agencies interested in improving integrated assessment methods.

6.1 Introduction

One of the challenges of agreeing on a common approach between DRR and CCA is formally evaluating vulnerability assessment methods (Thomalla et al. 2006). A working group discussing such assessment methods at the DRR and CCA Workshop echoed the Expert Working Group II's (EWG II) conclusion that more dialogue is needed among the disaster risk, climate change, sustainable development and other communities focusing on risk and vulnerability so that more cohesive interdisciplinary assessment methods for overall human security can be developed (Birkmann and Wisner 2006). Not wishing to simply reiterate the findings of the EWG II, the purpose of this chapter is to reformulate the challenges of determining appropriate adaptation assessment methods under specific objectives of DRR and CCA. The issues relating to assessment methodologies discussed in the working group on methods at the EWG II Workshop, and in the section dealing with assessing sustainable livelihoods in the "Sustainable Adaptation" chapter (see Chapter 4) of this publication are categorized and reviewed as background for discussion of relevant assessment methodology case studies from Workshop participants and emergent challenges in research and practice.

6.2 Formulating an integrative assessment approach

Considerations for ensuring an integrative approach to assessing vulnerability for planning adaptation measures include the need to bridge natural and social science, to combine quantitative and qualitative approaches, to bring together various perceptions of the involved stakeholders and to incorporate future changes in the assessment.

6.2.1 Bridging natural science and social science approaches

Many natural and applied scientists, including "positivist" economists, consider risk as a physical reality such that risk assessment is achieved only through objective quantification of physical impacts (Cardona 2003). This approach results in a partial view that includes the replacement cost of the affected system based on physical vulnerability, and neglects the social, cultural, economic and political aspects of an overall risk evaluation. The use of Geographical Information System (GIS) to create hazard exposure maps, often erroneously referred to as risk or vulnerability maps, enables greater depth in explaining potential physical impacts and other direct side effects, but does not include the breadth needed for an all-encompassing assessment. Exclusive natural science approaches to quantifying exposure or even susceptibility to damage exclude the assessment of resilience capacity to absorb or recover from the impact and thus cannot assess the overall consequences of a disaster event on the society. The generally "constructivist" social scientists consider risk as a social construction such that assessment of risk can only be through subjective perceptions, representations and interactions of social actors (Cardona 2003). In the past, social science approaches emphasized subjective social modelling and neglected the importance of estimating environmental and physical damage.

The need for a social-environmental perspective of holistic vulnerability refocused interest on the need to consider capacity for adaptation to physical impacts by combining the notions of all types of vulnerability derived from natural, social, economic and political processes (Wisner et al. 2004). To integrate the physical and social sciences such that both physical resistance and individual and community self-protection are considered, methods must be improved to consider both biophysical vulnerability and socio-economic vulnerability. To do so, the divides between objectivist/positivist and subjectivist/constructivist approaches must be overcome by bridging the qualitative and quantitative methods for both subjective risk perception and scientific objective measurement such that assessment methods can support decision-making for action towards DRR and CCA that is appropriate for all scales and objectives.

6.2.2 Bridging quantitative with qualitative approaches

Haimes and Chittester (2005) paraphrased Einstein in saying that "to the extent risk assessment is precise, it is not real; to the extent risk assessment is real, it is not precise." Along these lines, EWG II further identified a conflict relating to incommensurability between proponents of deductive and inductive assessments methods (Birkmann and Wisner 2006). Depending on scope and objectives, assessments can be narrative, qualitative and quantitative. Quantitative methods for risk assessments can be more appealing for precision, but they only capture certain aspects of risk because of the lack of in-depth data and, in the context of DRR, have contributed to a focus on technocratic rather than socially embedded solutions (Benson and Twigg 2004; GTZ 2004). Additionally, although qualitative methods are sometimes criticized as being overly subjective, quantitative risk assessment also relies on probabilities and indicators that are subjectively determined (Haimes and Chittester 2005). But, as the scale increases towards the macro, the detailed information obtainable at the local level must be simplified and aggregated through quantified indicators and proxies in order to be useful for decision-making.

Some of the concerns raised by the members of the methods work group at the Workshop related to whether or not to use such quantitative indicators, and, if so, what process should be used to reliably match quantitative methods with relevant objectives. Cannon (2006) has already cautioned against the use of any indicators in situations in which political, social and economic causes of vulnerability will prevent their political applicability. Furthermore, in cross-location studies, some indicators may not be applicable if not taking into consideration the institutions and processes that cross different geographical areas and scales which may result in differing vulnerability assessment conclusions. Indicators based on historic observations and frequency-based statistics can prove misleading in assessing future vulnerability of people whose human-environment relationships are expected to drastically change as a result of climate change or human-induced modification of the natural and built environments. In linking DRR and CCA if unacceptable levels of vulnerability result from impacts that exceed the affected population's desired capacities to absorb them, location-specific information about the processes underlying these capacities needs to be understood before any indicators can be relevant (Cardona 2003).

Since not all relevant relationships can be measured quantitatively, EWG II (Birkmann and Wisner 2006) concurred with previous views of GTZ (2004) and Haimes and Chittester (2005) that for most objectives and for all scales, the depth of focus and the understanding of relationships obtained from qualitative methods is necessary to compliment quantitative data in metrics, in order to indirectly measure impacts of risks both with and without potential adaptation. In higher-level assessments, opportunities exist for nesting studies by scale and for up-scaling the results (Birkmann and Wisner 2006). Depending on the objectives of vulnerability assessment mixed methodologies within a community can entail participatory selection of criteria for assessment, quantification of direct physical vulnerability and then qualitative approaches to understand how perturbations from the baseline living situation affect different community subgroups (GTZ 2004). In the quest to bridge natural and social science approaches, EWG II recommended more cross-training and interdisciplinary team formation to enable an optimal mix of quantitative and qualitative methods at all scales (Birkmann and Wisner 2006).

6.2.3 Bridging insiders and outsiders towards process and product

Another concern of the methods working group in the Workshop related to the recent extensive discourse about the value of local knowledge in lower-scale or community-level risk identification (e.g., Weichselgartner and Obersteiner 2002; Dekens 2007; Hewitt 2009) and the EWG-referenced conflict between process-oriented and outcome-oriented assessment goals (Birkmann and Wisner 2006). At one extreme, some physical scientists, engineers, economists, social scientists, planners, government and NGO administrators and practitioners and other stakeholders from outside local communities focus on concrete deliverable results such as a written reports or a map. At the opposite extreme other stakeholders are more interested in participatory processes that include affected groups in problem analysis and aim to empower the target groups in conducting their own risk assessments.

An overall focus on concrete deliverables may result in problems related to the social impact of their process, which may be inappropriate because their perceptions of vulnerabilities are not shared by vulnerable groups inside the community. While rushed and dynamic conditions such as relief and recovery can require processes such as rapid appraisal, process-oriented participatory assessment methods are appropriate if the objective is assessment of local knowledge, needs and potentials such that collaborative mutual learning on the part of both inside and outside stakeholders is enabled. Co-determining this risk knowledge with participants inside affected communities also enhances transparency about risks and risk management capabilities and the co-ownership of decision-making and resultant responsibilities to adapt (Renn et al. 1998; GTZ 2004). Key challenges include treating people as the proponents of their own research and ensuring that the assessment includes determination of the relative advantages and disadvantages of any intervention across the risk-scape of a local population.

6.2.4 Bridging the past and present with the future

Among the criteria listed in chapter 4, assessment methods for sustainable development that include the effects of future disaster events and climate change are required, and need to be integrated into overall development decision-making and dynamic predictions. Sustainable development requires the improvement of living conditions in both normal and adverse times in a period of unprecedented rapid change. Assessment methods need to incorporate both the effects of development trends on the underlying vulnerabilities to climate change and disaster events and the effects of all of these changes and resultant interventions under normal and adverse conditions. Using the analogue of the Heisenberger Uncertainty Principle (Haimes and Chittester 2005), however, dynamic measurement of both specific adaptation efficacy and the future benefits from avoidance of the risk is impossible because the underlying system has changed from the employed adaptation and other exogenous and endogenous development and climate factors. Assessment methods need to focus on "the dynamics of individuals, groups, and societies vis-à-vis their perceptions of risk, evaluation of alternative actions, and the evolution of complex behavior in response to multiples of goals and stress. Most of the widely distributed protocols still concentrate on what is exposed instead of understanding the processes and dynamics of exposures and responses" (Thomalla et al. 2006). As such, recent climate change vulnerability literature has steered away from physical impact assessment (i.e. an outcome approach) and towards assessment of the inherent or adaptive capacity of systems (i.e. a contextual approach) (Brooks 2003; O'Brien et al. 2007). The resulting challenge in the choice of assessment methodology is to consider past and current disaster risks and future concerns by facilitating the measurement of change in the variables being measured due to changes in conditions, as well as the risk-managing ability of the affected entities to assess vulnerability to future events (Alwang et al. 2002).

Though a future-focused contextual approach is viewed as essential for understanding long-term impacts and facilitating adaptation, the methods working group in the Workshop was concerned about potential obstacles to incorporating climate change into assessments that were also focused on the impacts of development trends. One obstacle is the diversity of different policy analysis and practice methods used by the different actors across the DRR, CCA and sustainable

development fields so that integration is difficult. Another one is the lack of available and accessible location-specific historical data that prevents any attempt at extrapolation to a future scenario. One potential solution to the above concerns was to create local future scenarios that incorporate potential changes in relevant variables to assess impacts through simulation. Concerns about such scenarios include the lack of local capacity and methods for adapting climate change scenarios to local conditions. Furthermore, adaptation optimization requires the choice of a time horizon in the future scenario such that a conflict emerges between short-term development scenarios and long-term scenarios that incorporate climate changes.

6.3 Assessment according to the scales and objectives

For both DRR and CCA, an optimal vulnerability assessment methodology depends on the scale and specific purpose of the assessment, as well as the accessible information (Birkmann and Wisner 2006; Stephen and Downing 2001). Measurement needs vary, depending on the scale in question, from micro, household level through to macro, national and international assessments. Per the Food Economy Group (FEG), additional scale concerns include the scale of complexity of information desired by the decision-making entity and the scale of the interdisciplinary team conducting the assessment. Because assessment information must be conducive with decision-making, conflict may arise in determining how much qualitative location-specific information will be helpful and how many different aspects of vulnerability, with their resultant conflicting terminologies, are desired.

The numerous examples of different assessment objectives include the following: index creation to compare vulnerability or capacity across location, time and social groups; prioritization to catalogue various covariate and idiosyncratic risks and the levels of vulnerability of different groups to them; evaluation of existing risk-related prevention, mitigation, adaptation and coping strategies; and targets to specifically understand vulnerability of a particular population subgroup (Alwang et al. 2002; Heitzman et al. 2002). Additionally, differences in underlying risk management objectives can dictate different methodologies. Examples include a "min-max" objective for which quantity of loss is to be measured, to minimize the size of the maximum possible welfare loss in an assumed covariately affected area; "safety-first" and "success scenario deviation" objectives for which either the quantity relative to a certain threshold or success level or the probability of falling below that threshold or level is measured; and an "expected utility" objective for which standard deviation is measured so as to maximize expected returns given a level of vulnerability (Alwang et al. 2002; Siegel and Alwang 1999).

Because of differences in location or other idiosyncratic factors, people and institutions, resources and other factors can be subjects of investigation and can influence how they are assessed. The levels of an entity's vulnerabilities are also both the effect and the cause of different processes, where a particular vulnerability is the effect of poverty and other factors, including other types of vulnerability, and the cause of particular negative outcomes from interaction with stimuli or stresses from hazards in an adverse event. Finally, assessment criteria must be established in order to evaluate outcomes. Encompassing all of these differences, the fundamental factor in any assessment that determines what is to be measured and the methodologies for measurement can be achieved by answering the following questions: who or what is vulnerable, to what, and with respect to what (Ionescu et al. 2005; Heitzman et al. 2002; Birkmann and Wisner 2006).

6.4 Empirical findings

6.4.1 Assessment objective: which areas are relatively most vulnerable?

An index is a tool enabling comparison across different spatial or temporal dimensions and can be used to rank different locations that are exposed to the same hazards and climate change conditions. The index should address the locations that are most vulnerable to the studied hazards and conditions and with respect to each other in terms of the changes in chosen indicators.

A recent study in Porong Sidoarjo, Indonesia, assessed that the villages around the mud embankment area are generally most vulnerable to the threats of three direct physical vulnerabilities from primary and secondary mud blasts, to further determine which are most vulnerable

with respect to each other based on an array of indicators of bio-physical vulnerability and socio-economic vulnerability impacts. A spatially differentiated risk index of the surrounding villages was created by multiplying a determined level of hazard threat by a determined level of disaster impact. Values were assigned to the grade of magnitude of the realized hazard threat and impacts from 1 to 5 according to clearly differentiated criteria in the three threat categories of the amounts of land subsidence, groundwater pollution and air pollution and twelve impact categories of different types of significant losses. As shown in Table 6.1, these threat values and impact values were multiplied so that the resulting products, assuming equal weights across categories, were summed up to reveal a final index value upon which to rank the level of risk in the villages as low, medium and high. This index was used to map the different threats and impacts so that communities could use it as a guide. A recommendation was also made to install subsidence and gas detection equipment that could be used by residents in the medium and high risk areas.

In a study in the state of Orissa, India, an index was created to assess which coastal districts of the state are generally most vulnerable to both cyclone and flood hazards, and with respect to each other based on a different set of indicators of bio-physical vulnerability and socio-economic vulnerability impacts. In contrast to the more subjective and qualitative scaled grading system used in Porong Sidoarjo, which was based on one value for each of the 12 indicators, a relative vulnerability index was created for each coastal district in Orissa, based on the quotient of the margin of each observation from the minimum value divided by the difference between the observation extremes for 45 different proxy variables. After construction of such a relative vulnerability index from data on these proxy variables under the domains of socio-economic and bio-physical vulnerability, the aggregate vulnerability was estimated. In order to show changes over time, such ranks were calculated for data from both 1991 and 2007 (see Table 6.2).

On the quantitative and qualitative spectrum, both studies used quantitative indicators and weighting of criteria that were subjectively determined. In Orissa, many indirect proxies were used in a quantitative and statistically verified scoring and ranking procedure. In Porong Sidoarjo, subjective scales were used to assign values to impacts and threats to obtain a scoring and ranking. The use of indicators for cross-location studies is required but perhaps not indicative due to differences in processes and institutions. Though different in their approaches, both studies utilized both biophysical and socio-economic indicators. The proxy variables used in Orissa and scales in Porong Sidoaro captured some of these underlying processes and institutions but generally focused on potential physical losses rather than underlying institutions and processes affected. Both studies were conducted exclusively by the outside evaluator, and while buy-in amongst community members in the process may not be beneficial while still assessing which communities may be considered for intervention, a methodological mix that includes insiders in the qualitative assessment process of their institutions and processes might help to verify whether the indicators are reliable predictors for a cross-location vulnerability comparison. Finally, neither study was dynamic and development-oriented. As their focus was limited to one or two hazards, the result is a partial view of an overall multi-hazard assessment of vulnerabilities inhibiting sustainable development that would require further weighting relative to the rankings according to expectations of all other hazards in these areas. Both methods are potentially useful as a starting point for comparing current vulnerability; the compared rankings of two different years in Orissa supports eventual consideration of current trends in a post-ranking assessment. The use of historic data exclusively in each index, however, rendered assessment of future vulnerability from the dynamics of development, climate change and intervention impossible. Both of these studies reveal some of the progress and remaining challenges of indices created for cross-location comparison of potential adaptation needs.

6.4.2 Assessment objective: what vulnerabilities need to be addressed?

Besides these methodologies for understanding differences in risk across locations, methodologies are also required for understanding differences across different vulnerability sub-groups within each location to determine whether any type of intervention is required or which vulnerabilities should be prioritized for reduction.

Calculation of level of risk in Siring Barat village								
Village: Siring Barat		Magnitude of threat	IMPACT					
No.	Threat		Dead	Injured	Sickness	Evacuation	Social culture	Psychological
			1	1	5	5	5	5
1	Release of hazardous materials		5	5	25	25	25	25
2	Land subsidance		5	5	25	25	25	25
3	Water pollution		4	4	20	20	20	20
		Magnitude of threat	IMPACT					
No.	Threat		Property damage	Facility damage	Infrastructure damage	Business continuity	Public service	Environment
			5	5	5	5	5	5
1	Release of Hazardous Materials		25	25	25	25	15	25
2	Land Subsidance		25	25	25	25	15	25
3	Water Pollution		20	20	20	20	12	20

Table 6.1: Calculation of level of risk in Siring Barat village. Source: Rohman 2009

Assessment of vulnerability in selected districts of Orissa												
Name of the district	Socio-economic vulnerability				Bio-physical vulnerability				Vulnerability			
	1991	Rank	2007	Rank	1991	Rank	2007	Rank	1991	Rank	2007	Rank
Balasore	0.565	6	0.542	3	0.452	1	0.441	4	0.508	4	0.491	3
Bhadrak	0.621	4	0.543	2	0.375	6	0.391	8	0.498	5	0.467	4
Kendrapada	0.624	3	0.524	4	0.412	3	0.464	1	0.518	3	0.523	1
Jagatsingh-pur	0.582	5	0.443	6	0.329	7	0.426	6	0.455	7	0.435	6
Puri	0.499	7	0.451	5	0.273	8	0.424	7	0.386	8	0.438	5
Ganjam	0.495	8	0.401	7	0.432	2	0.454	3	0.463	6	0.428	7
Jajpur	0.761	1	0.611	1	0.401	5	0.435	5	0.581	1	0.494	2
Cuttack	0.658	2	0.396	8	0.407	4	0.455	2	0.532	2	0.426	8

Table 6.2: Assessment of vulnerability in selected districts of Orissa. Source: Bahinipati 2009

While the exposure to hazards and climate change conditions are covariate, idiosyncratic factors across groups dictate investigation of vulnerable sub-groups, and again differing specific objectives dictate different methodologies.

Determining whether intervention or adaptation will be required: in this case, the entity for assessment is the difference between an indicator and a threshold level such that what is being assessed is how that relationship changes in response to a risk scenario with respect to specific community sub-groups. Such a vulnerability assessment method must be both predictive and forward-looking to integrate development, DRR and CCA decision-making into a forward-looking dynamic assessment of expected deficits below survival and livelihood protection thresholds. A specific challenge noted for such threshold assessments is that careful consideration needs to be given to the use of benchmark standards for subjective factors that are difficult to measure (Siegel and Alwang 1999). Based upon a vulnerability assessment of potential impacts of agricultural modifications in an agricultural community in Baucau District in East Timor, a methodology was created for extension of Household Economy Analysis (HEA) to assess the effects of hazards on conditions as they are perceived now and to integrate dynamic development and climate changes into assessment of future food and livelihood conditions. HEA is a participatory and predictive methodology that has been used to predict how a sub-group of people within a community will meet their survival and livelihood sustainability needs in future normal and adverse times based on past trends, but has not been further used for information about current deficit-reduction interventions and expected future trends in these predictions and decisions (FEG Consulting and Save the Children 2009).

In the initial HEA analysis (Alexander 2010), livelihood zoning, market analysis and vulnerability sub-grouping were performed with key informants according to HEA guidelines. Focus groups then used the participatory method of proportional piling to provide data for their sources of food, uses of food, sources of non-food income and for uses of income on expenditures. From this data, the baseline total income as a percentage of the 2,100 kilocalories minimum daily energy needs was calculated as the sum of food income in kilocalories and non-food income converted to kilocalories. Although thresholds were not determined for this study, in the baseline year (see Figure 6.2), the average access (spending 171% of minimum energy needs) and high access (at 191%) groups were clearly above both thresholds while the low access group, at 114 per cent, may have been below the livelihood protection threshold even in normal times. Based on a key informant pre-determined risk scenario of an initial direct effect of 40 per cent of crops destroyed, perceived deficit effects were discussed with each group along with the expected effects of prevalent coping mechanisms. From this data, total income as a percentage of minimum daily energy needs was calculated again for the adverse year with and without the effects of coping. The high access group's strong initial baseline level and more effective coping mechanisms resulted in a level of spending of 134 per cent of minimum energy needs that, while reduced, was assessed to be still well above a livelihood protection threshold. The medium access group, at 116 per cent, however, was assessed to possibly require livelihood assistance in adverse times while the low group, struggling with livelihood protection even in normal times and dipping to 62 per cent of its minimum energy needs in adverse times, was assessed as needing significant survival assistance.

These results reflect current vulnerabilities but show neither the potential effects of any endogenous alternative interventions to reduce them nor the expected effects of exogenous and other endogenous dynamic changes. To assess the effects of alternative interventions and thereby optimize agricultural method adaptation, a set of equations was developed for simulating the income net of food and livelihood deficits after the impacts of the stipulated adverse event and resulting coping mechanisms. A procedure was then developed for incorporating other planned endogenous, expected climate and other exogenous changes into the baseline assessment and adverse event scenarios for use in the focus groups so that all assessment is based on the future rather than the current or past conditions (see Table 6.3). These methodological extensions provide for an integrated dynamic household economy analysis that meets the criteria of being both participatory and predictive. By including information regarding potential changes in future

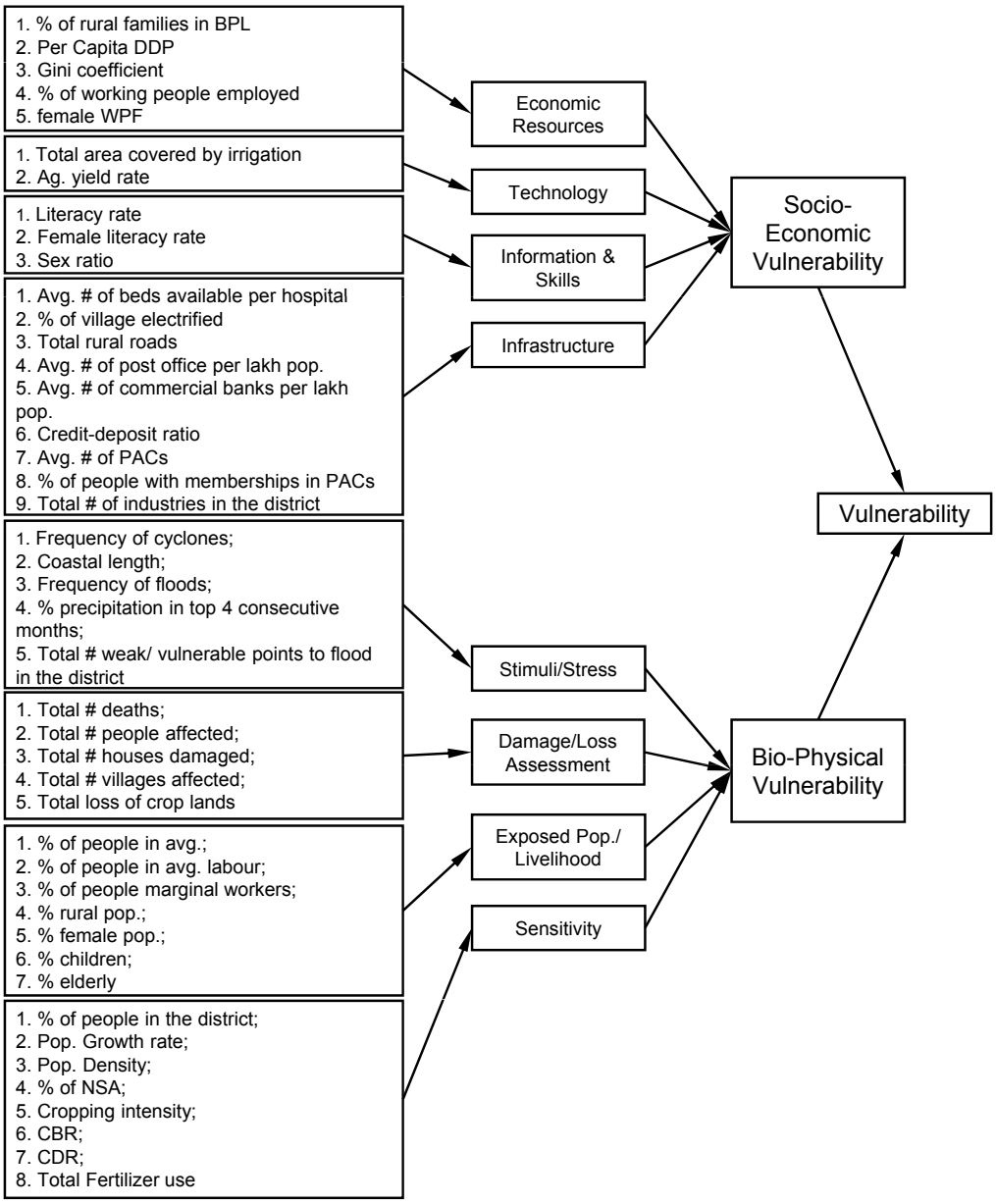

Figure 6.1: Conceptual framework for indicator use in Orissa. Source: Rohman 2009

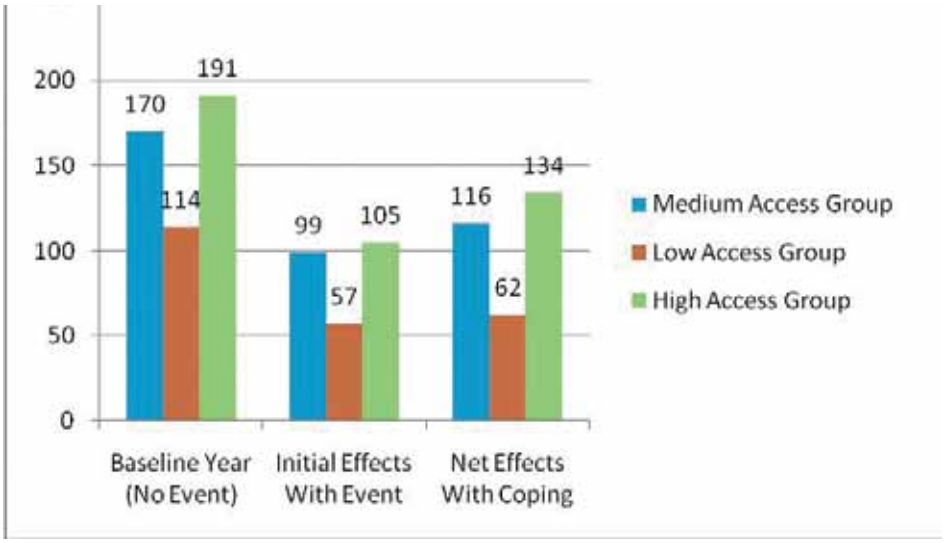

Figure 6.2: Venilale (East Timor) %s of minimum energy (kcal) needs. Source: Alexander 2009

access of various community groups and of the potential effects on sources and uses of food and non-food income of climatic, development and other future trends on both baseline and adverse event outcomes, future, rather than current or past, deficits relative to anticipated thresholds can be anticipated.

Determining prioritization of vulnerabilities for reduction decision-making: in a study on each of the nine islands of the Maldives, scenario-based iterative knowledge mapping was developed as a visualization tool to enable the development of a merged database from a baseline scenario in an adverse hazard event scenario and a future development and climate change scenario for prioritization of elements of disruption for vulnerable sub-groups from different islands. In this case, utilization of results from previous assessments of which islands to consider allowed proceeding towards risk reduction decision-making such that being assessed was the socio-economically vulnerable elements that should be prioritized for reduction according to risk scenarios with respect to the process for co-determining risk knowledge amongst the identified groups. Step one involved a biophysical vulnerability assessment team of natural and applied scientists who utilized indicators from historical data and information from discussions with KI and community representatives to create maps and tables of likely physical deviations from baseline conditions caused by potential hazard events. A similar attempt was made to describe these deviations from future environmental and physical trends due to exogenous climate change, and planned endogenous island resource and institutional modifications due to population transmigration and an investment consolidation scheme on these islands. Bridging from this assessment of a likely adverse event to future biophysical and socio-economic vulnerabilities was accomplished by using expert opinions to create scenarios of which percentage of the biophysical elements would be expected to be lost and, where possible, of expected ramifications on the island's basic societal functions (i.e. food and non-food access, livelihoods, health care, education, power, shelter, water and sanitation, physical safety, transportation, communications and psychosocial activities (Sundnes and Birnbaum 2003; Table 6.4). Next, after KI identified significant sub-groups considered least able to access Basic Societal Functions (BSFs) in normal and adverse years, a socio-economic vulnerability team used quantitative and qualitative participatory techniques with focus groups to elicit the current baseline socio-economic conditions of elements and processes of the BSFs. Thus, the physical adverse event scenario and the physical future scenario could be overlaid for discussion of likely effects of coping, buffering and adaptive capacities en route to identifying the highest priority risk reduction elements for their sub-group. Finally, step three involved creating mind maps to analyse the similarities and differences between sub-group perceptions for each scenario to facilitate an iterative process to revise the maps with sub-group representatives and other stakeholders from both inside and outside the community in order to obtain agreed-upon knowledge of final risk reduction priorities.

Although this final step was beyond the scope of the terms of reference of the project, the initial stages of this process have demonstrated the use of scenarios as a method to bridge past and present to the future, to encourage consideration of dynamic development and climate change trends to be multi-hazard by focusing on biophysical changes from a variety of possible events, and to better bridge the natural science and social science gap. The use of mind maps further demonstrated a method for bridging amongst different sub-groups and different inside and outside stakeholders by building a partnership for multiple-way communication of rationales for differing perceptions and for revising views based on subsequent analysis. One significant problem arose, however, in the attempts to incorporate climate change into the future scenario. Development trends and investments are changing so rapidly in the Maldives that a long-term scenario was not immediate enough to capture pressing development and migration concerns while a short-term scenario was not long enough to capture relevant climate change concerns. Thus, the short-term scenario took precedence and many climate change adaptation concerns were neglected.

On the quantitative and qualitative spectrum, the ultimate optimization of adaptation decisions in IDHEA is a quantitative simulation, but both the IDHEA and the scenario-based iterative prioritization methodologies are based on the

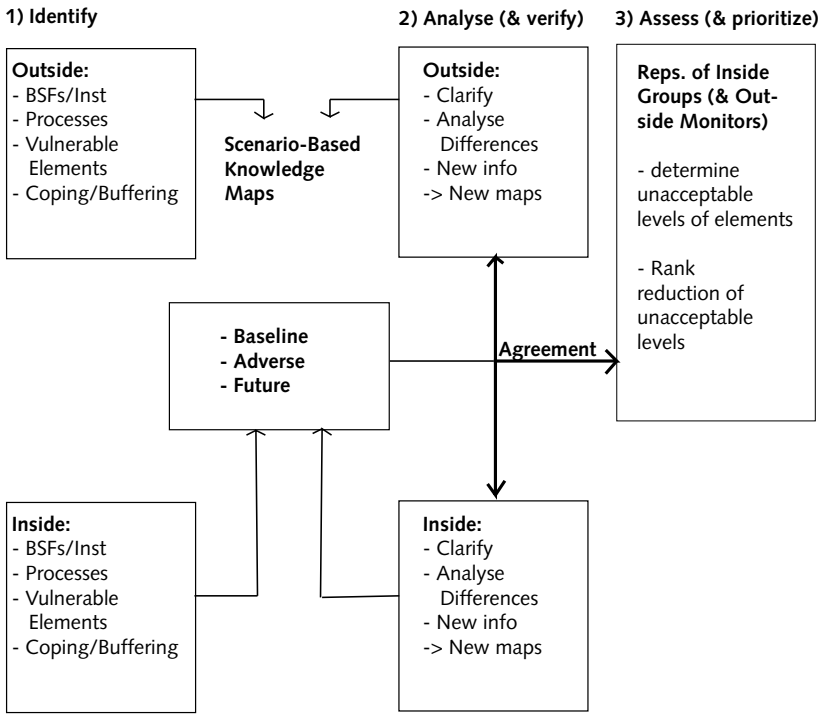

Figure 6.3: Vulnerability prioritization: Identification, Analysis, and Assessment. Source: Alexander 2009

Steps of the Integrated Dynamic Household Economy Analysis (IDHEA)		
	Steps	Dynamic modifications
Future baseline	Step 1: Livelihood zoning	· Zoning done the same · Get investments/trends into future scenario · Get trends into future adverse event scenario · Get market information on trends & interactions · Assess future survival and livelihood protection thresholds
	Step 2: Access breakdown	· Get information on access trends · If seems relevant, do access breakdown per trends
	Step 3: Livelihood strategies analysis	· Do baseline discussion without analysis · Add future scenario · Do analysis (with 5-10 years in the future as the Baseline)
Outcome analysis	Step 4: Problem specification	· Use future adverse events scenario · Do analysis for effects of likely future event/s (including likely changes in buffer capacity)
	Step 5: Coping capacity analysis	· Discuss likely effects of future and adverse event changes on coping · Do analysis for effects of likely future coping
	Step 6: Projected outcome	· Predict effects relative to future survival and livelihood protection thresholds · Treatment/s chosen to cost-effectively optimize attainment of desired future threshold

Table 6.3: Steps of the Integrated Dynamic Household Economy Analysis (IDHEA). Source: Alexander 2009

Summarized physical impact scenarios for Kudahuvadhoo island in the Maldives		
	Disaster event scenario likely: Tsunami/Rainstorm	Future scenario Population & investments
Environment	minor coral reef, coastal vegetation and beach erosion effects	Land reclamation: clearing of coastal vegetation for housing = flood/wind/coastal erosion exposure
Population	a few deaths; 5% of population displaced; 5% living in damaged houses	Additional displaced person relocation & other in-migration
Food/non-food access	damage: bad = agricultural plots	no direct changes
Livelihoods/income	5% of commercial centres closed; vessels damaged; bank damaged & closed	Expansion of bank; new boat repair area
Health care	possible disease outbreak; hospital 5% loss of function	To upgrade with population
Education & training	school temporarily used as emergency shelter	New nursery & primary school; boarding facility
Shelter	damage: bad = eastern side coastal houses; slight = tsunami-relocated houses	New/reallocated/relocated plots
Power	10% of transformers damaged; power houses down 1 week	New power house & fuel store
Water	groundwater saline 15 days in southern 1/2 of island; no drinking water shortage	More water tanks
Sanitation	sewerage system & waste treatment disrupted 2 weeks	Improved waste management & treatment
Transportation	harbour barely usable 2 week	harbour repairs
Communication	post/telecom office down 1 week; 10% loss of fuel storage	expansion of post/telecom facilities; new antenna
Physical safety	moderate risk: island office, island court, emergency services; warehouses, storage facilities, & schools used for emergency shelter	new police station; buffer zones
Psychosocial activities	damage: bad = cemetery; slight = mosques & sports facilities	new multi-purpose building; recreational areas; botanical garden; mosque; museum; cemetery

Table 6.4: Summarized physical impact scenarios for Kudahuvadhoo island in the Maldives. Source: Alexander 2009

quantification of subjective participatory group decisions according to a mix of pre-determined and co-determined criteria and scenarios that are based on qualitative descriptions and the categorization of the institutions and processes in the community. Each of these approaches utilized scenarios of biophysical impacts to inform the focus group discussions and analyses of socio-economic vulnerabilities according to impacts on the underlying elements and how these are framed and transformed by community processes and institutions. Although the evaluation of relationships to quantitative thresholds is based on the calculation of underlying components of food and non-food income and resultant mathematical simulation of alternative interventions in IDHEA, and although the creation of the biophysical impact scenarios in both methodologies tend to be outsider-controlled, the participatory sub-group focus of both methods encourages participation of insider community sub-group members in both process and product. Knowledge database creation using the iterative perception mapping technique specifically encourages all stakeholders to continue to modify and improve upon this knowledge with newly revised findings for consideration in decision-making. Although the explicit use of future scenarios in the iterative knowledge mapping methodology was specifically designed to allow dynamic and development-focused assessment, the initial HEA results were not dynamic and development-oriented until the proposed IDHEA extension provided for inclusion of participatory determination of potential net impacts of future investments, interventions and exogenous changes.

6.5 Implications for research, policy and practice

The methods working group in the Workshop and EWG II both emphasized the need for a common message from DRR and CCA communities about assessment needs according to stakeholders, scale and objectives (Birkmann and Wisner 2006). These case studies, rather than focusing on the results of any of the assessments, demonstrate some key methodological differences resulting from these differing needs and illuminate some additional concerns related to the aforementioned cross-cutting challenges to be addressed in new methodology research, policy and practice.

Although all of the studies aimed to bridge disciplines in assessing a mix of biophysical and socio-economic vulnerabilities, emanating implications included the needs to ensure incorporation of the role of, and effect on, community processes and institutions and to ensure that any used indicator reflects related differences across different locations. Additionally, research, policy and practice challenges include the need to improve the consistency of the terminology employed by the different disciplines and fields to better enable communication amongst them about what types of information is needed in order to make the final assessment products cohesive and understandable.

Different objectives, scales and stakeholders exemplified the difficulties in determining how to bridge quantitative and qualitative, as well as objective and subjective methods, to best obtain indicative data. The methods working group in the Workshop recommended research to ensure that indicators are realistic in terms of quality and access, scientifically evaluated and validated, identified in a participatory manner when possible, and as close to the local level as possible for accuracy and usefulness. Since indicators and subjective criteria are used for both quantitative and qualitative methods, however, the additional concern about whether or not indicators are useful at all seems to hinge on two elements: whether data should be obtained for the indicators from more quantitative or qualitative, and objective or subjective approaches, and whether the use of historical data renders indicators useless in supplying information about the future. While the index approaches involved supplying quantitative data to criteria with different types of subjectivity based on qualitative information, the location-specific approaches involved asking focus groups about particular items, with the responses requiring subjective judgement about how such responses indicated a particular component of vulnerability. Thus, all of these methods use indicators and require careful consideration as to how to include the DDR/CCA concerns, as well as which indicators to use, how information is supplied, who is making the decision about them and what the results are being used for. In cross-location assessments, further research regarding how to up-scale, yet keeping the indicator at the lowest scale possible and how to otherwise account for potential differences in processes

and institutions that might render indicators not applicable, is needed.

An analysis of the various levels of incorporation of development and future trends in the case study assessments builds upon understanding the potential irrelevance of historic assessment results and the resultant need for indicators and scenarios that incorporate these trends. The emerging research, policy and practice challenge in bridging the past and present with the future lies in the development of methods to create indicators and scenarios that effectively encompass the relevant effects of adaptation interventions, climate change and development trends with a sufficient time horizon for sustainable development considerations. Indicators, as used in the index studies that are based on historic data and proxies of past information, either need to be modified or replaced so that information relevant to decision-making about the future can be revealed through their application. In fact, the scales in the Porong Sidoarjo study and the decomposed indices in the Orissa study could be used as the elements of an adverse event scenario to show current vulnerability within locations, but would need to be modified to be useful for assessing future vulnerabilities either within or across locations. A core problem lies in how national and international climate and event scenarios can be transformed into local-level scenarios that can be used for the creation of intra-national level indices or local-level biophysical impact scenarios for assessing location-specific vulnerability. The methods working group in the Workshop emphasized the following needs: harmonized methodologies for scenario creation, methods for converting global and national climate change risk scenarios to local scenarios and capacity-building at the local level for creation and utilization of these local level scenarios. Additional research concerns, reflected in the examples, include the need for holistic assessment of all hazards relevant to sustainable development decision-making, as well as development and employment of scenario and simulation techniques that allow for both long-term and short-term trends to be considered in decision-making, even in areas undergoing rapid transformation.

All of the case study assessments showed the contentious nature of finding the optimal mix of roles of outsiders and insiders, but the need for cross-location reliability of indicators and for buy-in to assessment results helped to reinforce the need of ensuring that insiders are included as much as the process allows for. Bridging between stakeholders from inside and outside the community for the desired mix of process and product in studies above the local level, necessarily requires less direct participation of affected stakeholders but needs creative approaches for obtaining appropriate inside information about the processes and institutions that affect vulnerability at each underlying local level and for achieving commitment from these underlying areas to engage in the processes of co-determining risk knowledge and solutions, as well as for implementing and maintaining resultant risk adaptation measures. For location-specific assessment, the key challenge lies in determining the methods to employ to achieve the aforementioned situational, objective and location appropriate balance between precision of product and depth and potential of the process. Although the creation of risk knowledge databases at the local level can be difficult and costly initially, such databases can result in better bottom-up information provision and cost-effective adaptation policies.

In summary, achieving appropriate disaster and climate change vulnerability assessment integration implies research, policy and practice modifications to enable better bridging of natural and social science, quantitative with qualitative, insiders and outsiders and the past with the future. To do so, encouragement of conceptual consistency and information clarity can help enable cohesive and understandable assessment results. Furthermore, policy and practice should aim to better ensure that realistic, scientifically verifiable and participatory indicators, scales, indices and knowledge databases are constructed and developed, incorporating as much location-specific future trend information as possible for scenarios and simulations that enable forward-looking, local-level, assessment-specific, as well as short and long-term decision-making.

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7. Local government capability in managing disaster: evidence from Bantul, Indonesia

Bevaola Kusumasari

Due to the role of local government before, during and after disaster, it is very crucial to focus on enhancing its capability of managing disaster. Capability in managing disaster is reflected as a function of availability of institutions, human resources, policy for effective implementation, finance, technical facilities and leadership. This research assesses the capability of a particular local government in Indonesia for earthquake disaster management, taking Bantul regency as a case study. The findings show that both local government and the community need more capacity-building in dealing with emergency situations. Moreover, coordination and collaboration between all levels of government are revealed to be very important.

7.1 Introduction

Disasters can be seen as a fundamental aspect of normal life. According to data from the Office of US Foreign Disaster Assistance (OFDA)/ Centre for Research on the Epidemiology of Disasters (CRED) International Disasters Database (EM-DAT 2006), the frequency of natural disasters appears to have increased worldwide. In the decade 1900 – 1909, natural disasters occurred 73 times, but in the period of 2000 – 2005 the number of occurrences rose to 2788. Furthermore, in 2004 the International Federation of Red Cross (IFRC) and Red Crescent Societies reported that 231,764 people were killed by disasters in Asia from 1972 to 1996. The impact of disasters strongly influences societal, economical, environmental and institutional development.

Local governments play an important role before, during and after disaster because they have the best knowledge about the community. Unfortunately, there have been very few comprehensive studies of the internal resource capabilities, which explain capability as a key aspect of disaster management for central and local governments, and there have been few studies on the role of the local government, particularly in developing countries, even though many experts emphasize their crucial role in disaster events.

Two important areas have remained marginal in terms of the role of the local government in managing disasters. First, the issue has been examined mostly in the context of developed countries and insufficient attention has been paid to local governments in developing countries. Second, the capabilities of local authorities in managing disaster in every stage (pre-, during and post-disaster events) have not been examined. Indeed, in recent years many local government bodies in developing countries have faced difficulties in dealing with disasters since they have inadequate knowledge and management capabilities.

In order to fill this gap and taking into account the importance of local governments in managing disasters, this research examines and assesses the capability of the Bantul regency as a case study in Indonesia for earthquake disaster management for several reasons. First, the government of Indonesia classified the 2006 earthquake in Bantul and Central Java as a "local disaster", due to the number of people killed or injured. Around 4500 people died as a result of the 2006 earthquake in Bantul. As many authors observe, one way of categorizing local disasters is by the number of those killed (Contra 2002; Keller and Al-Madhari 1996; Kelleret al. 1997; Malaysian National Security Council 2003; Middleton and Franks 2001; Mitroff 1988). Also, the earthquake hit the most densely populated areas of Java, where 1,500 people live per quare kilometre, and destroyed domestic industries that have become the main resource of the Bantul local government.

Second, the Bantul local government responded rapidly to the 2006 earthquake to provide relief actions and has not relied on the help and donations of NGOs. Third, Satlak PB (District or Municipal Implementation Unit for Disaster Management) in Bantul, chaired by the Head of District (Bupati), has not been trained and experienced in pre-, during and post-disaster management. This is likely to adversely affect a huge number of disaster victims. Therefore, it seems necessary for this research to examine local government capabilities in earthquake disaster management.

7.2 Methodology

The research is an exploratory and intrinsic case study. Primary data was collected through in-depth interviews of KI from the central government in Jakarta, the provincial government at Jogjakarta and the local government at Bantul, who dealt with and had knowledge about 2006 Bantul earthquake. Besides, the representatives of international and local NGOs whose programmes were related to the 2006 Bantul earthquake were also interviewed.

7.3 Capability and disaster management

The concept of organizational capability has attracted much interest, primarily in management research. Recently, in the capability debate, issues of environmental uncertainty and change have come to the fore. Therefore, the emphasis on organizational capability has now shifted to the ability to change and quickly develop critical prerequisites for sustaining competitive advantage (Schreyögg and Kliesch-Eberl 2007). Indeed, uncertainty and change are key characteristics of disaster (Moynihan 2008). In addition to this, disasters can also have a catalytic effect by focusing political attention, widening the interest of the public, incorporating new ideas, and breaking down resistance to change (Birkland 2006). Schwartz and Sulitzeanu-Kenan (2004) warn that although disasters draw political attention, policy change requires certain conditions, such as perception of a problem in need of a solution, awareness that increases legal and hierarchical accountability, and a conducive political climate. The politics of accountability tends to seek guilty individuals, overlooking systems failures and fostering defensiveness (Drabek 1994). As a result, leaders dissociate themselves from perceived negative outcomes and deny that a problem exists, or deny that they made an error or that they are responsible for finding a solution (Argyris and Schön 1996). Information is suppressed or used as ammunition to rationalize behaviour and deflect blame rather than to identify useful lessons (Boin 2005).

Observing capabilities is perhaps the most significant structural problem in managing complex organizations today (Van de Ven 1986). Therefore, it is also important to define capability, as a key concept for this paper. Makadok (2001) defines capabilities as special types of "resources that are organizationally embedded non-transferable firm-specific resources whose purpose is to improve the productivity of other resources" (Makadok 2001: 389). Barney and Clark (2007) define capability as the attributes of an organization, such as financial, physical and individual/organizational capital, that enable it to exploit its resources in implementing strategies. Teece et al. (1990) provide a clear definition of capability as "a set of differentiated skills, complementary assets, and routines that provide the basis for an organisation's competitive capacities and sustainable advantage in a particular business" (Teece et al. 1990: 509). Also, capability is a collection of knowledge sets, which are distributed and constantly enhanced from multiple sources. Organizational capabilities represent the power of planned and coordinated specialized divisions of labour in order to achieve organizational goals (Lazonick 1995).

Amit and Schoemaker (1993) refer to capabilities as an organization's capacity to deploy resources, usually in combination, and using organizational processes to affect a desired objective. This definition has two key features. First, capabilities are those attributes of an organization that enable it to exploit its resources in implementing strategies. Second, the primary purpose of a capability is to enhance the productivity of other resources that an organization possesses. Resources are an organization's fundamental financial, physical, individual, and organizational capital attributes (Hill and Jones 1992; Hitt et al. 1997). Capabilities tend to focus on the ability of an organization to learn and evolve, and also on "the antecedent organizational and strategic routines by which leaders alter their resource base – acquire and shed resources, integrate them together, and recombine them – to generate value-creating strategies" (Eisenhardt and Martin 2000: 1107).

Capability does not represent a single resource in the concert of other resources such as financial assets, technology or manpower, but rather a distinctive and superior way of allocating resources (Schreyögg and Kliesch-Eberl 2007: 913). Organizational capability is by its nature conceived as collective and socially embedded. It is shaped through social interaction and represents a collectively shared "way of problem solving" (Cyert and March 1963: 162). Capability implies

skills that have proved to solve extraordinary problems in complexity (Levinthal 2000). Complexity refers to the characteristics of a problem situation and of decision-making under uncertainty. Solving complex task requires abilities with a broad capacity. The complexity of a capability, therefore, reflects the internal requirement for mastering complex tasks (Schreyögg and Kliesch-Eberl 2007).

7.4 Analytical framework

In relation to disaster events, it is fundamental to identify the demands (dynamic and evolving conditions, role of uncertainty and situational constraints) that characterize the environment in which disaster response occurs and develop the management capabilities required to deal with disasters. Cigler (2007) defines capability as capacity, thus in terms of the financial, technical, effective policy, institutional, leadership and human resource capacities that local government bodies must have in order to perform activities in all stages of routine emergencies (see Figure 7.1). The capability needed in disaster management relates to delegation, communication, decision-making and inter-agency coordination (Paton and Jackson 2002).

In this study, capability is defined as the ability of the Bantul local government to organize assets, competence and knowledge to achieve its goals. Capability in managing disaster is a function of institutions, human resources, policy for effective implementation, financial and technical resources and leadership. In addition to this, the utilization of capabilities represents the key success factor of disaster management. Key success factors are competitive factors that affect

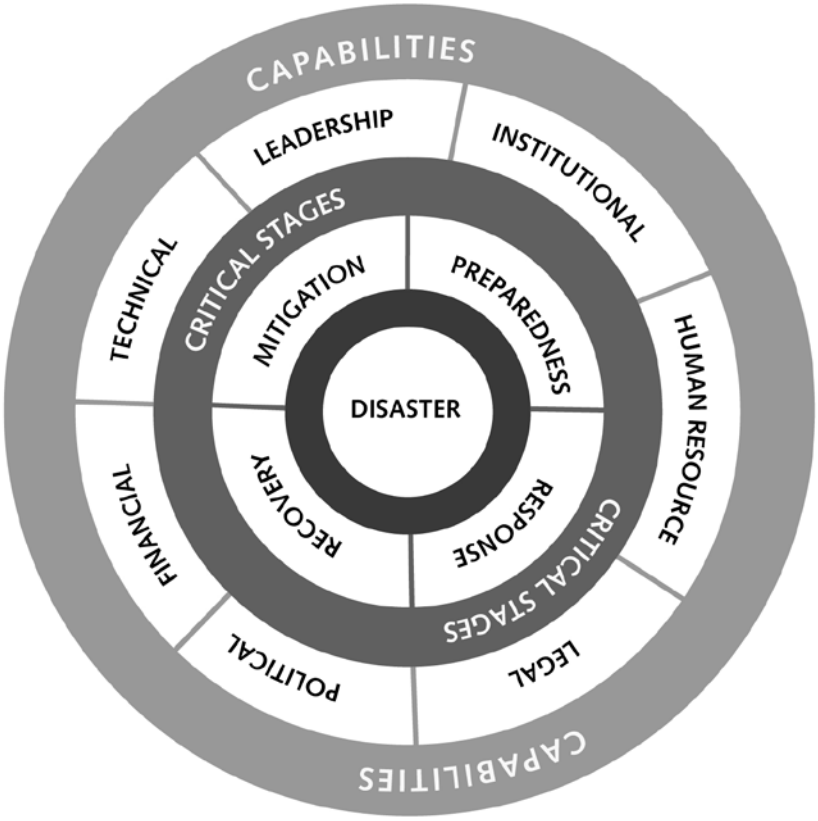

Figure 7.1: Local government capability in managing natural disaster. Source: Kusumasari, modified from Cigler (2007)

local government's ability to manage disasters (see Table 7.1).

In terms of institution-related capability, local government is most capable when it has a clear structure, role, responsibility and relationship with all other levels of government. The competitive factors of human resource-related capability are observable when the local government has sufficient personnel, proper tasks, delegation and division of labour within the organization in order to manage a disaster. The key success factors contributing to the capability to effectively implement policy are the availability of appropriate policies, rules and regulations for making decisions, mobilizing resources and engaging relevant public or private organizations. Having sufficient financial resources to support activities in all stages of disaster management is crucial for enhancing the financial capability of the local government. Important factors in strengthening the technical capability of local government institutions are an effective logistic management system, a sufficient technology information system, and a communication network between organizations, the community and media representatives. A significant factor that contributes to leadership-related capability at the local level is the ability of the leaders to make quick and appropriate decisions when needed and also to strengthen the confidence of the people affected by disaster. Natural disasters require very specific leadership capability because extreme events often overwhelm local capabilities. Therefore, leaders at the local level must adapt and rebuild the emergency system and aim to minimize the adverse effects of disaster as fast as possible. Their actions and competence in dealing with these especially difficult conditions may emerge as a key indicator of the accomplishment of leadership.

The attributes of a local government can be seen as resources in disaster management and they will reflect the capability of an organization to express the ability to perform every stage of disaster management. This study defines capability as an organization's resources (financial, physical, individual and organizational capital) that are required to achieve an organization's goal.

7.5 Findings from the case study of Bantul, Indonesia

This research has revealed some important facts regarding the capability of the local government in Bantul managing disaster, summarized in Table 7.2.

Local capability requirements and critical factors of disaster management	
Local government capability: key functional success factors	
1. Institutional	Having a clear structure, role, responsibilities and relationship between all levels of government
2. Human resource	Having sufficient personnel, proper task delegation and division of labour
3. Policy for effective	Availability of appropriate policies, rules and effective implementation regulations for making decision, mobilizing resources and engaging relevant public/private organizations
4. Financial	Having sufficient financial resources to support activities in all stages of disaster management
5. Technical	Having effective logistic management system, sufficient technology information system and communication network between organizations, communities and media representatives
6. Leadership	Building local level leadership to make quick and appropriate decision if and when needed

Table 7.1: Local capability requirements and critical factors of disaster management. Source: Cigler 2007: 70; Perry 2007: 425

Bantul capability in managing disaster	
Capability	Findings
Institutional	There were neither clear structures, roles, nor responsibilities implemented under the emergency condition
Human resource	Limited number of personnel had knowledge in managing disasters
Policy for effective implementation	Local government had no written policy, particularly on disaster management
Financial	The available budget was limited
Technical	No effective logistic management system and sufficient technology information system
Leadership	Local leadership (Bantul Mayor) played an important role in motivating community to participate in rebuilding Bantul

Table 7.2. Bantul capability in managing disaster. Source: Kusumasari (Survey Result) 2009

In terms of institution-related capability, local government is most capable when it has a clear structure, role and responsibilities under emergency conditions. No institutional indicators were found at the local level, however, the personnel acted spontaneously under the direction of the Bantul Mayor to provide help to the community.

The factors of human resource-related capability are visible when the local government has sufficient personnel, proper tasks, delegation and division of labour within the organization in order to manage a disaster. One research finding is that only a limited number of personnel had knowledge in managing disasters. However, the willingness to work under emergency conditions despite limited resources was the main contribution of the Bantul local government in its attempt to help the community.

The key success factors contributing to policy for effective implementation-related capability are the availability of appropriate policies, rules and regulations for making decisions, mobilizing resources and engaging relevant public or private organizations. It is found that the local government has no written policy, particularly on disaster management. However, decision-making was based on the assistance of the central and provincial government and its policies, which adapt to local needs and culture.

Having sufficient monetary resources to support activities in all stages of disaster management is crucial for enhancing financial capability. Bantul local government has a limited budget, although in the response and recovery phase they had the option to switch allocations from normal programs to disaster management activities.

Important factors in strengthening technical capability of local government institutions are an effective logistic management system, a sufficient technology information system and an effective communication network between organizations, the community and the media. No effective logistic management system and sufficient technology information system were found in the case study. However, many international and national agencies supported the local government body by mobilizing essential emergency relief supplies.

A significant factor that contributes to leadership-related capability was the role of the Bantul Mayor who was responsible for the high level of community participation in the emergency, rehabilitation and reconstruction phases.

In the disaster management cycle, it is found that the mitigation phase has the lowest capability level compared to the recovery and response phases. This was because there was limited preparation by local government and community in fighting disaster.

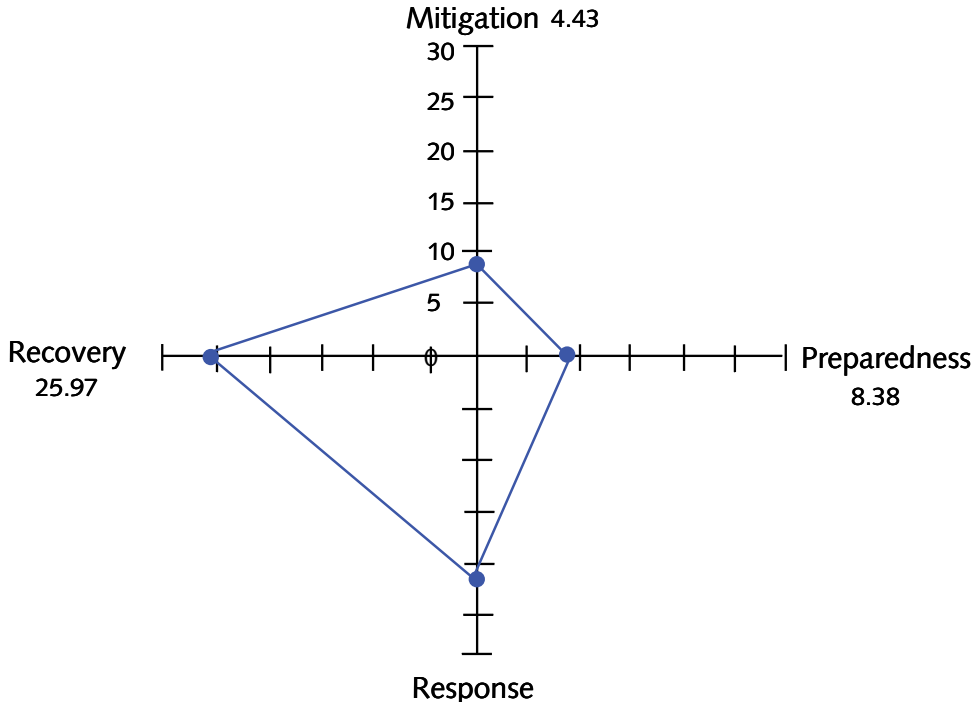

Figure 7.2: Disaster management level of Bantul local government: Source: Kusumasari (Survey Result) 2009

7.6 Conclusions

This study has described the resource capability for a local government in managing disasters. Learning from the experience of Bantul with regard to managing natural disasters, it found that in spite of existing leadership capability and engagement at the local level, the Bantul local government body lacks skills and expertise when dealing with an unexpected and detrimental situation since it does not know what to do in an emergency. On the other hand, by showing the local authorities that the assessment resulted in the low level of mitigation and preparedness, they learned the importance of education, socialization and escape structures, as well as of warning systems and wave resisting structures in order to increase the peoples´ safety in the event of future disasters.

To conclude, this research highlights the importance of the capability of the local government and preparedness needed to address broader issues rather than only immediate responses to the disaster. The physical and economic vulnerabilities of the community in disaster areas need to be adequately taken into consideration. Due to a lack of disaster management capability, the local government body has been forced to make decisions based on information that might be inaccurate and incomplete. Coordination and collaboration between all levels of government have an essential function, because in an emergency this would save lives. Unfortunately, a lack of coordination and collaboration between different levels of authority is a real issue in the case study area. The local government body has limited resources and expertise while institutions, organizations or agencies on other levels may have adequate resources. To be effective, disaster management planning needs to be accompanied by restructuring of government functions, and, as a part of strategic social planning, all the stakeholders must be involved in working collaboratively.

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8. Disaster Risk Reduction and management through effective institutional linkages, the case study of Pakistan

Muhammad Asim and Kidokoro Tetsuo

The impact of a hazard can be reduced by applying proper disaster management tools such as preparedness and mitigation measures. In Pakistan, the 2005 earthquake that brought massive destruction at the national level was mismanaged by government agencies. Lack of linkage between authorities and the slow response from the government have contributed to more human losses in the disastrous event. Hence, there is need to re-organize the system at all tires of government to cope with disastrous events. The paper will review the concept of institutional strengthening for risk reduction.

8.1 Background

A disaster is said to take place when the losses originating from a given event overwhelm the capacity of a population (local, regional or national) to respond to and recover from the impacts. Disaster risk emerges from the interaction between a natural hazard – the external risk factor – and vulnerability – the internal risk factor. During the previous century, disasters emanating from natural and technological hazards have occurred with increasing frequency (Pinkowski 2008). Although it is not possible to decrease the frequency of any natural hazard, the impact of the hazard can be reduced by applying appropriate disaster management tools. Thus, it is necessary to know the intensity of the disaster in order to utilize facilities of appropriate agencies and acquire related equipment. Lack of knowledge in hazard assessment, planning, risk management, vulnerability analysis and personal empowerment could lead to costly and ill-suited responses, endangering the environment, infrastructure and humans.

From an analysis of the 2005 earthquake in Pakistan that brought massive destruction at the national level, it is evident that the government did not have a plan to cope with such a disaster. Even several hours after the event, they could not identify the extent of this disaster as no linkage was established between authorities to communicate in such a type of incident. As a result, more human lives were lost as the government was slow to respond. Hence, there is need to reorganize the system at all tiers of government to cope with disastrous events. Further, to cope with these disaster risks, the legal backing provided by the Calamity Act of 1958 is mainly concerned with organizing emergency response. Under the 1958 Act a system of relief commissioners at provincial level was established. An Emergency Relief Cell (ERC) in the Cabinet Secretariat was responsible for organizing disaster response by the federal government. The awareness of policymakers, media, civil society, NGOs, United Nations agencies and other stakeholders regarding disaster risk management remains low. Even though having all these measures, the government failed to cope with the 2005 earthquake and this has triggered a reorganization of the Disaster Management System by the government. Thus, realizing the importance of DRR for sustainable social, economic and environmental development, the Government of Pakistan is establishing policy, legal and institutional arrangements, strategies and programmes to minimize risks and vulnerabilities. In this regard, the National Disaster Management Ordinance was passed in 2006 for its implementation to be carried out by the National Disaster Management Commission (NDMC). Thereafter, the National Disaster Management Authority (NDMA) was established that will be responsible for disaster management activities.

The efficacy of the NDMC and NDMA was criticized during the June 2007 cyclone in Baluchistan, Pakistan, by NGOs, media and the public. Though the system has provisions to cope with disaster risk, it used a top-down approach and institutions like Local Government Units (LGUs) were not involved. Although in the disaster management framework, tasks are assigned to LGUs, they remain ignorant about their duties. Their training has not been conducted and no calamity fund has been allocated for rescue activities.

In all phases of disaster management, the prime authority lies with the government who has the mandate of the people. Thus, there is an ongoing need to build an efficient institutional set-up for disaster management. Therefore, the strengthening of institutions and also legislation-for the prevention of disaster impacts is an important task for the government.

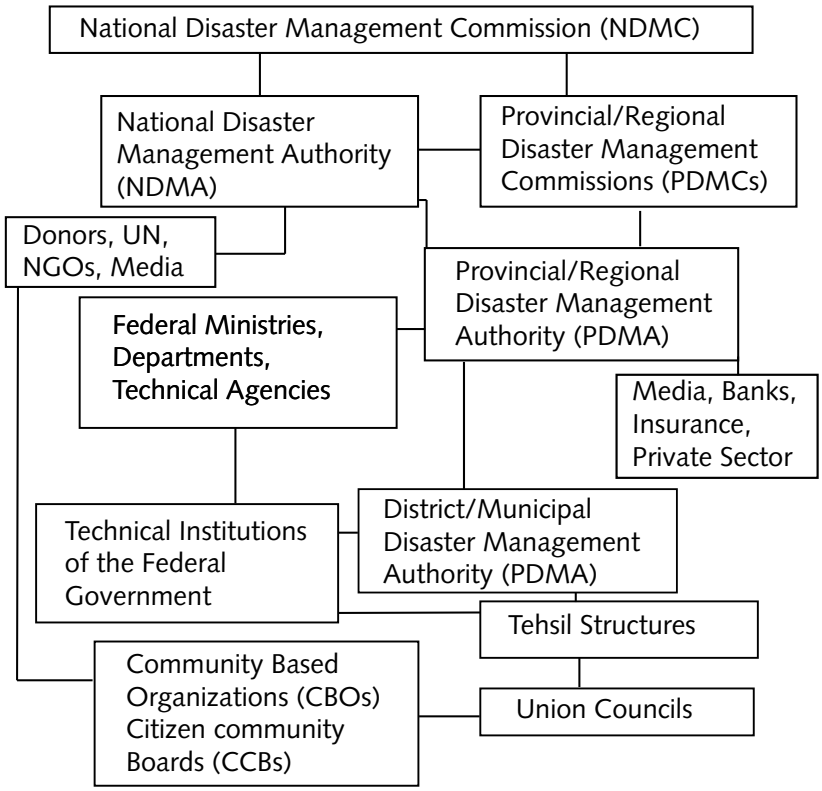

Figure 8.1: Pakistan disaster management system. Source: NDMA 2009 (Pakistan)

8.2 Disaster management in Pakistan

The history of disaster management can be divided into two phases: before and after the 2005 earthquake. It was a significant incident in the history of Pakistan, killing over 70,000 people and leaving over one million homeless. The media and other agencies reported that the government was not ready for such an incident as they were not prepared at all, and not at any level. In case of floods, early warning is issued and provides the time to accomplish tasks but the earthquake presented a different situation.

In 1970 when a cyclone struck Pakistan, policymakers established the Federal Relief Commission (FRC) in the Prime Minister Secretariat. It was the start of the disaster management system in the country and the mandate was allocated to the FRC by the Calamity Act 1958. Thus, there was a system available but this commission has a reactive approach. The FRC's job was to provide assistance in case of disaster but they never planned any activity for hazardous events. When the 2005 earthquake struck, the government institutions responded slowly. This event provided an impetus to institutionalize a new system for disaster management. Thus, the Disaster Management Ordinance 2006 was promulgated and under this ordinance the NDMC was constituted. NDMC comprised the elected people while the NDMA was established under NDMC. The NDMC chairman is the Prime Minister of the Country and this commission is meant to take the key decision and allocation of the funds. Whereas the NDMA's function is to implement the decisions of the commission, the NDMA is comprised of the employees of the federal government and heads of line agencies.

Further, the Ordinance also provided the mandate to establish the disaster management authority at the provincial level (which is the lower tier in the government system that can be called region). In the same way, it provides guidelines to constitute the disaster management authority at the local government level (District level) (see Figure 8.1). The system is constituted but still their approach is reactive rather than proactive.

8.3 Methodology

The analysis framework is based on the devolution of the system for disaster management, i.e there should be high level of coordination among central government and local government tiers. Local governments should have a proactive role in the mitigation and rescue operation since their accessibility to the people at the grass roots level is higher than the central government and they can perform and set up on a short notice as response to an incident. Further, disasters may also impact on the local government units so the central government should not wait for the call from local governments but rather take initiative for the relief activities. In addition to this, there are two important variables, being exposure to risk and the capability to cope. Exposure to risk can be caused by lack of knowledge, no early warning, no risk sensitive planning and no drills against the vulnerability of hazards. On the other hand, capability can be increased by the drills, training programmes of authorities, funds for activities and mitigation and preparedness for known risks.

The tool that was adopted to investigate the system was the key informant interview with disaster management agencies at the national, provincial and district level. Further, the KI interviews were also conducted with the Japanese government officials, such as the Tokyo Metropolitan government and Asian Disaster Reduction Centre, the Kobe and Hyogo Governments and also the officials of Pakistan's government responsible for disaster management like the NDMA, Provincial Disaster Management Authorities and line agencies.

The interview format was organized into the following three sections: i) organizational setup, ii) measures taken in reducing disaster risk, and iii) funds for the activities. Besides this, literature regarding the reports of the agencies on previous disaster management activities, which explain the impediments in the system and causes for delayed response and lack of preparedness with regards to the institutional mechanism problems, were considered.

8.4 Preliminary findings

The investigation on the three aspects of disaster management in Pakistan (organizational setup, measures taken in reducing disaster risk and funds for the activities) reveals the following facts:

Organizational setup: Pakistan was frequently hit by disasters in the past years with the most frequent hazard being flooding. Physical damages were quite high and caused deeper poverty of the lower income class people. Later, the 2005 earthquake event was an eye-opener for the government, as the earthquake struck the country and there was no mechanism to respond to such a big disaster. There was only the FRC at national level and the Provincial Relief Commissioner, who was working at provincial level to cope with such situations. After the 2005 earthquake, the paradigm was shifted and the approach was changed from reactive to proactive. The organizational setup was institutionalized from the national level down the tiers towards the provincial/regional or local level. The National Disaster Management Ordinance was passed and at the national level the NDMA was established, in the same way that the provinces also have an authority called Provincial Disaster Management Authority. However, the provinces are not accepting the authority of the central government due to their provincial autonomy determined by the constitution. Furthermore, there are different organizations working for the rescue services which overlap the system. One example of this system can be seen in Punjab province, where Rescue 1122 is working in parallel to the district fire services.

It is the belief of the general public that the central government is more powerful in terms of capacity and funding than the local government. Thus, the main responsibility is always left on the shoulders of the central government, which has more authority and funds. But on the other side, local institutions are the first to respond in case of any mishap due to their footage in the area. However, as a mismatch their capacity is less than the national agencies in terms of rescue and relief equipments and goods. On the contrary, this devolution of powers to the local government restricts the central government from interfering in the business of local authorities jurisdictions unless with their consent. Therefore, there is a need to create legislation for disaster management, which could strengthen the powers of the central government to take measures at the local levels to prevent higher impacts such as in the case of the 2005 earthquake. The lesson learned drawn from the event is that local units were also victims of the hazard impact.

It is necessary to reorganize the system of disaster management from national level to the local government level. There should be a stronger link between local agencies and national agencies for rescue and preparedness. The local agencies have better knowledge about the local area and the condition of areas, as well as stronger social networks. Therefore, the networking of the local government and national government should be strengthened, among other activities, in terms of rescue and relief.

Within this research, a comparative study was also conducted with other countries. Similar lessons are drawn from the two incidents in other countries, the Hanshin Awaji earthquake, Kobe, Japan, and the Hurricane Kathrina, USA. In case of the Hanshin Awaji earthquake the central government was not able to respond due to the absence of a call from the local government as they were also victim of the earthquake. The same happened in the USA as the Federal Emergency Management Authority could not respond, as they thought they might interfere with the functions of the local government if they were to provide assistance without their call. This caused more casualties and people had to suffer more than necessary.

Measures taken in reducing disaster risk: the interview with the authorities at national, provincial and district levels revealed the fact that in the past most rescue operations were conducted by the Army, especially in floods. This was also the case in the 2005 earthquake, as the Army also played a vital role in search and rescue operations. The information given to the general public for preparedness was not sufficient and there was no training conducted for the vulnerable communities, like children at schools. Most of the activities were focused on rescue and relief, whereas no activities were carried out for mitigation. This phenomenon can be understood as the institutions working separately and without an institutionalized command system existing to provide policy information or implementation from national level to lower tiers. Presently, some agencies like Civil Defence and Rehabilitation authorities are still working under different ministries.

It is necessary to establish an apex organization which controls the involved agencies and implements the policy to reduce the disaster risks in the future. In this way specialized staff will have the leading role to control the organization of activities.

Funds allocation: no activities can be carried out without sufficient funding as all activities – from evacuation, rescue, awareness campaign, to rehabilitation activities – require resourcing. The government of Pakistan has not allocated funds for a calamity fund. Thus, if any incident happens in the future then the government has to withdraw funds from the development activities and it will disturb those projects concerning for example health, education and infrastructure construction. This will consequently further increase the poverty and vulnerability of the people. Further, the funding which is already invested for the initialization of those projects will also be wasted. Moreover, the delay in funds release also disturbs the implementation of rescue and response, which could cause additional human losses.

8.5 Conclusion

An important aspect of management is institutional hierarchy that should be placed appropriately to fulfil the allocated roles and responsibilities. The disaster impact can be minimized if there is a proper incident command system and all the institutions from national to local government are working in collaboration. The disaster management system in Pakistan has been fully reorganized after 2005, but it still failed to respond effectively during the impacts of the 2007 cyclone in Baluchistan. The system can work in a better way if the issues like coordination of agencies, overlapping of functions and funding allocations are properly addressed and measures taken accordingly.

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9. Role of local government system in Disaster Risk Reduction: a case study of Punjab Province in Pakistan

Ijaz Ahmad

Disasters, whether natural or non-natural, cause loss and damage to human life, homes, assets, livelihoods and the natural environment. Natural disasters include earthquake, landslides, floods, wind storms, lightening, drought, epidemics, whereas man-made ones comprise sectarian violence, cross border firing, road accidents and terrorism.

In different countries of the world one or the other or both types (natural or non-natural) of disasters occur depending upon the location of countries. In developing countries, governments and private sectors work jointly in certain situations and people mostly look towards government agencies in times of disaster. But experiences show that neither the government line agencies nor the private sector alone have sufficient resources to meet the challenge of this herculean task. Even line agencies in the government sector neither have any type of horizontal nor vertical links that are necessary at times of any disaster to reduce the severity of loss. This shows a poor coordination mechanism among the agencies mainly responsible to provide basic services in the affected areas.

By population, Punjab is the biggest province of Pakistan. The Government has introduced a new local government system in 2001, which replaced the previous model practiced since 1979. Efforts are made in the system to involve the people more and more and especially it is inclined towards the grass roots level. This paper mainly focuses on the shortcomings of workings of the local government system regarding DRR. The entire paper is based on a literature review and KI survey results. Regarding the KI survey, officers working in line departments were consulted and interviews were conducted by the researcher. Based on the conclusions, efforts are made to provide useful recommendation for capacity-building of the present local government system towards DRR. It is hoped that the recommendations of this paper will be helpful to improve the efficiency of the local government system.

9.1 Introduction

There is a saying that "When planning for a year, plant corn. When planning for a decade, plant trees. When planning for life, train and educate people" (NDMA 2009; Government of Pakistan 1998). Planning often fails when any area is confronted with unforeseen disaster. The disaster Tsunami in Indonesia "struck Aceh, at the western tip of the Indonesian archipelago, in 2004 killed an estimated 167,700 people and displaced hundreds of thousands more" (HPN 2009). The effects of this incidence had not yet finished when an earthquake in Pakistan hit the northern part of the India and Pakistan border, due to which about 73,000 people lost their lives along with 3.5 million who were displaced. In the same disaster, over 800,000 houses were destroyed. In order to reduce the severity of disaster impacts, the governments tried to use the available resources but since they were unprepared for the sudden event, large losses of both human lives and property occurred. In both India and Pakistan, the private (national and international) organizations worked with the government line agencies to reduce the intensity of disasters. Due to these disasters, governments put their efforts to frame strategies for DRR, including strengthening the local government system in Pakistan. The main reason for this was the fact that local government mainly works at the grass roots level and communities are involved in all stages of planning and implementation. It was considered that active involvement of people could reduce losses of disasters. Now, the question arises whether the local government system in Pakistan has the capability to combat any disaster, which may arise in any part of the country.

9.2 Methodology

In order to explore issues of coordination mechanism between local government and other departments (provincial, federal), reports both published and unpublished that are relevant to this topic were consulted. KI interviews were conducted with officials of Irrigation, Health and Agricultural departments working at the provincial levels. A questionnaire was prepared for the key informants and based on the questionnaire interviews were conducted with officials from the line departments during the month of September 2009. After an analysis of the results of

the KI survey, conclusions are drawn and recommendations for improvement of the present local government system are given.

9.3 Description of the study area, Punjab Province

Pakistan is a developing country with a population of more than 140 million. It has a total land area of 796,095 square kilometres. The varied size settlements are scattered between rural and urban areas. During the year 2001, the government of Pakistan introduced a new local government system, which replaced the old system from 1979. One of the major characteristics of this new system was devolution of powers from national to local level. The entire local government system was overhauled and a uniform administrative structure has been introduced throughout the country. The entire country area is divided into four administrative tiers: viz. Province, District, Tehsil and Union Council. Pakistan has four provinces namely Balochistan, Punjab, Sind and Khyber Pakhtoonkah Provinces along with Northern areas, Federally Administrated Tribal Areas (FATA) and Islamabad Capital Territory.

Punjab province is the biggest with regard to population, as according to the 1998 census the total population of the province was 73621290. The population is growing at a fast rate and sizes of urban areas are increasing at a much faster rate than ever before. Punjab is also called land of five rivers, namely Ravi, Sutleg, Chenab, Jhelum and Baiass. These rivers are further expanded into a canal system. The irrigation system of Punjab is considered to be one of the best in the world. Due to the presence of these five rivers, this province is famous for its extensive agricultural production. Major parts of the country's food requirements are fulfilled with the agricultural produce of Punjab. The province is well connected through rail, road and air with all parts of the country. The province is also connected with the Indian border. For administrative purposes the entire province is divided into 36 districts.

The major disasters that occurred in the province during the previous years were floods, virus attack, cyclone and drought. The effects of these disasters in terms of human or property losses can be estimated by table 9.1: the table shows that the most severe disasters that occurred in Punjab province were in form of floods followed by droughts and virus attacks.

9.4 Local government system in Pakistan

Under the new local government ordinance of 2001, political and executive systems have been introduced at three tiers: viz. District/City District (a City District set up is present in Lahore, Gujranwala, Faisalabad, Rawalpindi, Multan districts), Tehsil/Town and Union Council. Political and executive offices have been established to run the state affairs.

Certain changes have been made in the old local government system. Although the effort was good in its intentions, unfortunately no arrangement could be made in that set up to cope with any disaster, which may arise in an area. There is only one Deputy District Officer of Civil Defence at the district level but its role is not clear and could not show any significant performance during the past years. Apart from this, no department, which was given responsibility to start relief work at time of disaster, exists. Therefore, in this situation there are maximum chances of large losses of property and human lives in case a disaster occurs. This was also confirmed through KI interviews by receiving similar types of responses that arrangements are almost negligible to meet any disaster.

Similar types of structures exist at the sub-district (Tehsil/town in case of city district) level within the framework of local governments where no special department has been established, that would be responsible for any type of relief work at time of a disaster. At this Tehsil/town level, there also exists a gap in that no arrangements could be found that can help to stop or reduce the effects of disasters.

In continuation of exploring the local government system, the third tier is the Union Council set up that is present at the grass roots level. This is the lowest level in the local government system, which exists at both urban and rural levels. Here, maximum provisions are made for community interaction and participation in decision-making. A vacancy with the name of Secretary Community Development was created but its objectives are not specifically addressed towards making arrangements necessary to reduce effects of disasters in any area. Hence, this level also lacks management of DRR.

Losses caused by natural disasters in Punjab in the recent past				
Type	Year	Lives lost	Villages affected	People affected
Flood	2001 1998 1997 1996 1992	47 250 196 435 234	4 161 5891 3767 7435	202397 2085585 1272499 4121010 2881300
Virus attack	1988 2004 2003 2002	- - - -	4035 702 144 122	- - - -
Cyclone	2002	-	7	-
Drought	2004 2003 2002 2001	- - - -	313 31 3493 3449	- - - -

Table 9.1: Losses caused by natural disasters in Punjab in the recent past.
Source: Provincial Disaster Management Authority 2008

9.5 Discussion

The results of the survey and KI interviews show that the Department of Irrigation and Power at the provincial level which is responsible for the case of floods, as well as the Department of Agriculture which deals with droughts, have neither link nor regular coordination mechanism with the local government. Both Agriculture and Irrigation departments work independently to cope with the situation. Likewise, the Health department also works without coordination with local government. Unfortunately, there do not exist direct horizontal or vertical links between the provincial and local government within the institutional setting. Both provincial and local governments work in parallel and could not make a bridge for cooperation. Consequently, temporary arrangements have to be made during disaster events. Rescue and other measures are started randomly at time of incidence. These temporary arrangements are in form of interference of a third department, which is the Army. For example, Table 9.1 shows that in the province disasters mainly occurred in form of floods. In this case, the Army from the barracks support the rescue works of the government departments – both local government and others at the provincial level. But the district, Tehsil, or union councils under the local government system do not have any arrangements to cope with any type of disaster situation. This institutional weakness puts peoples' lives and properties at stake. The severity of disaster varies with respect to district, tehsil and union council levels. After the disaster event, this situation does not get better due to lack of planning and proper management of the local government for recovery and rehabilitation.

9.6 Conclusions and recommendations

Based on the aforementioned study, the following conclusions are drawn:

1. A new local government system has been introduced and efforts have been made to devolve the powers from top to bottom. Attention to the people at the grass roots and their involvement in decision-making are increasing. For this purpose, a three-tier administrative structure has been devised: viz. District/ City District, Tehsil/Town and Union Council.

2. At the local government level, sufficient arrangements to cope with disasters have not been developed and implemented efficiently. Local governments still have to depend on other department/s to reduce disaster impacts.

3. There exists a very weak or almost no coordination between the local government and other departments working at national or provincial levels.

4. Particularly the departments working at the provincial level are not ready to co-operate with the local bodies. The disaster occurrences in the past have proved this lack of cooperation as a critical factor.

The following recommendations are made in order to reduce disaster risks in the province:

1. There is a strong need for strengthening the present local government system both in terms of administration and coordination.

2. The line agencies working at federal and provincial levels should establish a strong link with the new local government system to enhance the effectiveness of efforts to minimize disaster risks and losses.

3. There should be a separate directorate under the umbrella of the new local government organizational structure, similar to other directorates. This directorate should formulate policies and strategies to prepare the people especially at the grass roots level.

4. The role of private organization to reduce the disasters risk cannot be ignored. Therefore, there is a severe need to involve the private agencies in DRR processes. This also requires establishment of strong links between private organizations with the local government.

5. Local government political weight can be used as an important resource to minimize human losses. Political figures can play their roles in preparing the people to combat any disaster (if any) in the areas.

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10. Importance of good governance and capacity-building in planning for Climate Change Adaptation: reflection from Indonesia

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For effective CCA planning, various prerequisites are needed. This paper describes the importance of good governance and capacity-building to support CCA planning. Planning of CCA should be aligned with good governance principles that ensure the mainstreaming of CCA and associated disaster risks in local development strategies. What is also needed is political commitment and institutional development (governance), which recognizes DRR and adaptation to climate change as national and local responsibilities. Efforts should be made to decentralize authority wherever possible. In order to relate DRR/CCA recommendations to local realities, global trends towards devolution of authority must be taken into account so that local leaders are able to make decisions about planning, management and resource allocation. Devolution is good for DRR/CCA since it puts decision-making in the hands of those who are directly experiencing climate change and disaster risks. On the other hand, capacity-building for climate change refers to the development or strengthening of skills, expertise and knowledge in individuals and institutions and organizations. Building human and institutional capacity to address climate change should be a fundamental component of a climate change adaptation programme. In response to current priorities, addressing climate change can be best accomplished by integrating capacity-building into government, institutional and community decision-making. The last part of this paper highlights a case study of CCA in Indonesia.

10.1 Introduction

Currently, new patterns of risk are created by the climate change brought by global warming. Pribadi (2008) summarized that climate ranges, regional averages, as well as climate zones would be altered by global warming, impacting the current hydrological cycle resulting in a higher frequency and magnitude of hydro-meteorological disaster events, such as the increase of coastal flooding, aggravated by SLR due to the melting of glaciers and polar ice, as well as the oceans' thermal expansion. Natural disaster events, such as floods and landslides, will be increasing, in terms of frequency as well as severity. Many local communities, especially the poor ones, are very sensitive to the change, meaning that vulnerability is increasing, despite the continuing support from the social networks and the safety nets from various institutions. The increase of social and economic pressures due to the changes, in addition to already existing geo-hazards, will significantly affect and raise the current disaster risk level. The achievement of the Millennium Development Goals (MDGs) of various countries related to poverty, hunger and health may also be seriously compromised.

At the local level, to properly respond to the increasing risks, it is important to ensure that DRR and CCA adjust to the dynamics of decision-making at provincial, municipal and community levels, because these are the levels at which impacts will be most strongly felt. DRR/CCA guidance will be needed to support development agencies in understanding the pressures, obstacles and incentives confronted by local actors as they decide on their own courses of action in dealing with climate change and disaster risks.

In this regard, good governance and capacity are two critical aspects which, connected to each other, will determine the success, or otherwise, of the efforts in DRR/CCA. In essence, good governance requires that decisions are made and implemented using a clear and legitimate process, to achieve consistent and effective policies, and when considering CCA, good governance means the manner in which decisions are made which articulate adaptation strategies to climate change, adopting from the "born" policies. On the other side, good governance principles for adaptation to climate change planning are also meaningless without capacity-building efforts to back them up, and capacity-building without good governance will also be ineffective.

10.2 Purpose of the study

Governance is about how governments and organizations interact, how they relate to citizens and how decisions are taken in a complex world. Thus, governance is a process wherein societies and organizations make important decisions, determine whom they involve in the decision-making process and how they are accountable.

The concept of governance may be usefully applied at different levels – global, national, institutional and community. In principle, the concept of governance may be applied to any form of collective action. Governance opens a new intellectual space as it provides a concept that allows us to discuss the role of government in dealing with public issues and the contribution that other players may make. It opens the possibility that groups in society other than government, that is in particular the community and voluntary sectors, have a strong role to play in addressing and communicating CCA planning and disaster risk assessment options. Capacity-building is a strategy for managing DRR and CCA, but is a challenge for planning and needs to be addressed systematically.

The objective of this paper is to discuss approaches of good governance and capacity-building to the development of CCA planning, as well as to highlight the importance of short and long-term engagement of those approaches.

10.3 Methodology

This paper is based on a literature review, participatory observation, as well as discussions process with practitioners and experts. From this research a number of key issues have been identified.

10.4 Good governance

10.4.1 Principles

The Global Assessment Report on DRR (UN/ISDR 2009) argues that good governance is usually built on a partnership between competent and accountable local government and an active civil society that can articulate needs and priorities, and is supported by the decentralization of authority and resources from a supportive central government. Improvements in urban and local governance can integrate DRR considerations into broader social and environmental planning strategies that ensure land tenure, secure livelihoods and community safety.

Good governance is often underpinned by strong local democracy. Competent and democratic local governments often arise where decentralization programmes have ensured power and resources for the local level. For example, the introduction of elected mayors and councillors over the last 10–20 years has helped make many city governments more accountable and responsive to their citizens. However, it also usually requires a dynamic and proactive civil society and the emergence of innovative partnerships between grass roots organizations, local NGOs and local government. Good governance is not only the result of elected mayors and councillors or national decentralization processes, but also of civil society having avenues to participate in governance. This combination of national policies and programmes that encourage decentralization strengthened local democracy, and an active civil society has held the key to a wide range of innovative partnerships that can potentially support efforts of adaptation to climate change and sustainable DRR.

In order to ensure effective mainstreaming of adaptation to climate change and associated disaster risks in local development strategies, good governance is needed. Risk assessment and the subsequent implementation of DRR programmes in development activity support different aspects of good governance.

Table 10.1 is a compilation of good governance principles, based on the United Nations Development Programme (UNDP 1997) and on the Institute on Governance, Ottawa, Canada (Graham et al. 2003).

10.4.2 Good governance and Disaster Risk Reduction/Climate Change Adaptation approach

Overcoming issues in adaptation to climate change and DRR requires policymakers and stakeholders at the national level to connect across a broad range of sectors, demonstrating their commitment and offering concrete solutions, and many are applicable at the local and individual levels. What is needed is political commitment and institutional development (governance), which recognizes DRR as national and local responsibilities. National and local authorities need to recognize the value of investing in DRR, ensuring sufficient resource allocation and the implementation of realistic policies. Increased national and local commitment is required, with more institutional structures set in place to support local coordination of disaster reduction activities. To a large measure DRR/CCA incentives and constraints are derived from how institutional, organizational and individual perspectives are framed at the local level. For example,

Compilation of good governance principles	
	UNDP good governance principles
1. Legitimacy and voice	Participation – all men and women should have a voice in decision-making, either directly or through legitimate intermediate institutions that represent their intention. Such broad participation is built on freedom of association and speech, as well as capacities to participate constructively. Consensus orientation – good governance mediates differing interests to reach a broad consensus on what is in the best interest of the group and, where possible, on policies and procedures.
2. Direction	Strategic vision – leaders and the public have a broad and long-term perspective on good governance and human development, along with a sense of what is needed for such development. There is also an understanding of the historical, cultural and social complexities in which that perspective is grounded.
3. Performance	Responsiveness – institutions and processes try to serve all stakeholders. Effectiveness and efficiency – processes and institutions produce results that meet needs while making the best use of resources. Accountability – decision-makers in government, the private sector and civil society organizations are accountable to the public, as well as to institutional stakeholders. This accountability differs depending on the organizations and whether the decision is internal or external.
4. Accountability	Transparency – transparency is built on the free flow of information. Processes, institutions and information are directly accessible to those concerned with them, and enough information is provided to understand and monitor them.
5. Fairness	Equity – all men and women have opportunities to improve or maintain their well-being. Rule of Law – legal frameworks should be fair and enforced impartially, particularly the laws on human rights.

Table 10.1: Compilation of good governance principles. Source: UNDP 1997; Graham et al. 2003: 3

the priorities of farmers, town councils, businesses, local media and micro-entrepreneurs must be the starting point if effective measures are to be developed to manage CCA.

Enhancing policy development and integration ensures that all relevant sectors include disaster risk management as a basic tool of sustainable development. Cross-sectoral policy cooperation is necessary to ensure a coherent and consistent approach across environmental and socio-economic policy areas, such as designing interventions concerning natural resource management, agriculture or coastal zone management, that link DRR/CCA goals with local efforts to pursue opportunities and overcome constraints to development. Facilitating greater engagement of market actors, from insurance companies to agricultural input suppliers, in responding to the demands that will be stimulated by local awareness of the risks and opportunities of adapting to climate change, should achieve the aforementioned ends. As has been mentioned by Christoplos (2008), natural resource management is about finding ways to combine short-term profit with longer-term sustainability. For example, agricultural extension and private enterprise are already active in adapting their strategies to rising commodity prices. The need for drought-resistant seed varieties, for example, is something that should be part of their business strategy. The challenge for development efforts is to make certain (by developing policies and regulations) that these market actors have an enabling environment in which to adapt their businesses based on accurate and appropriate information and investment incentives that reflect the challenges and opportunities of DRR/CCA.

Within the country, under the theme of increasing intra-local cooperation, policy interests and material resources need to go beyond strictly national boundaries, with regional efforts strengthening national and local capacities. Information exchange and sharing of experiences at the local level are vital to maintain a healthy dialogue for DRR/CCA.

Therefore, as noted by the Commission on Climate Change and Development (Christoplos 2008), the "political will" for DRR/CCA is a commodity that must be generated locally. It also requires that technology transfer efforts are aligned with initiatives to "empower" local officials to govern in ways that are responsive to their communities, thus bridging the gap between scientific knowledge and practice.

10.4.3 Good governance and decentralization

By continuing efforts to decentralize disaster risk management practice, community participation and local decision-making is supported. In order to relate DRR/CCA recommendations to local realities, global trends towards decentralization must be taken into account. In this context local decision makers are increasingly able to make appropriate decisions.

Devolution is good for DRR/CCA since it puts decision-making in the hands of those who are directly experiencing climate change and disaster risks. According to the policy brief, commissioned by the Commission on Climate Change and Development proposed by Christoplos (2008), information, such as agro-meteorological data (combined with strengthening of local capacities to understand and use this information) and transparency regarding development planning have proven effective in enabling them to make better informed decisions.

Public information and debate are also vital as local government is often more accountable to its constituents than to a distant national government. Pressures for implementing DRR/CCA must also come from below, thus ensuring an inclusive approach. By building on decentralization demands, it brings attention to what "they" want from "us" as the starting point for dialogue, rather than what "we" expect "them" to do. It engages also local stakeholders to explore which new actors should take on new or different roles in DRR/CCA.

DRR/CCA in terms of good governance should be in alignment with the "new landscape" of local institutions and community engagement (Christoplos 2008), the encouragement of accountability and integrity of the public sector as one of the foundations for sustainable change and awareness that informal relations and norms strongly influence the actions of local government and civil society. Also it is important to adapt DRR/CCA mechanisms to minimize transactions costs for local government and other public sectors.

In addition it is suggested that if DRR is implemented by adopting good governance practices, an indirect benefit may be generated wherein the pre-conditions are set for the implementation of deeper reform that can decrease overall vulnerability (Tompkins et al. 2008). One example proposed by Mitchell (2003) and Allen (2006) in Tompkins et al. (2008) involves disaster managers adopting community-based participatory disaster response plans that encourage stakeholder mobilization and the creation of social capital, which in turn challenges power inequalities at the local level.

Therefore, it is critical not only that we find out what has enabled some countries or regions to fare well in terms of reducing risk and how to transfer this knowledge to other nations, but also to understand how success can foster long-term reduction of vulnerability to climate change. Wisner et al. (2004) in Tompkins et al. (2008) also refer that identifying generic lessons from best-practices case studies in different geographic regions experiencing different types of hazards and utilizing different forms of governance may provide some insight into how DRR/CCA practice can be enhanced to bring out the wider development gains.

10.5 Capacity-building

10.5.1 Capacity-building defined

Building a country's capacity encompasses a country's human, scientific, technological, organizational, institutional and resource capabilities. A fundamental goal of capacity-building is to enhance the ability to evaluate and address the crucial questions related to policy choices and modes of implementation among development options, based on an understanding of environment potentials and limits and of needs perceived by the people of the country concerned (UNCED 1992).

10.5.2 Capacity-building and Climate Change Adaptation

Building human and institutional capacity to address climate change is a fundamental component of CCA. Capacity-building cuts across many

of the issues under consideration in the climate change process, including activities focused on for example, greenhouse gas mitigation, technology transfer, land-based carbon sequestration, climate change science and last but not least vulnerability and adaptation to climate impacts.

In response to the current needs, education and training throughout the country could provide relevant knowledge and skills to address CCA priorities. Training should address the development and transfer of technologies, such as vulnerability and adaptation to climate impacts, monitoring and evaluation of greenhouse gas (GHG) emissions, and the economics of climate change. Government should place emphasis on partnerships with the private sector and on working with local and national authorities, engaging communities, and NGOs to create alliances that build upon the relative strengths of each. Training and technical assistance programmes often support demonstration activities that strengthen in-country capacity, as well as promote strategic partnerships, education and outreach, technology cooperation and research.

It is clear that all areas of climate change policy development require additional attention and investments of human, financial and technical resources. The list of capacity needs, according to the Organization for Economic Co-operation and Development (Levina 2002) are:

1. Establishment or strengthening institutions at the national level to coordinate and guide activities for climate change policy development and implementation (including national systems for data collection and verification)

2. Transfer of methodologies and know-how on monitoring and data collection, data quality assurance and control, through:

- Methodological and legislative assistance, with respect to accession issues
- Public awareness support
- Education of local government and industry stakeholders and support for dialogue among various stakeholders
- Awareness-raising among government officials and parliamentarians
- Training of local experts.

It is crucial that governments create conditions that are conducive to the success of technical assistance efforts. The first step in this direction would be a clear division of responsibilities among all institutions involved in climate policy development. Without a precise designation of authority the effectiveness of assistance programmes will be reduced.

The government should promulgate those policies. In addition, as the private sector is going to be one of beneficiaries of these flexibility mechanisms, the government should try to find ways to involve the private sector (with its financial and human resources) in the development of national systems that a country needs to participate in DRR/CCA. For example, many local government and industry stakeholders do not understand the importance of the national inventory to their future involvement in the mechanisms. Engaging and educating them on these issues may lead to further mobilization of in-country financial resources.

10.6 Reflection from Indonesia

10.6.1 Climate Change Adaptation policy development

Indonesia has started a series of activities to respond to increasing climate risk by developing various policy initiatives, through task forces within different government sectors and research institutions, as well as a national committee on climate change mitigation and adaptation. These government sectors (water resources, coastal zones and peat land, coastal and small islands, agriculture, forestry, health, energy, infrastructure and spatial planning) have developed programmes for adaptation in the short and long-term as presented in the Indonesia Country Report "Climate Variability and Climate Change, and their Implications" (Ministry of Environment 2007). An example of long-term plan for the Agriculture sector that has been described by Boer et al. (2008) in the Indonesia Country Report is given below:

- adjust the cropping pattern following the climate forecast
- improve crop management
- improve irrigation facility and irrigation efficiency

- provide more opportunity for alternative economic activities
- set up policy to ban conversion of rice field to other uses in Java; stand by funding, insurance system
- expand the rice growing areas to less vulnerable areas, new varieties
- maintain and increase forest cover in the upstream
- diversity of food consumption
- develop new irrigation plan facility in vulnerable rice production centre areas whenever possible to allow for increasing planting index and productivity
- inter-basin transfer.

Research to develop knowledge on climate change phenomena and problems in Indonesia has been ongoing since the 1990s, conducted by academic institutions and government research organizations. Although work on the issue has not always been conducted in an integrated and coordinated manner, it has provided valuable input to the development of government policy and programmes, despite a sectoral approach.

The development of the National Action Plan Addressing Climate Change (NAPA-CC) in Indonesia was initiated during the International Joint Workshop on Water and Climate from 23 to 24 May 2007, organized by the Indonesia Water Partnership and the Ministry of Public Works. This workshop was followed-up by a report on climate change and its implications in Indonesia and subsequently, the government launched the Indonesia Country Report and NAPA-CC documents at the ICCOP Meeting in Bali in 2007 (see further in Pribadi et al. 2010).

Following the establishment of the NAPA-CC, the Ministry of National Development Planning/ National Development Planning Agency produced a document on the National Development Planning Response to Climate Change: Long-Term and Medium-Term 2004 – 2009 National Development Planning Climate Change Mitigation and Adaptation Program, which covers initiatives in the forestry, marine, mining and mineral resources, environment, agriculture, health, water resources, transportation, energy, electricity/ power, housing and settlements sectors) (Anon 2007d in Pribadi et al. 2010). A document produced by UNDP Indonesia in 2007, "The Other Half of Climate Change", discusses the climate change issues in term of threats to livelihoods, health, food security and water sector. The recommended priority areas to be developed for CCA programmes include agriculture, coastal zone management, water supply, health, urban areas and disaster management.

UNDP also supported the national government in developing Indonesia's Climate Change Adaptation Program (ICCAP) which was drafted in December 2007, consisting of the following principles:

- opting for no-regrets measures and addressing climate variability as the starting points
- ensuring participatory approach in developing the CCA agenda
- adjusting the ongoing and planned initiatives and programmes for possible adaptation measures to the climate risks
- institutionalizing and effectively utilizing the knowledge base on climate variability to better manage current and future risks
- harmonizing policies and programmes in decentralized and multi sectoral setting.

The approach adopted by the ICCAP is such as to:

- contribute to embedding climate risk and opportunity management into development planning within the framework of the MDGs
- ensure consideration of climate change and opportunities in development decisions and investment to improve socio-economic resiliency of sectors and communities to climate change and variability

The ICCAP targeted the following output:

- a national Consortium and Research Grant Facility for Climate Risk and Opportunity Management (CROM)
- guidance for climate resilient spatial planning, settlement design and infrastructure systems in key sectors and priority geographic areas

- education, awareness and training programmes to enhance CROM in seasonal/ inter-annual and multi-decadal time scales
- community, private and government institutional capacities strengthened to undertake CROM
- policy, legal and regulation framework for CROM implementation on the seasonal/ inter-annual and multi-decadal time scales
- climate and development information exchange systems established in a number of priority sectors and vulnerable regions.

Although ICCAP provides an opportunity for a programmed CCA planning approach and supports different aspects of good governance, such as strategic vision, transparency, fairness, performance and accountability, the process was not followed up by the necessary detailed planning and implementation due to a change in the governance. Nevertheless, some of the ideas are being taken seriously and some projects were developed accordingly and implemented, although in a partial manner.

A new study on climate change conducted by the National Planning Development Agency/ Bappenas (Bappenas 2008; Boer et al. 2008; Widiaryanto 2009) as the follow-up of the Bali Action Plan (agreed during the COP 13 UNFCCC climate negotiations 2007 in Bali) has produced the National Development Planning Response to Climate Change Document that reveals four objectives, such as (1) to integrate climate change programmes as part of national development planning process; (2) to present sectoral and cross-sectoral top priorities on climate change within the framework of sustainable development; (3) to provide an overview of funding mechanisms and institutional arrangements within the bilateral as well as multilateral cooperation scheme; and (4) to provide clear guidance for development partnership on climate change. This document is essential and strategic since it translates the existing climate change action plans into national development programmes. It is to be used for initial input into discussions with sectoral ministries and non-departmental institutions to prepare the Mid-Term Development Plan 2010-2014. It is a living document, which is dynamic and would be adjusted with the ongoing growing of commitment to climate change initiatives. It have been identified about 54 climate change projects (26 adaptation, 18 mitigation and 8 integrated adaptation and mitigation projects). It should serve as well as a reference for the international community to support climate change related programmes prioritized by Indonesian national development.

10.6.2 Discussion

The development of the policies on CCA at the national level was supposed to be followed up and taken down to the local government and grass root level of implementation. However, despite the progress in the devolution of the governance and government authority in Indonesia since the political reform of the 1998, challenges over the implementation of the CCA policies at the local level have not been really completely addressed. The desk study on Indonesian Environmental and Climate Change Policy Brief prepared for the Swedish International Development Cooperation Agency (Sida) by Wingqvist and Dahlberg (2008) revealed that, after the devolution process in 2001, there has been a degree of devolution of government at current level, and local authorities were able to develop their own plans; however, the issues around the enforcement of these policies remain.

Actually, good policies exist, but there is capacity limitation to enforce these legislations at the local level. In addition, new challenges have risen for environment and natural resources managers. There are gaps between policy and practice, as well as weak vertical and horizontal integration. Currently the State Ministry of Environment is Indonesia's central environmental authority, supervising and supporting provincial and local authorities in environmental management and the implementation of national policy and regulations. However, regulatory bodies in many provinces and districts fall directly under the governor or head of a district, sometimes making new interpretation of the existing rules. It certainly is a capacity constraint; therefore, there is a need to strengthen the environmental management capacities of local government agencies, particularly important in the context of a vast decentralization process.

Furthermore, when it comes to CCA planning at the local level, communities' involvement could be encouraged by local government, ena-

bling them to participate by creating an umbrella programme of small scale adaptation project activities, without neglecting the role of NGOs and Community Organizations as a facilitator and implementer.

10.7 Conclusion

The response to DRR/CCA has changed from a single agency approach to partnership, focusing on more proactive risk management measures developed with communities. Management plans to facilitate and guide the mitigation and adaptation strategy are to be formulated in public participatory processes by starting applying good governance principles at the local level. Local governments play an important role in DRR/CCA, in particular in its implementation through real activities. The dynamic of the local political situation related to the change of political leaders through a direct election process may influence local disaster management policy. There is a strong need in strengthening the environmental management capacities of local government authorities for better and target-oriented CCA planning, especially in the context where vast devolution process is catapulted. Good governance's principles have to be applied throughout the process but without sufficient knowledge and continuous capacity-building, the whole process of CCA planning will not be effective or even not possible at all. Good governance and capacity-building is inter-related and should appear as one package in the CCA planning process.

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11. Linking Disaster Risk Reduction and Climate Change Adaptation: comparing experiences from developed and developing countries

Riyanti Djalante, Shantana R. Halder, Farah Mulyasari and Shabana Khan

The benefits of integrating DRR and CCA have frequently been emphasized in the literature. Conceptual similarities and differences along with barriers and opportunities for their convergence have been put forward. However, linking the two approaches has been found to be difficult in policy and practice. This paper presents the institutional responses to linking DRR and CCA in Indonesia, Bangladesh and New Zealand and the key challenges faced at the ground level. Indonesia and Bangladesh are chosen to represent experiences of low and middle income countries which are currently two of the most vulnerable countries to climate change impacts, while New Zealand represents an example of highly-developed countries but is still vulnerable to certain types of climate change impacts.

11.1 Introduction

Linking DRR and CCA has been recognized as a significant step for reducing vulnerabilities to changing risks derived from climate change. The Bali Action Plan of the UNFCCC Parties highlights that existing knowledge, experience and capacities for reducing vulnerabilities and increasing preparedness to extreme weather events must be harnessed in adapting to climate change (UNFCCC 2007). The integration of the two approaches is also emphasized in the 2009 Global Platform on DRR (GP-DRR 2009). Interlinking DRR and CCA has three key benefits. These are the reduction in climate related losses (Venton and La-Trobe 2008), more efficient use of financial, human and natural resources (Schipper and Pelling 2006) and increased effectiveness and sustainability of both adaptation and DRR approaches.

Various strategies have been highlighted to integrate the two processes. A key strategy is to focus on the commonalities and synergies between the two processes. DRR needs to take into account changing hazards and adaptation needs and to place more emphasis on developing capacity and resilience against hazards. Another commonality is that both DRR and CCA emphasize vulnerability reduction and sustainable and flexible long-term strategies to reduce the risks of adverse impacts. Both also promote approaches that are pro-active, holistic and long-term either before or after hazards occur (Schipper 2009).

Differences between DRR and CCA, in contrary, exist in terms of the terminology used, the actors involved and the types of interventions employed. Thomalla et al. (2006) outline six current differences between DRR and CCA, in terms of their approach, organizations and institutions, international conferences, assessment, strategies and funding. These differences create problems in implementing an integrated response to DRR and CCA.

The reasons behind the visible lack of effective interlinking of the two processes are elaborated by Tearfund (2008). These include:

Confusion over similarities and differences: whilst there are many similarities between the two subjects, there are also several differences that are quite straightforward (e.g., earthquake-focused DRR is not related to climate change), while others are more subtle. The climate change and DRR communities have not always well understood these differences, and there has been general confusion about where synergies start and end. Confusion and erroneous assumptions about the synergies between adaptation and DRR may have hindered the climate change community from embracing the DRR agenda, and prevented the DRR community from becoming more engaged in climate change policy and processes at all levels.

Concern over different approaches: climate change and disaster risk management communities have different origins, approaches to and methods for addressing adaptation and DRR. These differences have acted as a barrier to closer collaboration. For example, adaptation to date has been treated as a predominantly top-down process, augmented by international policy responses through the UNFCCC. In contrast, the disaster risk management community has established the need for a community-based emphasis a long time ago. The current "top-down" approach to adaptation can be an issue of concern to DRR policymakers and practitioners. Another significant difference in approach relates to perspectives on vulnerability. The disaster risk

management community is more likely to consider and address social, physical and economic factors contributing to people's vulnerability. The disaster risk management community has expressed concern that if adaptation and DRR agendas are brought together the focus on vulnerability and poverty reduction will be lost. Whether or not such concerns are justified, there is some evidence that they have – in part – hindered DRR policymakers from being more actively involved in the climate change agenda in recent years. To achieve more synergy between adaptation and DRR, the two communities need to focus on a shared agenda of poverty reduction, increasing funding flows to the poorest people and working together on challenges.

Lack of clarity regarding how integration is achieved: although coordination and collaboration on CCA and DRR seems like an obvious and fruitful step forward, it is important to understand when, at what level, and to what extent coordination is required, as well as who should take the lead. These aspects have not been clearly established yet. One reason for this is that collaborative work must involve scientists, practitioners and policymakers from communities that are in many ways very distinct and with different cultures, all drawing on different types of information, knowledge and experiences.

In spite of the aforementioned issues that could explain the failure to link DRR and CCA, DRR and CCA have similar aims and mutual benefits. However, to date the climate change and disaster risk management communities have operated largely in isolation from each other. This situation must change as a matter of urgency. One of the criteria of success in linking DRR and CCA is that DRR and CCA policymakers, experts and practitioners must communicate and collaborate with each other effectively to ensure a comprehensive risk management approach to development at local, national and international levels of government. This could result in the following benefits: reduction of climate-related losses through more widespread implementation of DRR measures linked with adaptation, using financial, human and natural resources more efficiently, and increased effectiveness and sustainability of both adaptation and DRR approaches.

11.2 Purpose of the study

The purpose of this paper is to present three case studies of implementing integrated DRR and CCA response at the national level in Indonesia, Bangladesh and New Zealand, followed by a discussion of common challenges and issues faced at ground level.

11.3 Methodology

This study is based on an empirical study conducted on various international initiatives, programmes, policies and institutions, which guide DRR and CCA in the three countries. New Zealand is included as a case study representing a developed country due to its similar characteristics to many Southeast Asian developing countries; apart from a variety of hazard exposures, its economy is primarily based on agriculture. A significant proportion of the population of the country is indigenous, which along with other immigrant ethnicities is vulnerable to climate change and associated changes in hazard characteristics. The difference in the level of development of New Zealand with respect to other Southeast Asian countries opens the opportunity to share a variety of measures, as well as the lessons learned from past events. A comparison of case studies from developed and developing countries could provide rich and diverse information base along with methods and technology that can be shared for collective growth and development.

11.4 Case study I: the Indonesian experience

This case study explores how international initiatives, programmes, policies and institutions guide DRR and CCA in Indonesia and how these are translated into operational activities at the national and sub-national levels.

Governance of DRR and CCA: while the linking of DRR and CCA approaches has been strongly advocated, limited joint action has occurred to date. In Indonesia DRR and CCA are coordinated by two different institutions with different funding mechanisms. Bappenas, UNDP, the National Agency for Disaster Risk Reduction (Badan Nasional Penanggulangan Bencana - BNPB) and The National Council for Climate Change (Dewan Nasional Perubahan Iklim – DNPI) all have important roles in facilitating and coordinating the linkages between DRR and CCA and in mainstreaming them into development agendas

(Bappenas 2009; UNDP 2009; BNPB 2009; KNLH 2009). DRR is managed by BNPB at the national level and the Regional Disaster Risk Reduction Agency (Badan Penanggulangan Bencana Daerah - BPBD) at the sub-national level (BNPB 2009). Climate change mitigation and adaptation are coordinated at the national level by the National Council for Climate Change (Dewan Nasional Perubahan Iklim - DNPI) (KNLH 2009) and on the sub-national level by different sectoral agencies such as the Ministry of the Environment, the Ministry for Energy and the Ministry for Water Resources.

Examining the structures of the two agencies, we can identify several important differences. While BNPB is led by a head who holds parallel status to a minister, DNPI is directly led by the President of the Republic of Indonesia. The fact that there is a direct involvement of the President and eigtheen ministers could imply that climate change is considered a high priority on the national development agenda. But it is still unclear how to coordinate climate change management between national and sub-national government levels. Examining the regulations of DNPI closely, there are no clear guidelines for planning and coordinating climate change actions at sub-national levels. Moreover, considering that the Minister of the Environment coordinates the day-to-day activities of DNPI, indicates that the government focuses more on mitigation than on advocating adaptation more strongly. We suggest that UNDP and Bappenas should play crucial roles in creating a stronger linkage between DRR and CCA.

In 2007, a National Action Plan for Disaster Risk Reduction (NAPA-DRR)/ Rencana Aksi Nasional Pengurangan Resiko Bencana (RAN-PRB) 2006-2009 was issued (Bappenas 2007), and a National Action Plan for Climate Change (NAPA-CC)/Rencana Aksi Nasional Perubahan Iklim (RAN-PI) was produced in 2007 (KNLH 2007). The NAPA-CC specifically states that Indonesia's current capacity in dealing with climate chance will strongly affect its capacity to do so in the future and that it is therefore important that the current NAPA-DRR is incorporated in the NAPA-CC.

Mainstreaming DRR and CCA into Development: development processes in Indonesia are coordinated by Bappenas, which plays a crucial role in the coordination of development agencies in DRR and CCA and in the mainstreaming of DRR and CCA into development planning. As stated in the National Development Planning Law or Undang-Undang Sistem Perencanaan Pembangunan Nasional/SPPN Number 25 Year 2004, development processes in Indonesia are guided by three key development documents of Long-Term Development Planning (Rencana Pembangunan Jangka Panjang - RPJP), Mid-Term National Development Planning (Rencana Pembangunan Jangka Menengah - RPJMN) and an Annual Development Plan (Rencana Kerja Pemerintah - RKP) (UU No. 25/2004).

Law Number 17 Year 2007 stipulates Indonesia's Long-term Development Planning (RPJP) 2005–2025. The twenty year development direction is to achieve a sustainable Indonesia "Terwujudnya Indonesia yang Asri dan Lestari". Climate change and disasters are identified as critical challenges to Indonesia's development. The plan highlights the various disasters caused by extreme climatic events in Indonesia, including the recent floods and droughts that have brought forth heavy economic losses (UU No. 17/2007).

There is no specific mention of climate change and disasters in the Presidential Regulation Number 7 Year 2005 on the RPJMN 2004-2009. Instead, they are incorporated into the social welfare, natural resources and the environment development agendas (Perpres No. 7/2005).

The government, through Bappenas, produced an annual development planning agenda (Rencana Kerja Pemerintah - RKP). RKP is guided by the RPJP 2005-2025 and RPJMN 2004-2009, and must incorporate the results of public, multi-stakeholder consultations (Musrenbang/Musyawarah Perencanaan Pembangunan), as a bottom-up approach to the development process. The RKP puts forward the government's priorities for development to be addressed in the following year. There are some issues such as education, health and economic development which will always be high on the agenda, but DRR, climate change mitigation and adaptation are also considered urgent.

The 2004 tsunami resulted in considerable institutional and policy changes in Indonesia. Both RPJP 2005-2025 and RPJMN 2005-2009 did not specifically mention DRR as part of the long and mid-term development priorities because

these planning documents were created prior to the tsunami. Examining RKP documents prior to and after the 2004 tsunami clearly shows a shift in policy. The RKP 2006 to 2010 represents a change in DRR policy from providing post-disaster relief to achieving sustainability. There was no specific mention of DRR in the 2005 RKP because it had already been finalized before the tsunami struck. Starting with RKP 2006, the government's agenda for DRR was to "provide information regarding earthquake disasters and TEWS [Tsunami Early Warning Systems], which is accessible to the communities" and to "provide information and EWS [Early Warning Systems] with regards to climate change" (Perpres No. 39/2005). In the RKPs for 2007 and 2008, DRR constitutes one of the nine national development priorities (Perpres No. 19/2006), (Perpres No. 18/2007). An important target is to strengthen the preparedness of institutions and communities in preventing and mitigating the risks of future natural disasters. This mainstreaming process went further in the RKP for 2009 and 2010 which states that DRR and CCA should be linked and mainstreamed into the development process together (Perpres No. 38/2008). Both RKPs reiterate the importance of capacity-building in terms of building institutions, improving education and public awareness in dealing with climate change mitigation and adaptation, as well as with multiple hazards. However, there is no further guidance on how sectoral agencies should facilitate the linkage between DRR and CCA at the national and sub-national levels.

The Indonesian Law No. 25/2004 states that local governments are obliged to develop their planning and development programmes in line with national priorities. Local governments therefore need to translate RPJMN and RKP into their Mid-Term Regional Development Planning (Rencana Pembangunan Jangka Menengah Daerah - RPJMD), their annual Local Government Development Plan (Rencana Kerja Pemerintah Daerah), and their Regional Budget Expenditure Plans (Anggaran Pembangunan dan Belanja Daerah - APBD).

Funding Mechanisms for DRR and CCA: funding and capacity-building have a significant impact on creating awareness and improving the capacity of sub-national governments to develop institutions, policies and strategies for DRR. While funding mechanisms for DRR have devolved down to the sub-national government level, funding for action on climate change primarily targets policy formulation at the national level. In addition, existing strategies for climate change funding in Indonesia focus on mitigation rather than on adaptation.

Considering the large amounts of international funding expected to be available for climate change compared to those available for DRR, the DRR community is increasingly trying to access climate change funding mechanisms by promoting activities that both reduce vulnerabilities to multiple hazards and to expected climate change impacts. The Global Facility for Disaster Reduction and Recovery (GF-DRR) is a partnership of the International Strategy for Disaster Reduction (ISDR) system which supports the implementation of the HFA (GF-DRR 2009a). In Indonesia, GF-DRR is actively involved in building capacity for DRR through education, awareness-raising and supporting the preparation of the updated NAPA-DRR 2010-2014 (GF-DRR 2009b). Other international donors including the IFRC and international NGOs are actively supporting various HFA activities at the local level (IFRC 2009). Another example of DRR funding that has devolved to the sub-national level is the UNDP coordinated Safer Community through DRR project (UNDP 2007).

For CCA, there are four potential sources of international funding that can be utilized by the government of Indonesia (KNLH 2009), which are the Non-UNFCCC mechanism, the UNFCCC mechanism, Clean Development Mechanism (CDM) and private sector investments. The non-UNFCCC mechanism comprises grants from Bilateral Countries or Multilateral Institutions and Foreign Loans (Programme Loan, Sectoral Loan, Trust Fund). The UNFCC mechanisms include the Global Environmental Facility (GEF), the Special Climate Change Fund (SCCF), the Adaptation Fund (AF) and the up-coming Reduction Emission from Deforestation and Degradation (REDD) mechanism. Another possible mechanism is through CDM investment that can be conducted through bilateral, multilateral and unilateral arrangements. Lastly, the private sector can also finance mitigation and adaptation strategies. The government utilizes fiscal instruments to encour-

age the private sector to invest in environmentally friendly technology.

Community-based Disaster Risk Reduction and Climate Change Adaptation initiatives: in Indonesia, the 2004 tsunami resulted in changes in the way that grass-roots NGOs and Community Based Organizations (CBOs) respond to disasters, as well as in perceptions to risks and in the awareness of the value of the environment of DRR (Miller et al. 2006; Thomalla et al. 2006; Birkmann et al. 2006; Birkmann and Fernando 2008). NGOs and CBOs have shifted their focus from disaster relief and recovery to more proactive approaches of reducing hazard vulnerabilities and building resilience to shocks and surprises. While CBDRR has been actively advocated in Indonesia, we are not aware of any formally planned initiatives for community-based CCA. Based on these observations we contend that linking DRR and CCA at the community level should be prioritized and supported in the form of community-based and community-led initiatives that improve communities' resilience to climate change impacts and other hazards. We argue that existing tools for CBDRR need to be utilized as much as possible rather than re-inventing the wheel for community-based CCA.

Several CBOs and NGOs that have been actively involved in DRR and the formation of the Planas PRB in 2009 strengthened and acknowledged the importance of their roles in dealing with DRR in Indonesia. The Indonesian Red Cross (Palang Merah Indonesia - PMI) is a good example of how an NGO has expanded its mandate from focusing only on DRR to integrating CCA within its own capacity and experiences (IFRC 2009). PMI has long been involved in various humanitarian activities in Indonesia under the umbrella of the IFRC and is currently expanding its activities relating to climate-risk reductions. Supported by the IFRC, the Netherlands Red Cross (NLRC) and the German Red Cross (GRC) through the Community-Based Disaster Preparedness (CBDP) initiative, PMI is conducting two leading programmes of Community-based First Aid (Pertolongan Pertama Berbasis Masyarakat) and Integrated Community-Based Risk Reduction to Climate Change (ICBRR-CC) (Pengurangan Resiko Terpadu Berbasis Masyarakat untuk Adaptasi Perubahan Iklim) (PERTAMA) (PMI 2009).

The Indonesia Disaster Management Society (Masyarakat Penanggulangan Bencana Indonesia - MPBI) has been particularly active in the drafting of Law Number 24 Year 2007 on Disaster Management (MPBIa 2009). MPBI has been engaged with international organizations on various DRR activities, as well as conducting training for local governments in developing their disaster management plans. MPBI conducts annual meetings for CBDRR practitioners to enable knowledge sharing, networking and the development of more effective frameworks for CBDRR. During its fifth annually meeting in 2009 in Makassar, the need to integrate DRR and CCA with poverty reduction was strongly acknowledged and agreed on by all participants (MPBI 2009b).

Another example of the importance of NGOs is the Tsunami Alert Community (Komunitas Siaga Tsunami – KOGAMI), a non-profit organization that aims to educate people about disaster preparedness and how to survive and recover from disasters, especially earthquakes and tsunamis (KOGAMI 2009). KOGAMI is a great example of how local, collective actions can be successfully scaled-up into a more robust organization. Starting as a locally initiated relief action to help victims of the 2004 tsunami in Simuelue Island, KOGAMI transformed into an organization that is now expanding its DRR activities, through close coordination with the Government of Padang City, BNPB at the national level and various international agencies and organizations. There are also guidelines and training materials produced by several NGOs in Indonesia to support CBDRR in Indonesia (MPBI 2009; IDEP 2007).

11.5 Case Study II: the Bangladesh Approach

Bangladesh is commonly cited as a country extremely vulnerable to natural disasters. Regular river floods affect 20 per cent of the country increasing up to 68 per cent in extreme years. The floods of 1988, 1998, 2004 and 2007 were particularly catastrophic, resulting in large-scale destruction and loss of lives. The country is one of the worst sufferers of tropical cyclones, which originate in the Bay of Bengal and are accompanied by storm surges. On average 1.3 cyclones a year hit Bangladesh's coast. The worst cyclones were those of 1970, 1991 and 2007 causing the death of about half a million of people. Annually, the country loses about 8,700 hectares of

land due to river erosion, displacing around 180-200,000 people. Bangladesh remains in the list of seismically active regions of the world although there were no large scale earthquakes experienced in the last hundred years. The Centre for Research on the Epidemiology of Disasters (CRED) estimates that close to 229 million people have been directly affected by natural disasters during the thirty year period from 1979 to 2008, with over 7,700 killed and economic damage in the order of US$ 5.6 billion.

Bangladesh is one of the countries most at risk from the impacts of climate change. The available data and information illustrates the rapid increase in the frequency and intensity of large scale disasters due to its geophysical location, dominance of flood plains, low elevation from the sea, high population density, high levels of poverty and overwhelming dependence on natural resources. According to the 4th IPCC report, by 2050 rice production in Bangladesh could decline by 8 per cent and wheat by 32 per cent against the base year of 1990. There will be a huge shortage of safe drinking water especially in the coastal belt and in drought-prone areas in the north-west of the country. Increasingly saline drinking water may also result in health hazards, especially for pregnant women and increase the incidence of water-borne and air-borne diseases. Due to riverbank erosion and salinity intrusion about six to eight million displaced people would have to migrate to cities, which would increase the slum population.

Problem identification: Bangladesh has already experienced some significant impacts especially in terms of coastal inundation and erosion, saline intrusion, deforestation, loss of biodiversity and agricultural production and large scale migration. It is estimated that about 830,000 million hectares of arable land is affected by varying degrees of soil salinity. During the period 1973–1987 about 2.18 million tons of rice were damaged due to drought and 2.38 million tons due to flood. Annually, drought affects about 2.32 million hectares and 1.2 million hectares of cropped land during the Kharif (summer) (November to June) and Rabi (winter) (July to October) seasons respectively, while soil salinity, water logging and acidification respectively affect 3.05 million hectares, 0.7 million hectares and 0.6 million hectares of crop land in the country.

The coast of Bangladesh constitutes one third of the country's territory and is vulnerable to the predicted SLR due to climate change. There are 138 polders in the coast, which protect crops from the tidal inundation. These polders will be at risk of overtopping due to SLR resulting in damage to agriculture due to inundation. The recent study on the economic modelling of CCA needs, conducted by the Centre for Environmental Geographic and Information Services (CEGIS) with financial support from CDMP, made a number of scenario-based estimations, which revealed that if no adaptation is pursued the annual average loss could increase to 3 per cent of the GDP due to the expected increased frequency of floods over the next 100 years. Expected damage has risen to US$ 765 million annually. If adaptation is pursued, a total of US$ 127 million would be required for raising the road height for a length of 811 kilometres. Comparing the costs and benefits of such adaptations, Economic Internal Rate of Return (EIRR) (at a discount rate of 12%) shows a positive impact (63%). Delays in the implementation of adaptation measures or increases of costs may produce risks, but resilience of project impact to these risks have been tested and found that the EIRR still remains around 39 per cent under the most risky assumptions.

A similar exercise has been carried out for the health sector, which envisages a 7 per cent increase of diarrhoea and 1 per cent increase of dengue patients by 2050 due to changes in the climate if no adaptation measures are pursued. The adaptation costs for health care, both private and public, have been estimated to be around US$ 18 million per year. On the other hand, benefits have been estimated in broad terms: saving of private health expenditures and wage savings for the poor. Over a period of 40 years, the cash flow analysis shows that base-case EIRR stands out around 41 per cent.

Approach/framework used: DRR and CCA share a common concern: reducing the vulnerability of communities and supporting sustainable development (see Figure 11.1). Climate change is altering disaster risks, not only through increased weather related events, SLR and temperature and rainfall variability, but also through increases in societal vulnerabilities from stresses on water availability, agriculture and ecosystems. While CCA involves an adjustment in natural and hu-

man systems, DRR is the development and application of policies and practices that minimize risks of vulnerabilities and disasters. Thus DRR is an essential part of adaptation – the first line of defence against climate change impacts.

Bangladesh has created a number of guiding frameworks and working models which have received significant international recognition. These are being utilized to assist other countries in developing their national climate and disaster management frameworks and systems. The climate risk management framework (see Figure 11.2) is designed to provide an overview of the linkages between mitigation, climate risk management and disaster risk reduction and their relationship with development and sector planning.

This is important because it provides a roadmap for donors who have expressed the wish to support CCA, climate risk management and DRR but are unsure as to which element or elements they should support. This model (see Figure 11.3) attempts to promote the need for:

- Research and modelling to convert macro level national climate change predictions into micro level impacts
- Capacity-building and information sharing to facilitate sectoral impacts
- Extensive cross-sectoral analysis to achieve impact statements for all sectors
- Ensuring that Community Risk Assessments focus on existing and future risk through the inclusion of scientific climate change impact analysis
- Integrating the outcomes of climate change impact analysis and community risk assessments within development and agency planning frameworks.

The Bangladesh disaster management framework developed by the Comprehensive Disaster Management Programme (CDMP) and adopted by the Government of Bangladesh is utilized to add clarity on Bangladesh's disaster management objective associated with achieving a paradigm shift from reactive response and relief to a more comprehensive culture of risk reduction. The key elements of the framework are risk reduction, comprising the sub elements associated with (1) defining and redefining the risk environment and (2) managing the risk environment, whereas the second element is emergency response. This model attempts to promote:

- That risk is dynamic and always changing – hence the need for continual redefinition of risk factors
- Both scientific and community (traditional) analysis is essential for accurate risk assessment
- Risk analysis must consider existing and future risks – through climate change impact analysis
- Risk analysis must be comprehensive and follow all hazards, all sectors and all risk approaches
- Risk management strategies should be designed around specific risk factors
- Effective response must be designed utilizing risk information
- Systems must be revised based on lessons learned.

Climate change threatens both previous achievements and future efforts to reduce poverty in Bangladesh, particularly by threatening water and food security and by damaging essential infrastructure during more frequent disaster events. CDMP developed this framework model for mainstreaming DRR integrating climate risks and followed by community level adaptation, which will contribute to sustainable livelihood development and poverty reduction in the end (see Figure 11.4).

With CDMP efforts the country has achieved a number of milestones as the first steps towards DRR and CCA mainstreaming:

- DRR and CCA issues have been included in the South Asian Association for Regional Cooperation (SAARC) Framework for Action 2006-2015, Bangladesh Poverty Reduction Strategy Paper I and II, Bangladesh Disaster Management Policy, Act, Plan, revised Standing Orders on Disasters and in the Allocation of Business of the Ministry of Food and Disaster Management.
- The Executive Committee of the National Economic Council (ECNEC), in its meeting of 8 October 2007 took a decision that all

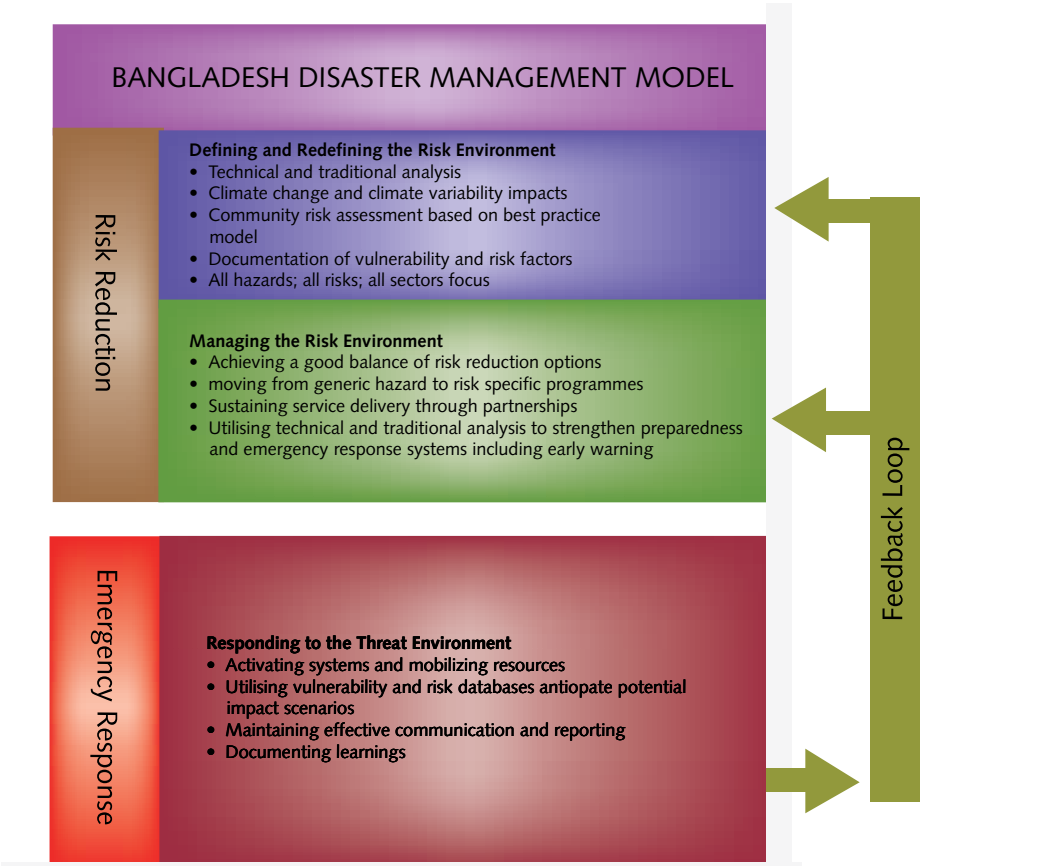

Figure 11.1: Common elements of DRR and CCA. Source: Halder 2009

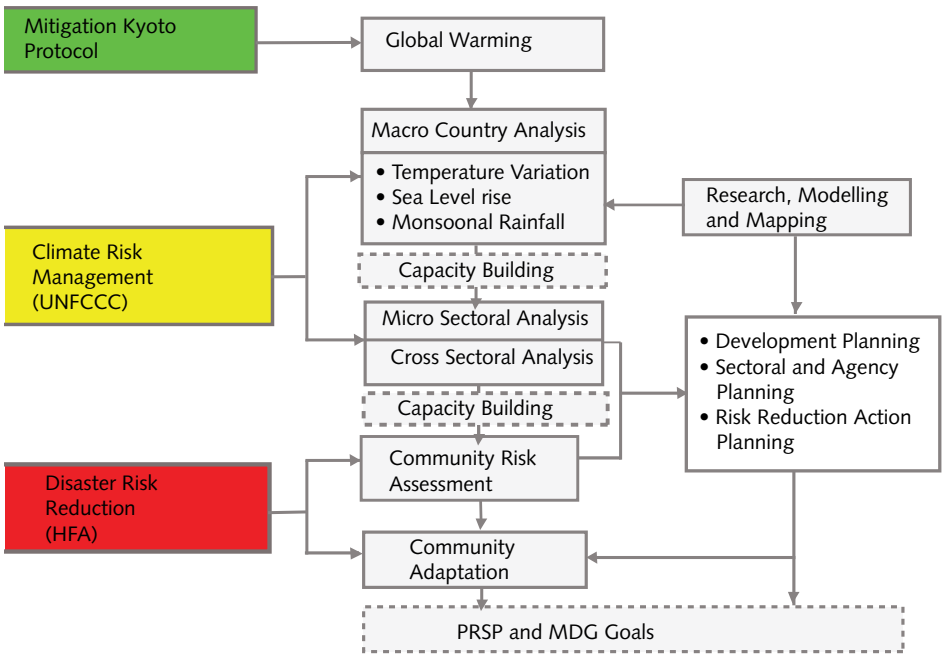

Figure 11.2: Climate risk management framework. Source: Halder 2009

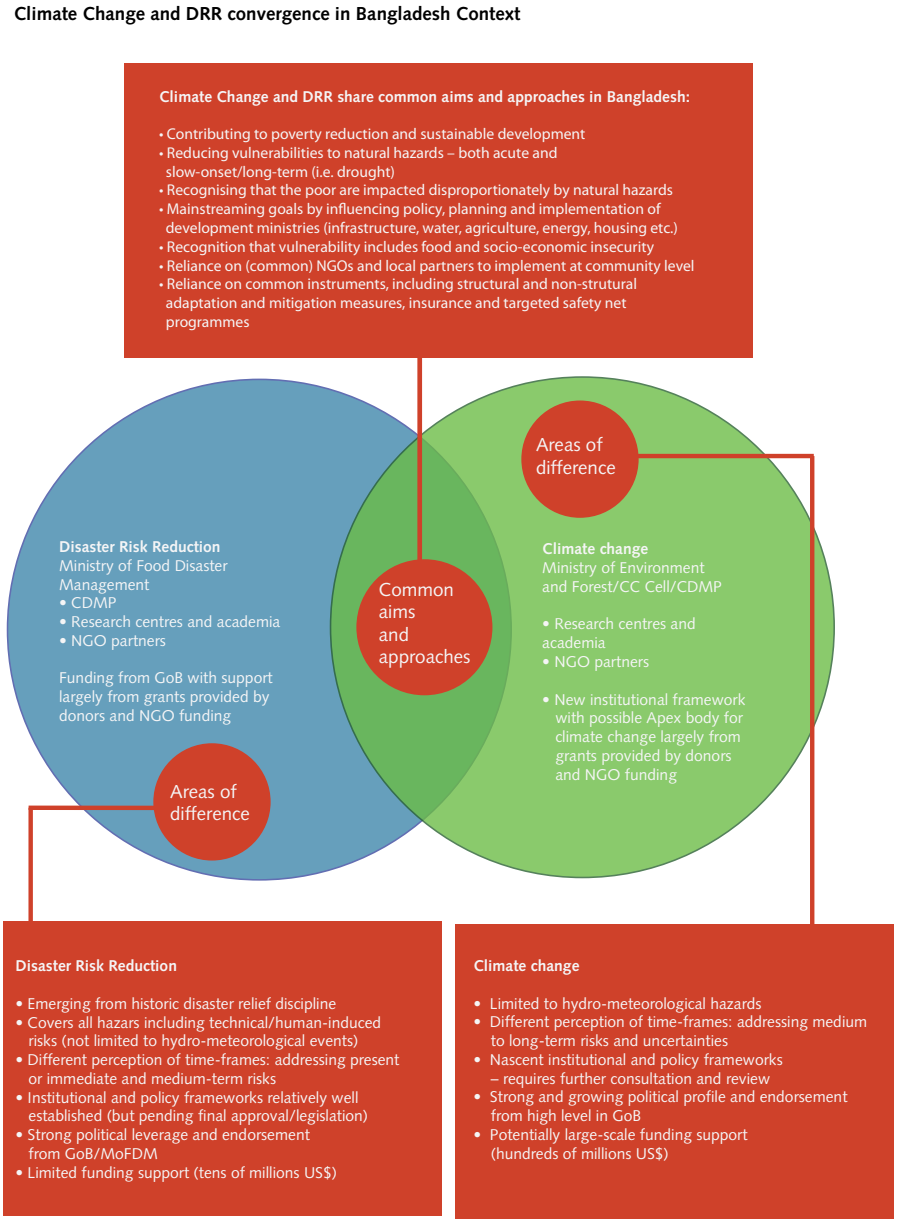

Figure 11.3: Climate risk model. Source: Halder 2009

Development Project Proposal (DPP) and Working Paper for the ECNEC must include information on "lessons learnt from the previous project" as well as "Risk Identification and Risk Mitigation" under the Item No. 26 of the DPP form and under Item No. 17 of the ECNEC working paper form. To facilitate implementation of this decision CDMP developed a guidebook for mainstreaming DRR and CCA across hazards and sectors.

- The Directorate of Relief and Rehabilitation developed and published a uniform Community Risk Assessment (CRA) Guideline and risk reduction Action Planning Procedure to identify, assess, evaluate and prioritize community risks and prepare risk specific plans for their reduction. As of now around 611 union action plans have been prepared following the above-mentioned guideline.

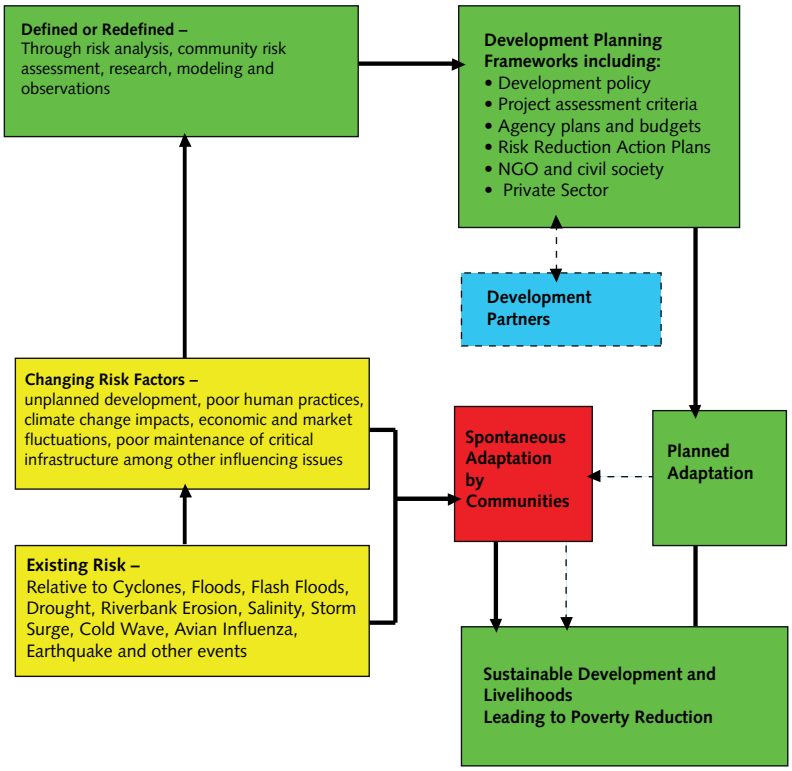

Figure 11.4: Mainstreaming DRR integrating climate risks. Source: Halder 2009

- As part of the demonstration of its commitment, CDMP is utilizing most of its Local Disaster Risk Reduction Fund for the implementation of the risk reduction action plans prepared through the CRA process. So far about 562 small-scale structural and non-structural risk reduction interventions have been implemented in 11 districts benefiting over 500,000 people. The interventions include household plinth raising, construction/repairing of earthen roads, construction of community shelters, roadside/riverside tree plantations, livelihood support including skills training and input supply, installation of pond sand filters, rainwater harvesting plants to ensure supply of safe drinking water, piloting of a community alerting system, testing different agricultural adaptation options suitable for different hazard conditions, etc.
- Building the country's capacity on climate change modelling and adaptation research. Generating national and district level climate change impact scenarios, as well as testing these through action research in a number of adaptation options for further testing and replication. Estimating the economic cost of adaptation in the transportation and heath sectors.
- The NGO Affairs Bureau has agreed to include DRR issues in the FD-6 Format as one of the prerequisites for approval of the donor funded projects.
- CDMP received approval of its proposal from the Ministry of Information to have a regular programme on DRR and Climate Risk Management in Bangladesh Television with effect from 1 April 2008.
- The Ministry of Environment and Forest formulated and launched the Bangladesh Climate Change Strategy and Action Plan 2008 – a 10 year roadmap, which complements the ongoing efforts of the government towards responding to climate change at the national level, as well as approaching the international community towards addressing this concern.

11.6 Case study III: New Zealand response for hazards and Climate Change Adaptation

The country is exposed to a range of natural hazards such as earthquakes, flooding, land-

slides, extra-tropical cyclones, tsunami and volcanoes. Climate change is likely to increase the intensity of many of these hazards. Areas located in the coastal zones are particularly vulnerable to climate change and may face hazards due to increase in the intensity of rainfall, storms, landslides, droughts and bushfires (Pittock 2005; IPCC 2007b; MfE 2008a). Apart from the changes in its biophysical susceptibility, the risk to natural hazards is also likely to change due to change in the human vulnerability. Due to SLR and other climate change impacts, New Zealand is likely to receive immigrants from neighbouring South Pacific Islands (Pittock 2005; Mataki et al. 2008). The immigrating population could add to the local vulnerability through a lack of awareness about local hazards along with inadequate coping capacity. Considering the changing risks through climate change, several efforts have been made by the New Zealand government to integrate the hazard response along with CCA at different levels.

Principles: the New Zealand government's strategy for climate change aims for both climate change mitigation and adaptation. It involves principles that include sustainability, consideration of the foreseeable needs of future generations, avoidance, remedy or mitigation of adverse effects, adoption of a precautionary/cautious approach, the ethics of stewardship/Kaitiatanga, consultation and participation, financial responsibility and liability (MfE 2008b: 16). While these principles are incorporated in the response planned for hazard reduction and CCA, there is less evidence of their success and measurement, which is partly attributed to their recent application.

Legislation: the issues and response to DRR in New Zealand mainly fall into two categories: District/Regional Planning and Civil Defence Emergency Management. The primary Acts that deal with these two sectors are the Resource Management Act (RMA) (1991) and the Civil Defence Emergency Management Act (2002), along with other supportive acts including the Local Government Act (2002), Building Act (2004), Land Information Memorandum (LIM) and Project Information Memorandum (PIM), and the Health Act (1956) (MfE 2008a & 2009b).

The RMA (1991) is the overarching Act that requires local administration to plan for all natural hazards. It defines natural hazard as any atmospheric or earth or water-related occurrence (including earthquake, tsunami, erosion, volcanic and geothermal activity, landslip, subsidence, sedimentation, wind, drought, fire or flooding), the action of which adversely affects or may adversely affect human life, property or other aspects of the environment. The Act abides both regional and local authorities to work together for natural hazard management (www.legislation.govt.nz). The Act was amended in March 2004 to accommodate Energy and Climate Change issues. According to the Act, climate change is a change in climate that is attributed directly or indirectly to human activity and that alters the composition of the global atmosphere in addition to natural climate variability observed over a comparable time period. It required local authorities to plan for the effects of climate change but not to consider the climate change effects of GHGs discharges into the air (Resource Management Act 2004: 2). The Act has significant implications for climate change adaptation particularly relating to energy use. The Act gives authority to regional councils to make rules but the subsequent rules are no more or less restrictive than regulations (Resource Management Act 2004: 3). The Act leads to a guidance policy called the New Zealand Coastal Policy Statement (NZCPS) for coastal zone management, besides the National Policy Statement (NPS), which specifies policy for hazard management particularly flood risk management in all areas. The NZCPS was reviewed in 2008 and emerging issues including climate change were included (MfE 2009c: 20)

The overall response to natural hazards is dealt with in detail in the Civil Defence Emergency Management (CDEM) Act (2002). The focus of this act is again based on the sustainable management of hazards and emergency response (MfE 2009c). It asks local government authorities to join together to prepare a Regional Civil Defence Group Plan focusing on all aspects of hazard response. The National CDEM Strategy provides the framework for response according to the CDEM Act. It defines 4Rs of New Zealand's integrated approach to CDEM i.e. reduction, readiness, response and recovery (DIA 2007: 5). It also specifies that CDEM must consider the implications of climate change (DIA 2007: 3). While these acts are significant steps to channel the resources for integrated DRR and CCA, their imple-

mentation is governed at the local level through planning and local practicalities.

Planning: it is recognized that forward-looking or proactive planning is more effective compared to emergency response at the time of event (MfE 2009a). Local Government and Regional Councils are required by RMA to make long and short- term plans in the lines of NPS and NZCPS for hazard mitigation and CCA. They are encouraged to take proactive action, recognize the significance of coastal set-back zones taking 100 years of planning horizon into consideration, risk avoidance for new development areas, better risk management in existing area, building long-term resilience, employ both statutory and non statutory methods and facilitating further research and understanding in the field (MfE 2009c). Local governments are also asked to use the process of the New Zealand Standard for Risk Management AS/NZS4360 in order to understand the risks and hazards that fits well in the framework of RMA and CDEM (MfE 2009c: 23). It asks to assess risk by:

- Identifying the coastal margins and describing the local assets or infrastructures that are at risk from the coastal hazards
- Considering how such risk may be caused or exacerbated by climate change or by changing development in coastal margins
- Evaluate the likelihood and consequences of such risk over the timeframes of interests (MfE 2009c).

Local Councils are also required to consider climate change and a lifetime of more than 30 years for new infrastructure and assets in hazards and land use planning (MfE 2004). This particularly applies to storm water system capacity and design, planning of irrigation systems, decisions for river and coastal flood-prone areas, housing and infrastructure in coastal areas prone to erosion, and land use planning for native ecosystems (MfE 2004). The success and application of these measurements are hard to assess due to recent changes in the plans.

Building partnerships: developing partnerships has been identified as an important step to deal with the multiple impacts of climate change. The Ministry of Environment has established the Interdepartmental Climate Change Adaptation group that currently involves 21 departments with different engagement levels in order to pursue cross-government initiatives on CCA by sharing information, thus ensuring coordinated and consistent efforts across government (MfE 2009b). Besides, development of partnerships between communities, industry groups, utilities and local governments are also deemed significant and are encouraged (MfE 2009b).

Information and education: information provision has been taken into consideration for both local government and local people. The Ministry of Environment has produced a number of documents for the guidance of local government to understand the process and planning for climate change. These include the A/NZ Risk Management Standard, a Guide for Local Government to prepare for climate change and a Guide for Local Government to Prepare for Coastal Change. The production of guidance on planning for climate change and flood risk is in the process. The Ministry also supplies the case studies, practical checklists and technical reports for knowledge sharing (MfE 2009c). Besides, to pursue further research has been highlighted as the key strategy to deal with climate change impact and adaptation (MfE 2009c).

Increased public awareness regarding hazards and mitigation has been consistently emphasized by national, regional and local governments. Acts such as the LIM, PIM and Building Act ask local governments to provide information regarding building in hazard-prone area in New Zealand (MfE 2009c). The government also provides information through educational materials, natural register/databases, hazard maps, websites, public talks and meetings, use of media, coast care groups and technical reports (MfE 2009c: 25).

Community involvement: the government actively supports and encourages community participation for early planning in hazard mitigation and CCA. Various local initiatives have been taken by various city and district councils due to recognized the long-term value of this process. Some key examples include the dune restoration programme at the Bay of Plenty in which local volunteers planted nearly 300,000 native dunes that enhanced the beach resilience towards strong winds, storms and erosion (MfE 2007, 2009c). However, such response is fragmented across the country because of various practical reasons. However,

in order to achieve efficient hazard management it is important that a holistic approach is taken by integrating various aspects of response and hazards in all areas.

11.7 Discussion

The case studies highlight that integration of DRR and CCA faces various shortcomings and challenges at local level. These include:

- The institutional frameworks, political processes, funding mechanisms, information exchange and practitioner communities have developed independently and remain largely separate to date
- Although efforts have been made, there has been no evidence of a systematic integration of disaster risk management and CCA in terms of concrete project activities by government agencies
- Lack of coordination is an important barrier. Climate change is often housed in environmental or meteorology departments of governments. While government departments responsible for poverty and DRR are in some cases aware of vulnerability to extreme climate events, they have no means of co-ordination. This leads to the development of parallel efforts in all three areas.
- The efforts are also fragmented across space. The reasons could be cited as various social factors along with varying hazard exposure.

Although the aforementioned case studies note substantive guidance and examples of how to link DRR into the CCA process, it recognizes that there is no blue-print for successful integration of DRR into development. Each country needs to tailor its programmes to the specific needs of the country involved, and the priorities and capacities of the national government and its population.

11.8 Conclusions

In the end it can be concluded that integration of DRR and CCA is not a technical activity. It is a long-term process that requires more than just developing appropriate approaches and tools. On the practical side, since a range of different organizations are involved at international, national, regional and local levels, it needs an enabling environment proving and sustaining policy support, planning and capacity-building at all levels. Effective communication, coordination and building partnerships among various stakeholders are essential tools. Often funding dictates the response to CCA and DDR; however, effective community participation for both decision-making and response could facilitate the process. Apart from the implementation of integrated response, monitoring and measuring of work done and progress made are key pillars to harness the opportunities and strengthen the integration (Collymore 2009). However, less has been achieved on this front due to recent application of combined methodologies. Therefore, there is a need for sharing knowledge at different levels and scales of spatial, temporal and social response.

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12. Concluding remarks

Climate change is happening in addition to the existing risks and it is necessary to promote effective DRR and CCA and to find synergies between policy and management responses in both DRR and CCA. This proposition served as the starting point for the Workshop and for the major issues presented in papers and case studies presented in this publication. In these concluding remarks, we review selected issues and challenges of DRR and CCA indicated at the beginning of the publication (see Chapter 1):

- The need for a better understanding of conceptual frameworks relating to DRR and CCA
- The need to clearly define the goals of vulnerability and risk assessment, as well as understanding the social, cultural and political contexts
- The need to better understand and resolve the institutional challenges in implementing effective DRR and CCA and bringing DRR and CCA together in policy and practice at national and local levels.

These issues were discussed within various case studies from Chapter 2 through Chapter 11, and are associated with the common cross-cutting themes, namely sustainable adaptation, community participation, vulnerability and risk assessment, good governance and capacity-building, and the linking of DRR and CCA. The summary of lessons learned from the case studies are delineated in Table 12.1 at the end of this chapter.

12.1 The need for a better understanding of conceptual frameworks

Following from the case studies and discussions on the theme of sustainable adaptation, community participation and vulnerability and risk assessment, it was indicated that an adaptation framework should take into consideration the whole socio-ecological system. This was shown in various case studies: problems arising from differing access to the water supply for agricultural activities for the upstream and downstram communities in Chapter 2, Vietnam (influence of dyke building), and in Chapter 3, Indonesia (with inappropriately controlled irrigation system). It may also be helpful to recognize thresholds of the socio-ecological system, thus to what extent they may maintain the current situation and pressures (see discussion on resilience and socio-ecological in Sub-Chapter 1.4; Renaud et al. 2010).

It is important to assess the vulnerability of different social groups, considering their exposure to hazards, their susceptibility, as well as their coping and adaptive capacity to plan and put into place risk reduction, as well as adaptation measures. Such assessments should also include the socio-cultural context of the assessed object, which can be a constraint for adaptation, as described clearly in the case of farmers in Indonesia.

The fact that different stakeholders, including both insiders, e.g., the farmers, population groups, and outsiders, e.g., scientists or governments, may have different perceptions and priorities, implies that subjective judgement needs to be taken into account when defining vulnerability and adaptation. The inclusion of vulnerable groups to be actively engaged in defining their own vulnerability and adaptation options was further emphasized in various case studies on community participation (see Chapter 5). However, it is also important to note that communities might have difficulties to evaluate their vulnerability and coping capacity to hazards that they have not yet experienced, such as SLR (see e.g., Birkmann and Teichman 2010).

In assessing vulnerability, various dimensions of emphasis (social, economic, physical, environmental) may require different approaches. It is important to have an integrative, multi-disciplinary approach, and to combine qualitative and quantitative methods. It is also necessary for CCA to incorporate possible future scenarios in the assessment, which is shown in the example in chapter 6. However, this should be applied in a location-specific context and where only fragmented data is available. It remains a challenge to transform global climate change scenarios to the local level and tools and methods need to be developed to help achieve this.

With regard to good governance and capacity-building, the government organizational capability at all levels is strongly correlated with institutional coping and adaptive capacity. The case studies in Indonesia and Pakistan (see Chapters 7, 8, 9) give examples of assessing the capability of local governments and identify constraints in im-

plementing DRR or CCA. It is important to assess also institutional vulnerability, including management and resourcing arrangements, coordination, communication and inter-agency cooperation at national, sub-national and local levels, as failure at one level can influence others.

The need to link the DRR and CCA concepts and components with allied areas of sustainable development, long-term vulnerability reduction and poverty alleviation (Schipper 2009; Thomalla et al. 2006), was also emphasized throughout this publication.

12.2 Need for clear definitions of assessment goals and understanding of context

It is important to clearly define "who or what" is vulnerable, "to what", "when" and "with respect to what". Elements that are exposed and vulnerable can include ecological system or social system exposed to natural hazards (example of coastal hazards in New Zealand and Bangladesh as referred to in Chapter 4), which will require different adaptation strategies. With regard to the question "with respect to what", as briefly mentioned above, different social groups are embedded in different social and cultural contexts and therefore have different levels of vulnerability even to the same hazards. Different areas will have different baseline vulnerabilities and adaptive capacities, and consequently different adaptation options.

Understanding the socio-cultural, ecological and technological limitations to adaptation, as well as different perceptions in choosing the best adaptation strategies, and the underlying processes that influence vulnerability is essential before starting an assessment or the development of indicators (see examples in Chapter 2, 3, 4, 5 and 6). Therefore, the involvement of various stakeholders in assessments – including vulnerable people themselves – to identify various responses and roles of sub-groups to hazard events (see Chapter 5) is strongly recommended, and this should occur iteratively and in a participatory manner. This entails access to and transparency of information on risks and has the added benefit of raising the awareness of all stakeholders (see Chapter 10).

To build an enabling environment for DRR and CCA, it is important to understand the baseline capability of local governments who deal directly with the risk and disaster management, to identify priorities for enhancing coping and adaptive capacity. It is equally necessary to understand institutional vulnerability which may arise from weak interlinkages and arrangement accross government levels (see examples in Chapter 7, 8, 9, 10 and 11). Institutional vulnerability sets as a political context that in turn influences the effectiveness of any DRR and adaptation measure.

12.3 The need for understanding and overcoming institutional challenges

From all the case studies, it is clear that overcoming institutional challenges is a prerequisite if DRR and CCA measures are to achieve their objectives. Often unplanned adaptation can even be counter productive and maladaptive, e.g., overexploitation of groundwater to maintain agricultural activities, or may negatively impact particular sub-groups (e.g., the aquaculture community outside of dyke; see Chapter 2).

A top-down approach that does not involve local communities was also emphasized as an inappropriate approach for sustainable risk reduction and CCA, since it cannot capture the reality of risk management at local level. Capacity-building of community ability to understand the problems they are facing and the raising of awareness prior to the implementation of adaptation measures is needed. In parallel, an enabling environment for participation should be created by understanding complex challenges associated with power relations within and accross various social systems (see Chapter 5).

It is noted that adaptation may involve multiple measures which should be integrated, for example it is not sufficient just to provide information on weather variability and hope that the cropping pattern will adjust itself, but this needs to be accompanied by capacity-building on alternative crops, conditioning of markets, provisioning of local traders, and financial support (see Chapter 3). For such strategies to be successful multiple partners may be required including government at all levels and the private sector.

The case studies revealed that there is still a lack of clear procedure on how to systematically integrate risk assessments with sustainable development. This is particularly difficult if there is no coordination and muti-sectoral approach among

the various government and non-government agencies involved (Chapters 7, 8, 9, 10 and 11). At the local level, the current situation is often worse due to the fact that in many places the capability to manage disasters at the local level is still lacking and there is lack of interlinkage between national and local levels.

Separate processes in the policy domains of DRR and CCA add to the challenges of putting them into sustainable practice. The case studies in chapter 11 show that the linkage is already acknowledged in principle, but the effectiveness of integrating both domains still varies accross regions and countries. However, good practices and efforts have been made, especially by linking both domains to development planning from national to local levels.

12.4 Research needs

The discussions and case studies in the Workshop and in this publication provided concrete examples and highlighted important aspects in planning a sustainable DRR and CCA, which are embedded in the context of South and Southeast Asia. Further identified research needs are as follows:

- Better understanding of various adaptation strategies and their applicability, such as diversification of agricultural areas in saline affected areas: what to diversify, how to do it, and what are the cost-benefits in different contexts
- Multi-disciplinary and participatory approach in adaptation assessment to deal with socio-cultural, technological and ecological limitations at the local level
- Identification of constraints and opportunities of implementating local level adaptation measures
- Assessing future vulnerability using local level scenarios of climate change and changing risk profiles
- Multi-hazard assessments for sustainable development decision-making
- Development and employment of scenario and simulation techniques for long-term and short-term trends
- Understanding effective participation mechanisms and the development of effective participatory planning methods in DRR and CCA
- Assessing the possibility of local and context-specific assessment for cross-location assessment: how to build a context-specific risk database, how to upscale while maintaining the lowest possible scale and to account for potential differences in processes and institutions
- Further study on institutional vulnerability and capacity-building at the local level
- Development of risk-knowledge transfer mechanisms at different levels, spatial and temporal scales

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Abbreviations and acronyms

AF	Adaptation Fund
ADPC	Asian Disaster Preparedness Center
APBD	Regional Budget Expenditure Plans (Indonesia)
BMG	Badan Meteorologi dan Geofisika
BMKG	Indonesia´s National Meteorological, Climatology and Geophysics Agency
BNPB	Indonesia's National Disaster Management Agency
BPBD	Badan Penanggulangan Bencana Daerah
BPL	Below Poverty Line
BPPTP	Besar Pengkajian dan Pengembangan Teknologi Pertanian
BSFs	Basic Societal Functions
CBDP	Community-Based Disaster Preparedness
CBDRR	Community-Based Disaster Risk Reduction
CBO	Community-Based Organization
CCA	Climate Change Adaptation
CDEM	Civil Defence Emergency Management, New Zealand
CDM	Clean Development Mechanism
CDMP	Comprehensive Disaster Management Programme
CDRF	Community Disaster Resilience Fund
CEGIS	Centre for Environmental Geographic and Information Services
CFS	Climate Field School
CRA	Community Risk Assessment
CRED	Centre for Research on the Epidemiology of Disasters
CROM	National Consortium and Research Grant Facility for Climate Risk and Opportunity Management
DAAD	German Academic Exchange Service
DIA	Department of Internal Affairs
DKKV	German Committee for Disaster Reduction
DNPI	Indonesia´s National Board for Climate Change
DPP	Development Project Proposal
DRR	Disaster Risk Reduction
ECNEC	Executive Committee of the National Economic Council, Bangladesh
EIRR	Economic Internal Rate of Return
EM-DAT	The International Disaster Database

EWG II	The 2nd meeting and the report of the 2nd meeting of the UNU-EHS Expert Working Group on Measuring Vulnerability
ERC	Emergency Relief Cell
FATA	Federally Administrated Tribal Areas
FEG	Food Economy Group
FGD	Focus Group Discussion
FRC	Federal Relief Commission, Pakistan
GDP	Gross Domestic Product
GEF	Global Environment Facility
GF-DRR	Global Facility for Disaster Reduction and Recovery
GHG	Greenhouse Gas
GIS	Geographical Information System
GRC	German Red Cross
GSO	General Statistics Office of Vietnam
HEA	Household Economy Analysis
HEC-II	Hydraulic Engineering Consultants Corporation No. 2
HFA	Hyogo Framework for Action
ICBRR-CC	Integrated Community-Based Risk Reduction to Climate Change
IDHEA	Integrated Dynamic Household Economy Analysis
IFRC	International Federation of Red Cross and Red Crescent Societies
INGO	International Non-Governmental Organization
INR	Indian Rupee
IPCC	Intergovernmental Panel on Climate Change
KI	Key Informant
KOGAMI	Tsunami Alert Community
LIM	Land Information Memorandum
MBPI	Indonesia Disaster Management Society
MDGs	Millenium Development Goals
MIDS	Madras Institute of Development Studies
NAPA-CC	National Action Plan for Climate Change
NAPA-DRR	National Action Plan for Disaster Risk Reduction
NDMA	National Disaster Management Authority, Pakistan
NDMC	National Disaster Management Commission, Pakistan
NGO	Non Governmental Organization
NLRC	Netherlands Red Cross

NPS	National Policy Statement
NZCPS	New Zealand Coastal Zone Management
OFDA	Office of Foreign Disaster Assistance, USA
PIM	Project Information Memorandum
PLOW	Professional Development for Livelihoods Advisers
PMI	Indonesian Red Cross
PPT	Parts per Trillion
PRA	Participatory Rural Appraisal
PSBA-UGM	Research Centre for Disaster, Gadjah Mada University
REDD	Reduction Emission from Deforestation and Degradation
RKP	Annual Development Plan, Indonesia
RMA	Resource Management Act, New Zealand
RPJMD	Mid-Term Regional Development Planning
RPJMN	National Mid-Term Development Plan, Indonesia
RPJP	Long-Term Development Planning, Indonesia
SAARC	South Asian Association for Regional Cooperation
SCCF	Special Climate Change Fund
SES	Socio-Ecological System
SHEEP	Society for Health, Education, Environment and Peace
Sida	Swedish International Development Cooperation Agency
SLR	Sea Level Rise
SMS	South Mang Thit Sub-project, Vietnam
SPRING	Spatial Planning for Regions in Growing Economies
TCSO	Tra Cu Statistical Organization
TEWS	Tsunami Early Warning Systems
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNICEF	United Nations Children´s Fund
UN/ISDR	United Nations International Strategy for Disaster Reduction
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Conventions on Climate Change
UNU-EHS	United Nations University Institute for Environment and Human
USAID	United States Agency for Intenational Development
WALHI	Friends of the Earth Indonesia
WMO	World Meteorological Organization

Summary of lessons learned from the case studies

Topic	Context of the case study, key words	Conceptual framework and terminology used	How to have a clear definition of goal/purpose, with consideration of social context of the vulnerable	Identification of institutional weakness (awareness, communication, coordination, cooperation)	Research needs/gaps
	Sustainable adaptation				
Chapter 2	Vietnam - salinity intrusion, weather uncertainty, agriculture & aquaculture, farmers, various autonomous & planned structural & non-structural measures	Consideration of socio-ecological system, e.g., dyke´s impact upstream-dowstream. Adaptation assessment based on different vulnerability: exposure, susceptibility (sectors, social groups)	Importance of identifying different vulnerability of different exposed elements and social groups, e.g., Khmer population participation of vulnerable groups	Lack of management, e.g., groundwater management (GW pricing & monitoring) may lead to maladaptation (overexpliotation of GW) Lack of effective instruments for special vulnerable groups, bottom-up approach	Participatory & multi-disciplinary planning approach More research in adaptation strategies e.g., diversification in agricultural areas in saline affected areas, what to diversify, how, cost-benefit in different context
Chapter 3	Indonesia Climate uncertainty, agriculture, farmers, cropping management – info on weather forecast	Consideration of different perceptions of different stakeholders that lead to different prioritization of adapation. Consideration of limitations and capacity e.g., organizational skills, in adaptation assessment (adaptive capacity) Threshold of a system: until when farmers can maintain their old cropping pattern	Understanding the socio-cultural & ecological & technological limitations in adaptation e.g., collective actions/cropping habits – cropping management, irrigation down/upstream, GW – fuel price Different perceptions in choosing the best adaptation strategies	Capacity-building of the community to understand the problems they are facing and raise awareness prior to implementation of adaptation. Lack of management of adaptation strategies e.g., irrigation up/downstream. Capacity and reliability of local government in providing information – trust. Integrated approach in adaptation e.g., info on cropping pattern combined with other capacity-building: further knowledge on alternative crop, market, provision of local trader, financial support	Adaptation assessment participatory approach, incorporating socio-cultural, technological, ecological limitations in adaptation assessment
Chapter 4	Conceptual discussion, example of Bangladesh, NZ, Aceh, coastal hazards Community participation	Consideration of (regional) scales and phases of disaster management. Consideration of various dimensions of vulnerability in adaptation assessment. Linking vulnerability with poverty (livelihoods and self-protection)	Define exposed and vulnerable elements, e.g. ecology or society (NZ vs. Bangladesh) Participation of community and vulnerable groups, consideration of local context Planning adaptation should happen in various scales with different approaches & vulnerable elements Context specific, different countries – different baseline vulnerability & adaptive capacity – different adaptation options	Good practice e.g., in NZ requires awareness – acceptability at local level. Lack of coordination, clear procedure, assessment methods Lack of integration of risk assessment methods in sustainable development decision-making	Decision-making, local level adaptation measures Adaptation assessment methods: multi-hazard, development and poverty reduction oriented, sub-group focused, dynamic Integrated methodology in vulnerability assessment with various dimensions (physical, env., ec., soc.) Identification of constraints and opportunities for co-ordinating implementation of local level adaptation measures
	Community participation				
Chapter 5	Maldives (sub-groups – social,economic), Indonesia (youth), India (women)	Using scenarios of normal, disaster risk and future (including climate change) situations and apply these for various sub-groups	Perceived vulnerabilities differ by sub-group related with access to resources, different exposure to various hazards Identification of response and recognizing the active role of sub-groups to hazard events e.g., youth and women, reveal potentials to enhance overall DRR if involved	Complex challenges associated power relations within and across various social systems Top-down approach in CCA planning Active participation is impeded by lack of awareness on climate change impacts and available response methods to reduce susceptibility	Understanding the effective participation mechanisms and participatory methods

Summary of lessons learned from the case studies

Topic	Context of the case study, key words	Conceptual framework and terminology used	How to have a clear definition of goal/purpose, with consideration of social context of the vulnerable	Identification of institutional weakness (awareness, communication, coordination, cooperation)	Research needs/gaps
	Vulnerability and risk assessment				
Chapter 6	General methodological discussion, example of Indonesia, India, East Timor and Maldives	Integration of various dimensions and approaches of vulnerability: social, economic, physical, environment. Hybrid of social-environmental perspective. Combination of qualitative-quantitative Challenges: diversity of methods used by different actors, lack of available location-specific data for extrapolation Integrating the future scenario	Understanding the context and underlying processes influencing vulnerability before developing indicators Clearly define: who or what is vulnerable, to what and with respect to what Definition of vulnerability variables by outside evaluators vs insiders/various perceptions insiders-outsiders	Different methods used by various actors in DRR & CCA Lack of knowledge and awareness at local level	Incorporation of the role of and effect on community processes and institutions Better link terminology employed by different disciplines and fields Cross-location assessment: how to upscale, keep at the lowest possible scale, account for potential differences in processes and institutions Assessing future vulnerability need transformation of national and international level climate and event scenarios into local-level scenarios Holistic assessment of all hazards relevant to sustainable development decision-making Development and employment of scenario and simulation techniques (long- and short-term trends) Creation of risk-knowledge database at local level
	Good governance and capacity-building				
Chapter 7	Indonesia, earthquake, local government	Criteria to measure capability of actors, such as the local government Various definitions of capability (organizational context)	Understanding the (baseline) capability of the local government dealing directly with the disasters, identification of needs for capacity-building (enhancing coping and adaptive capacity)	It is revealed that most of the time, the capability at the local level is still lacking and coordination between different authority level is still weak	More focus on capacity-building of local government and institutional setting at the local level
Chapter 8	Pakistan, earthquake/disaster management, national-local government	Interlinkage between various government levels Institutional vulnerability & capability	Understanding institutional vulnerability due to weak interlinkages and arrangement across government levels	Lack of interlinkage between national and local level in contrast to devolution of power. Lack of coordination between Ministries	Institutional vulnerability for capacity-building
Chapter 9	Pakistan, floods, local government	Interlinkage between various government levels & agencies	Understanding institutional vulnerability due to weak interlinkages and arrangement across government levels	No clear role or institutional arrangement for DRR Lack of interlinkage, coordination, cooperation	Instititutional vulnerability for capacity-building
Chapter 10	General conceptual discussion, example of Indonesia	Integrating DRR & CCA in sustainable development	Democracy in access to and transparency of information on climate change Ensuring the participation of various stakeholders	Good governance in DRR & CCA: political will for cross-sectoral cooperation, bottom-up, participatory, democratic access to knowledge, accountability and awareness Capacity-building (human and institutional) promotes effective participation of various stakeholders Sectoral approach, lack of coordination	

Summary of lessons learned from the case studies					
Topic	Context of the case study, key words	Conceptual framework and terminology used	How to have a clear definition of goal/purpose, with consideration of social context of the vulnerable	Identification of institutional weakness (awareness, communication, coordination, cooperation)	Research needs/gaps
	Vulnerability and risk assessment				
Chapter 11	Indonesia, Bangladesh, New Zealand	Common elements DRR & CCA: - focus on climatic hazards - vulnerability and risk reduction - pro-active, holistic and long-term Different elements DRR & CCA: - terminology - actors & types of interventions - approach - organizations, institutions, international conferences - assessment - strategies - funding Linking DRR & CCA to be integrated in development planning	Understanding & improvement of the institutional framework and context that influences the vulnerability reduction measures	Indonesia: different actors, approach and institutions, as well as funding mechanisms in DRR & CCA. However, its linkage is acknowledged, common actors are to integrate DRR & CCA into development planning and community-based approach that could promote linkage between DRR & CCA Bangladesh: the CDMP Disaster Management Framework can incorporate climate risks to contribute in sustainable livelihood development & poverty reduction New Zealand: a good practice of incorporating climate change in the DRR institutions and development strategies Common challenges: separate processes DRR & CCA, systematic integration in government projects, lack of coordination, fragmented efforts	Sharing knowledge at different levels, scales of spatial, temporal and social response

Table 12.1: Summary of lessons learned from the case studies

Annex: Programme of the DAAD/UNU-EHS International PhD Workshop on Disaster Risk Reduction and Climate Change Adaptation in Context of South and Southeast Asia

Day 1: 23 NOVEMBER 2009

I – Opening Ceremony

09:00 – 09:30 Welcoming Address *Dr Helmut Buchholt / Head of DAAD Regional Office Jakarta, Dr Fabrice Renaud / Director (ad Interim) UNU-EHS, Prof. Dr Retno Sunarminingsih Sudibyo / Vice Rector Education, Research and Community Service, Gadjah Mada Univesity*

09:00 – 09:45 Introduction: Workshop programme and Objective
Dr Joern Birkmann / UNU-EHS

09:45 – 10:00 Coffee Break

II – Keynote Presentations: Climate Change Impacts in the Coastal Areas and Emerging Challenges for Disaster Risk Reduction

10:00 – 10:30 Emerging Challenges for DRR in Context of Climate Change in Coastal Regions
Philip Buckle / Senior expert in Disaster Management and Civil Protection

10:30 – 11:00 Framing Vulnerability and Adaptation Assessment in Context of Climate Change
Dr Joern Birkmann & Dr Fabrice Renaud / UNU-EHS

11:00 – 11:30 Climate Change Impacts in the Coastal Regions in South and Southeast Asia & Institutional challenges of CCA
Bach Tan Sinh. PhD National Institute for Science and Technology Policy and Strategic Studies, Vietnam

11:30 – 12:00 Vulnerability and Adaptation Strategies of the Coastal Communities to Climate Change in Coastal Regions in Context of South and Southeast Asia
Dr Sunarto, MS & Dr Muh Aris Marfai / PSBA UGM

12:00 – 12:15 Q&A Session
Moderator: Dr Djati Mardiatno / PSBA UGM

12:15 - 13:15 Lunch Break

III – Poster Presentations and Parallel Group Discussions

13:15 – 14:00 Brainstorming of Important Discussion Themes – What are the important management and methodological aspects for planning DRR and CCA?
Moderator: Dr Muh Aris Marfai / PSBA UGM

14:00 – 16:00 Poster Presentations and Parallel Group Discussions – What are the challenges for planning sustainable DRR and CCA at national and local level related to the identified aspects in the brainstorming? – What are the research findings from case studies in South and Southeast Asia?
Moderator: Dr Wiwit Suryanto / PSBA+ Group leaders

17:15 – 17:30 Announcements on the Field Activity on Day 2

19:30 – 21:00 Welcoming Dinner

DAY 2: 24 NOVEMBER 2009

IV – Field Activity – Learning from the Example in the City of Semarang

07:00 – 10:00 Departure to Semarang
Moderator: Dr Muh Aris Marfai and Dyah Rahmawati Hizbaron / PSBA

10:00 – 12:00 Observation of the affected areas:Inundation and land subsidence problems; exposure to sea level rise

12:00 – 14:00 Visit to Local Disaster Management Body
Presentation and discussion about the existing natural hazards and events, as well as the current DRR measures in the city

Lunch Break during visit

14:00 – 16:30 Observation at the Community Level
Group activities: observation and interviews with the affected community

16:30 – 21:00 Return to Yogyakarta + Dinner

DAY 3: 25 NOVEMBER 2009

V – Learning from Example in Indonesia (National Level)

09:00 – 10:00 Reflection of the previous days

10:00 – 12:30 Fish-Bowl-Discussion: Indonesian National Framework of DRR & CCA
Moderator: Dr Shantana Halder / CMBP
State-of-the-art of CC consideration in current DRR Framework
Dr Sudibyakto / BNPB
CCA Framework and Role of DRR in CCA
Dr. Edvin Aldrian / BMKG
Role of community-based DRR in CCA
Mr. Banu Subagyo / UNDP / MPBI

12:30 – 13:30 Lunch Break

13:30 – 14:15 Linking DRR & CCA: Case Study in Indonesia
Riyanti Djalante / PhD Student Macquire University, Sidney

VI – Summary of the Lessons Learned and Identification of Cross-Cutting Themes

14:15 – 15:30 Moderated Discussion: Key words and Summary of the Lessons Learned
Moderator: Philip Buckle

15:30 – 16:00 Coffee Break

16:00 – 16:30 Discussion about Joint Papers and Brief Evaluation of the Workshop
Moderator: Dr Joern Birkmann / Neysa Setiadi

15:45 – 16:00 Closing ceremony
Representative from UNU / PSBA

ANNEX : Participants in the DAAD/UNU-EHS International PhD Workshop on DRR and CCA in Context of South and Southeast Asia

Family name	First name	Name of Institution	Country of Origin
Ahmad	Ijaz	Department of City and Regional Planning, University of Engineering and Technology, Lahore, Pakistan	Pakistan
Alexander	Robert	University of Hawaii at Manoa, Hawaii	USA
Asim	Muhammad	Department of Urban Engineering, The University of Tokyo, Japan	Japan
Bahinipati	Chandra Sekhar	Madras Institute of Development Studies (MIDS)	India
Soeksmono	Boedi	Rekompak Program, Jakarta, Indonesia	Indonesia
De Milliano	Cecile Wilfriede Johanna	Disaster Research Centre (PSBA) at 'Universitas Gadjah Mada', Indonesia / University of Groningen, Netherlands	The Netherlands
Djalante	Riyanti	Macquarie University, Sydney, Australia	Indonesia
Halder	Shantana Rani	CDMP, Disaster Management, UNDP Bangladesh	Bangladesh
Jati	Raditya	University Gadjah Mada, Yogyakarta, Indonesia	Indonesia
Khan	Shabana	School of Geography, Environment & Earth Sciences, Victoria University of Wellington, New Zealand	India
Kusumasari	Bevaola	Department of Management, Faculty of Business and Economics, Monash University, Australia	Indonesia
Majeed	Saadia	Department of Disaster Management (BRAC), Bangladesh	Bangladesh
Mulyasari	Farah	Center for Disaster Mitigation, Institut Teknologi Bandung (ITB), Indonesia	Indonesia
Nguyen Thanh	Binh	Institute for Environment and Human Security (EHS) Germany / Mekong Delta Development Research Institute, Vietnam	Vietnam
Patabendi	Prabath De Siva	Center for Disaster Risk Reduction, Sri Lanka	Sri Lanka
Peters	Gerrit	Institute of Geography, University of Cologne, Germany	Germany
Purwanto	Arief Budi	Center for Coastal and Marine Resources Studies (CCMRS), Bogor Agricultural University, Indonesia	Indonesia
Rohman	Mohammad Arif	Civil Engineering Department, Institut Teknologi Sepuluh Nopember (ITS), Indonesia	Indonesia
Siregar	Raja	OXFAM GB Indonesia / Wageningen University and Research Centre (WUR), the Netherland	Indonesia
Solangaarachchi	Daminda	ADFA, UNSW Canberra, Australia	Sri Lanka

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Institute for Environment and Human Security

"Advancing human security through knowledge-based approaches to reducing vulnerability and environmental risks"

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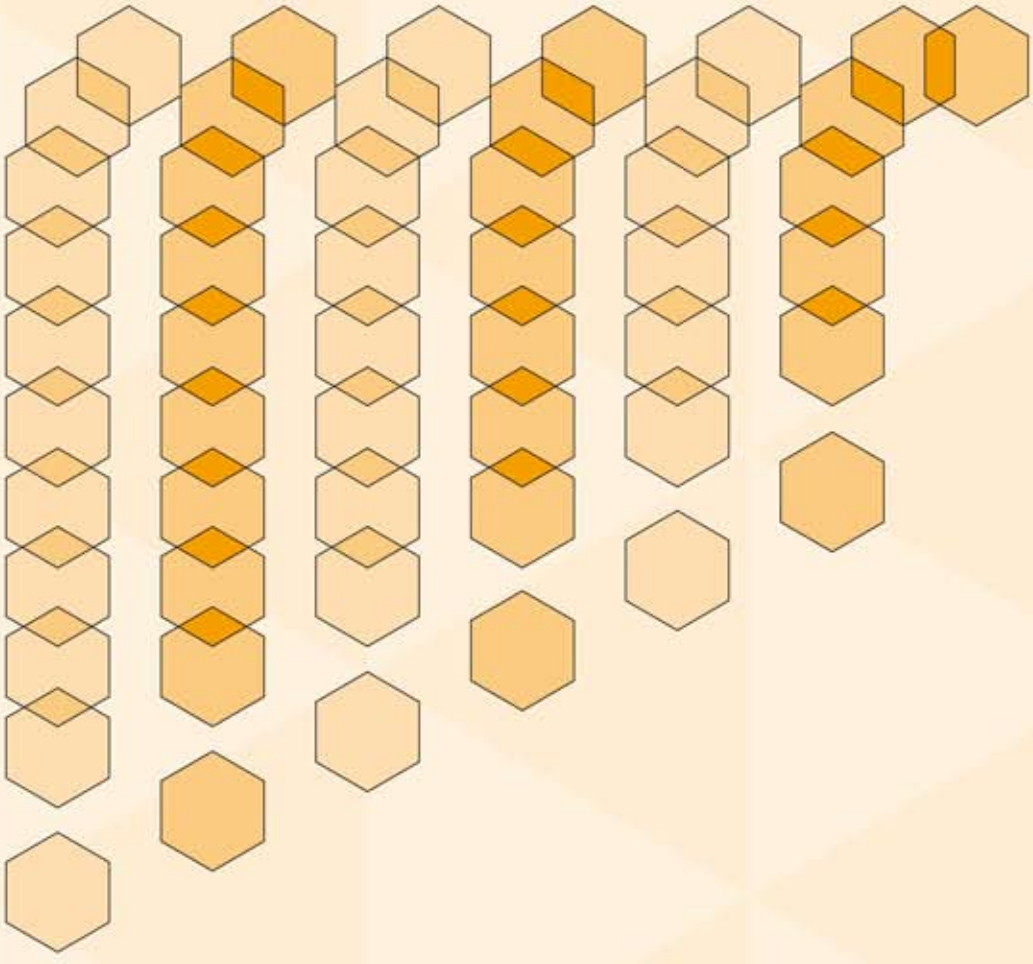
- **Vulnerability assessment**, resilience analysis, risk management and adaptation strategies within linked human-environment systems; and
- Internal displacement and trans-boundary **migration** due to environmental push-factors;

whereby the major drivers such as land degradation, desertification, natural hazard events, gradual human-induced and natural environmental and climatic change and variability, including water depletion and quality deterioration are considered. Preparedness, adaptation and response are the main dimensions along which human security can be strengthened. A special work focus of UNU-EHS is to conduct research on water-related hazards along big rivers and on deltas. In addition, on behalf of the UNITED NATIONS UNIVERSITY, UNU-EHS is actively engaged in the activities of the International Flood Initiative (IFI), which focuses on research, information networking, education and training, empowering communities and providing technical assistance and guidance.



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