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Addressing the Challenge:

Recommendations and Quality Criteria for Linking Disaster Risk Reduction and Adaptation to Climate Change

German Committee for Disaster Reduction

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Table of Contents

Preface

Ambassador
Busso von Alvensleben
Deputy Director-General
responsible for Global Issues:
Civilian Crisis Prevention,
Human Rights, Humanitarian
Aid and International Terrorism

Each year 250 million people fall victim to natural disasters. Since 1992 the international community has contributed approximately 2.7 billion US dollars worldwide to mediate the effects of hurricanes, floods and drought. The number and scale of natural disasters have been increasing for years, also as a result of climate change. This intensification especially affects developing countries: When these countries in particular are struck by natural disasters, in many cases it is not unexpected, but they are often inadequately prepared. And even when they are well prepared, the resources they have available to deal with the shock are simply not as extensive.

Disaster reduction is therefore the current watchword. Systematic disaster reduction measures can save many lives worldwide. Through these measures, we can considerably reduce the extent to which a hurricane or an earthquake sets back a country's development. Farsighted measures like early warning systems, evacuation plans and emergency training within the affected population can help prevent human suffering and reduce damage.

For these reasons, the German Government is working to strengthen disaster reduction worldwide. The aims are to mitigate and adapt to the effects of natural hazards on the population, predict the development of new hazards, implement preventive measures and, in this way, secure progress in development. Instead of relying exclusively on disaster relief and comprehensive humanitarian and development assistance, it is important that disaster prevention becomes an integral component of every national development strategy.

In this respect, Germany works closely with the Secretariat of the UN International Strategy for Disaster Reduction and its Platform for the Promotion of Early Warning located in Bonn. The Federal Government strongly supports the implementation of the Hyogo Framework for Action and its goal of substantially reducing the negative effects of natural disasters on the population by 2015. Against this background, we attach great importance to the 2009 Global Platform and its contribution to the implementation of the Hyogo Framework for Action.

The German Government is prepared to continue doing its part. In addition to funds for development-oriented emergency and transitional aid, Germany annually puts 10% of its emergency humanitarian assistance towards disaster reduction measures. Moreover, it is important to us to strengthen the link between disaster reduction and the climate change agenda and to establish disaster reduction as an important component of adaptation to the negative effects of climate change.

Germany's engagement in the field of disaster reduction is by no means limited to action by the Federal Government. The German Committee for Disaster Reduction (DKKV) plays a pioneering role as a centre of excellence and expertise for disaster prevention issues. Under the auspices of the International Decade for Natural Disaster Reduction in the 1990s, all UN member states were called upon to establish national disaster reduction committees. Germany was convinced that the valuable work of its national committee should be continued beyond the end of the UN Decade for Natural Disaster Reduction. The German Committee for Disaster Reduction's expertise is also evident in this current study, which is intended to serve as a set of guidelines for strengthening disaster prevention. The dimension of, and risks posed by, climate change underline the need for action and effective strategies in this field.

Prevention is better than cure – this bit of wisdom from the field of medicine could not be more relevant to the topic at hand and should be applied in our approach to handling natural disasters around the world.

Foreword

Margareta Wahlström
Assistant Secretary-General for Disaster Risk Reduction and Special Representative of the U.N. Secretary-General for the implementation of the Hyogo Framework for Action

Addressing the human dimensions of climate change must become a priority for us all. In the march towards new global agreements to address the impacts of climate change, many reports are being produced, many speeches are being made. The most promising of these suggest a growing commitment to climate change adaptation. This is a welcome but long overdue development, we must not forget that urgency of reducing greenhouse gas emissions stems from our hope to reduce human suffering, to protect communities, especially the poorest and most vulnerable of our communities, from the impacts of natural hazards – floods, storms, drought, sea-level rise.

Over the last two decades (1988-2007), 76% of all disaster events were hydrological, meteorological or climatological in nature; these accounted for 45% of the deaths and 79% of the economic losses caused by natural hazards.The real tragedy is that many of these deaths can be avoided. While we debate on exact numbers, the scientific community through the IPCC Fourth Assessment Report warns that these numbers will surely increase – that is the frequency and magnitude of the events as well as the growing vulnerability of populations in urban areas and the rural populations working to sustain their livelihoods in a fragile and changing environment.

As this report illustrates, disaster risk reduction has accumulated a rich portfolio of experience, instruments and methods on how to predict weather related hazards and at the same time assess and address the vulnerability of many aspects of society. These initiatives provide an important resource for informed adaptation strategies to extreme events and are further supported by a worldwide movement to implement the Hyogo Framework for Action – an internationally-agreed 10-year plan for reducing the impacts of disasters.

Studies like this are an important contribution to our deliberations at the global level and planning and implementing our efforts at the national and community levels.We must continue to bring the experiences from diverse corners of the world to light and to consider carefully the factors that enabled success as well as the gaps and barriers to implementing disaster risk reduction.

This study undertaken by the German Committee for Disaster Reduction (DKKV) and its members addresses important future oriented questions we have to deal with if we attempt to reduce the human impacts of climate change.

Executive Summary

The following report is based on the acknowledgement that climate change is a fact (see IPCC 2007) and that it must be seen as a threat to human society. Even if a reduction of green house gas emissions will be achieved in the future, changes in the climate that have been set in motion up to the present will increase the effects that are already visible today: Increases in temperature, variations in precipitation, melting of glaciers, sea level rise and particularly – more intensive weather related extreme events, such as tropical storms, floods, droughts and heat waves are unavoidable. Therefore, we currently find ourselves at a crucial point: In addition to the indispensable task of reducing global carbon emissions through mitigation and a gradual transition to a post-carbon society, equal efforts must be directed to enhance the quality and intensity of adaptation to the unavoidable effects of climate change.

Climate change adaptation (CCA) must be urgently mainstreamed into all viable sectors of society, be it water, land or resource management, urban and rural planning, social protection or humanitarian assistance. Thereby, it is important to maintain a subtle balance between requesting and providing additional resources to prepare for and adapt to the known and unknown effects and impacts of climate change on the one hand and the continuing support of ongoing activities that aim to achieve sustainable development and resilience on the other. In addition, we must address the question: What, if adaptation fails?

Disaster risk reduction (DRR) is a highly promising tool to maintain this balance and to promote more resilience and adaptive capacities particularly regarding extreme events linked to climate change. Extreme weather events have the potential to destroy substantial parts of society as Hurricanes Katrina in 2005 and Nargis in 2008 have proven. The increasing number of these disasters bear the risk that even the humanitarian system will become overwhelmed. Since policies and affected communities have few options to eliminate natural hazards and extreme events, preparedness and vulnerability reduction are the core issues to be addressed when dealing with adaptation strategies. Hence, disaster risk reduction is not only an important option to adapt effectively to climate extremes but also a promising way to prevent societies from being set back in their efforts to develop.

Over the past years and decades DRR has been strengthened by a large portfolio of experience, instruments and methods to predict weather related hazards and at the same time assessing risks by taking into consideration the vulnerability of different social groups, social-ecological systems and critical infrastructures as well as some of the related root causes. These methodologies and experiences provide an important source of knowledge for well-founded strategies of adaptation to extreme events. Disaster risk reduction must no longer be seen as a post shock-oriented tool to restore communities affected by disasters to their pre-disaster condition. Instead, it must be acknowledged as a toolkit that can be used to take advantage of the opportunities that catastrophes provide for change and to create long-term resilience. Furthermore, it can provide sophisticated instruments to constantly monitor, evaluate and adjust adaptation strategies in the face of ongoing uncertainty and risk.

If adaptation measures fail, the humanitarian community is the first one to be confronted with the consequences. While the potential of linking DRR and CCA has already received growing acceptance within the scientific and also the humanitarian and development community, the integration of both fields of work has hardly been put into practice. Furthermore, important study areas where this integration would be particularly fruitful have been overlooked – such as coupled social-ecological systems or risk reduction and adaptation in urban areas. Several reasons are responsible for this delay: Lack of awareness of the tools and methods that disaster risk reduction provides for adapting to climate change, missing data and information as well as a lack of standardized tools to mainstream adaptation, structural, institutional and financial barriers and challenges as well as differences between the conceptual approaches of climate and risk reduction scientists and managers.

The present study addresses the urgent need to link DRR and CCA, while critically reflecting on opportunities and limitations. On the basis of a review of current strategies to link DRR and CCA at the international, national and local level and around 59 standardized as well as non-standardized expert interviews with national and international experts of diverse professional backgrounds, this report summarizes the challenges for a fruitful integration. In addition, it gives guidance for the future direction by providing practical recommendations and quality criteria for developing effective strategies for adaptation to extreme events. Main findings are among others:

- The number of actors being involved in DRR and CCA was seen as a challenge. The effective and efficient communication and cooperation between the administrative entities/ ministries to which DRR and CCA belong and the political awareness of the urgency of the problem need to be addressed.

- Although climate change data are available, the spatial resolution needs to be improved. Local and region-specific data sources that provide data of dynamic social and economic processes are also insufficient. Data and prognostic capacity regarding extreme events linked to climate change are limited.

- The monitoring after disasters need to be established in order to derive more information on how disasters and disaster response catalyze changes and whether these developments increase or reduce the adaptive capacity of communities to climate change.

- Current funding structures were identified as a major drawback for further integrating the fields of disaster risk reduction and climate change adaptation. Especially problematic were the differences between a rather short-term funding for disaster response by humanitarian donors and the necessity of long-term financial support for adaptation strategies.

- Response, recovery and reconstruction after disasters have not yet sufficiently been used to promote and realize vulnerability reduction and climate change adaptation.

- Core areas of work which are affected by climate change have not yet been sufficiently addressed by the actors involved (e.g. urban development and coupled social-ecological systems – see figure 8 in chapter V).

Based on these findings recommendations include among others (see chapter V for an extended list):

Table 1:

Key Recommendations

- The adoption of a cross-sectoral, multi-scale and integrative approach to link DRR and CCA and to mainstream both into other activities on sustainable development in rural as well as in urban areas
- The development of standardized methods, databases and quality criteria for moving from impact and needs assessment after disasters to a forward-looking vulnerability, capacity and adaptation assessment
- The strengthening of the focus on creeping changes within the DRR community which will affect millions of people when climate change intensifies (e.g. salinization of water resources in delta regions like the Mekong) and which could potentially turn into sudden-onset disasters when passing thresholds
- The advanced consideration of climate change adaptation aspects in the DRR community, particularly in the areas of response, recovery, reconstruction, mitigation and preparedness (development of standards and checklists for integrating climate change adaptation into programs for e.g. temporary shelter, water, healthcare and sanitation infrastructures as well as urban planning)
- Improvement of disaster management and especially response capacities focusing on Hot Spot regions of climate change, based on the latest scientific evidence about the future effects
- The translation of guiding principles, such as "resilience" and "adaptive" societies into more precise goals for specific regions (coastal areas, flood prone areas etc.) in order to be useful for practical actions and strategies on the ground
- The coordination of actors, institutions and organizations to build on existing capacities and explore synergies
- The creation of flexible funding schemes that shift from short-term and project-oriented financing to the support of forward-oriented strategies that finally lead to long-term sustainability
- The acknowledgement that disasters are windows of opportunity that allow for innovation and change if appropriate measures are taken and a long-term perspective is adopted
- The creation of structures and instruments that improve social learning and memory
- The provision of the necessary information and the successful link between different knowledge types – expert knowledge, local knowledge or experimental knowledge accumulated in institutional and personal memory
- The development of a comprehensive and internationally accepted framework that could serve as a conceptual and practical orientation when putting the integration of DRR and CCA into practice (the quality criteria summarized below could serve as a guidance)

The study calls for the formulation of quality and evaluation criteria for integrative climate change adaptation and disaster risk reduction strategies that must be kept in mind by different stakeholders in order to ensure that strategies, funded by public or private donations, have undergone a quality check and address important shortcomings of present adaptation strategies.

Quality criteria that should be considered for these strategies are – among others:

- Integrative climate change adaptation strategies include aspects of DRR and span over different spatial and temporal scales as well as various sectors
- Internationally agreed standards and principles are in place that provide orientation, avoid contradictory and parallel approaches in target countries and allow for monitoring and evaluation (especially with regard to the avoidance of negative secondary effects of measures taken)
- Strategies for donors and national governments to respond to disasters are not only based on needs and damage assessments but also on vulnerability and adaptation assessments (including the definition of goals for climate change adaptation in the reconstruction phase)
- The international disaster management and response system has incorporated a strategy to deal with the negative effects of climate change
- Mechanisms have been established to moderate actual or potential conflicts between different norms of various stakeholders, such as between norms of the national government and the local community (e.g. in the reconstruction process in New Orleans after Hurricane Katrina)
- Budget schemes for these integrated adaptation strategies include funding for all relevant stakeholders as well as "hard" (e.g. infrastructure) and "soft" measures (ecosystem management) and ensure short, medium and long-term commitment
- A code has been established by the donors that prevents unsustainable practices and people and governments from taking "short-cuts" that increase own benefits on the expense of others
- Funding for a specific disaster can also be used to promote climate change adaptation in the region
- Different institutions and organizations, particularly state and non-state actors (national and local governments as well as community initiatives and NGOs) are eligible for adaptation funding, thus ensuring cooperation and provoking types of competition regarding the best ideas and concepts

These recommendations, quality and evaluation criteria aim to provide policy makers and practitioners with a practical guide on where to go from here when trying to link DRR and CCA more successfully. The DRR's potential regarding climate change adaptation has to be made more visible in the international agenda, especially along the way to the next Conference of the Parties of the United Nations Framework Convention on Climate Change in Copenhagen in December 2009. Apart from the essential goal to reach an agreement on how to further reduce green house gases through activities of mitigation, the parties must outline a clear strategy on how societies can adapt to the unavoidable consequences of climate change. Disaster risk reduction should build a strong pillar within this strategy and within the post-Kyoto protocol in order to help communities to build resilience and live with change. However, as this study outlines, also disaster risk reduction goals, strategies and measures have to be modified to meet the goals for climate change adaptation more effectively.

Chapter 1:

Looking over the Edge – Introduction

The 3rd and 4th Assessment Report of the Intergovernmental Panel on Climate Change, underscored by increasing weather-related extreme events and disasters call for adjustments in human society which have been termed "climate change adaptation". The IPCC reports clearly state that increasing effects of human-induced climate change are unavoidable in the short- middle- and long-term, despite global mitigation efforts. The worsening trends of the number of hurricanes, floods, droughts and other weather extremes as well as melting glaciers and sea level rise confirm that climate change is already happening right now. The humanitarian consequences are tremendous. Therefore, we currently find ourselves at a crucial point: In addition to the indispensable task of reducing global carbon emissions through mitigation and a gradual transition to a post-carbon society, equal efforts must be directed to enhancing the quality and intensity of adaptation to the unavoidable effects of climate change. The time has come to act. Linking climate change adaptation (CCA) and disaster risk reduction (DRR) could be a crucial step. However, a major challenge lies in providing the right answers and appropriate solutions for achieving climate change adaptation – particularly adaptation to extreme events. Answers to questions like: What is the final objective and type of future that we want to move toward? What does adaptation really imply and mean for disaster risk reduction? What are the challenges and barriers when linking CCA goals, programs and measures with disaster risk reduction? What can the climate change adaptation community learn from the experiences of the DRR community? Does adaptation to climate change need a separate set of experts, instruments and funding? How can theoretical thinking about adaptation and risk reduction – such as goals like resilience, living with risk, adaptive societies – finally be put into practice? Do these communities even speak the same language? And what, if adaptation fails?

This report attempts to help those that must make decisions in the present while having to take into account the future. It attempts to outline key challenges that have to be addressed by various stakeholders when linking DRR and CCA. Moreover, the report serves as a practical guide in the right direction and a basis for further discussion, especially in light of the preparation of the upcoming Conference of the Parties of the United Nations Framework Convention on Climate Change in Copenhagen in December 2009.

First and foremost this report would like to send out an appeal. An appeal to address the challenge to link climate change adaptation and disaster risk reduction and to incorporate these integrative strategies in the development approach that also addresses the underlying problems such as pressure on ecosystems, increasing poverty and rapid growth of mega urban areas as well as those pointed out by the Millennium Development Goals. Often when development strategies as well as adaptation measures (e.g. dyke systems) fail the humanitarian community is the first to be confronted with the consequences.

The effects of human-induced climate change have become more evident during the last few years and projections regarding the development of extreme events linked to it indicate changes of an unprecedented scale which must alert both fields of work – disaster risk reduction and climate change adaptation. For this, all societies have to prepare. As it is the case with respect to many other threats humanity is facing richer societies and nations will generally better be able to do this. Hence, one important goal is that all the underlying causes for resilience that poorer people lack need to be addressed with a priority in developing and developed countries alike. Adaptation to and information on climate change must be mainstreamed into all sectors of human society, be it e.g. food security, urban planning, water, resource or land use management and finally – disaster risk reduction. It is most likely that – despite all adaptation measures – the increasing number of extreme events will pose additional challenges to the humanitarian system. These new challenges have to be addressed. Strategies and measures used will have to be revised and further developed to be able to deal with the changing character of extreme events, vulnerability and other underlying risk factors.

In this regard, sound adaptation and disaster risk reduction means to promote change rather than to preserve vulnerable conditions or to aim for a stability and robustness of societies and structures which might at the end be misleading. If vulnerabilities can be reduced and resilience be built in order to constantly adapt to change, all societies will be better able to deal with stressors and shocks (extreme events), be they related to climate change or other triggers. Especially under the consideration of uncertainties that are still attached to several aspects of climate change, primarily with regard to the local effects of extreme events, attention should be drawn to the reduction of the problems that we can influence: for example through social protection, through the sustainable use of our resources, through the adequate management of urban growth, the reduction of poverty and sound disaster management. Measures taken must be constantly monitored and evaluated in order to be able to adjust them in the face of uncertainty and new and unexpected developments.

However, a real mainstreaming of adaptation has not occurred yet. Most adaptation strategies we have analyzed have not sufficiently addressed cross-sectoral issues and links between different governance levels. Furthermore, the synergies between climate change adaptation and disaster risk reduction have only weakly been addressed in the past.

Therefore, the potential of DRR to achieve climate change adaptation goals must be promoted much clearer. Disaster risk reduction has gained considerable experience and skills in dealing with adverse events and with preventing them by assessing and reducing local vulnerabilities. Thus, disaster risk reduction plays an important role in achieving long-term sustainability, especially under the threat of climate change. In addition, the knowledge within the DRR community on how to use the window of opportunity immediately following a disaster to implement strategies that lead to more resilience plays a vital role.

Thus, climate change provides the challenge to the work of the DRR community to encourage the further improvement of tools such as better vulnerability and capacity indicators for informed and more effective adaptation strategies, especially in areas which have not been sufficiently addressed yet by the CCA community – such as coupled social-ecological systems and urban planning. Both, DRR and CCA could improve in establishing the components of resilience thinking in society – especially social and institutional learning (e.g. on how to deal with extreme events) as well as the will and ability to constantly prepare for and adapt to change and even to consider scenarios about what needs to be done if adaptation fails (dike collapses etc.). Therefore, the linked approaches of DRR and CCA must compose an important part of the post-Kyoto protocol.

Disaster risk reduction provides a great opportunity to maintain the balance between attention to climate change and at the same time further enhancement of general sustainable development. In fact, the potential of linking DRR and CCA has been widely accepted and emphasized. However, despite many general suggestions on creating better synergies, several challenges and barriers still exist that hinder an effective integration and mainstreaming in praxis that are often overlooked.

This study outlines these challenges and barriers. After a brief overview of the different use of terminology in both fields of work – DRR and CCA (chapter II)– which outlines the first challenge that needs to be overcome, chapter III presents current attempts of linking both communities at the international, national and local level. On the basis of these case studies and the conducted interviews, chapter IV points out the encountered barriers that have delayed an effective integration up to the present. Chapter V finally concludes with practical recommendations as well as quality and evaluation criteria that should serve as a guidance for the next steps to be taken.

Besides the analysis of important scientific papers and political documents, emphasis is given to expert opinions. The standardized and non-standardized interviews were carried out with 43[1] experts worldwide, spanning different fields of expertise, such as disaster risk reduction, climate projections and impact analysis, urban disaster management, development assistance and environmental protection. The selected experts from Asia, Africa, Europe, North America, the Pacific and the Caribbean emphasized that current links between disaster risk reduction and climate change adaptation are a key task, but presently have not been sufficiently realized and implemented. This study gives guidance on how to overcome the barriers and challenges in order to help communities to build resilience and live with change.

[1] Some of the interview partners completed the questionnaire in addition to a personal interview – thus the total number of standardized and non-standardized interviews equals 59

Chapter 2:

Same Terms – Different Meanings?

Although there is growing recognition that climate change adaptation and disaster risk reduction strategies need to be linked to address the challenges of sustainable development, resilience and human security, conceptual and competing definitions are often overlooked. Therefore, before turning to a detailed analysis of the challenges and synergies to link disaster risk reduction and climate change adaptation, this chapter will give special attention to the use of terminology and its different definitions, which present one of the major obstacles when bringing together two different fields of expertise.

Terms play an important role for conceptualizing problems and developing solutions. However, the present discourse of CCA and DRR, especially within the communities of climate change adaptation, disaster risk reduction and vulnerability research to natural hazards is characterized by competing terms and concepts. The disaster risk reduction community has primarily focused on major disasters and sudden-onset hazards – often from a social science perspective – while the climate change adaptation community has developed its terminology mainly based on research with a natural science perspective. Even if both communities are using similar terms, such as hazard, vulnerability, mitigation, adaptation and resilience, they may attribute different meanings to the same term (see e.g. Schipper 2009, p. 21, O'Brien 2008, p. 5). Both communities for example focus on vulnerability reduction. However, are they really talking about the same thing? If not, then practical actions and coherent strategies might be at risk, since a different understanding of what vulnerability means implies consequently also different approaches for strategies and solutions.

Since both the CCA and the DDR community aim to raise awareness, increase cooperation and dialogue between experts, policy makers and practitioners on matters of climate change related risk and extreme events (see Tearfund 2009), the awareness of differences and the identification of a common ground on terms is an essential task. Therefore, differences and similarities with regard to key terms are summarized in the following sections and outlined in detail in table 2 in appendix 3. In addition, important recommendations are presented for what would need to be done to develop a congruent terminology and thus more integrated concepts.

Hazards and Extreme Events

Climate-related changes and particularly extreme events are important issues that are of interest to both the CCA and the DRR community. While the climate change research has a stronger emphasis on gradual and creeping changes, such as the increase of the mean temperature, sea level rise and changes in precipitation patterns, the disaster risk reduction community has a dominant focus on crises and disasters linked to sudden-onset hazards. These different points of emphasis may, among others, be a result of the specific funding regimes and the different institutions involved in DRR and CCA, which will be discussed in more detail in chapter IV.

Vulnerability

The term vulnerability is a major link between both schools of thought. However, although this important link exists, there are major differences in the understanding and definition of the term. Even within the disaster risk community does a variety of meanings exist which are associated with the term vulnerability. However, a widely accepted definition is that vulnerability means the conditions and processes determined by physical, social, economic, and environmental factors, which increase the susceptibility of a community to the impact of hazards or reduce the ability of a community to recover from such impacts (see UN/ISDR 2004, Annex I, p. 7, Wisner 2002). Thus, vulnerability is mainly a characteristic of the exposed element or society and its ability to respond to a hazard or stressor (see e.g. Birkmann 2006, Bohle 2001). In contrast, the climate change community includes in its vulnerability definition also the character, magnitude and rate of climate change, which are mainly characteristics of natural phenomena (IPCC, 4ht Assessment Report, Working Group II, Appendix I). While the disaster risk community underlines that

vulnerability is foremost the "internal" side of risk, thus, the conditions of a society or an exposed object that a potential hazardous event could impact upon, the vulnerability definition of the IPCC links vulnerability to characteristics of the changing environmental conditions. In that sense the IPCC vulnerability definition moves towards what is called "risk" in disaster risk reduction research (see table 2 in the appendix). In the future, it will be necessary to identify a basic generic framework of vulnerability, for example, linking key components such as exposure, susceptibility and coping, with additional elements that reflect specific hazard or climate change features.

Although a certain consensus on current assessment tools of vulnerability can be identified within the DRR and CCA communities, the sharpening of different terms associated to vulnerability, such as sensitivity, fragility or susceptibility remains a challenge. Very important is also the differentiation between vulnerability and risk. While in the DRR community the probability of harmful consequences or expected losses (e.g. deaths, injuries, etc.) resulting from interactions between natural hazards and vulnerable conditions is defined as "risk" (conventionally expressed in the following formula *Risk = Hazard * Vulnerability* (see e.g. UN/ISDR 2004), the IPCC and CCA community often view vulnerability as the final product of their assessment chain (see e.g. Füssel/Klein 2006, p. 322). Thus, the understanding of vulnerability within the CCA community moves strongly towards the risk definition of the disaster risk community. In exchange, the risk term in the CCA community nearly neglects vulnerability and therefore does not view risk as the result of the interaction of a hazard or extreme event and vulnerable conditions. However, Oliver-Smith (1999) underlines, that disasters and the degree of resilience or vulnerability of the systems that interact with them are a gauge of the success or failure of the systems´ adaptation.

When aiming to create better synergies between DRR and CCA it is crucial to achieve a consensus on the differences between vulnerability and risks related to climate change. Furthermore, coping and adaptation are another pair of terms that are often used synonymously although there exists an important difference between them.

Coping and Adaptation

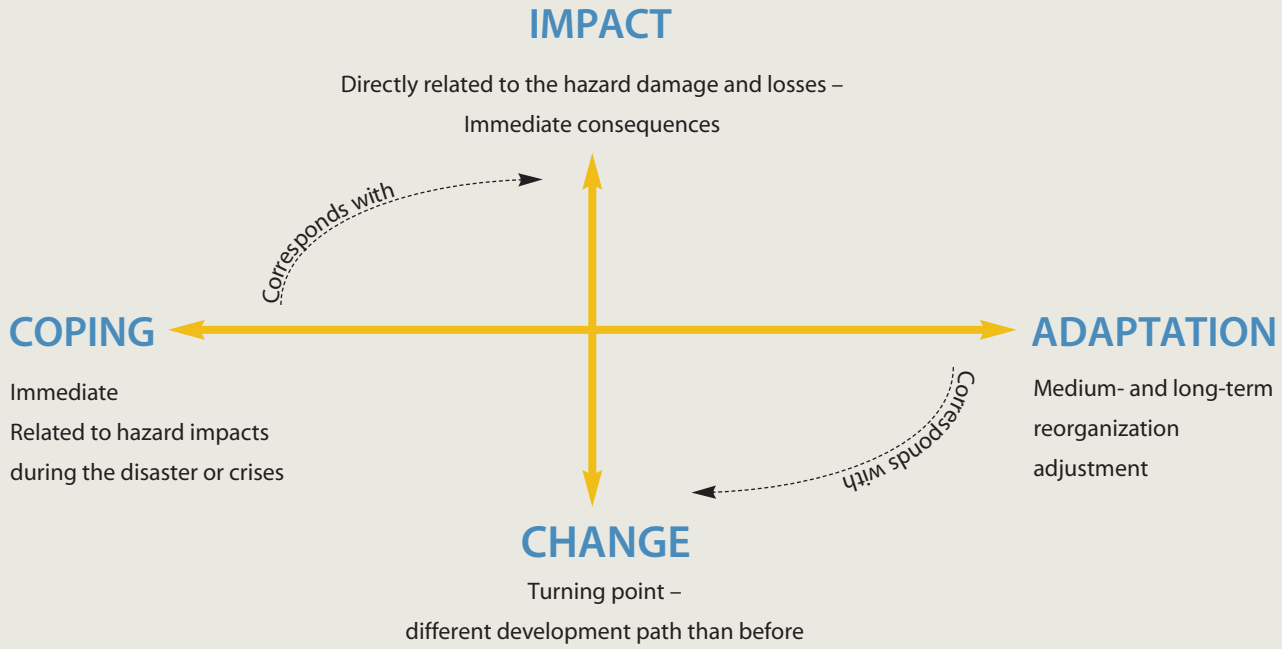
Another key necessity for identifying important conceptual differences and eventually finding greater common ground is to distinguish more precisely between "coping" on the one hand and "adaptation" on the other. Coping is used by the DRR community mainly to describe response processes to actual or potential hazard impacts. The concept of adaptation was developed by the CCA community as a second strategy towards the challenges of climate change – somewhat in contrast to climate change mitigation (reduction of greenhouse gas emissions). Today, even key institutions seem to use both terms synonymously without paying sufficient attention to their different qualities and characteristics (UN/ISDR 2004, p. 16; UNEP 2002, p. 426; IPCC 2001, p. 365).

Interestingly, the different definitions of coping and adaptation are often linked, such that adaptation should allow societies to better cope with stressors. However, an important difference is that "adaptation" implies adjustments to changing conditions or a changing environment, while coping in the DRR community involves reactions, decision-making and dealing with the hazard impact. This does not necessarily imply an adjustment.

Furthermore, most definitions leave the time dimension relatively open. Adaptation, for example, could encompass a range of actions and measures over various time frames. In contrast, Vogel/O'Brien (2004) and Birkmann (2009a) stress that coping and adaptation imply different timescales. While coping is often short-term and linked to the ability to survive and cope with the impacts of a hazardous or extreme event, such as eating fewer meals during a drought, the aim of adaptation strategies is to maintain the "standard of living" and therefore requires planned action with a long-term perspective (see Birkmann/Fernando 2008, Birkmann 2009a, Vogel/O'Brien 2004).

In order to underline these differences Birkmann developed the following figure (see figure 1), which also stresses that adaptation strategies need to have different qualities than just spontaneous coping actions. Coping may involve improvisation. Adaptation is part of local knowledge. The figure illustrates that coping mainly refers to a feedback process that is directly linked to actual or potential hazard impacts, while adaptation is determined by medium- and long-term adjustments

Figure 1: Coping and Adaptation as well as Impact and Change



Source: Birkmann 2009a, based on Birkmann et al. 2009

and reorganization processes that correspond to the notion of change (see in detail disasters and change in Birkmann et al. 2009). Furthermore, the link between adaptation and change constitutes transformation.

Recommendations

The envisaged IPCC Special Report on "Managing the Risks of Extreme Events to Advance Climate Change Adaptation", whose development was approved during the 30th Session of the IPCC in April 2009, will have to address terminology as one important challenge when linking DRR and CCA and propose solutions in order to improve the common terminological ground.

A potential way out of the dilemma of the incongruent use of terminology might be a process-oriented understanding of vulnerability, coping and adaptive capacity, where terms are defined in relation to each other. For example, the definitions of preparedness and coping capacities in the DRR community and of adaptation in the CCA community seem to have much in common. Hence, a comparison of their respective scope and meaning could lead to a more precise understanding of e.g. the differences between coping and adaptation.

The clarification of terms according to a process-oriented and system perspective would need to deal with the definitions of

1) extreme events and natural hazards linked to climate change,
2) exposure characteristics,
3) what sensitivity and susceptibility mean in specific contexts (e. g. for a community or coupled social-ecological system) and
4) response capacities of a system to actual or potential changes in form of

4a) coping and
4b) adaptive capacities.

This process-oriented focus could function as a bridge between climate change research in the form of climate change modelling and impact assessments on the one hand and the risk perspective of the disaster risk reduction community – including hazard, vulnerability, coping and adaptation aspects – on the other.

Finally, it could facilitate the important understanding of vulnerability and adaptation as dynamic processes in contrast to static conditions.

Chapter 3:

Where do we stand? Current Integrative Strategies

Several research and discussion papers have been published during the last years that tried to identify signs of convergence between disaster risk reduction and climate change adaptation. However, these signs are still rather vague and remain abstract. Chapter III reviews important reports published on the subject and discusses several international case studies. It provides a background for the further discussion of challenges and the formulation of recommendations, quality and evaluation criteria for improved and integrative climate change adaptation strategies and disaster risk reduction.

1) Introduction

The discussion paper on "Disaster Risk Management in a Changing Climate" (2005) originally prepared by UNFCCC as a contribution to the World Conference on Disaster Reduction in Kobe in 2005, for example, noted a convergence of the agendas of DRR and CCA. It stated that both are based on a risk management approach which includes evaluating risks, vulnerabilities and possible remedial measures and adopt a forward looking perspective (UNFCCC 2005). Development was seen as the integrating platform for climate change and risk management. Nevertheless, it already noted differences in the time horizon applied by both communities in their daily work and listed some drawbacks in linking them more effectively, including the fact of uncertainty, short-term versus long-term thinking, a lack of information and its dissemination. In 2006 a synthesis report of a follow-up project to the aforementioned discussion paper initiated by the inter-agency Vulnerability and Adaptation Resource Group (VARG) was published. The report titled "Linking Climate Change Adaptation and Disaster Risk Management for Sustainable Poverty Reduction" aimed at measuring progress in linking DRR and CCA using the case studies of Vietnam, Mexico and Kenya as the basis. Good progress was seen in improving disaster risk management as well as in forecasting and modeling climate conditions, which could be used by the disaster reduction community. A more detailed convergence of both communities, however, could not be derived.

In 2008 the paper on "Linking climate change adaptation and disaster risk reduction" by Tearfund identified signs of convergence between CCA and DRR. But again, the signs only stated that DRR was increasingly forward looking and that more adaptation tools were needed that considered the experience made within DRR. Although the paper is a good starting point, it does not provide sufficient information on how DRR and CCA could be linked appropriately and which challenges would have to be addressed in order to do so.

In effect, the many suggestions on how to link DRR and CCA that have been made during the past few years are still very abstract and formulated on a very general level and are therefore hard to translate into praxis[2].

Furthermore, important study areas for linking DRR and CCA in praxis, such as coupled social-ecological systems and related issues such as complexity and feedback processes as well as more specific contexts such as urban areas and critical infrastructures, have not yet been rigorously included in research.

The expert interviews that were conducted within the framework of this study in various national and international humanitarian and development organizations confirmed that mainstreaming adaptation into their daily work has only recently been taken up. In most organizations, the first step has been to create a working

2 Such suggestions included among others the statement that adaptation measures must be demand driven (see e.g. Task Force on Climate Change, Vulnerable Communities and Adaptation 2003) and especially tailored to link CCA/DRR goals with local efforts to pursue market opportunities (see e.g. Commission on Climate Change and Development 2008) or to use Social Protection as a common ground to link disaster risk reduction and climate change adaptation (Davies et al. 2008 for IDS).

group on climate change adaptation that is currently screening the work of the organization in order to integrate adaptation strategies into the relevant sectors. Most of them stated that appropriate policies, standards and practical advice for really linking climate change adaptation to ongoing and future activities are still missing. Since the decision to take this topic forward depends at the moment largely on developments at the international and national political levels which directly influence the structure of financial and funding schemes, the following sections will first assess current developments at these scales. Thereafter, efforts at the local scale are reviewed. With respect to the national as well as the local scale, emphasis is given to the analysis of case studies that show and underline the need to link disaster risk reduction and climate change adaptation more effectively as well as to understand more precisely the barriers and challenges which these approaches are currently facing.

2) International Efforts

Besides the integration and acknowledgement of disaster risk reduction as one tool to promote adaptation in current draft documents for the climate change negotiations formulated by the UNFCCC (e.g. UNFCCC 2009), the most recent strategy to improve the knowledge base about linking DRR and CCA is the decision of the 30th Session of the IPCC to develop a Special Report on "Managing the Risks of Extreme Events to Advance Climate Change Adaptation", involving climate change experts and experts from the field of disaster risk reduction, vulnerability and development research. The proposal for this special report – which will be published in 2011 – was introduced by Norway and the International Strategy for Disaster Risk Reduction (ISDR) during the 29th Session of the IPCC in September 2008 and positively evaluated by the experts of a scoping meeting held in Oslo in March 2009. One of the reasons for this proposal is the request of the Parties to the UNFCCC Nairobi Work Programme for further information on the possibility of including disaster risk reduction strategies into national policies and programs. Furthermore, up to the present, a comprehensive assessment of the guides, frameworks, and tools used by various institutions, organizations and communities to build capacity for reducing vulnerability and risk, to implement early warning systems and to establish overall preparedness and resilience has not been conducted (IPCC 2009). Particularly, if DRR strategies and tools should also allow for adaptation to climate change and extreme events, the specific options and limitations of these tools have to be understood in greater depth. Since the Special Report that will be prepared by the IPCC will only be published in 2011, there is an urgent need for the disaster risk reduction community to provide the development and humanitarian community with valuable and practical information of its potential for climate change adaption beforehand. The various meetings prior to and the COP 15 Conference in Copenhagen in December 2009 will be important venues to do so and to underline what DRR could provide and which limitations need to be considered or targeted.

3) National Efforts

On the national level, the most prominent efforts to include climate change adaptation in planning activities, are the National Adaptation Programs of Action (NAPAs) that provide a process for Least Developed Countries (LDCs) to identify areas in which urgent activities and projects are needed in order to adapt to climate change[3].

Although disaster risk was identified as an urgent problem by many of the LDCs, only 24 of the 38 LDCs that have submitted their NAPAs to the UNFCCC so far have called for immediate action and projects in the field of disaster management and early warning. Of these 24 countries, only 7 requested projects that included capacity building and the development of preparedness. All other countries called for early warning systems or technical measures that primarily focus on the natural hazards side. This clearly supports the argument for the IPCC Special Report that at the national level much more information is needed on the potential and the various tools and methods that DRR could provide

3 The process of the development of NAPAs was initiated during the UNFCCC COP 7 conference in Marrakesh in 2001 and is funded by the least developed countries fund, which is based on voluntary contributions from developed countries and managed through the Global Environmental Facility.

for climate change adaptation, particularly linked to extreme events. Another major drawback for an effective translation of the NAPAs into action is the fact that the development of the NAPAs has been financed through the least developed countries fund, while for their actual implementation no funding scheme has been found yet. In this regard the Commission on Climate Change and Development (2009) concludes, that NAPAs have not been sufficiently implemented in national budget and planning. Hence, most NAPAs remain only at a planning stage. As the NAPAs have been termed as "the most promising UNFCCC tool for integrating climate change and development policies" (Huq et al. 2006), there is an urgent need to redefine the scope and funding for these strategies.

Besides the NAPAs, however, individual efforts to integrate climate change adaptation into national programs and policies have been taken by several developing and developed countries. In terms of developed countries, the United Kingdom launched their national adaptation strategy in 2008 which is called „Adapting to Climate Change in England: a framework for action" (see website UK CIP (UK Climate Impacts Programme)), which is an important milestone. However, in many areas it remains vague in terms of mainstreaming activities and of linking climate change adaptation as a core task to other sectors. Germany has agreed on the "German strategy for adaptation to climate change" (see website BMU German Strategy for Adaptation to Climate Change) in December 2008 and mentions disaster reduction as one area which should support adaptation measures in terms of facilitating risk communication and developing guidelines on preventive measures for businesses. It remains to be seen if the proposed linkages will really be put into action once the plans are implemented. Compared to these initiatives in developed countries developing countries such as Vietnam and Indonesia have also formulated goals and strategies for climate change adaptation. The following sections will give an overview on their respective activities regarding climate change adaptation and disaster risk reduction and on positive as well as negative signals for their possible linkage.

Vietnam and Indonesia were chosen as the case studies due to their special vulnerability towards climate-related hazards and because they represent important regions where UNU-EHS has been conducting empirical research for several years.

Text Box 1:

Vietnam: The Challenge of integrating DRR and CCA

(by Matthias Garschagen, Nguyen Thanh Binh, Le Ngoc Thach)

1. Natural Hazards, Disasters and Climate Change Impacts in Vietnam

Vietnam suffers from a double burden as it has a long history of disasters of natural origin and is amongst the countries most at risk of future climate change impacts. Building a long monsoon-affected coastline of 3,260 km along the typhoon-ridden South China Sea and containing mountainous areas as well as the Deltas of some of Southeast Asia's major rivers like the Mekong and the Red River, the Socialist Republic is highly exposed to various natural hazards. Over the decade of 1997-2006 the country experienced 7,500 casualties from typhoons, floods and other natural hazards. Economic losses due to those disasters ranged around 1.5% of GDP (SRV 2007).

In addition to these risks, Vietnam faces multiple challenges with respect to climate change impacts. As per current population and land use patterns, a sea level rise of one meter would directly affect 6 million citizens, equalling 7,3% of the national population (Carew-Reid 2008). The figures for some hotspot areas are much more drastic, including Ho Chi Minh City (the economic hub of the country) where the homes of 12% of the population and numerous industrial estates would be inundated or the Mekong Delta (also called the "rice-bowl of Vietnam" due to its importance in terms of food production) where one third of the population and almost 10,000 km² of agricultural land would be directly affected (ibid.). Apart from these direct effects, sea level rise will cause large-scale salinisation problems affecting agricultural production far beyond the lines of direct inundation.

It is further predicted that climate change will augment the number and intensity of typhoons making landfall in Vietnam (CFSC 2004).The increase in typhoon activity is projected to drive a geographical expansion of typhoon tracks suggestingthat an increasing number will make landfall in the Southern parts (ibid.), challenging the conventional perception that typhoons are predominantly a problem for Vietnam's central and northern parts. Lastly, extreme floods are expected to occur more often and to become more intensive due to changes in rain patterns and river discharge (Tran et al. 2008; Wassmann et al. 2004).

2. The response: DRR and CCA in Vietnam

The supervision and coordination of disaster risk management and climate change adaptation efforts fall within the remit of different governmental sectors in Vietnam. The Ministry of Agriculture and Rural Development (MARD) takes a leading role in the country's disaster risk management. Within the section on water resources, the official mandate of the Ministry defines the sector's responsibility to "unify the management of dyke construction and protection, headwork for prevention of floods and typhoons and efforts to prevent and combat flush flooding, floods, typhoons, drought, and landslides along riversides and coastal areas" (SRV 2009a). The assignment of these tasks to the sector of agriculture and rural development results from the long history of water-related hazards and from the fact that much of the hydrological infrastructure (such as dykes, dams and embankments) plays a double role for irrigation as well as for flood protection purposes.

In order to plan and coordinate measures at the different horizontal levels, a Committee for Flood and Strom Control is installed at the national level and in each province, district and commune respectively. MARD and its subsidiary sub-national and local institutions play a major role in these committees as they execute most tasks and delegate the chair or vice-chair. Besides, the committees include members of the respective People's Committees and representatives (mostly directors or heads) of the different sectoral planning institutions. The responsibilities are to assess vulnerabilities to natural hazards, to raise awareness amongst the population, to coordinate the maintenance of disaster protection infrastructure (such as dykes or storm shelters) and to prepare disaster response and recovery measures.

In November 2007, the Prime Minister approved the long-term National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020. This strategy confirms the role of MARD as the focal agency for disaster risk management in Vietnam and sets out broad guiding principles and objectives. Included in these are the improvement of

early warning systems, the improvement of planning and building codes in view of natural hazards, the fostering of capacity building at all levels, the relocation of people in disaster-prone areas and the upgrade of structural protection measures (SRV 2007).

Only one year after the approval of the National Strategy for Natural Disasters Prevention, Response and Mitigation, the Prime Minister passed the National Target Program to Respond to Climate Change in December 2008. This program acknowledges that responding to climate change impacts is of high importance for enabling the country's sustainable development. It, therefore, calls for adaptation efforts at all levels and for mainstreaming climate change adaptation into general planning[4]. The main objectives (which translate into action steps) are: impact assessments of climate change on every sector, area and locality; the identification of measures for action; the promotion of scientific and technical activities for developing response measures; the improvement of the organisational structure and of institutional capacities; the enhancement of public awareness and participation; the fostering of international cooperation to obtain external support; the mainstreaming of climate change issues into socio-economic, sectoral and local development strategies and planning and finally the development and implementation of action plans of all ministries, sectors and localities to respond to climate change, including the implementation of pilot projects (see SRV 2008 for the original wording).

In contrast to the field of disaster risk management, the coordination of climate change response efforts is declared to be within the responsibility of the Ministry of Natural Resources and the Environment (MONRE). In accordance to that, MONRE also takes the leading role in the accomplishment of many of the specific tasks defined in the program. However, the program appoints other Ministries as leading agency for the development and implementation of those measures that are outside the domain of MONRE. On this note, the Ministry of Information and Communication is in charge of establishing information exchange related to climate change over public media and the Ministry of Planning and Investment has to lead the activities on mainstreaming climate change issues into development planning – to only name a few examples.

Even though both national schemes are important policy milestones setting the course for Vietnam's ongoing and future endeavours to deal with its hazardous conditions, they manifest the Socialist Republic's struggle to integrate formal disaster risk management and climate change adaptation. Albeit sharing large overlaps in terms of their target phenomena, the language and concepts used by the two domains rather create the impression of dealing with two separate sets of problems. The national strategy on natural disasters specifies the set of relevant hazards and is mainly concerned with the construction and maintenance of – mostly structural – protection measures and provisioning of short-term disaster response. The climate change target plan on the other hand uses a broad and open language and remains very vague with respect to the hazards and problems to be expected, let alone regarding guiding principles or criteria for potential adaptation measures (for a discussion of negative implications from this shortfall compare Garschagen 2009). Even though the plan rightly calls for an in-depth assessment of the multifaceted climate change impacts – claiming that the knowledge on the varying impacts is insufficient so far – the likelihood of intensified natural hazards such as typhoons and floods (as one field of impacts) is already revealed by numerous highly credible national and international studies. The precautionary principle would, therefore, demand a more explicit response to these risks – even though this would imply to enter the traditional grounds of another governmental sector. But gaps can be observed also on a less subtle level, as the climate change program does at no point refer to the earlier disaster strategy. Hence, the work packages and assignments of tasks within the two schemes are not synchronized – not even with respect to rather similar topics.

Resulting from the lack of institutional and conceptual integration both domains suffer losses in efficiency as well as effectiveness which jeopardize the success of adaptation and risk reduction. Climate change impacts and disaster risk can be considered top-priority crosscutting themes in Vietnam as they affect virtually any sector (agriculture, industry, constructions, transportation

4 The plan comprises climate change mitigation as well as adaptation themes. However, owing to the focus of this study, only the adaptation aspects will be covered here.

etc.) and all layers of society. As resources are limited on the other hand and priorities have to be set, there is great demand for an integrative development of adaptation and disaster risk reduction strategies (based on solid quality criteria). Such an integrated planning process has to go beyond the currently prevailing practice of preparing reports and plans intra-sectorally and only exchanging them afterwards – the latter procedure is also envisaged for most of the work packages of the two schemes reviewed.

Figure 2: Marginal settlement with high exposure to multiple natural hazards, Can Tho, Mekong Delta. Source: M. Garschagen

The development of such quality criteria would be a long and complicated process facing substantial difficulties with respect to, for example, uncertainties and political power relations. However, such criteria could contribute to improving the process of planning by making it more transparent and comprehensive. By doing so, they would help to identify and advocate solutions with the highest possible levels of efficiency and/or effectiveness. Based on empirical research on hazard vulnerability and climate change adaptation in Vietnam some aspects are proposed for consideration when developing those criteria:

What is the short-, medium, and long-term cost-benefit relation between structural disaster risk protection and other soft or hard adaptation measures of certain assets?
(e.g.: Vietnam's Mekong Delta is currently experiencing the development of numerous new industrial parks which are today not very much at risk to natural hazards but are located along water-transportation ways and will be highly exposed to flooding or sea level rise in a few decades. In the near future they are likely to generate high profits. In the long-term, however, protection will be very costly and losses due to damage become more likely. Is the choice of currently less advantageous but less exposed locations in the long term more desirable?)

Do measures for disaster preparedness and response that target one particular hazard have negative effects on the adaptive capacity to other climate change impacts (in the future)?
(e.g.: In southern Vietnam, one prominent measure to follow the official paradigm of "living with floods" is to build elevated houses on bamboo or concrete frameworks. These constructions are, however, highly vulnerable to strong winds and typhoons – both of which will be increasingly experienced in southern Vietnam in the course of climate change.)

Can (local) measures be jointly financed by DRR and CCA funds?
(In the field of DRR sophisticated financial mechanisms have been developed that regulate the vertical and horizontal financial flows. For climate change adaptation efforts, such mechanisms are not specified yet. Due to the double purpose that many measures will serve in future, joint financial mechanisms should be considered during the process of formulating CCA budgets. This, however, requires overcoming the rather segregated sectoral planning and financing culture in Vietnam.)

Are the capacities at sub-national and local level sufficient to accomplish the tasks of DDR and CCA which in most cases have to be implemented or even planned at those levels?
(Vietnam has been experiencing the decentralisation of substantial tasks and responsibilities over the last years. On the other hand resources have in many cases not been upgraded adequately. This creates significant challenges in particular with respect to DRR and CCA as important know-how (such as climate change modelling or digital elevation models for planning purposes) is not available at the local level. Local DRR and CCA institutions could improve their situation through joint requests for and common usage of resources and know-how.)

Text Box 2:

Integrating DRR and CCA in Indonesia

(by Claudia Bach and Neysa Setiadi)

1. Natural Hazards, Disasters and Climate Change Impacts in Indonesia

The Republic of Indonesia as the largest archipelagic state in the world which consists of five major and more than 17,000 minor islands is exposed to various types of natural hazards and one of the vulnerable countries to climate related hazards (UN-OCHA 2006). The occurrence of extreme climate events proved to bring adverse impacts to Indonesia, e.g. the costs of 2.2 Million USD in water supply and electricity production due to big flood in Jakarta 2007, more than 1000 Million USD direct and indirect losses in 1997/1998 forest fires related to the El-Niño event, as well as other impacts on agricultural production and health (Indonesian Country Report 2007).

Changes in climate such as increase of temperature, changing rainfall pattern and sea level rise and their impacts have been observed in several regions in Indonesia. The analysis of climate change scenarios for Indonesia predicts higher flood and drought risks (ibid.). Moreover, as an island country with about 81,000 km long coastline, Indonesia has a very high coastal population, e.g. 65% of the population of the main island of Java live in the coastal region and in 1997, it was reported that about two million people lived in the coastal regions with an elevation between 0 to 2 meter above sea level (ibid.). There are many industries and sectors that operate along the coastal areas, which contribute to about 25% of the gross domestic product and absorb about 15% of employment (Dahuri dan Dutton, 2000). Sea level rise is another consequence of climate change that will add to flood risk along Indonesia´s coastline and cause huge impacts on the existing socio-economic activities. Subandono (2002) estimated that with a sea level rise of about 1 m, about 405,000 ha of coastal land including small islands will be flooded. The impacts might be severe in certain coastal areas such as the north coast of Java, the east coast of Sumatra, and the south coast of Sulawesi.

2. The response: DRR and CCA in Indonesia

Indonesia has a long history of DRR. The first national coordinating board for disaster management was already set up in 1966. Since the 1990s the responsibility of the institution has no longer been limited to natural disasters but extended to also include human-induced disasters. Members of the National Coordinating Agency for Disaster Management are, amongst others, the Minister of Home and Social Affairs, the Minister of Health, Settlement and Regional Infrastructure as well as the Minister of Communications. The organisational structure additionally includes members of the provincial, regional and site level (National Coordinating Board for Disaster Management 2004). The devastating disaster due to the Indian Ocean Tsunami 2004 that affected the northern region of Sumatra has also catalyzed further activities to strengthen risk management and preparedness especially of coastal communities, among others for example through the development and implementation of a Tsunami Early Warning System. In 2006 the National Action Plan on Disaster Reduction 2006-2009 was launched by the Government of Indonesia, which links its activities to global strategies such as the Yokohama

Figure 3: Flood in Jakarta 2007. Source: ECHO

Strategy and the Hyogo Framework for Action. It intends to mainstream disaster risk reduction measures into the development framework, particularly in the National Middle-term Development Plan and Government´s Annual Work Plan. It defines its five key priority areas for disaster risk reduction according to the five priority areas for action of the HFA. For each of the priority areas, projects are outlined including the responsible institutions and the timeframe within the period 2006-2009. This action was further strengthened by passing of the new law on disaster management (UU 24/2007) in 2007, followed by establishment of a National Disaster Management Agency (BNPB) in early 2008, which is entitled to state budget allocation for coordinating and implementing disaster management activities.

In parallel to the process in disaster risk reduction, the national government has developed the National Action Plan Addressing Climate Change in November 2007 (NAPACC), followed by the establishment of the National Board on Climate Change (DNPI) which is led directly by the President to strengthen policy on climate change and coordinate related activities in July 2008. Within NAPACC, the Ministry of Environment has developed an adaptation plan which focuses on the sectors most vulnerable to climate change including water resources, agriculture, fisheries, coastal and marine, infrastructure and settlement, health and forestry. In each focus area climate change adaptation has to be linked to four main development issues:

- Poverty reduction
- Social and economic development
- Investment
- Spatial planning

Thus, the adaptation process is closely related to the Millennium Development Goals and hence, ongoing development projects might be adapted to take climate change adaptation measures into account. Strategies are developed for different timeframes (2009-2012; 2012-2025 and 2025-2050) and in cooperation with other ministries (e.g. Department of Forestry, Department of Finance, National Planning Development Agency, Ministry of Marine Affairs and Fisheries, Department of Industry). As the funding capacity through national budget for the plan is limited, funding schemes such as fiscal, financial and market instruments as well as non-conventional funding sources (e.g. debt for adaptation/mitigation swap) are considered. The need for international cooperation has been emphasized (NAPACC).

Disaster Risk Reduction and Adaptation to Climate Change are important topics in Indonesia's policies and both intend to mainstream their strategies and plans into the existing development framework (Long-term, Medium-term Development Plan and Work Plan). The necessity to link the climate change adaptation agenda with disaster risk reduction was mentioned in NAPACC and climate change was also considered as one hazard factor in the National Action Plan on Disaster Risk Reduction, however, they are not really integrated yet. This shall relate to differences in leading actors, main focus of disaster risks (existing versus future risks), funding scheme and the implementation period of both communities.

Furthermore, the cooperation of the National Development Agency and the National Coordinating Agency for Disaster Management with respect to the Disaster Reduction Plan and the downscaling of the plan into concrete projects show some first efforts of cooperation taken by the development and the disaster risk community. However, in-depth cooperation between the CCA and the DRR communities could not be identified. Integration of DRR and CCA activities at national level, such as extending the established Tsunami Early Warning System also to monitor other climate change related coastal hazards, is still a challenge. Also, the local level faces challenges, e.g. in obtaining relevant data to integrate multi-hazard and climate change related aspects into actual urban planning documents (Discussion of UNU-EHS experts with the planning agencies of the city of Padang, 2008).

Presently, linkages between DRR and CCA are primarily visible in some single projects that were in their majority initiated by non-government organizations such as the Indonesian Red Cross (Padang, Merak).

Preliminary Conclusions regarding the National Case Studies

Both case studies outline the enormous challenges the countries face and will face in the future due to climate change and extreme weather events. Despite the national efforts of the governments of Vietnam and Indonesia to implement plans for disaster reduction and climate change adaptation, possible synergies and therefore links between both topics have not sufficiently been taken up. In contrast, both topics are mainly treated as separate fields of action and are therefore affiliated with different governmental ministries or agencies. As has been recognized with respect to most of the NAPAs, in Vietnam disaster risk reduction strategies are mostly implemented in form of technical solutions such as dykes, early warning systems and building codes. In contrast, the Indonesian Adaptation Plan is closely linked to general development activities, but it only refers to disaster risk reduction in a limited way as an appropriate tool. A particular problem in both countries is the effective coordination and cooperation between different ministries and governance levels as outlined above.

4) Local Efforts

Considering the weak efforts to integrate DRR and CCA at a national level a coherent strategy for a linkage at the local level cannot be expected soon. However, some national and international projects have been carried out to explore the advantages of linking disaster risk reduction and climate change adaptation at the local level. Two of such projects will be presented here. The first project is a small-scale national project carried out by the Universidad de Chile in Agüita de la Perdiz, Chile. The second was conducted by the FAO and the Asian Disaster Preparedness Centre (ADPC), under the Comprehensive Disaster Risk Management Programme (CDMP) and in close collaboration with the Ministry of Agriculture Department of Agricultural Extension (DAE) in Bangladesh. Both projects should provide an overview of the various activities at the local level.

Text Box 3

Disaster Risk Management related to heavy Rainfall: Case Study Agüita de la Perdiz, Chile

(by Paulina Aldunce)

The community "Agüita de la Perdiz" is located within the city of Concepción which is the second largest city in Chile. Due to the fact that the area is only accessible by one single road,the community is characterized by a strong sense of identity with high levels of community organization and participation. (see also Debels et al. 2008). On June 26th 2005 a precipitation event of 162.2 mm in 24 hours occurred which was an amount that had not been experienced during the last 142 years. Physical vulnerability such as settlements on high slopes exposed to high landslide risk as well as social vulnerability created through high levels of poverty, inhospitable conditions and the illegal occupation of the area led to the partial or totaldestruction of almost 100 homes.

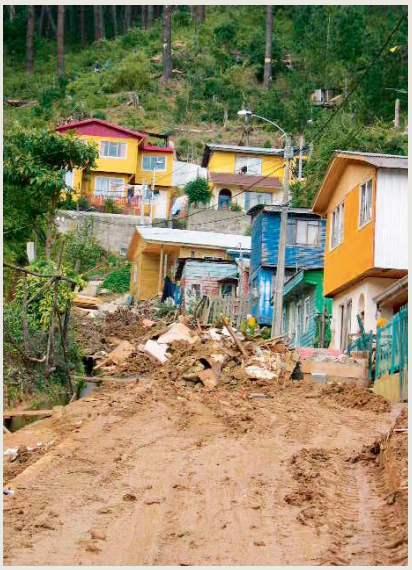


Figure 4: Landslide in Argüita de la Perdiz, Chile. Source: P. Aldunce

Scope, main objectives and methodology

The project "Disaster Risk Management related to rainfall: Case study Agüita de la Perdiz, Chile" was carried out by the Department of Environmental Sciences and Renewable Natural Resources of the University of Chile between June 2005 and July 2007.

Disaster Risk Management (DRM) has been identified as one of the tools for effective adaptation to increased climate variability and change. In this respect, the project aimed to identify factors that promote or hinder adequate DRM. In addition, the project was designed to learn from these factors, and consider the ones that hinder DRM as opportunities for its improvement and thus an opportunity for long-term adaptation that could be used by local actors. The methodology included interviews with social actors involved in DRM in Agüita de la Perdiz as well as a semi-structured survey of the affected population. In addition, local governmental documents like laws, zoning plans and official statements were reviewed. Main results are outlined in the following factors presented below.

Main results

The analysis of the interviews, the community survey and the review of documents resulted in the following findings:

Factors that promote adequate DRM and long-term adaptive capacity

- The current DRM law (passed in 2002), called the Civil Protection National Plan (CPNP), aims at decentralizing public administration, allowing appropriate planning according to the needs of each hierarchical level of public agencies. It enhances participation of social actors, defining their responsibilities, systematizing risk assessment, and standardizing the basic elements of emergency plans.
- The CPNP is the result of a learning process based on lessons from past experiences. It also promotes a better governance system leading to DRM.
- The community of Agüita de la Perdiz possesses its own zoning plans which include disaster risk assessment.
- The local community shows strong leadership,sense of belonging and autonomy resulting in pro-activeness, local knowledge of risks and the physical environment, as well as a sense of its own responsibility for disaster prevention and self-emergency-response.
- Lessons learned from frequent previous disasters have enhanced community participation and organization resulting in increased empowerment and lower rates of apathy to disasters.
- Technical and organizational preparedness exist at multiple levels in public agencies.
- Mitigation and reconstruction efforts by public agencies and the community have been displayed in the area.

Factors that hinder adequate DRM and long-term adaptive capacity

- CPNP is supposed to provide the framework for vertical and horizontal coordination of parties but this does not always occur.
- The community seldom participates in local decision making processes.
- More capacity building is needed: e.g. through training of public servants and more time allocated to DRM activities.
- Social vulnerability forces illegal occupation of risky areas.
- Mitigation and reconstruction initiatives have not always resulted in positive outcomes: protection walls on high slopes have deteriorated rapidly which led to increased risk.

Text Box 4:

Livelihood adaptation to climate variability and change (LACC) in drought-prone areas of Bangladesh

(by Shalini Kanwar)

Background

Between 1991 and 2000 93 major disasters were recorded in Bangladesh, resulting in nearly 200 000 deaths and causing US$5.9 billion in damage with high losses in agriculture (FAO 2006). Agriculture is the largest sector of the Bangladesh economy, accounting for some 35 percent of the GDP and 63 percent of the labour force. Agricultural production is already under pressure from increasing demands for food and the parallel problem of depletion of land and water resources caused by overuse and contamination. A continued trend of more frequent and intense droughts, as a result of further climate variability and climate change, is expected to have significant impacts on the agricultural sector (FAO 2006). Due to effects of climate change, the distribution patterns of precipitation during the growing season, high temperatures and higher rates of evapotranspiration will create water stress conditions and a decline in agricultural production in the drought-prone areas of the country.

Project area

The study was implemented in the pilot areas in Chapai Nawabganj (Gomastapur and Nachole Upazillas) and Naogoan (Porsha and Sapahar Upazillas), districts mainly covering the Barind Tract and the Punarbhava and Ganges river floodplain. Average annual rainfall in the study area ranges between 1400–1500 mm, with 80 percent occurring during monsoon season (June– September). During the dry months, water deficits range from 400–500 mm. The surface water flow of the Mohananda and the Punarbhava rivers tends to decrease in the dry season. The rate of depletion of groundwater has been increasing since tubewell irrigation and crop intensification began in the early 1980s (FAO 2006).

Scope, main objectives and methodology

The project was carried out under the technical guidance of FAO and the Asian Disaster Preparedness Centre (ADPC), Comprehensive Disaster Risk Management Programme (CDMP) and in close collaboration with the Ministry of Agriculture Department of Agricultural Extension (DAE). It consisted of two phases, LACC I (2005-2007) and LACC II (2008-2009).The preparation of a third phase is currently under way.

The main objective of the project was to improve the adaptive capacity to climate variability and change for sustainable food and livelihood security in drought prone regions of Bangladesh (FAO 2009a). Subcomponents of this overall objective included:

1) introduction and further strengthening of institutional and technical capacities for improved adaptation to climate variability and change; addressing technology needs for adaptation, awareness raising and climate information needs.

2) Implementation usingparticipatory methods and jointly with local communities of good practices and strategies to effectively address climate change adaptation and disaster preparedness and develop strategies for their long-term sustainability.

3) Provision of recommendations for up-scaling and mainstreaming of successful pilot tested livelihood adaptation options into development planning and policy decision making.

The methodology of the project included the following components:

- characterization of livelihood systems;
- profiling of vulnerable groups;
- assessment of past and current climate impacts;
- understanding and assessment of local perceptions of climate impacts, local coping capacities and existing adaptation strategies using participatory tools;
- increased understanding of the effect of drought on agriculture and allied sectors;
- analysis of climate analogues and climate change model outputs and scenario development by using General Circulation Models(GCM);
- evaluating, field testing and documenting locally selected options and introduced adaptation practices and

developing a good practice adaptation options menu;

- development of extension tools and awareness-raising strategies and introducing long-lead climate forecasting, capacity building and training of DAE extension staff and community representatives;
- providing technical advice and coordination support.

Institutional setup of actors relevant for the study

The Government of Bangladesh (GoB) is responsible for drought relief work by undertaking relief measures such as drinking water, food grains and food subsidies to special groups and through food-for-work programmes. The rural work programme of the GoB provides employment to the population affected by drought and helps mitigatedrought severity. The Disaster Management Bureau (DMB) coordinates drought relief work with local governments and also implements activities in human resource development, database and information services, and documentation of disaster management.

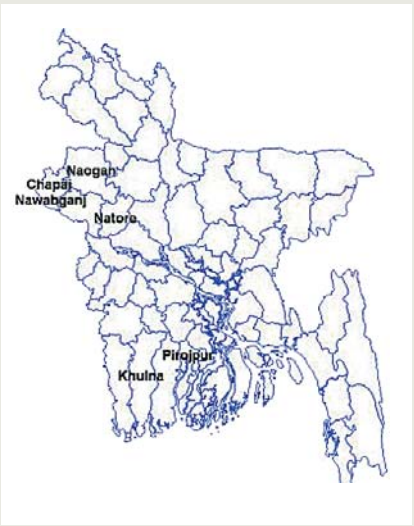


Figure 5: Study Areas of LACC. Source: http://www.fao.org/climatechange/47739/en

Due to a paradigm shift from relief and response to comprehensive disaster management, the Ministry of Food and Disaster Management (MoFDM) was established in 2003. Climate related impacts are addressed at various institutional levels ranging from the Union Disaster Management Committee (lowest community level) to the apex institution level, the National Disaster Management Council. As a technical arm of the Ministry of Food and Disaster Management, DMB oversees and coordinates all activities related to disaster management from the national to the grassroots levels. It is also entrusted to maintain an effective liaison with government agencies, donors and NGOs to ensure maximum cooperation and coordination in all aspects of disaster management. The Disaster Management Programme (CDMP) was designed as a long-term programme of the Ministry of Food and Disaster Management with multi-agency involvement. Funded jointly by the United Nations Development Programme (UNDP) and the Department for International Development (DFID), the programme was launched in 2003 with its activities designed to be implemented in phases. One of its major activities is related to climate change adaptation in various sectors.

Main results

Positive outcomes and synergies developed (among others)

- Documentation of local agricultural adaptation practices, defined through participatory approaches, which were evaluated in collaboration with other relevant national institutions and disseminated by various means.
- Strong collaboration and involvement of various international, national and local institutions.
- Regular exchange of ideas took place between the Climate Change Cell at DoE and other related CDMP components.
- Climate change scenarios were developed from consultation with national research institutions and national focal points such as the CDMP Climate Change Cell and other CDMP components within Bangladesh.
- An institutional framework that can respond to development needs and the dissemination of weather and climate information for drought risk management was set up.
- Efforts were undertaken to develop the technical capacity of working group members, municipalities and community members for interpreting, communicating and applyingclimate information effectively.
- Efforts were taken to improve the technical capacities of the Department of Agriculture Extension (DAE) and the local disaster management committees as well as the coordination among them.
- Various adaptation measures and options for drought risk management found high acceptance among farmers.

Gaps Identified

- There were recent shifts in coping strategies and livelihood options of rural men and women due to institutional interference, economic motivation and employment opportunities. Present household coping strategies and non agricultural adjustments were insufficient for proper adjustment to future climate variability and change-related threats. Identification of additional good practices and broader replication and exchange of good practices needs promotion.
- There was lack of coordination, capacities and expertise among several institutions, including government agencies, NGOs, social, informal and private institutions and farmers' water-user groups operating in the area.
- Local disaster management committees exist, but their capacities for advocating adaptation practices are limited.
- At the national level, the Bangladesh Meteorological Department (BMD) generates weather and climate information relevant to drought risk management. However, this information hardly allows the end users to make pro-active decisions, as it often is not properly packaged into easily understandable or usable formats.
- Only limited sharing of information takes place between BMD and other governmental agencies such as DAE, DMB etc. The problem is exacerbated as these agencies belong to different ministries in the Government of Bangladesh.
- Available weather and climate forecast information products at national level is not tailored to match local user's needs. There is need for translating global climate outlooks into local outlooks, translating local climate outlooks into impact scenarios, and communicating response options.

Preliminary Conclusions regarding the Local Case Studies

The two project case studies conducted in Chile and Bangladesh varied in several aspects in their approach and scope. Nevertheless, some common and several individual conclusions for the potential of DRR to enhance CCA on the community level can be drawn:

a) Participation, responsibility, local knowledge and sense of ownership of the local community in conducting risk reduction activities is key

b) Technical and organizational cooperation between and within multiple levels of public agencies, national and international organizations are a prerequisite

c) It is crucial to capture the needs of the local people and to ensure that short-term and long-term adaptive measures are linked with a clear focus on possible future risks within an integrative cross- sectoral planning approach

d) Awareness raising is of utmost importance – the dissemination of all awareness messages in local languages need to become an integral part of the livelihood adaptation process

e) Capacity building of public servants and the local population must be a prominent part of DRR activities

f) Climate change and risk information disseminated to the local end-users must be prepared in a usable and understandable format

g) Strategies should, where possible, be based on past experience (e.g. with extreme events) and developed according to the lessons learned

h) Adaptation is a social learning process and location specific – decentralized strategies are required to develop location-specific adaptation options to manage future anticipated risks considering bio-physical, socio-economic and socio-cultural factors

i) Indicator-based monitoring of ongoing adaptation and risk management practices and alerts on the risk of maladaptation are essential, especially in order to increase social learning

j) Locally adapted plans, such as zoning and risk management plans and institutional frameworks help to improve organization, coordination and the dissemination of information, however, these plans must have a certain flexibility for specific local adjustments

k) Mitigation and reconstruction initiatives must be carried out with great caution and a wider conceptual approach in order to avoid negative secondary effects

l) Applying a livelihoods perspective is helpful in order to identify local vulnerabilities and capacities

m) Links between disaster risk management, development and research must be further strengthened

5) Conclusions

The selected case studies at national and local level and the outline of the international discussion in Chapter III shows that we stand only at the foot of the mountain in attempting to link disaster risk reduction and climate change adaptation. Despite several proposals by the scientific and development community on integrating both fields of work, little has been put into praxis yet. At the international level, only very recently has the great opportunity been recognized for building on disaster risk reduction strategies and instruments in order to advance climate change adaptation efforts. This gap which will be filled by the IPCC Special Report on "Managing the Risks of Extreme Events to Advance Climate Change Adaptation" was identified by national level agencies and planners, and is reflected in a very small number of National Adaptation Programs of Action. Projects on disaster risk reduction to respond to urgent needs of climate change adaptation, particularly to extreme events should be integral parts of NAPAs. The two national case studies presented in this chapter point to the fact that adaptation and disaster risk reduction measures are still focusing too much on technical solutions rather than on the reduction of underlying vulnerabilities and the implementation of resilience building features into society and infrastructure. Furthermore, the great need for the coordination of different actors, institutions and organizations across and between political levels was strongly emphasized. This became evident again in the two local case studies on concrete projects. The involvement of all stakeholders, including the local population is also identified as crucial. Capacity building and the need for the dissemination of appropriately prepared and specific local information were seen as vital. In addition, appropriate monitoring instruments and the organizational and institutional frameworks for improved social learning must be in place. It can be concluded that an international framework on linking DRR and CCA effectively could help countries and communities appreciate the synergies that certainly exist between both fields of work. This framework could provide an orientation for the structural, financial, material as well as personal requirements for this type of integration. The framework should be accompanied by quality and evaluation criteria that could serve as a guidance for policy makers and help to evaluate potential efforts. Such criteria could include, for example, the assessment of cost-benefit relations between structural disaster risk protection and other soft or hard adaptation measures. In addition, the measures should help to evaluate the benefit of adaptation strategies in terms of their short- and long-term sustainability to avoid possible negative secondary effects. Recommendations, quality and evaluation criteria will be formulated and discussed in chapter V. They will provide some guidance for the development of such a framework.

Chapter 4:

Why have we not come further? Barriers and Challenges

This chapter summarizes important challenges and barriers that have to be addressed when developing integrative strategies for linking disaster risk reduction and climate change adaptation. It follows up on the results of chapter II and III and is based on key findings of expert interviews conducted with more than 43 experts during May 2009[5]. The standardized interviews were analyzed based on statistical methods, the non-standardized interviews on the basis of a qualitative content analysis.

The obvious threat to human security and development that climate change imposes calls for the development of adequate adaptation strategies. As the current discourse on these strategies reveal, climate change is no longer seen as a pure environmental problem but as a risk that affects ecosystems and society alike. Therefore, adaptation strategies need to consider both: natural and social processes and hence a communication and cooperation between natural and social scientists as well as the development community is essential. Huq and Toulim (2006) speak hereby of the second era of climate change in which new actors enter the scene. They even describe a third era that has begun with the publication of the Stern Review in late 2006 and the IPCC´s Fourth Assessment report in April 2007. Both publications demonstrated that human-induced climate change is already happening. As they emphasized that the effects are felt mostly be the poor and developing world in contrast to those that carry the responsibility for it, Huq and Toulim predict that the third era of climate change will have to address the question of how to compensate people for the damage that has already been done. This question will especially become relevant in certain areas where adaptation no longer is a possibility but the only way for people to escape from the adverse consequences of climate change, is to move away from their homes and resettle in more secure places (addressed as the third phase of adaptation by Saleemul Huq, 08.05.09). Hence, the limits of climate change adaptation and the possibility of its failure, which could result in new types of conflicts and disasters, have to be considered more seriously as well as the consequence that climate change is increasingly becoming an issue of global justice. New actors will come into the play that try to find solutions for the emerging trends of disasters, conflict, migration and ethics on all political scales. This arrangement of many different actors belonging to different fields of expertise,organizations and institutions, that follow different visions and objectives, are one reason for the several mismatches and barriers to link DRR and CCA that have been identified by previous studies and by the experts consulted for this report. These barriers have often hindered an effective cooperation of both communities up to the present or at least need to be considered when improving the quality of current adaptation strategies and DRR activities.

They range from different affiliations of the two fields of work to separate institutions and hence different languages, objectives and funding schemes to different temporal and spatial scales in research and practice contexts. The case studies described in chapter III underline the need to address and examine these challenges in greater depth. In this regard the authors of this report have structured the identified challenges and barriers into three main dimensions (based on a classification developed by Birkmann 2009c):

1) Scale dimension
2) Normative dimension
3) Knowledge dimension

which will be outlined in the following sections.

[5] The selected experts represent different institutions and fields of expertise (disaster risk management – e.g. Disaster Management Centre South Africa, Asian Disaster Preparedness Centre, universities (e.g. University of Waikato, New Zealand, University of the West Indies, Jamaika, University of the South Pacific, Fiji), INGOs and NGOs dealing with development assistance and disaster risk reduction (e.g. World Vision, GTZ, Red Cross/Red Crescent including its Climate Centre, CARE, Save the Children) and regional networks –such as the Pacific Islands Applied Geoscience Commission and several national weather services. The non-standardized interviews were conducted according to guiding questions in Germany, during missions undertaken for the study in the United Kingdom and Fiji and via telephone.

1) Scale Dimension

When dealing with the development of appropriate strategies to reduce disaster risk, to respond to an actual disaster – e.g. the flood disaster in Namibia 2009 – and to develop appropriate adaptation strategies to climate change, scales are a key issue. For example, short-term interventions after disasters might be too limited to address major aspects of adaptation to climate change. Hence, temporal scales play a vital role. Current national adaptation strategies might be too broad in order to be meaningful to local stakeholders and therefore a mismatch of the applied spatial scales occurs. These examples underline the necessity to consider scale problems and mismatches more in-depth when linking DRR and CCA. In this context scale-mismatches can be identified on three different types of scales: The spatial, the temporal and the functional scale.

Spatial Scale Challenges when linking DRR and CCA

Within the topic of linking DRR and CCA, mismatches on the spatial scale evolve due to the fact that climate change issues have up to now primarily been analyzed on a global scale whereas disasters have been studied in the respective regions and localities where they occur. Climate scientists have mostly designed global models and predicted global trends striving for universal laws, whereas the disaster risk reduction community looks at local vulnerabilities and risks of specific areas, hazards and groups of people potentially or actually affected. The lack of local, down-scaled data of climate change effects that could lead to the preparation of specific adaptation and disaster risk reduction strategies is one of the major concerns of risk reduction and adaptation managers. Within the standardized interviews 77% of the respondents indicated that this area needs to be improved, while only 5% said it is sufficient as it is and 18% had no opinion about this. Accordingly, adaptation strategies hardly exist on the local scale but are up to now designed for entire countries or regions. To this kind of vertical mismatch of spatial scales a horizontal spatial mismatch may be added, which occurs because the sources of climate change often lie in different regions and countries than its effects. As mentioned above, this mismatch between countries that are primarily responsible for climate change and those that carry the burden of e.g. more extreme weather events, could lead to political conflict and thus to questions of global justice and security. Furthermore, horizontal mismatches of adaptation strategies may also lead to conflict. In many cases, negative secondary effects of adaptation measures, such as the consequences of larger dyke systems against floods, which are an advantage for the respective community, but might imply major problems for downstream communities, are not sufficiently considered in current responses to climate change and natural hazards (see e.g. Adger et al. 2005, p. 81; Birkmann 2009b).

Temporal Scale Challenges when linking DRR and CCA

With respect to temporal scales, DRR and CCA face other major challenges. While disaster risk reduction – particularly humanitarian assistance – is often event-related and rather short- term in its interventions, the climate change community is characterized by long-term perspectives which go far beyond any political cycle of elections. The long-term effects of climate change can be predicted, whereas precise information on climate-related extreme events which would be beneficial and of major interest to the DRR community are still difficult to obtain. Thus, there exists a great need to improve the information basis for integrative adaptation strategies to extreme events, that span over different temporal scales. Decisions on infrastructural projects or change in land-use patterns, that need to be taken and implemented now, are directly confronted with these temporal scale mismatches. Oftentimes, planning processes have to be carried out under uncertainty. Furthermore, developments in society, such as high population pressure, a growing number of elderly or the heavy dependence on critical (=essential for the functioning of human society) infrastructure do not allow for the reaction to fast changes. Thus, a lack of flexibility to react quickly to extreme events or adapt to climate related changes creates additional problems that need to be considered. Lastly, negative secondary effects of adaptation measures are often detected on other temporal scales, when for example the use of more air-conditioning in order to adapt to higher temperatures lead to an increase of global warming in the future since more energy is consumed (Adger et al. 2005, p. 78).

An effective cooperation of disaster risk reduction and climate change adaptation actors could help to detect, address and overcome these temporal scale challenges and thus help to make a difference in the future.

Functional Scale Challenges when linking DRR and CCA

The functional scale mismatch refers to the organization of the management of crises and climate change adaptation by actors affiliated to different institutions (encompassing rules, norms and rights as well as the organizations that enforce them) and the related distribution of responsibilities that are often a challenge (for the description of functional scales see Cumming et al. 2006 in the context of resilience). The lack of coordination between different agencies and ministries involved in DRR and CCA is factor that often leads to mismatches in addressing the problem and appropriate solutions. For example, in most countries, climate change issues have been tackled by the environmental ministries and meteorological services whereas disaster risk management often lies within the responsibility of the ministry of the interior, defense or development. Differences in their respective mandate, programs and sets of measures on how to deal with climate change issues on the one and disaster risk reduction on the other hand provide great difficulty when developing a coherent strategy between DRR and CCA as well as when addressing the right functional scale of adaptation strategies. Functional scale mismatches are often linked to mismatches between the administrative and social management practice to deal with environmental threats and problems and the actual speed and spatial extend of the environmental threat / problem.These functional mismatches are again linked to the spatial and temporal scales, funding procedures and institutional and administrative settings.

Several important mismatches of the spatial, the temporal and the functional scale in bringing together climate change and risk reduction actors were identified by the interview partners and are listed below.

Spatial Scale Challenges

1) Top-down approach of climate change community (IPCC produces global models and scenarios that have not been sufficiently down-scaled, governments propose often large-scale (technological) solutions that help to increase the visibility of actions (see case study Chile)) versus the bottom-up approach of DRR- community (focus on local area of disasters and risk, vulnerability reduction, strengthening the resilience of livelihoods, looking at risks in specific areas)
2) Adaptation measures at one place might lead to negative secondary effects at other spatial levels (e.g. river embankments that lead to floods in downstream communities)

Temporal Scale Challenges

1) Short-term interventions and financing mechanisms by humanitarian donor organizations after disasters aiming at disaster relief, recovery and only sometimes sustainable reconstruction do not fit with medium and long-term adaptation strategies
2) Extensive donations after particular disaster events – such as after the Indian Ocean Tsunami 2004 – that need to be spent by NGOs or other organizations within short periods of time (usually 2-3 years) versus the amount and time needed for in-depth strategies and coordination to contribute to medium and long-term adaptation to CC
3) Adaptation measures taken in the near future might not be appropriate in the long run (e.g. increased use of air conditioning to adapt to higher temperatures that will increase temperatures in the future due to more energy consumption)
4) Needs and damage assessments as well as current vulnerability maps often represent the status-quo and do not take into account dynamics

Functional Scale Challenges

1) DDR and CCA communities are affiliated with different administrative entities/ ministries (see case studies Vietnam, Bangladesh) – issues of reputation and insistence of responsibility inhibit effective cooperation and resource sharing. Furthermore, the scope and approach of administrative units and management approaches sometimes do not fit with actual natural and environmental processes
2) Development and humanitarian organizations working in the same region may implement different approaches that lead to contradictory strategies (e.g. encouraging self-help vs. the pure donation of money)
3) Management and administrative scales do not fit with the natural hazard and environmental problem scale in spatial and temporal aspects

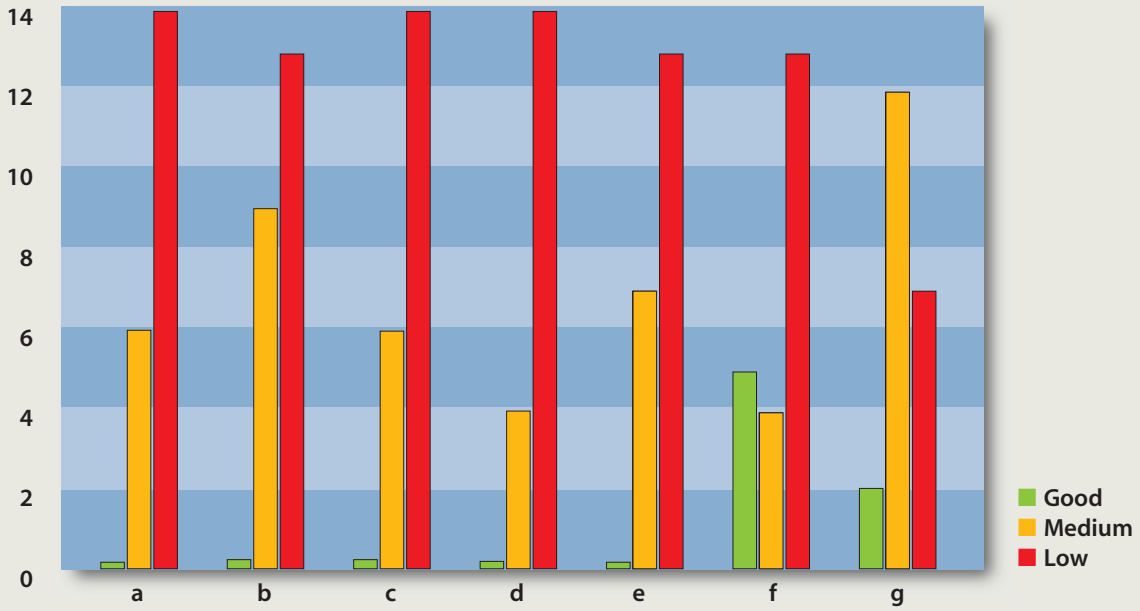
The standardized expert interviews clearly underlined that in many areas more needs to be done to effectively promote cooperation towards integrative strategies of DRR and CCA. In particular, the experts stressed that the cooperation between different ministries responsible for tasks and strategies for DRR and CCA is low as is the case with adaptation strategies at different governance levels (international, national, local) (see Figure 6). Interestingly, with regard to the cooperation between scientists and practitioners as well as the collaboration between different NGOs some experts judged the current situation as good. Overall, it has become obvious that a more coherent cooperation across and within scales is needed when combining disaster risk reduction with climate change adaptation agendas.

2) Normative Dimension

Norms – such as legislative, cultural or behavioural norms – influence decisively the functioning of human society. Not only individuals are guided by certain rules, but also larger organizations and whole societies follow certain standards that have been set by influential individuals or the evolution of new problems and the struggle to find solutions. The different eras of climate change described above are an example of the dynamics of such norms that frame certain problems differently every time new developments become obvious and therefore new actors get involved in finding solutions. The same is true for the whole issue of "environmental problems" as such – they were first seen as purely ecological problems, then their effects on human society became evident and the call for "sustainability" made its way around the world (Rio Declaration 1992). Today, social and ecological systems are often seen as closely coupled and the objective is to make thes coupled social-ecological systems resilient, that is, able to live with change and able to adapt to stressors and stresses (see also Resilience Alliance).

For the attempt to link DRR and CCA, the "norms" linked to the topic by society and adopted by each of the communities play an important role. But also concrete legal

Cooperation between different institutions and organizations regarding integrative strategies for DRR and CCA



a) The cross-sectoral and integrative character of current adaptation strategies is ... **b)** The link between DRR and CCA in current strategies is ... **c)** The link between CCA at different governance levels is ... **d)** The cooperation between different ministries regarding adaptation is ... **e)** The synergies between different stakeholders in DRR and CCA is ... **f)** The cooperation between scientists and practitioners is ... **g)** The collaboration between different NGOs/development organizations is ...

Figure 6: Level of cooperation between different institutions and organizations | Source: Own figure (based on expert interviews)

norms, such as zoning or coastal laws that affect both, risk reduction and adaptation, must be analyzed and systematically harmonized for purposes of DRR and CCA. New norms, standards and legal instruments comprising methods of financial compensation and mutual technological and social support, currently in negotiations, will enter into effect.. The Conference of the Parties in Copenhagen must come to an agreement on appropriate strategies on how to deal with these emerging conflicts and how to harmonize different norms in DRR and CCA.

The following challenges were identified by the interview partners to hinder an effective linkage between CA and DRR within the area of norms:

1) **Lack of clear norms when applying vulnerability and capacity assessment and when designing and implementing adaptation measures**

2) **The notion and desire for stability may hamper the chance to take advantage of change and dynamics – after disasters, the chance to use the opportunity and build back in an adaptive way considering future climate change is in most cases not taken – more commonly, infrastructure is rapidly built back to the pre-disaster condition**

3) **The notion of risks as being primarily a threat imposed by external forces leads to a lack of awareness and acceptance of responsibility that hampers the perception of potential consequences of actions and therefore forestalls adaptation**

4) **Final objectives of education are the acquisition of knowledge as well as socialization. Thus capabilities are developed on a common denominator and the diversity of thinking is reduced, thus leaving little room for the creativity that is necessary for finding solutions to global problems such as DRR and CCA**

5) **In many countries zoning standards and laws, or lack of enforcement, lets people live and settle in hazardous areas provoking not only human suffering but also immense costs for the insurance companies – lack of norms for appropriate adaptation hinders the revision of existing standards**

6) **The lack of general standards and norms of how to link DRR and CCA hinders the effective cooperation and development of indicators that could help to improve vulnerability and capacity assessment as well as the evaluation of adaptation strategies and their success**

3) Knowledge Dimension

Within the general sphere of knowledge additional barriers were identified by the experts. The lack of norms, indicators and standards that could help the integration of DRR and CCA has been outlined in the previous section and can be derived from the lack of basic knowledge in certain areas (e.g. data of local climate effects, seasonal weather forecasts, trends of extreme weather events). Another important aspect of knowledge (referred to as guiding knowledge) is the awareness of the limits of our knowledge and hence, the necessity to take decisions under conditions of uncertainty and possible surprise. Possible ways of dealing with the limits of knowledge are not sufficiently discussed between both communities.

The gaps and conflicts between scientific and local/traditional knowledge are another issue that requires attention when trying to find a common knowledge basis. Scientific knowledge on climate change or natural hazards and vulnerability, generated through research and standardized scientific methods contains valuable information on global to local trends as well as data that can be compared and made available to the scientific community for analysis. In contrast, local knowledge is knowledge accumulated by local people over many years and often generations that is primarily based on observations and daily experience with their direct environment. Both types of knowledge are important with respect to the linkage of CCA and DRR. Scientific

knowledge must be combined with local knowledge, but both must overcome significant obstacles to accomplish that goal. In some cases, local knowledge has been able to confirm or disprove scientific models and thus help to generate local data on trends. Local knowledge also reveals much of the capacities of local societies that might be difficult to assess from the outside. Solely the combination of different knowledge types can ensure that climate change adaptation to extreme events is successful and effective. Overall, the following challenges within the sphere of knowledge have been identified by the interview partners:

Knowledge Challenges

1) **Different use of terms and definitions by both communities (DRR and CCA) (see chapter II)**
2) **Weak links between the different types of knowledge and work of both communities (barrier for communication, joint programming and collaboration)**
3) **Lack of information on the concrete effects of climate change on the local level**
4) **Lack of information of census data (social and economic) especially in dynamic areas with high fluctuations of people, economic instability, etc**
5) **The workload and often times difficult living circumstances of the field staff does not allow for the familiarization with yet another cross-cutting issue to be mainstreamed into the daily work**
6) **Lack of information of the societal and political structures in the target area leads to a failure in addressing the right stakeholders which renders programs ineffective (e.g. people in power get easily offended if not involved and will inhibit the continuation and success of any measures)**
7) **Knowledge of climate change acquired by the scientific community has not trickled down to practitioners or is communicated in a way that is hard to understand and derive practical knowledge of**
8) **Donors have not yet extensively adopted funding guidelines that would include and link adaptation measures and DRR – therefore organizations are discouraged to include adaptation strategies into their project proposals**
9) **Theoretical knowledge on mainstreaming is not put into practice yet**
10) **Lack of substantial guidance on how to deal with the aspect of uncertainty**
11) **Lack of standards in how to mainstream CCA and DRR into other fields of development practice**
12) **Lack of indicators that could allow for climate screening and climate proofing of ongoing or future projects**
13) **Lack of indicators that could measure successful adaptation and could be integrated into funding guidelines as well as monitoring and evaluation strategies**

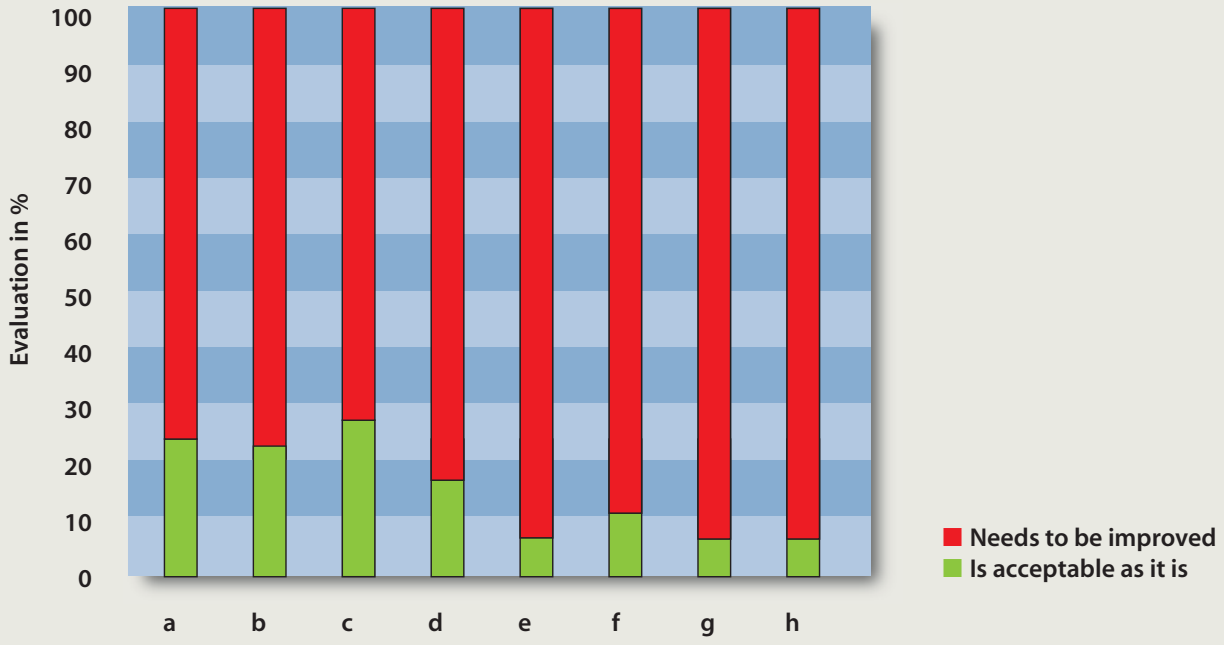
The challenges to effective linking of the DRR and CCA communities and strategies have up to the present constrained the active mainstreaming of adaptation into disaster reduction and other development strategies. Additionally, the CCA community has not sufficiently incorporated the opportunities that DRR offers for supporting climate change adaptation regarding extreme events. The following chapter will therefore present a range of practical recommendations that should support the next steps in overcoming these constraints.

Chapter 5:

Where do we go from here? Recommendations and Quality Criteria

The analysis of key terms and definitions used in disaster risk reduction and climate change adaptation (chapter II), the review of current strategies and selected case studies (chapter III) as well as the findings of the standardized and non-standardized expert interviews (chapter IV) clearly outline the challenges that have to be addressed when linking DRR and CCA more coherently in the future. Since the urgency of a better integration and an improvement of synergies have become evident through this and other recent studies – such as the Report of the Commission on Climate Change and Development (2009), the report of the IPCC Scoping Workshop for a Special Report on "Managing the Risks of Extreme Events to Advance Climate Change Adaptation" (see IPCC 2009) and the report for the Foreign Ministry of Norway on Disaster Risk Reduction, Climate Change Adaptation and Human Security (see O'Brien et al. 2009) – this chapter will summarize the challenges and provide a range of recommendations as well as quality and evaluation criteria for the next steps to be taken. Quality criteria are important points that should be considered when developing adaptation strategies as well as when evaluating their effectiveness and appropriateness. These recommendations and quality criteria should especially be kept in mind by those that are currently leading the discussions on the way to the COP 15 Conference in Copenhagen (see also special recommendations at the end of this chapter).

What needs to be improved and what is acceptable as it is?



a) Strategies to deal with the uncertainty of effects of climate change **b)** Availability of climate change data **c)** Information about relevant institutions and stakeholders for CCA **d)** Reliable information on extreme events **e)** Spatial resolution of climate change data **f)** A better cooperation between responsible actors and institutions **g)** Better linking of short and long-term strategies **h)** More coherent funding schemes regarding CCA and DRR

Figure 7: Areas where improvement is needed in climate change adaptation strategies | Source: own figure based on standardized expert interviews

The recommendations have been elaborated on the basis of the standardized and non-standardized expert interviews and additional research in the field and, together with the quality criteria, provide an important orientation for future strategies that aim to promote climate change adaptation to extreme events. Important general quality criteria for improved adaptation strategies have already been identified by Adger et al. (2005) and encompass: effectiveness, efficiency, legitimacy and equity (see Adger et al. 2005). The following section will go into more detail and address quality and evaluation criteria for specific areas of work that have been identified as most relevant to link disaster risk reduction and climate change adaptation more effectively (see Figure 7). These areas of work encompass:

1) Promotion of Cross-Sectoral and Multi-Scale Approaches
2) Improvement of Information and Knowledge Basis
3) Development of Coherent Norms and Assessment Tools
4) More Flexible Funding Structures
5) Promotion of the Potential of DRR for CCA and long-term Sustainability

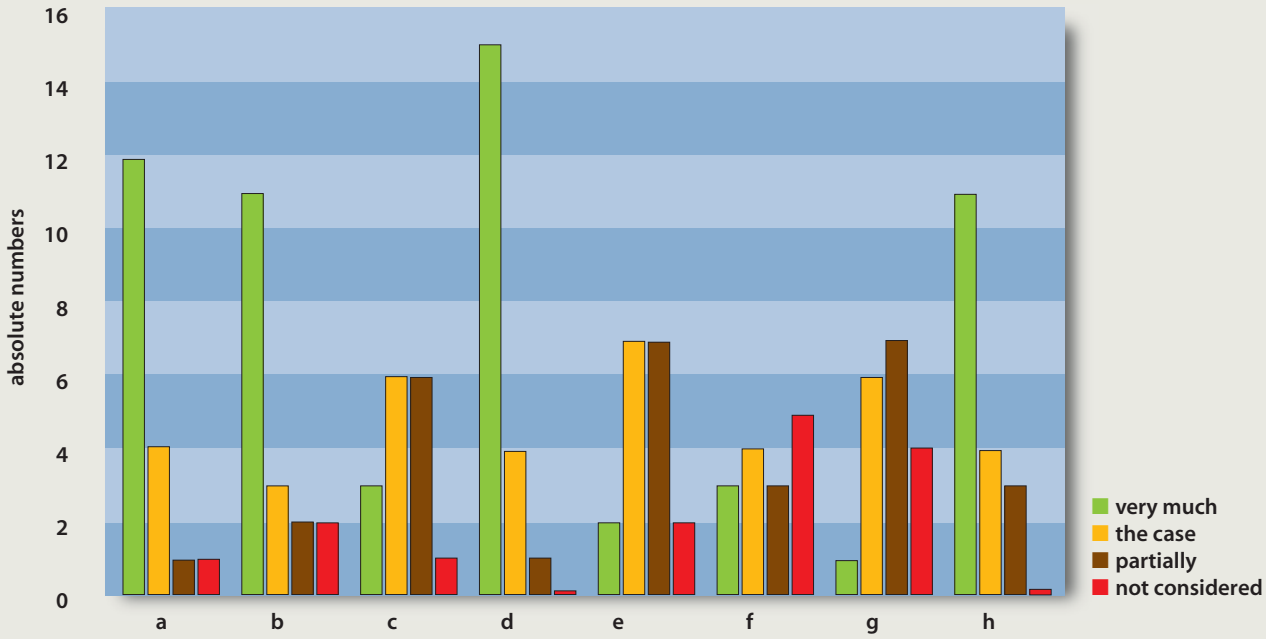
1) Promotion of Cross-Sectoral and Multi-Scale Approaches

The attention to and integration of different sectors affected by climate change is urgently needed. As Figure 8 shows, areas such as urban development have not been regarded sufficiently in current strategies.

Important challenges linked to the issue of scale (see chapter IV) included combining the top-down and bottom-up approaches of the climate change and the DRR communities in order to reduce and manage risks effectively and avoid negative secondary effects of CCA and DRR measures on other spatial and temporal scales (see also Birkmann 2009b).

In addition, the effective and efficient communication and cooperation between the administrative entities/ministries to which DRR and CCA belong and the political awareness of the urgency of the problem (also linked to functional scale problems, see chapter IV) need to be addressed. If possible, a more efficient scale of combining different adaptation strategies and disas-

Areas of work that are linked to climate change



a) Water management **b)** Agriculture and resource management **c)** Social protection **d)** Disaster risk reduction **e)** Poverty reduction **f)** CO-2-Reduction **g)** Urban development **h)** General vulnerability reduction

Figure 8: Areas of work that are linked to climate change | Source: own figure based on standardized expert

ter risk reduction concepts should be identified since there often exists a large gap between national approaches on the one hand and local approaches on the other (see CCD 2009). Lastly, the question must be raised of how to avoid contrary and counter-productive strategies in DRR and CCA within and across countries.

Recommendations regarding Scales:

Spatial

- Better cooperation between institutions and organizations on and between all political scales, particularly the national and local level scales
- Integration of both approaches especially at the "meso-scale" (e.g. sub-national level) which allows for the integration of national and local adaptation and risk reduction goals – this requires comprehensive information sharing
- Increase of awareness within the responsible representatives of the highest political level possible in order to ensure the integration of the topic in the daily activities of all political scales (ensure that climate change adaptation does not end with the development of the strategy)
- Strengthening of capacities of humanitarian assistance in regions most at risk due to climate related stressors and a high level of vulnerability (e.g. pre-positioning and decentralization of stocks)

Temporal

- Development of strategies to move from a needs and damage assessment during and after disasters to regularly updated vulnerability and risk maps to capture the dynamics of vulnerability and to evaluate the opportunities that post-disaster situations provide to promote sustainable recovery and climate change adaptation at the same time
- Development of norms and indicators for a better monitoring of the implications of adaptation strategies, in order to be able to modify and re-direct adaptation and disaster risk reduction measures
- Strengthening of the capacities of communities rather than imposing solutions in order to avoid negative effects and maladaptation (careful evaluation of current technical solutions is required, e.g. large dyke systems for cities)

Functional

- Enhancement of better cooperation and coordination of development and humanitarian organizations especially through the development of internationally set and accepted standards[6] for mainstreaming CCA into DRR practices (refer also to norms)
- Extension of the actors that are eligible for funding in case the highest political level does not fully support CCA and DRR – in this case, other people and agencies (such as environmental ministries) that have an interest and stake with respect to the topic should be supported in taking the lead
- Within projects: Familiarization with the local structure of power in all relevant spheres (political, religious, family, cultural, etc.) of the target country in order to address and involve all relevant stakeholders
- Attention to and integration of different areas of work affected by climate change that have not been sufficiently addressed yet (e.g. urban development or coupled social-ecological systems)
- Improvement of the links between administrative/management scales and the temporal and spatial scales of different hazard phenomena linked to climate change

Quality and Evaluation Criteria:

- Integrative adaptation strategies to climate change include aspects of DRR and span over different spatial and sectoral scales
- Strategies and measures for climate change adaptation and disaster risk reduction involve various ministries (cross-sectoral character) and local governments as well as relevant scientists in donor and target countries and actors of the respective communities, including relevant INGOs and NGOs
- Coordination and cooperation between humanitarian and development organizations for better effectiveness and efficiency in the target countries is ensured – screening of other programs and projects in the target countries and possible thematic linkages and cooperation are integrated into every planning process
- Standards and principles are in place (internationally agreed, e.g. developed by UN/ISDR) that avoid contradictory and parallel approaches in target countries

[6] In this context standards for humanitarian organizations are currently discussed within the SPHERE Project – Humanitarian Charter and Minimum Standards in Disaster Response (see SPERE project website: http://www.sphereproject.org/). These standards should be extended to adaptation to climate change.

(some of the recommendations and quality criteria could serve as an important basis for these standards and principles)

- Infrastructure that is implemented can be locally purchased and replaced and its maintenance and use can be integrated into the activities of the local people – at best it is built on already existing infrastructure and adapted to the requirements under climate change
- Infrastructural and constructive measures of climate change adaptation strategies as well as similar measures of disaster risk reduction strategies for extreme events are evaluated regarding their impact on coupled social-ecological systems and their potential secondary effects at other spatial and temporal scales
- A balance of "hard" and "soft" measures is ensured, including, in addition to constructive measures, also new ecosystem management approaches
- Maintenance of flexibility in structures[7] and in the minds of the people – where in the near future adaptation is a possibility, relocation might become a necessity in the long-term

2) Improvement of Information and Knowledge Basis

The standardized and non-standardized expert interviews revealed that although all experts today take climate change aspects into account, the knowledge and information base needs to be improved in many respects. A particular challenge for linking disaster risk reduction and climate change adaptation lies in the different language of climate scientists and disaster managers that hamper effective cooperation. A second challenge is the limited data and prognostic capacity regarding extreme events linked to climate change. The experts further stressed that although the availability of climate change data is available, the spatial resolution needs to be improved. Local and region-specific data sources that provide data of dynamic social and economic processes are also insufficient. This information is especially needed to move from a reactive needs and damage as well as static risk assessment to an improved dynamic vulnerability and adaptation assessment regarding different aspects such as social groups, critical infrastructure, and economic sectors. Improved knowledge sharing between scientists and practitioners as well as the affected people and the development of monitoring and evaluation standards were other challenges addressed by the interview partners (see Figure 7). Particularly the monitoring after disasters needs to be established in order to derive more information on how disasters and disaster response catalyze changes (see Birkmann et al. 2009) and whether these developments increase or reduce the adaptive capacity of communities to climate change.

Recommendations regarding Knowledge:

- Improvement of down-scaled climate data and potential extreme events, with an emphasis on the potential combination of slow-onset and sudden-onset events (e.g. floods, salinization due to low river water levels and incoming sea water in delta regions)
- Monitoring of the development and changes of vulnerability to climate change, particularly also during and after disasters (to improve the understanding of disaster response as a catalyst for change and climate change adaptation)
- Installation of a central and accessible knowledge management platform for different – particularly state and non-state-actors
- Expansion of the national census portfolio of each country by statistical data that is relevant for questions of adaptation to climate change and risk reduction – integration of a section on extreme events, vulnerability and climate change adaptation
- Training of climate scientists in social science questions and teaching the use of "climate language" to DRR specialists in order to have mediators that can facilitate the communication and information exchange needed between both communities (this is particularly relevant for international organizations and NGOs before sending staff to the field)
- Facilitate communication and cooperation between the respective scientific and practical communities (e.g. meetings as organized as side events during climate change talks where climate scientists and development and disaster risk reduction practitioners meet and exchange ideas and information)
- Preparation of scientific data in a way that enables practitioners to ask the right questions during their planning phases (e.g. Is it still useful to build a well in

7 e.g. flexible housing components that allow to adapt the respective physical structure of the building to different climatic stressors and extreme events or sanitation and water infrastructure in potentially flood or sea level rise prone areas that include sewage systems that allow to interrupt the inflow of water from outside to avoid the spread of diseases

the east of Cuba because droughts are getting more frequent?) – translation of knowledge for specific work areas, such as the question of how temporary shelters should be built when incorporating scenarios of future climate change in the region

- Involvement of experts of both fields of work or the respective mediators in planning processes
- Improvement of the mutual understanding of the different background of persons involved in climate change adaptation and disaster risk management through joint program developments and project implementation – including personnel from different governance levels (local, sub-national, national, international)
- Support of practitioners in switching from a past – oriented to a future-oriented approach in order to effectively reach their respective objectives considering climate induced changes
- Development and application of better knowledge management systems including modern technologies
- Encouragement of close cooperation with focal points in the countries that are already aware of the topic and thus can act as mediators and push the agenda forward, e.g. interdisciplinary and applied research oriented institutes at local and national universities dealing with DRR and CCA
- Acquisition of new staff with appropriate expertise that can facilitate capacity development in the field of linking DRR and CCA – requires other staff policies that allow employment of personnel longer than just-the recovery and reconstruction period after disasters
- Enhancement of the collaboration and the local and national capacity building on linking DRR and CCA through the involvement of universities (experts and volunteers e.g. recent university alumni)
- Joint application of knowledge, experience and capacities of the DRR and CCA communities in risk hotspots and through joint education and capacity building programs
- Clear and transparent communication of the limits of knowledge and areas of uncertainty in order to sensitize people and maintain flexibility and preparedness – dealing with extreme events and disasters means also dealing with the "unexpected"
- Initiation of pilot projects and identification of opportunities and limits of adaptation strategies
- Improvement of the knowledge on coupling and regulation processes between society and nature (or social-ecological systems) in rural and urban areas
- Extension of basic and applied knowledge on urban adaptation strategies and integrated DRR and CCA measures for urban climate resilience, particularly linked to the vulnerability of coupled social-technical systems, such as the dependency of people in cities on critical infrastructures (e.g. water and energy supply) and critical facilities, such as hospitals, homes for elderly persons and schools

Best practice proposal – Integration of CC relevant data into national census (Robin Mearns, World Bank, USA)

National statistical agencies should integrate social and economic data into the national census that are relevant for climate change related monitoring. Thus, the information basis regarding vulnerabilities and capacities could be improved and adaptation facilitated.

Text Box 5

- Identification and dissemination of best practice examples (see Text Boxes 5-8)
- Improvement of the link and understanding between global and local knowledge – matching of global data from IPCC models with local knowledge on perceived trends and adaptation capacities of local communities
- Focus on and communication of examples of hotspot regions where climate change effects are already visible (e.g. sea level rise, coral bleaching, salinisation of freshwater resources and more extreme events in SIDS)

Best practice proposal – Win-win solution using brush-wood (Johann Goldammer, Global Fire Monitoring Centre, Germany)

In fire prone wilderness areas, the brush-wood should be used for the production of renewable energies or for grazing in order to disburden the forests and thus prevent forest fires. This way not only the farmers would have an interest in preventing large-scale fires, but using brush-wood would at the same time be a mitigation, adaptation and disaster risk reduction strategy.

Text Box 6

- Identification of areas where influence and own options to act to reduce disaster risk and to improve climate change adaptation can be visible (e.g. land-use practices, capturing flash floods for improved agriculture or recharge of aquifers, or improved vegetation that permits the reduction of the risk of landslides)
- Communication of the constant improvement of scientific data and ensuring its channeling to the practitioners
- Improvement of the knowledge on whether and how small and large disasters might function as a catalyst for change and for promoting climate change adaptation
- Development of indicators for a joint vulnerability and adaptation assessment that allows integrating the different notions of vulnerability of the DRR and CCA community and that provides the basis for informed adaptation strategies
- Integration of information of the advancements and success of adaptation activities by the countries into an international information platform (e.g. the DevInfo see Text Box 8) – this would also help investors to take investment decisions

Best practice example: Climate Field Schools in Indonesia

Based on the successful concept of "Global Farmer Field Schools", Climate Field Schools were set up in two pilot areas in Indonesia between 2005 and 2007. The program, which is supported by the Indonesian Ministry of Agriculture, the Asian Disaster Preparedness Centre, the Indonesian Agency for Meteorology and Geophysics, and the University of Agriculture in Bogor, is designed to improve the farmers` knowledge on climate, climate variability and change as well as extreme events and advance responsive farming. The participatory approach takes the farmer´s local knowledge (observation of changes in meteorological phenomena, crops and soil) and experiments and combines it with improved seasonal forecasts and other scientific information that is made available to the farmers in their respective local languages through professional mediators. They are also encouraged to document their observations for a better knowledge management and learning. This way the farmers are better able to manage their soil, water and crop resources (e.g. appropriate planting time for rice) for best effects. The overarching objective is to build long-term resilience in the farmers` livelihoods. Text Box 7

For more information:
INSAM (The International Society for Agricultural Meteorology) (www.agrometeorology.org)
http://www.preventionweb.net/english/professional/publications/v.php?id=7895

Quality and Evaluation Criteria:

- Different forms of knowledge (local versus expert knowledge, basic and policy relevant knowledge) are integrated in adaptation strategies
- The way disaster risk reduction activities have incorporated climate change related aspects in e.g. mitigation plans, reconstruction programs and response and emergency relief is explained – particularly with respect to the criteria and questions how CCA was considered for shelter, sanitation and water infrastructure
- Strategies for donors and national governments to respond to disasters are based on needs and damage assessments as well as on vulnerability and adaptation assessments (moving from damage assessment to vulnerability reduction and adaptation strategies)
- Countries affected by disasters due to natural hazards have developed precise information on how to build back better (these standards for building back better include aspects of climate change adaptation, were developed in cooperation with affected local communities and are taken into consideration by donors and other aid and disaster agencies)
- Educational and training programs for DRR experts are in place at different levels (international, national, local) and in different institutions regarding the integration of climate change aspects in the phases and tools of disaster risk reduction (e.g. risk assessment, early warning, recovery, reconstruction)
- Personnel within organizations has been sensitized and trained before going to the field
- Knowledge of local communities has been improved through comprehensive information on disaster risk reduction and climate change adaptation linked to extreme events (e.g. also during post-disaster processes and in temporary camps)

Best practice proposal – Extension of MDG-DevInfo (Florian Wieneke, KfW, Germany)

Information of the advancements and success of climate adaptation activities in the countries should be integrated into an international geographical information system (GIS) such as it has been done with regard to the Millennium Development Goals in the DevInfo - www.devinfo.info) Text Box 8

3) Development of Coherent Norms and Assessment Tools

The DRR community focuses primarily on disaster resilience and humanitarian assistance as key visions for the actual work on the ground. Although humanitarian assistance is a key goal in times of disasters, climate change adaptation will require additional norms and guiding principles to ensure a medium- and long-term vision. The challenge in bringing together the DRR and CCA community in this respect is to find appropriate new norms and standards that clearly define the ultimate objective of adaptation. Only on the basis of clear visions and guidelines can long-term strategies be developed and implemented. Therefore, in some cases changes in the general functioning of society (societal, cultural norms) might be necessary which will hardly be completely achieved. Nevertheless, some recommendations of the expert interview partners address this challenge and provide recommendations.

Recommendations regarding Norms:

- Development of procedures and structures that help to achieve a consensus on goals for national, sub-national and local adaptation strategies to extreme events
- Systematic overview and evaluation of important norms and legal frameworks that are relevant for the promotion of climate change adaptation related to extreme events (e.g. risk assessment guidelines, building codes, funding regulations etc.)
- Implementation of more inclusive and participatory strategies to identify key goals for combined strategies of CCA and DRR particularly with respect to the uncertainty of the exact occurrence of extreme events
- Definition of goals and standards for vulnerability and risk reduction as well as adaptation for specific hazards and regions – including the consideration of other development patterns
- Promotion of the opportunities change can bring(e.g. innovation, new technologies, new income opportunities, etc.) and emphasis on the fact that no system that humans have ever devised was a permanent sustainable solution
- Encouragement of societies to be open to change and transitions and to review critically dominant norms and institutions
- Incorporation of the possibility of failure of adaptation in decision making and the resulting consequences – e.g. the necessity of relocation (e.g. in the Mekong Delta)

> *"The best controllable future is a future that you construct"*
>
> *(Sander E. van der Leeuw, Arizona State University)*

- Promotion of a cultural change to make people aware of and anticipate their own construction of risk and assume responsibility (e.g. unexpected negative secondary effects of measures on other temporal or spatial scales)
- More precise definitions of what global guiding visions, such as resilience, "no-regret" solutions, sustainable development, human security, mean for a specific region or a specific task
- Guarantee that DRR and CCA scientists and practitioners are aware of different norms and guiding visions that are applied and the respective implication for strategies and measures (e.g. humanitarian assistance does not mean the same as climate change adaptation)

Quality and Evaluation Criteria:

- Strategies for climate change adaptation with a special focus on extreme events stress the respective norms and guiding visions they are applying and using
- Goals for adaptation to climate change and disaster risk reduction to extreme events are based particularly at the sub-national and local level and are developed on a broad consensus of different stakeholders involved and affected by these plans and programs
- Standards and laws (e.g. zoning and coastal laws) have been revised and take into account climate change relevant issues (e.g. the problem of uncertainty)
- Mechanisms to moderate actual or potential conflicts between different norms of various stakeholders, such as between norms of national governments and local communities are in place (e.g. as became necessary during the reconstruction process in New Orleans after Hurricane Katrina)
- Multidisciplinary working groups have been established within organizations and ministries that follow up on the topic in a comprehensive manner and develop a coherent set of norms and goals that allow for the evaluation of the effectiveness and the degree to which a problem could be solved or a certain level of preparedness and adaptation could be realized (part of a broader learning tool)
- Planning processes have been professionalized through the definition of goals and norms for adaptation, for example in the field of critical infrastructure (power-supply) and the definition of resilience criteria (e.g. redundancy of structures, etc.)

4) More Flexible Funding Structures

Current funding structures were identified as a major drawback for further integrating the fields of disaster risk reduction and climate change adaptation. Especially problematic were the differences between a rather short-term funding for disaster response by humanitarian donors and the necessity of long-term financial support for adaptation strategies. Therefore, the challenges with respect to funding schemes lie in the question of how to ensure a link between short- and longer-term funding that takes into account the time frame necessary to implement adaptation measures. Related to this challenge is the question of how to ensure a process-oriented funding that focuses not only on one particular aspect, sector or outcome (e.g. large infrastructure projects) but also encourages comprehensive vulnerability reduction and adaptation. Longer-term funding schemes would have an additional advantage: Personnel in development or externally funded organizations would not have to change as frequently (due to uncertain financial resources and planning opportunities) and therefore valuable knowledge could be kept within the organization. Furthermore, if adaptation to climate change aims at involving different stakeholders, the eligibility of funding needs to be broadened to include state and non-state actors. This is particularly important when linking CCA and DRR, since particularly in the disaster risk reduction field various stakeholders and organizations have developed their own expertise and tools to promote resilience.

Recommendations regarding Funding:

- Bridging of the gaps in the cooperation between the respective donors and the ensuring of linked funding of humanitarian adaptation and development projects/programs
- Acceptance of different funding opportunities for the tasks at hand and improvement of linkages and cooperation between funding organizations and funded programs and projects
- More flexible DRR-funding – particularly in terms of the timespan and the opportunity to utilize the money received for a specific disaster for medium- and long-term adaptation strategies within the respective region
- Ensuring that DRR activities and programs which consider the quality criteria outlined in this chapter are eligible for funding sources steaming from the climate change adaptation funds
- Consideration of all relevant stakeholders in budget plans for integrated adaptation strategies
- Ensuring of the possibility of short, medium and long-term commitment and respective funding regimes
- Allocation of long-term funding for adaptation and development activities particularly for organizations that have already worked in a region after an emergency in order to utilize their experience for adaptation strategies to extreme events
- Provision of funding for programs rather than projects
- Inclusion of various phases in programming, particularly a phase of assessment of existing risks, vulnerabilities and capacities, a phase for the identification of

particular target sectors and a phase of linking the program to different projects in a region that allow to mutually enhance effectiveness

- Facilitation of increased awareness of private donors of the urgent need for long-term strategies that are directed to risk and vulnerability reduction as well as adaptation and of the benefits of donating money for preventing a crisis
- Ensuring that surplus money from private donations can be saved as resources and spent on other projects not in the scope of the original funding purpose (e.g. as possible within the Red Cross movement)
- Establishment of medium- and long-term funding that allow for keeping personnel and therefore accumulated experiences and knowledge

"Adaptation means a change in behavior. This cannot be accomplished by a project running over 2-3 years. In order to successfully mainstream adaptation, a cooperation with the local partners in the countries must be established that is funded for at least 10-15 years"

Robert Grassmann, Welthungerhilfe

Quality and Evaluation Criteria:

- A code has been established by the donors that does not allow for unsustainable practices and prevents people and governments from taking short-cuts
- Funding is flexible and can be shifted from one household year into another
- Funding for a specific disaster can also be used to promote climate change adaptation in the region
- Climate change funding supports medium and long-term programs on disaster risk reduction to extreme events
- Different institutions and organizations, particularly state and non-state actors are eligible for adaptation funding, enhancing cooperation and types of competition regarding the best ideas and concepts
- Cost-benefit assessments are applied in every program/ project in order to use resources effectively and efficiently
- Assessments and monitoring activities are applied regularly to avoid negative secondary effects that finally lead to maladaptation
- Adaptation funding is given particularly for those strategies that encompass joint norms and goals for adaptation to climate change including the CCA and DRR community as well as relevant state and non-state actors to ensure a common strategy to approach the problem (first step to solve conflicting norms)

5) Promotion of the Potential of DRR for CCA and long-term Sustainability

Due to obvious overlaps and synergies between DRR and CCA, some interview partners even considered it as needless to mention the many areas in which both fields can achieve common goals more effectively. Experts stated that they see both DRR and CCA as necessary tools in order to enhance sustainable development and have therefore always looked at both as being inherently linked. Generally, no interview partner denied the necessity and advantages of linking both communities. However, several experts declared that a lack existed of a more powerful promotion of this linkage including a comprehensive and detailed presentation of the working areas in which this can be accomplished (see also figure 9). This is especially worrying as in these sectors we have to address two different but interlinked challenges which are the quantitative challenge of dealing with an increasing demand for response and recovery and the qualitative challenge of improving the existing concepts.Recommendations of how to enhance and integrate aspects and goals of CCA within the different phases of the disaster cycle are given below. Most experts – within the standardized questionnaires – emphasized the phases of mitigation and prevention of being especially suitable to integrate long-term adaptation measures, whereby some outlined the necessity to also integrate long-term strategies into the response and recovery phases, thus using the "window of opportunity" a crises or disaster provides (see figure 9). Newer scientific publications underline that response, recovery and reconstruction after disasters have not yet sufficiently been used to promote and realize vulnerability reduction (see Birkmann/Fernando 2008, Birkmann 2009a) and climate change adaptation.

Areas where CCA can be integrated in DRR

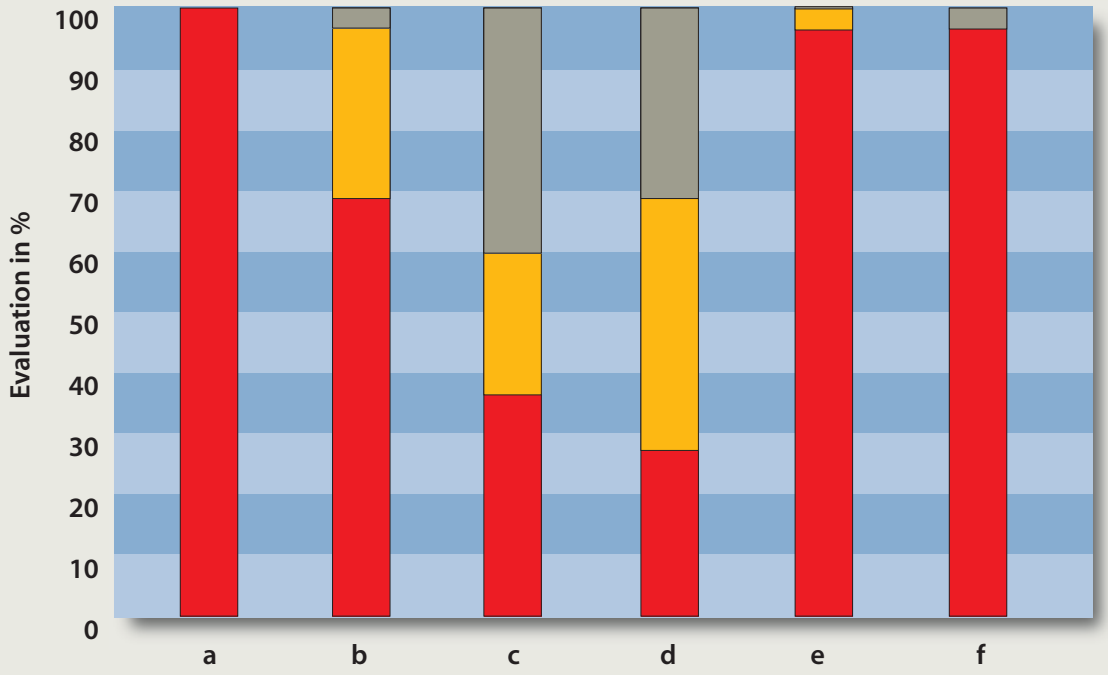


Figure 9: Areas where CCA can be integrated in DRR | Source: own figure based on standardized expert interviews

Recommendations:

Mitigation:

- Thorough identification of vulnerable and disaster prone areas
- Integration of CCA aspects in mitigation measures, such as building codes, public education and hazard mitigation (e.g. requires among others multi-hazard approaches)
- Joint awareness raising, education and capacity development (public campaigns, TV, radio, public forums, etc.)
- Protection of the environment and hence an adapted resource and land use management is key – this will not only mitigate risks and climate change but also provide for better health and long-term resource stability
- Ensuring that more emphasis is given to creeping changes and creeping hazards that are a challenge for climate change adaptation within DRR

Preparedness:

- Improvement of integrating adaptation concerns into early warning systems (e.g. Tsunami EWS should be extended to be able to monitor also coastal floods and sea level rise)
- Improvement of early warning systems in the area of creeping hazards (e.g. salinization of water resources due to the intrusion of sea water into delta regions)
- Preparation and revision of preparedness and evacuation plans to various extreme events linked to climate change
- Improvement of the use of information on the frequency of extreme events and multi-dimensional vulnerability and capacity mapping (e.g. including interactions between the vulnerability of social groups, economic sectors and critical infrastructures) for the development of warning systems (focus on the "last-mile") and emergency as well as evacuation plans and concepts for humanitarian assistance

Response

- Integration of information about anticipated climate-related changes into response strategies
- Development of flexible structures and concepts that can easily be changed or adjusted during the phases succeding humanitarian assistance
- Improvement of capacities focusing on Hot-Spot regions of climate change based on latest scientific knowledge

Recovery and Reconstruction:

- Development and adaptation of suitable micro-insurance and micro-finance schemes to support recovery processes
- Comprehensive usage of the long experience of DRR in dealing with adverse events and disasters
- Consideration of climate change information in reconstruction and building back to a new standard (a major challenge especially for western countries since an adapted reconstruction requires new investments)
- Systematic consideration of climate change adaptation aspects in the development of temporary and permanent shelters after disasters, integration of climate change aspects in medical care programs (e.g. distribution of information about new health threats due to climate change such as risk of malaria in areas which have not been affected in the past (high altitude), consideration of climate change adaptation in providing and building water- and sanitation infrastructure)

Quality and Evaluation Criteria:

- CCA strategies with respect to extreme events are built on existing DRR structures and institutions in the respective countries in order to create synergies, avoid redundancies and achieve the best effectiveness possible
- Tools and strategies of DRR are intensively promoted throughout the development and humanitarian community as well as within climate talks and IPCC reports in order to facilitate exchange and cooperation
- Final objective of each DDR and CCA initiative is the improvement and securing of livelihoods and the sustainable development of coupled social-ecological systems, therefore securing that activities in DDR and CCA do not include any measures that could have negative effects for other development sectors
- Disasters and respective recovery and reconstruction phases and programs are systematically used to promote CCA and DRR
- Checklists have been developed for the systematic consideration of climate change adaptation aspects in preparedness, response and recovery (e.g. check list for shelter programs, sanitation and water infrastructure, medical care and hygiene and health training)
- The importance of DRR and CCA for long-term resilience and sustainability is emphasized especially

during phases of crisis or global turbulences (e.g. current economic crisis)
- Urgency of the problem and the potential of DRR and CCA for finding solutions is sufficiently addressed, especially within national and therefore regional and local political processes (begin with most affected countries and then mainstream into others)
- Hazard maps consider climate change and respective implications for the hazard occurrence and magnitude as well as spatial extent
- Vulnerability and risk assessments consider multi-hazards, particularly extreme events linked to climate change
- Early Warning systems have a modular structure, that allows for integrating more than one hazard and to ensure that climate change related extreme events – sudden-onset as well as creeping-hazards – are taken into consideration

Special Recommendations for COP 15 in Copenhagen

Finally some recommendations were given by the expert interview partners that should be taken into consideration by the representatives to the 15th Conference of the Parties of the United Nations Framework Convention on Climate Change in Copenhagen in December 2009. These recommendations are listed below:

- Development of funding schemes for humanitarian and development organizations that leave space for the inclusion of short-mid- and long-term adaptation strategies into projects/ programs. Disasters should be seen as windows of opportunity that provide the chance for innovation and progress if appropriate measures are taken and a long-term perspective is adopted
- Development of financial instruments that are ultimately targeted to support sustainable development and therefore consider all relevant actors, political levels and time scales
- Development of transparent criteria and guidelines for the funding of DRR + CCA and the respective programs
- Attention to the necessity of community based approaches (need for improved localized information of climate change effects and for more opportunities at the local level to participate in decision making processes)
- Increased attention of the developed countries to the latest scientific findings (e.g. sea level rise is happening at a much faster rate than previously expected) and allocation of the necessary funding
- Development of financial instruments that ensure that strategies and measures are linked and not developed in parallel
- Creation of a special funding window for SIDS and other LDCs – distribution of the financial resources to the countries most at need and not according to other criteria
- Agreement on the targets and objectives of mitigation as well as adaptation strategies and an effective arrangement of the respective funding
- Emphasis on the high potential that disaster risk reduction provides for enhancing effective and high quality adaptation strategies must be included in funding schemes and criteria as well as in the post-Kyoto – Protocol
- Development of a comprehensive and internationally accepted framework that could serve as a conceptual and practical orientation when putting the integration of DRR and CCA into practice

Appendix

Appendix1

List of Abbreviations

ADPC	Asian Disaster Preparedness Centre
BMD	Bangladesh Meteorological Department
CCA	Climate Change Adaptation
CDMP	Comprehensive Disaster Risk Management Programme
COP	Conference of the Parties
CPNP	Civil Protection National Plan
DAE	Department of Agricultural Extension
DFID	Department of International Development
DKKV	German Committee for Disaster Reduction
DMB	Disaster Management Bureau
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organization
GCM	General Circulation Model
GoB	Government of Bangladesh
HFA	Hyogo Framework for Action
INSAM	International Society for Agricultural Meteorology
IPCC	Intergovernmental Penal on Climate Change
ISDR	International Strategy for Disaster Reduction
LACC	Livelihood Adaptation to Climate Vulnerability and Change
LDC	Least Developed Country
MARD	Miinistry of Agriculture and Rural Development
MONRE	Ministry of National Resources and the Environment
NAPA	National Adaptation Programmes of Action
NAPACC	National Action Plan Addressing Climate Change
SIDS	Small Island Development States
SRV	Socialist Republic of Vietnam
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNU-EHS	UNITED NATIONS UNIVERSITY – Institute for Environment and Human Security

Appendix2

List of Tables, Figures and Text Boxes

Tables

Figures

Text Boxes

Appendix 3 Table 2: Terminology: Similarities, Differences and Recommendations

Disaster Risk Reduction Community (DRR Community)	Climate Change Adaptation Community (CCA Community)		Similarities/ Differences	Recommendation
Adaptation				
Interestingly, key publications of UN/ISDR, such as "Living with Risk" (2004) do not employ the term adaptation in the core glossary at the end on basic terms of disaster risk reduction (see UN/ISDR 2004). In current documents adaptation is linked to three activities in DRR such as: a) Risk Assessment, b) Early warning systems and c) Sector-specific risk reduction plans (see UN/ISDR; Submission to the UNFCCC; Status of Implementation of Article 4, Paragraph 8 of the Convention, Decision 5/CP.7 and Decision 1/CP.10). However, a more in-depth definition is not provided. Summarizing definitions of adaptation in DRR research, adaptation can be understood as e.g. the change or adjustment of livelihoods to the altered conditions in order to maintain major activities during extreme events without losing assets and capital. In contrast to coping adaptation is determined by medium- and long-term adjustments (Vogel/O'Brien 2004) and correspond with the notion of change (Birkmann 2009).	Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. (IPCC 4th Assessment Report, Working Group II; Appendix I)		The disaster risk community has not sufficiently defined adaptation in terms of extreme events and disaster risk yet. The IPCC definition would also be a good starting point for the DRR community.	Differences between adaptation and coping should be made clear. The areas where adaptation should be considered in DRR need to be extended, e.g. also disaster aid and reconstruction (water, sanitation, shelter) should consider aspects of climate change adaptation in the future.
Coping / Coping capacity				
The means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and human-induced hazards (UN/ISDR 2004). Strategies and measures that act directly upon damage during the event by alleviating or containing the impact or by bringing about efficient relief (Thywissen 2006). Coping is mainly impact related and rather short-term, compared to adaptation (Birkmann 2009).	Coping is a function of: perception (of risk and potential avenues of action – the ability to cope is information contingent); possibilities (options ranging from avoidance and insurance, prevention, mitigation, coping); private action (degree to which special capital can be invoked); and public action (e.g. Webb and Harinarayan, 1999; Sharma et al. 2000 quoted in IPCC 2001).		The DRR community links coping capacity to a hazard and its impacts whereas the term coping is used in the CCA community in a broader sense encompassing risk perception, options of individuals to act and public actions.	Coping should be used to describe short-term actions that are more spontaneous than strategic adaptation. Coping is hazard specific and hazard related. Adaptation is broader and should encompass a long-term perspective.
Extreme Event				
DRR distinguishes mainly extreme events according to a) sudden-onset hazards and b) creeping changes. Furthermore, extreme events are also classified with regard to 1) Sudden-onset hazards, such as floods, droughts, windstorms, and extreme temperatures 2) events in which trends outside the domain of climate increase exposure or vulnerability to climate – related extremes such as coastal development increasing exposure to storm surges on top of sea-level rise 3) result of climate change such as glacial lake outburst and wildfire in forests that had historically been too wet to burn or disasters of more complex origin such as landslides and wild land fires (Scoping Paper for the IPCC Special Report Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation 2009)	An extreme event is an event that is rare within its statistical reference distribution at a particular place. Definitions of 'rare' vary, but an extreme weather event would normally be as rare as or rarer than the 10th or 90th percentile. By definition, the characteristics of what is called 'extreme weather' may vary from place to place. Extreme weather events may typically include floods and droughts (IPCC, 4th Assessment Report, Working Group II, Appendix I).		The CCA community defines Extreme Event primarily based on its statistical occurrence (rare events) while the DRR community mainly focuses on different hazard and disaster types and their chain of development.	The statistical focus on rare events might be misleading for the future, since extreme events become more frequent. Therefore the definition should be broadened including aspects of the DRR community, such as the characteristics of an extreme event (extreme weather, magnitude etc.).

Disaster Risk Reduction Community (DRR Community)	Climate Change Adaptation Community (CCA Community)		Similarities/ Differences	Recommendation
Hazard				
A potentially damaging physical event, force or phenomenon or human activity that may causeloss of life or injury, property damage, social and economic disruption or environmental degradation. Hazards can include latent conditions that may represent future threats and can have different origins. Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterised by its location, intensity, frequency and probability (UN/ISDR 2004).	Not a key term for the CCA community.		The term hazard is hardly defined for CCA.	Link the definitions of hazard and extreme events in a way that it becomes more visible what the major differences between a hazard and an extreme event are. Climate change may create hazards or exaggerate normal forces to create extreme events.
Impacts				
The term impact is used to describe the overall effects or the expected consequences of a hazard affecting a society or another system exposed (UN/ISDR 2004). Specific impacts and consequences would be classified as losses or damages.	The effects of climate change on natural and human systems. Depending on the consideration of adaptation, one can distinguish between potential impacts and residual impacts: **Potential impacts:** all impacts that may occur given a projected change in climate, without considering adaptation. **Residual impacts:** the impacts of climate change that would occur after adaptation. (IPCC 4th Assessment Report; Working Group II, Appendix I)		The term impact in the DRR community is mainly linked to hazard impacts, while the CCA community also focuses on residual impacts linked to changes after adaptation.	Both communities use their specific impact definition. Solely the residual impacts need to be also considered in the DRR community, although the term is not very common. Consequences of adaptation would be a better term.
Mitigation				
Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards. (UN/ISDR 2004).	Reduction of greenhouse gas emissions and other strategies to enhance greenhouse gas sinks. (IPCC, 4th Assessment Report, Working Group II; Appendix I)		The communities are talking about different things. CCA deals with the reduction of greenhouse gases, while DRR the adverse impact of natural hazards should be reduced.	Mitigation and adaptation are key differences in CCA, thus a practical recommendation might be to add to the word mitigation the respective function, such as hazard impact mitigation and greenhouse gas-mitigation.
Preparedness				
Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations (UN/ISDR; Living with Risk 2004; Annex I).	Not a key term for the CCA community.		The term hazard is hardly defined for CCA. Adaptation is used fairly uncritically for preparedness.	The relation between preparedness and adaptation needs to be clarified.
Resilience				
The capacity of a system, community or society potentially exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures (UN/ISDR 2004). The capability of a system to maintain its basic functions and structures in a time of shocks and perturbations (Adger et al., 2005; Allenby and Fink, 2005).	The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to adapt to stress and change. (IPCC, 4th Assessment Report, Working Group II, Appendix I)		Definitions are similar but the DRR definition stresses the adaptation/learning process.	For concepts and strategies there is a need to specify what type of basic structures and functions need to be maintained during the time of shocks and stresses (extreme events). Remark: Resilience should not be confused with robustness or stability. Change is also an important pre-requisite for more resilience. Resilience should be distinguished from, but linked to adaptation.

Disaster Risk Reduction Community (DRR Community)	Climate Change Adaptation Community (CCA Community)		Similarities/ Differences	Recommendation
Response				
The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected. (UN/ISDR Glossary, http://www.unisdr.org/eng/terminology/terminology-2009-eng.html).	Not a key term for the CCA community.		The term hazard is hardly defined for CCA.	Response might be a term that need to be added into the vocabulary of the IPCC and the CCA when dealing with extreme events.
Risk				
The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions. Conventionally risk is expressed by the notation Risk = Hazards x Vulnerability. Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability. Beyond expressing a possibility of physical harm, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying cases (UN/ISDR 2004).	The concept of risk combines the magnitude of the impact (a specific change in a system caused by its exposure to climate change) with the probability of its occurrence. (IPCC, 4th Assessment Report, Working Group II, Appendix I)		The IPCC definition completely neglects the vulnerability ('internal') side of the risk which is included in the DRR definition. The term risk is defined very narrowly in the CCA community and encompasses mainly the magnitude, impact and frequency as key characteristics.	The harmonization of both definitions is crucial for a fruitful dialog between both communities. A concentration emphasis on hazard aspects within the CCA community is not helpful, since most important also foradaptation strategies is the identification, measurement and assessment of vulnerability as an important component of risk. Impacts are different from vulnerabilities. CCA and IPCC should put more emphasis on vulnerability in their risk definition.
Sensitivity				
Sensitivity is linked to the ability and timeframe of a system to react. The terms fragility and susceptibility are used to describe the potential of being adversely affected. (Birkmann 2006, Cardona et al. 2005)	Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate variability or change. The effect may be direct (e.g., a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g., damages caused by an increase in the frequency of coastal flooding due to sea-level rise). (IPCC; 4th Assessment Report; Working Group II; Appendix I)		The CCA definition on sensitivity is very broad compared to the understanding of sensitivity and susceptibility in the DRR and vulnerability research community.	There is a need to differentiate sensitivity and susceptibility, since sensitive systems might not be susceptible per se.
Susceptibility				
Susceptibility means that an exposed system –regardless of whether it reacts rapidly or slowly – can face serious harm and disruption or is adversely affected. (Birkmann 2006, Cardona et al. 2005)	Not a key term for the CCA community.		The term hazard is hardly defined for CCA.	There is a need to acknowledge the differences between sensitivity and susceptibility.
Vulnerability				
Conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards (UN/ISDR 2004). Vulnerability is characterized by a double structure and encompasses an internal and an external side (see in detail Bohle 2001). Vulnerability is multi-dimensional, scale dependent and dynamic (Vogel/O'Brien 2004, Birkmann 2006, Cutter 2003, Downing et al. 2006).	The degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity. (IPCC 4th Assessment Report, Working Group II, Appendix I)		The CCA school mainly views vulnerability as an end-point, while DRR focuses vulnerability more as a starting point. Vulnerability in the DRR community is clearly separated from the hazard part, while the vulnerability definition in the CCA community also encompasses the character, magnitude and rate of climate change. Exposure could be a bridge between vulnerability and the hazard or extreme event, but the magnitude and rate of climate change are not really a core characteristic of vulnerability and should therefore be treated separately.	Establishment of a process oriented view of vulnerability. Identification of generic elements of vulnerability. Improvement of the separation between vulnerability and characteristics of the climate change phenomena. A generic framework should be developed that outlines the main characteristics of vulnerability to climate change in a dynamic way.

Appendix 4 Table 3: List of Expert Interview Partners

	Name	Current position	Institution	City	Country
1	Agarwal, Sumeet	Coordinator	SEEDS	Delhi	India
2	Arambepola, N.M.S.I.	Director	Urban Disaster Risk Management	Bangkok	Thailand
3	Bonte-Grapentin, Michael	Senior Advisor	Pacific Islands Applied Geoscience Commission	Suva	Fiji
4	Braune, Sibylle	Head Development Cooperation	German Red Cross	Berlin	Germany
5	Campbell, John	Associate Professor	The University of Waikato	Hamilton	New Zealand
6	Chand, Roshni	Regional Disaster Programme Manager	Foundation of the Peoples of the South Pacific International	Suva	Fiji
7	Daschkeit, Achim	Scientific Advisor at the Centre of Excellence for Climate Impact and Adaptation	Federal Environment Agency	Dessau	Germany
8	Dier, Sabine	Programme Officer Asia	CARE Deutschland-Luxemburg e.V.	Bonn	Germany
9	Frew, Mike	Program Officer	Save the Children	Wellington	New Zealand
10	Glass, Derek	Senior Expert	ADRA (Adventist Development and Relief Agency)	Bloemfontein	South Africa
11	Goldammer, Johann Georg	Director	Global Fire Monitoring Centre	Freiburg	Germany
12	Grassmann, Robert	Senior Advisor	Welthungerhilfe	Bonn	Germany
13	Gregoire, Crispin	Ambassador to the United Nations for Dominica	Alliance of Small Island States	New York	USA
14	Grothmann, Torsten	Senior Scientist	Potsdam Institute for Climate Impact Research	Potsdam	Germany
15	Halder, Shantana	Senior Program Specialists	Comprehensive Disaster Management Programme	Dhaka	Bangladesh
16	Harnisch, Jochen	Coordinator Climate Change Policy	KfW Entwicklungsbank	Frankfurt	Germany
17	Helmer, Madeleen	Head Red Cross/ Red Crescent Climate Centre	Red Cross/ Red Crescent Climate Centre	The Hague	Netherlands
18	Huq, Saleemul	Senior Fellow, Climate Change	IIED	London	UK
19	Jordaan, Andries	Director of Disaster Management Training and Education Centre for Africa	University of the Free State	Bloemfontein	South Africa
20	Karunarathne, Padma	Director	Municipal Council	Colombo	Sri Lanka
21	Kato, Miwa	Junior Professional Officer, Adaptation, Science and Technology Programme	United Nations Framework Convention on Climate Change	Bonn	Germany
22	Khoza, Mzamani	Senior Project Consultanat: Disaster Management and GIS, Capacity Building and Research	National Disaster Management Centre	Pretoria	South Africa
23	Klose, Thorsten	Desk Officer Disaster Risk Reduction	German Red Cross	Berlin	Germany
24	Kuenkel, Nana	Climate Protection Programme for Developing Countries	GTZ	Eschborn	Germany
25	Marerua, Florencio	Capacity Building Advisor	World Vision International	Johannesburg	South Africa
26	McGree, Simon	Principal Scientific Officer (Climate Services)	Fiji Meteorological Office	Nadi	Fiji
27	Mearns, Robin	Lead specialist and Team Leader of the Social Dimensions of Climate Change	World Bank, Social Development Department	Washington	USA
28	Mitchell, Tom	Research Fellow, Vulnerability and Poverty Reduction	IDS	London	UK
29	Nelson, Don	Assistant Professor	University of Georgia	Georgia	USA
30	Pilardeaux, Benno	Head of Media and Public Relations	German Advisory Council on Global Change	Berlin	Germany
31	Poolman, Eugene	Chief forecasting specialist; Disaster Risk Reduction	South African Weather Service	Pretoria	South Africa
32	Power, Mary	Director Resource Mobilization Office	WMO	Geneva	Switzerland
33	Rottach,Peter	Consultant	Diakonie Katastrophenhilfe	Stuttgart	Germany
34	Roy, Argya Sinha	Project Manager	Asian Disaster Preparedness Centre	Bangkok	Thailand
35	Scholz, Imme	Deputy Director	German Development Institute	Bonn	Germany
36	Siebert, Michael	Head of Sector Program Disaster Risk Management	GTZ	Eschborn	Germany
37	Smith, David C.	Consultant	Environment and Disaster Management, University of the West Indies	Kingston	Jamaica
38	Swiegers, Chris	Disaster Risk Management Coordinator	Department of Water Affairs	Pretoria	South Africa
39	Veitayaki, Joeli	Professor	University of the South Pacific	Suva	Fiji
40	van der Leeuw, Sander E.	Director and Professor	Arizona State University	Arizona	USA
41	Webb, Arthur	Program Manager	Pacific Islands Applied Geoscience Commission	Suva	Fiji
42	Wieneke, Florian	Senior Economist, Development Economics	KfW Entwicklungsbank	Frankfurt	Germany
43	Win, Ma Hnin	Consultant	Asian Disaster Preparedness Centre	Bangkok	Thailand

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