INTEGRATING DISASTER RISK MANAGEMENT INTO **CLIMATE CHANGE ADAPTATION**

DISASTER RISK MANAGEMENT
PRACTITIONER'S HANDBOOK SERIES

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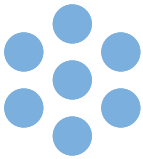

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Integrating Disaster Risk Management into Climate Change Adaptation is the result of a collaborative, multistakeholder effort over the course of 2011-2013, drawing upon the knowledge and experience of many organizations and individuals across Asia and the Pacific.

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SECTION 1

INTRODUCTION

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1.1 ABOUT THE SERIES

The **Disaster Risk Management Practitioner's Handbook Series** portrays what the disaster risk management (DRM) practitioner can contribute to a selection of government led processes in order to strengthen disaster resilience and foster sustainable, inclusive development across Asia and the Pacific.

Governments in the region have recognized that reducing underlying vulnerabilities and exposure to natural hazards is critical to achieving sustainable development. There is an increasing call to integrate the management of disaster risk into all public and private activities. As such, DRM practitioners are increasingly expected to support the integration of DRM within the many stages of development.

Accordingly, the handbooks aim to provide advice to the DRM practitioner on both strategic and practical options for operational implementation of DRM within a selection of development processes and tools. The advice contained in the handbooks draws on the experience and knowledge of a wide range of DRM and development practitioners with experience across Asia and the Pacific.

The series is comprised of three complementary handbooks:

Integrating Disaster Risk Management into the **Development Process**

Integrating Disaster Risk Management into **Urban Management**

Integrating Disaster Risk Management into **Climate Change Adaptation**

The handbooks specifically address those DRM practitioners who are government officials and have the role or responsibility to manage or reduce disaster risks. As such, the practitioner may be a member of a national or subnational DRM agency, or an officer within a line ministry or subnational authority who has been charged with the responsibility for DRM within the agency's scope of work.

For DRM practitioners who are familiar with integrating DRM, the handbooks can function as an aide memoire. For practitioners with less experience, the handbooks can act as a guide to where they can best direct their efforts. For officials engaged in development planning, urban management and climate change adaptation, the handbooks will provide insight into how they can benefit from the contributions of the DRM practitioner.

A note on cross-referencing

Each handbook can be used alone or in combination with the other two. It is hoped that the practitioner will find each handbook to be complete within the scope of the topic. However, in order to facilitate a greater understanding of the topic under discussion, the practitioner is invited to follow-up on the systematic cross-referencing found throughout all three handbooks. The three handbooks will be respectively cross-referenced as

DEVELOPMENT | URBAN | CLIMATE

1.2 ABOUT THIS HANDBOOK

Integrating Disaster Risk Management into Climate Change Adaptation promotes the adoption of a risk management approach to climate-sensitive decision-making and serves as a reference to integrate DRM with climate change adaptation (CCA). It guides the reader on how to contribute to CCA by improving the management of climate extremes.

The handbook specifically addresses those DRM practitioners who sit within:

- the National Disaster Management Agency; or
- line agencies and local governments and have the designated responsibility for DRM.

The handbook provides DRM practitioners with advice for integrating DRM into key adaptation processes: policies, adaptation strategies, and adaptation projects. The handbook explicitly guides the practitioner on how to support government authorities to consider and treat disaster risk through these tools. The guidance provided aims to:

- promote the importance of DRM as a starting point for adaptation;
- supply the practitioner with sound arguments to be used as they advocate the integration of DRM;
- identify approaches, strategies, tools and activities for comprehensive integration of DRM into the designated adaptation processes; and
- demonstrate the fundamental concept of integration so that the DRM practitioner can apply it wherever the need arises.

Section 2 of the handbook outlines the DRM practitioner's role in the efforts for CCA. It briefly describes the context and interlinks between climate change and disaster risk, the processes for adaptation, and the perspective and experiences of DRM that can be utilized within and by CCA.

Section 3 provides detailed strategic guidance on how to integrate DRM within the stages of climate change policy formulation (Chapter 3.1), CCA strategy formulation (Chapter 3.2), and the adaptation project cycle (Chapter 3.3).

Section 4 concludes with key messages for the DRM practitioner.

SECTION 2

THE DRM PRACTITIONER AND THE CLIMATE CHANGE ADAPTATION PROCESS

MANAGING GLACIAL LAKE OUTBURST FLOOD IN NEPAL. Within two decades, 24 GLOF events were experienced in Nepal. Related to a faster melting of glaciers, the ice-dammed glacial lakes can cause disastrous floods if they become unstable as their volume increases or rock avalanches strike their surface.

In Nepal, little attention was paid to this phenomenon until the sudden outburst on August 4, 1985 of Dig Tsho, a small glacial lake in the western section of Sagarmatha National Park (Mt. Everest). The GLOF was triggered by an avalanche that splashed into the lake, and produced a surge wave that overtopped and caused the collapse of the end moraine dam. Dig Tsho discharged an estimated 6 - 10 million m^3 of water into the valley below over a four-hour period, and caused over three million dollars worth of damage. It destroyed the nearly completed Namche Small Hydro-electrical facility located about 11 km downstream, and disrupted the downstream community of Khumbu for several months; the surge event caused damage as far as 50 to 60 km downstream.

Identifying potentially dangerous glacial lakes, risk assessment, disaster preparedness, monitoring and early warning are necessary to reduce the loss of lives and properties found downstream. “As glaciers and glacial lakes are related to both water resources and to water-related natural hazards, they need to be mapped and monitored to assess both their potential hazard and their resource value” (ICIMOD, 2011: p. v). In order to adapt to climate change impacts in Nepal, GLOF therefore has to be managed.

Just as today's development decisions will influence tomorrow's climate, so too will tomorrow's climate influence the success of today's development decisions.

ADB, 2005

Climate change represents an additional source of uncertainty for the disaster risk manager, mostly stemming from the limitations of climate science in making reliable projections of climate change impacts upon disaster exposure and vulnerability.

CCA is concerned with actions to moderate climate change impacts in the long term, as well as to take advantage of any potential beneficial consequences. It is concerned with both the risks associated with increases in extreme weather and climate-related hazards, and long-term gradual changes in weather patterns that exacerbate vulnerability.

Countries have treated the two policy fields of DRM and CCA separately in the past, with ministries for environment looking after CCA, and civil defense or disaster management offices taking responsibility for DRM.

THE DISASTER RISK MANAGEMENT PRACTITIONER PLAYS AN IMPORTANT ROLE IN PROMOTING RESILIENCE BY FACILITATING THE MANAGEMENT OF DISASTER RISK WITHIN THE PROCESSES THAT GUIDE CLIMATE CHANGE ADAPTATION

2.1 THE DRM PRACTITIONER: FACILITATING INTEGRATION

As governments steadily increase their interest and work towards adapting to the impacts of climate change, DRM can also find a niche within this work to manage disaster risks associated with extreme climate events. The DRM practitioner is an individual whose professional function is as a focal point who contributes to the management of disaster risk for a particular sector, geographic area or organization. Given these alternatives, DRM practitioners are likely to be either a) located within a sector line agency, ministry, or municipal department or b) located within a national, district or municipal disaster management office. Initially, the

BOX 1 The DRM practitioner

The DRM practitioner works ...

for	municipal, subnational or national government agencies
on	• reducing disaster risk where possible • managing the remaining disaster risk
with	• government agencies and departments • DRM or CCA focal points • at-risk communities and civil society organizations • universities and other research oriented organizations • bilateral and multilateral development partners • private businesses and the media
by	using appropriate current and future risk information to affect changes in: • knowledge and awareness • activities and behavior • technical capacity • political commitment • plans and policies • programs and budgets • institutional arrangements • management tools and systems
to	• protect communities, assets and livelihoods from the adverse impacts of natural hazards • promote disaster preparedness, response and recovery practices • achieve long-term sustainable development

DRM practitioner may or may not have received extensive training in DRM. Box 1 describes what the DRM practitioner does, with whom, how, and why.

2.2 THE DRM PRACTITIONER'S CONTRIBUTION TO CLIMATE CHANGE ADAPTATION

Disaster risk management is a broad concept that aims to avoid, reduce or transfer the adverse impacts of hazards on people, property and the environment through activities and measures for prevention, mitigation and preparedness. It involves the judicious design, implementation and evaluation of strategies, policies and measures that aim to:

- improve knowledge and understanding of disaster risk, including hazards, exposure and vulnerabilities, and capacities;
- reduce disaster risk by the use of protective measures which aim at protecting lives and assets;
- promote disaster preparedness, response and recovery practices; and
- facilitate and advance sustainable development (IPCC, 2012).

The aim of DRM is consistent with the aim of CCA to minimize the impact of climate change.

To effectively integrate DRM into existing CCA processes, the DRM practitioner's primary contributions are: the risk management process, the DRM perspective, and risk treatment measures. The risk management process:

- facilitates planning against uncertainties;
- emphasizes a holistic consideration of *who* and *what* are at risk in *which location*;

- promotes multihazard risk management (as opposed to looking only at climate-related hazards); and
- builds experience in risk management measures which can be implemented to reduce the impacts of climate variability and extremes.

DRM practitioners possess a number of unique characteristics from which to draw in order to manage disaster risks. They can contribute the perspectives, tools, techniques, knowledge, skills and experience detailed in the toolkit in Box 2 to other fields in order to support the integration of DRM. These provide the practitioner with a robust platform, based on empirical evidence, from which to manage disaster risk to climate variability and climate extremes. Of all the items in the toolkit, the perspective and risk treatment methods are the most important contributions to CCA.

PERSPECTIVE | DRM considers all hazards, not just climate-related hazards, and practitioners encourage that CCA efforts are consistent with other plans and measures for managing disaster risk from other types of hazards (such as earthquakes, volcanoes, chemicals, technological etc.). To focus on a single hazard at a time is very narrow when a country is exposed to multiple hazards.

Both DRM and CCA must face multiple stakeholders and their perceptions about risks. DRM accommodates other risks (such as financial, political and economic) that may be more important or imminent to the sectors and communities they are trying to assist, and the practitioners must exhibit flexibility to address those prioritized needs along with treating disaster risk and adapting to climate change.

DRM prepares for complicated and unfolding situations such as when one hazard triggers a second, or a strong earthquake and volcanic eruption occur even while a government is still responding to a typhoon.

Finally, when reviewing how to treat risk DRM looks to experience or information from all time scales – the past as a source of experience, the present as a dynamic changer of risk, and the future that is the source of uncertainty for preparing for disasters.

TOOLS | The DRM practitioner uses specific tools, some of which are unique to the DRM field, in order to achieve the aim of reducing risk and managing residual risk. Tools the DRM practitioner might use include spatial analysis software, risk assessment methods, and public policies.

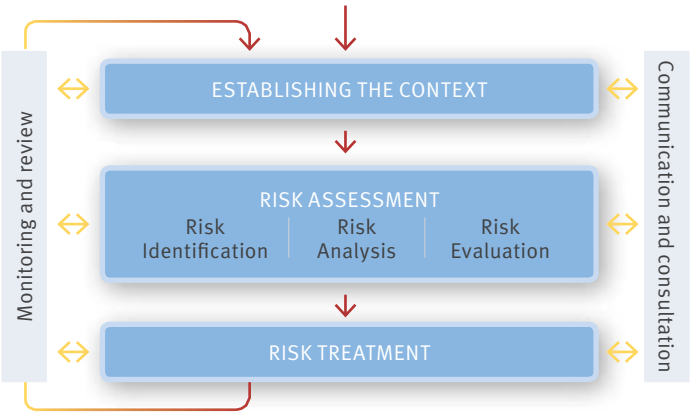
SKILLS | Use of the tools mentioned above requires a specific skill-set that the DRM practitioner may learn through structured training, self-directed study and job experience. These skills can include public outreach and persuasion, technical analysis and planning.

EXPERIENCE AND KNOWLEDGE | The practitioner can influence CCA by drawing upon personal experience and examples from around the region of sound DRM practices as well as the consequences of actions that ignore disaster risk. For this reason DRM practitioners are encouraged to record, document and disseminate their experiences, particularly for use in training and orientation of new practitioners.

APPROACH | To manage risk, the practitioner takes a DRM approach to their work, following a continuous process of gathering and analyzing risk information, deciding what risks need to be reduced and then treating the risk. Integration involves embedding the stages of this process for managing risk within the processes guiding development.

This DRM process can be understood as consisting of the following five stages (for a more detailed explanation see ISO31000 Risk Management: Principles and guidelines on implementation):

FIGURE 1 Disaster risk management process



Adapted from International Organization for Standardization, 2009

1. **Communication and consultation**. Discussion is opened with public officials and the affected public as an ongoing process throughout the stages of DRM. Generally, this is undertaken to ensure that those public officials and stakeholders understand and make known the issues surrounding risk: to initiate the need for risk management, the consequences of disaster impacts, the risk management measures required, the basis of decisions, and the reason why particular actions are required.
2. **Establishing the context**. This stage refers to defining the parameters that would affect DRM. The tasks here would be to identify: 1) the cultural, political and economic environment; 2) the responsibilities and capacities of the implementing government organizations, as well as the existing roles of private and community organizations; 3) establish how decisions are made; and 4) establish risk criteria for the levels of acceptable risk.
3. **Risk assessment**. This is a process of risk identification, risk analysis and risk evaluation. It can involve technical professionals (social scientists, engineers, etc.), local leaders

and people from affected sectors and communities. The tasks are to identify all possible threats, study their impacts, analyze the consequences of risk and the likelihood that these may occur, and evaluate if the level of risk found meets the criteria for what is acceptable.

4. **Risk treatment**. The general objective of this stage is to identify and implement the different measures that can reduce or manage risk, selecting from among those options, and implementing the choices. This stage is a cyclical process of: assessing the risk treatment by testing using tools such as computer modeling, pilot projects, drills and simulations; evaluating the effectiveness of the treatment; and modifying or generating a new risk treatment until the level of risk is acceptable.

   Risk is treated using specific structural, non-structural or environmental measures or a combination of these. Measures can accept, avoid, reduce or transfer risk. Measures are determined by the context: nature and scope of risk, capacity of stakeholders to implement measures, likely cost and effectiveness of measures, resources available etc. Risk treatment measures are first identified and then evaluated. The World Bank (2013: 19-20) recommends that policymakers adopt a robust approach to uncertainty and unknown risks that incorporates a greater degree of flexibility into the measures for treating risk. Table 1 has examples of different types of measures and associated treatment functions. | see URBAN ⁝⁝ Table 1 for a discussion of particular measures for urbanized areas |

5. **Monitoring and review**. This risk management process is undertaken so that continual improvements can be made in all the stages. The purposes are to: analyze and learn lessons from events, changes and trends; detect changes in the context including changes to the risk itself which can require revision of risk treatments and priorities; ensure that the risk control and treatment measures are effective in both design and operation; and identify emerging risks.

TABLE 1 Examples of risk treatment measures and functions

Measure	Risk functions			
	Retains risk	Avoids risk	Reduces risk	Transfers risk
Structural measures				
Barriers (e.g. constructing sea walls against sea level rise and its impacts)			✻	
Phased relocation of communities to safer places		✻		
Strengthening of existing structures (e.g. raising existing sea walls)			✻	
Non-structural measures				
Early warning systems			✻	
Evacuation planning (e.g. adding evacuation shelters to accommodate rising numbers of people and animals exposed to climate-related hazards)			✻	
Crop insurance (against drought or typhoons)				✻
Calamity funds (reserves and credit)	✻			
Poverty reduction			✻	
Rooftop gardens in urban areas, floating gardens in flood prone areas (to reduce food insecurity)			✻	
Environmental measures				
Barriers (e.g. mangroves against storm surge)			✻	
Strengthening (e.g. grass and bio-nets for slope stabilization against rain-triggered landslides)			✻	
Promoting open, green spaces (for improving percolation of water into the ground, space for rivers to flood, and reducing heat reflected by concrete)			✻	

Integrating DRM into CCA processes requires embedding these risk management phases and perspective inside adaptation planning and implementation processes by sectors (such as water and agriculture) or for specific areas within a country (such as towns and cities on exposed deltas and fragile environments). Each sector or area has its unique adaptation needs and challenges, and the aim of integration is being part of the discovery of a good path to resilience to changing climates.

Box 2 summarizes the contributions the DRM practitioner can make to facilitate the integration of DRM into the CCA process.

BOX 2 The DRM practitioner's contribution to CCA

Perspective

- Looks at things through a risk lens
- Focuses on reducing current and future risk related to all hazards

Tools

- Risk assessment methods
- Damage and loss assessments
- Computer-based modeling of risk and disaster impacts
- National DRM policies and frameworks
- International agreements and conventions
- GIS-based spatial analysis

Skills

- Advocacy
- Awareness raising
- Capacity building
- Risk communication
- Negotiation
- Planning and testing
- Interpreting technical information
- Spatial and financial analysis

Experience and knowledge

- DRM theory
- The practitioner's own
- Natural hazards and climate change
- Sound practice from the region

Approach

- Consultation and communication
- Establishing the context
- Risk assessment
- Risk treatment
- Monitor and review

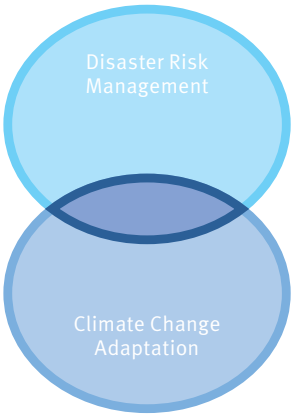
2.3 CLIMATE CHANGE AND DISASTER RISK MANAGEMENT

CCA is concerned with actions to moderate climate change impacts in the long term, as well as to take advantage of any potential beneficial consequences. It is concerned with both the risks associated with increases in extreme weather and climate-related hazards, and long-term gradual changes in weather patterns that exacerbate vulnerability.

Regional climate models simulate the general climate trends that will be felt in various parts of Asia and the Pacific. Such changes are expected to become more apparent over time and have a more significant influence on the frequency and intensity of climate-related hazards. Impacts include the following:

- **The changing climate can lead to an increase in the frequency, intensity and spatial extent of climate-related hazards**. Climate projections show temperature rises occurring across Asia; heat waves and warm spells are likely to increase in frequency and/or duration for the Asian region (IPCC, 2012: 201). Temperature increase could lead to more mudflows, avalanches and spring-time floods from glacier melt; more intense tropical cyclones; and could help expand the natural habitat of disease-carrying mosquitoes and other disease vectors (IPCC, 2007: 478-9). Increases in heavy precipitation are expected in East Asia, while Southeast Asia is expected to have more days with intense precipitation (IPCC, 2012: 201). Some islands are already experiencing some of the expected effects of climate change such as increasing areas of suitable habitat for disease-carrying vectors, and more frequent storm surges, floods and droughts (ADB, 2011: 27).

FIGURE 2 The overlap between DRM and CCA



Managing risks due to all hazards.

Managing disaster risk related to climate variability and climate extremes, and preparing for risks related to climate change.

Long-term adaptation to changes in climate, including an appreciation of the potential benefits climate change might bring.

Adapated from Mitchell and van Aalst, 2008

- **When the climate changes projected for the future occur, they will interact with development decisions, increasing exposure of populations to hazards.** Sea level rise, a projected consequence of global climate change, is of particular concern for coastal settlements in Asia and the Pacific where the increases in some areas are expected to be higher than the global average. It is an incremental change, but it adds to the magnitude of coastal storms and tropical cyclones. The largest impacts are expected in coastal cities where the present elevation is less than 10 m above the average mean sea level; possible impacts include poor drainage, hampered sanitation services and constraints on freshwater supplies (McGranahan et al., 2007). Preliminary assessments are available for Bangkok, Ho Chi Minh, Jakarta and Manila (World Bank, 2010).

- **Repeated exposure to climate-related hazards can reduce the coping capacity of populations, increasing their vulnerability to the impacts of climate-related hazards.** Climate-related hazards are affected by intra-seasonal changes, as well as season-to-season and year-to-year variations in the climate. UNISDR (2011: 34-40) analyzed reports of disaster loss due to low-intensity hazards of 21 countries for a 40-year period; 96 per cent of the reports were weather-related, and show a rising trend in damage to houses, schools and health facilities. Accumulated effects include increased probability of related hazards (such as floods and landslides), increased impacts and ultimately lower resilience especially of poor and marginalized groups.

These impacts may jeopardize development and poverty reduction efforts, especially if settlements and infrastructure coincide where disaster risks will be significant. Managing climate-related disaster risks therefore includes preparation for extreme events and climate variability potentially arising out of climate changes. DRM and CCA have very similar aims in terms of promoting resilience in the face of hazards. They both focus on reducing vulnerability by improving the ways to anticipate, cope with and recover from their impacts.

However, DRM and CCA are not the same as each field has its own concerns, with DRM looking to manage risks from all hazards and CCA looking to help societal systems and undertakings adapt to a changing climate. DRM tends to be looked after by civil defense authorities, while CCA tends to be looked after by ministries of environment. The two fields overlap in a common area (see Figure 2), as both are concerned reducing vulnerability, with monitoring climate-related hazards and reducing exposure to these, and raising societal capacities to manage climate risks. DRM has a long history of dealing with climate-related hazards, and therefore has robust methods relevant to adaptation.

CASE STUDY

Tracing how climate conditions and development decisions increased flood risk in Pakistan

The series of floods in 2010 from Pakistan's Indus River affected more than 20 million people, resulted in the deaths of almost 2,000 people, caused damage and indirect costs of more than PKR 855 billion (USD 10 billion), and a 2 per cent decline in GDP (ADB and World Bank, 2010). It was the country's worst flood disaster in terms of number of affected population and economic damages (EM-DAT, 2013b).

The expansion of farmland into the flood plain increased the exposure and vulnerability of people to the floods. As the Indus irrigation system expanded to be one of the largest in the world, wetlands were converted into farmland and the bulk of the population settled in the floodplains. People tended to live in flimsy houses, thus over 900,000 houses were completely destroyed by the flood, 92 per cent of which were poorly constructed of mud and unreinforced light materials.

The dynamic Indus River carries a high sediment load from the Himalayan and Karakoram mountain ranges. Protective structures such as barrages and embankments constricted the river and may have led to the accumulation of sediment and subsequent overflow of floodwater (Gaurav et al., 2011).

A massive cutback in flood defenses as a direct result of money being reallocated to the military budget (Hunt, 2010) represents the balancing act that many countries perform in the face of competing political priorities. Furthermore, prior to the flood, most government institutions were struggling to fulfill their mandates under the 2006 National Disaster Management Ordinance; systems and procedures were still evolving, institutional and human capacity development for DRM was still being undertaken (ADB and World Bank, 2010). There was low capacity for communicating early warning from district to community levels, while at-risk communities had low capacity to interpret the warning and limited options to respond (ADPC, 2012).

The main cause of deaths and damage was the lack of drainage infrastructure and poor maintenance of flood defenses. However, with the climate change trend leaning towards more intense rainfall events, it is now urgent to turn to DRM to anticipate and avoid similar flood impacts in the future. The climate conditions that contributed to flood risk were heavy rains of more than 200 mm within 24 hours and very high river flows (Ministry of Water and Power, 2010). The flood is listed as one of several extreme events linked to global climate change (WMO, 2011). With the detected westward-shift of the monsoon's reach and a compression of the rainy period (Hanif, 2011), there is a possibility for such floods to recur in the Indus River floodplain.

2.4 PROCESSES FOR CLIMATE CHANGE ADAPTATION

"Adaptation refers to adjustments in ecological, social, or economic systems in response to actual or expected climatic stimuli and their effects or impacts." (IPCC, 2012: 5). It is a broad concept covering the actions taken by individuals, communities, private companies, and governments to reduce vulnerability.

Individuals and small communities can adapt to changed climate conditions on their own without help; examples from rural communities include crop calendar shifts, soil and water management changes, and crop changes (World Bank, 2012).

Adaptation may also be consciously undertaken by humans, primarily through the planning and action by government, but also through influencing private actions through law, incentives and regulation (Smit and Pilosofova, 2001). Planned adaptation can (Burton and Van Alst, 2004):

- first focus on current needs, vulnerabilities and climate risks to yield immediate benefits for slowing the rapidly rising disaster losses due to extreme climate events;
- anticipate climate trends in building design and land use planning to be more effective and less expensive than last-minute retrofitting of buildings; and
- be part of development and not isolated from it, to consider not just the projected climate changes but also address vulnerability and exposure.

To help make decisions to minimize climate-related disaster risks, DRM practitioners will have to work collaboratively with CCA focal agencies, CCA focal points in sectors, climate scientists and technical specialists supporting the development sectors to promote:

- **Policies** that can be framed to reduce climate change impacts through measures that enhance society's resilience or actions that expand the range of coping strategies. The DRM practitioner may advocate for measures to be included within the CCA policy environment.
- **Adaptation strategies** that are sets of adaptation policy options and measures in response to current vulnerability and future climate risks. The DRM practitioner may promote the inclusion of risk management approaches and DRM measures within CCA strategies.
- **Adaptation projects** that are an implementation mechanism of the adaptation process, translating adaptation strategies into tangible outputs on the ground. The DRM practitioner may promote the protection of CCA projects from the impacts of hazards that pose a threat to the project.

These are the relevant processes for achieving CCA, and are discussed in Section 3.

2.5 THE OUTCOMES OF INTEGRATION

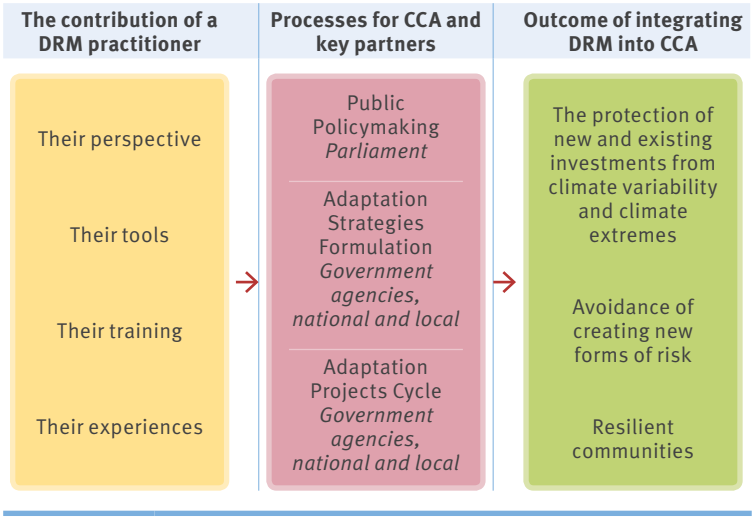
The integration of DRM into CCA is envisioned to have three fundamental outcomes. First, it should lead slowly but surely to the protection of all existing and new investments against hazard events. The aim is to create urban or rural communities, for example, that can withstand the changing effects of climate-related hazards.

Second, it seeks to avoid the creation of new forms of risk due to poorly planned adaptation. This means that all new rail lines, housing developments or social amenities, for example, are planned and implemented in such a way that they do not exacerbate existing risks or create new ones.

Third, it seeks to promote processes that will enable communities to monitor their risk environment, develop their own understanding of what creates their risks and of how to manage it, take decisions to effectively reduce risk, and be able to revisit that decision and amend it as the need arises.

These are joint outcomes to be aimed for in CCA. It helps that many of the tools, mechanisms and information needed to achieve them are shared. The integration of DRM and CCA is a two-way street, and other publications look into how CCA has to be integrated into DRM (see for example Mitchell et al., 2010).

FIGURE 3 Contribution of the DRM practitioner to CCA process



BOX 3 Words from the field

Dr. Jacob Tio, environment and natural resource risk assessment consultant, Philippines.

"DRR/CCA is a multidisciplinary effort - no one can claim expertise in such a diverse field. Inputs and contributions of other specialists are needed for any DRR/CCA initiative to succeed. Projects require the participation of and contribution from a whole range of partners at various levels of government (e.g., academe, government agency, local government partners). It is a challenging and seemingly insurmountable task of coordinating and ensuring that partner institutions are on the same page.

My advice is to have everyone form a team, and to volunteer for roles and tasks. The team spirit will help smooth out differences of opinions, and promote problem-solving discussions instead of pointless debates. Dealing with people who are rigid in their belief and attitude is very challenging. Finding a common ground for partners sometimes seemed impossible, but we eventually defined goals that we all shared.

Finding a champion within each partner-institution is the strategy to overcome institutional challenges. In my experience, champions will serve as advocates in their respective sphere of influence to achieve project objectives and ultimately promote DRM and CCA. Identify these champions and maintain a personal relationship with them. This is the most important step that will save a lot of time in developing a common vision of adaptation and risk management, as well as help facilitate coordination and cooperation. Knowing people with the same vision and thinking is quite gratifying."

NOTES

SECTION 3

THE CONTRIBUTION OF DRM TO ADAPTING TO CLIMATE CHANGE

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Chapter 3.1

HOW TO INTEGRATE DISASTER RISK MANAGEMENT INTO CLIMATE CHANGE POLICY

OVERVIEW

In recent years, countries in Asia and the Pacific have been moving in the direction of adopting national level climate change policy. These policies often address climate change adaptation as well as mitigation.

Climate change policies are crucial to adapting to long term changes in the climate because they enable governments to take certain actions by focusing resources in a particular direction. In terms of adaptation, these policies serve to formally recognize CCA as a topic that needs to be addressed, assign responsibilities for action and set out the procedures for both determining the adaptation trajectory and establishing strategies.

Managing disaster risk from extreme climate events needs to be given due recognition as an issue within CCA policy. Given that adaptation to climate change is a long-term activity, it is necessary to minimize the negative consequences of natural hazards on people, assets and livelihoods as adaptation takes place. Establishing a policy environment for CCA that is sensitive to the risk of disasters supports effective adaptation in the long run.

The public policymaking process can be generally described as five functional activities of agenda setting, formulation, adoption,

implementation, and evaluation and feedback (Anderson, 2010). These activities are interrelated and can occur simultaneously, reflecting the complex nature of policymaking.

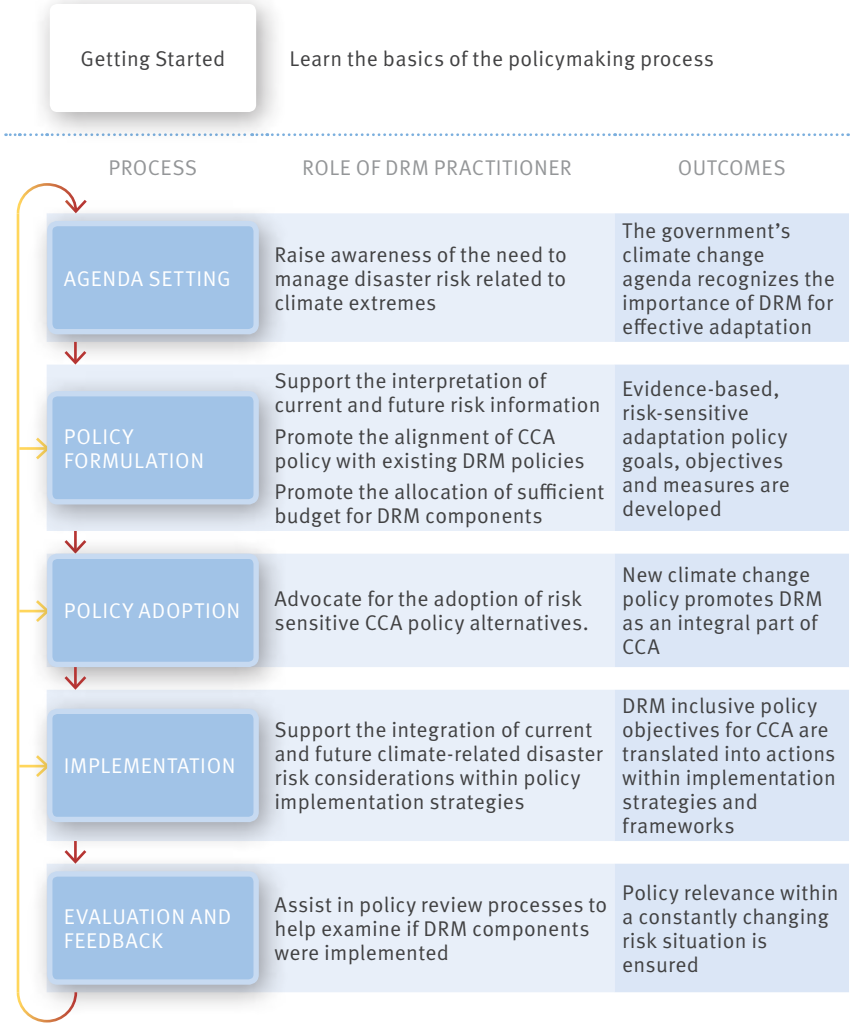
Many actors have vested interests in the development of climate change policy. The CCA components are often formulated with the inputs of public agencies for the environment, agriculture, natural resource management and disaster risk management. Additionally, universities or other research bodies are often consulted. The DRM practitioner plays an important supportive role in the development of climate change policies that contribute to managing disaster risk for adaptation.

THE GOAL OF THE DRM PRACTITIONER

By engaging in the process to develop climate change policies, the DRM practitioner aims to ensure that:

- new policies related to the promotion of CCA incorporate policy goals that help manage disaster risk to current and future extreme events.

FIGURE 4 The DRM practitioner's contribution to CCA public policymaking



GETTING STARTED

DRM practitioners can begin by familiarizing themselves with the basic approach for policy formulation and approval that is followed in the country and identifying key actors and potential partners. Policymaking bodies typically have a set of procedures that enable systematic and rational policymaking, where advocates from all sides of an issue have an opportunity to present their arguments. The formulation of climate change policy will follow the same process.

It is important to identify the basic stages in the public policymaking process; the typical timeframes; responsible parties, such as working groups or committees (including their composition and function); and any potential allies. In additional, the DRM practitioner can identify those opportunities to give briefings to policymakers about DRM issues within CCA. The fundamental aspects of the process, including the key players, can be quickly learned through a short meeting with a mid-level officer from the national planning agency or from a mid-level officer from the agency primarily responsible for the climate change policy. | See DEVELOPMENT ⁂ 3.1, for further discussion on understanding the basics of the policymaking process |

SUPPORTING DRM INFORMATION AND KNOWLEDGE REQUIREMENTS

To support the formation of disaster risk sensitive climate change policy, policymakers will require information regarding the potential impacts of climate extremes on achieving adaptation goals as well as information regarding international and national commitments:

Risk assessments and the supporting studies (e.g. assessments of hazards, vulnerability and capacity; disaster profiles) are good starting points for identifying the disaster impacts that need to be managed through adaptation measures. Damage and loss assessments and evaluations of recovery projects are also useful ways to identify the issues that can also be addressed by government policies on CCA.

International conventions, agreements and regional frameworks pertinent to CCA or DRM can provide the rationale for the strategic importance of DRM within CCA, and why risk management goals must be included within CCA policies.

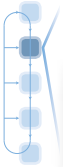
Many countries have laws, policies, frameworks, and national and local public agencies to guide DRM planning and practice. These typically articulate the national vision and core principles to guide DRM. The DRM practitioner can draw upon these tools to bolster the argument for incorporating the management of climate extremes within climate change adaptation. Additionally, the practitioner can reference these existing mechanisms to ensure that CCA efforts are coherent, and ultimately contribute to lessening the exposure and vulnerability to the impacts of disasters.

	ROLE OF DRM PRACTITIONER	OUTCOMES
AGENDA SETTING	Raise awareness of the need to manage disaster risk related to climate extremes	The government's climate change agenda recognizes the importance of DRM for effective adaptation

The policymaking process begins with the identification of public problems. Climate change becomes a part of the public agenda when society recognizes the significance of potential impacts and deems the government capable of doing something to remedy the situation. In this stage of the process, the government decides which topics deserve attention within climate change policy.

At this initial stage, it is necessary to raise the awareness of policymakers and the general public on the need to manage the risk of those climate hazards that are likely to change in intensity and frequency as a result of climate change. The DRM practitioner can support this task by drawing attention to the destructive potential of climate extremes and highlighting the need to use DRM in order to effectively adapt to them.

Whenever possible, DRM practitioners can indirectly influence public opinion and gain public support at public forums, radio and television programs, disaster preparedness events, and other public events to promote the need to manage disaster risk from climate extremes. Public speaking, distributing information materials, showing videos that focus on the relationship between climate extremes and disaster risk are some ways to communicate the message at these events.



	ROLE OF DRM PRACTITIONER	OUTCOMES
POLICY FORMULATION	Support the interpretation of current and future risk information Promote the alignment of CCA policy with existing DRM policies Promote the allocation of sufficient budget for DRM components	Evidence-based, risk-sensitive adaptation policy goals, objectives and measures are developed

This stage of policymaking involves deciding on the aims and objectives towards addressing the broad goals that government has placed on the policy agenda. The crafting of alternatives or options for dealing with a problem is done at this stage. The formulation of climate change policy results in a specific statement, such as a proposed bill requiring the State to take action to anticipate and prepare for the impacts of climate change. The policy statement will also identify the government agency responsible for executing the policy, how it is to be implemented and with what resources.

For climate change policy to effectively manage the risk of climate extremes, DRM considerations will have to be incorporated into the CCA provisions of the policy. The DRM practitioner can support this process by examining the CCA provisions of the draft policy from a DRM perspective. While doing so, the practitioner may choose to ask the following questions:

1. **Does the proposed policy recognize the need to tackle climate extremes**? For countries that are projected to experience increased frequency or intensity of climate extremes as a result of climate change, the policy will need to acknowledge the importance of managing the risk of these events so that their impacts do not impede the ability of society to adapt. Additionally, having a goal of managing disaster risk due to climate extremes within the policy language will be a basis for action by national disaster management agencies and other DRM practitioners.

2. **Will the proposed policy recommend disaster risk management as a way to manage climate extremes**? The capacity of the NDMO to continually face climate extremes will have to be calibrated against the projected increases in intensity of the hazards, exposure of people and assets, and vulnerability. In addition, the policy would ideally have provisions that require periodic risk assessments to provide evidence of disaster risk, climate variability and change, and the possible impacts of these on exposure and vulnerability.

3. **Is a climate service established that provides tailored climate information, technical advice and early warning of climate extremes**? Gaining a better understanding of uncertainty and climate variability to improve the management of its associated risk could be a policy objective. Climate monitoring systems and instrumentation may be provided in policy to enable effective early warning, and the resulting data can be used for risk assessments and climate change projections.

4. **Are the institutional responsibilities and resources for managing climate risk specified in policy**? The integration of roles and responsibilities for DRM and CCA are critical for institutional coherence, standardization of processes, and ease in decision-making. This includes: the designation of the NDMO as the lead agency for managing impacts from climate extremes, and the appropriate decentralization of roles and responsibilities to local authorities at the most suitable level (national, provincial or local) that is as close to those affected by decisions, provided capacity exists to implement the functions.

It is highly likely that policymakers will ask for technical testimony from the national agency whose mandate includes DRM or a sector that is projected to be affected by climate change. If there is an opportunity to do so, the DRM practitioner can assist in

BOX 4 Core messages for policy-makers

DRM is needed to adapt to climate extremes.

The NDMO has the mandate and experience to tackle the management of risks from climate extremes.

DRM and CCA are closely linked and could be tackled together to promote sustainable development.

Invest in the hazard monitoring and climate monitoring systems needed for early warning.

Invest in raising the government's capacities for disaster preparedness to face threats from more frequent or more intense floods, storms, tropical cyclones, landslides, or droughts.

Community-based DRM raises the resilience of communities against climate extremes and other hazards. Support local governments, the private sector and civil society in their capacities and complementary roles to play in promoting DRM and CCA.

Source: Adapted from IFRC, 2009

interpreting risk information and preparing formal arguments and statements for this testimony. The DRM practitioner may choose to transform the evidence gathered into a succinct form such as a policy brief. This brief can capture the issues as simple core messages to be communicated to policymakers. Box 4 gives an exemplary list of core messages regarding the integration of DRM into CCA policy provisions.

These core messages can be supported with statistics describing exposed populations and assets, the likely socio-economic benefits of risk management, and risk maps. | See DEVELOPMENT 3.1 for a further discussion of DRM related evidence to draw upon for policy formulation | Policy briefs can also include recommended actions for the way forward based on the evidence gathered, including operational steps and implications.

Additionally, the DRM practitioner can encourage lobbying in order to further influence policy formulation by other stakeholders, including civil society organizations (CSOs) and researchers.

This stage of the process is about making a discrete choice from among two or more alternatives, most likely involving decisions by policymakers over accepting or rejecting specific provisions in the text.

The DRM practitioner may identify the provisions that will help DRM and can assist those advocating for these. At the end of the day, the votes of many lawmakers will matter; look for potential champions within the parliament who can take the policy recommendation forward.

Box 5 describes the DRM inclusive climate change policy that has been adopted in Pakistan. Box 6 describes the decision from the Viet Nam government to create a climate change program.

BOX 5 Pakistan's National Climate Change Policy

In 2012, Pakistan's Ministry of Climate Change launched the country's first National Climate Change Policy with the policy goal, "To ensure that climate change is mainstreamed into economically and socially vulnerable sectors of the economy and to steer Pakistan towards climate resilient development."

The policy was based on the 2010 report by the Task Force on Climate Change, and developed through a series of meetings and deliberations of nine working groups. The recommendations were subjected to extensive consultations with provincial and federal ministries, institutions and civil society.

The result is a comprehensive framework for the development of national sector-wide action plans for climate change adaptation and mitigation. It identifies CCA policy measures for the economically and socially vulnerable sectors of water, agriculture and livestock, human health, forestry, biodiversity and other vulnerable ecosystems.

The policy includes an objective specifically related to managing those climate extremes related to climate change: "To minimize the risks arising from the expected increase in the frequency and intensity of extreme weather events such as floods, droughts and tropical storms." It has 22 specific policy measures for disaster management in the context of climate change, including: allocating adequate financial and other resources to implement Pakistan's National Disaster Risk Management Framework, protective measures against flood and cyclones, risk mapping, flood forecasting and drought monitoring, early warning systems, disaster preparedness measures including evacuation shelters, and insurance for loss and damage in the aftermath of disasters.

Source: Ministry of Climate Change, Government of Pakistan, 2012

BOX 6

Viet Nam Policy Statement on Climate Change and Disaster Risk Reduction

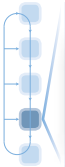
Decision Approving the National Target Program on Response to Climate Change

The Government of Viet Nam created the National Target Program laying out its comprehensive policy to respond to climate change. It was created through Decision Number 158/2008/QD-TTg issued by the Prime Minister Nguyen Tan Dong in December 2008. Based on the principles of sustainable development, the document sets out the guiding principles, strategic objectives, tasks and timeline for achieving the program activities. Implementation is expected from the entire political system and society, and the policy places the Ministry of National Resources and Environment as the standing agency that shall coordinate the activities of concerned agencies.

The program intends for climate change response activities to be carried out in a "focal and concentrated manner" in response to both urgent and potential long-term impacts, for its tasks to be integrated within "development strategies, programs, master plans and plans of branches and localities, institutionalized in legal documents and thoroughly understood in their implementation." A central task is to develop climate change scenarios for Viet Nam, with priority on sea level rise, and to assess the impacts on all sectors including DRM (for typhoon, flood and drought). Other tasks had accompanying projects to develop a national disaster prevention program, improve climate monitoring, forecasting, and early warning systems, rehabilitate disaster damage, and more.

The policy resulted in the creation of the Support Program to Respond to Climate Change. The support program aimed to raise USD 3-5 billion to address climate change in Viet Nam.

Sources: Reliefweb, JICA



	ROLE OF DRM PRACTITIONER	OUTCOMES
IMPLEMENTATION	Support the integration of current and future climate-related disaster risk considerations within policy implementation strategies	DRM inclusive policy objectives for CCA are translated into actions within implementation strategies and frameworks

This stage of the process encompasses the actions that government takes to put a law into effect to achieve its goals.

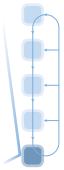
If DRM has been identified as an approach to manage risk from climate extremes, then the NDMO or the relevant government agency working towards DRM will have to take the lead in developing programs for this purpose. The lead agency will have to work with other ministries to develop a well-coordinated system for anticipating potential impacts and preparing for these. The DRM practitioner can help by liaising with other agencies involved in this endeavor.

The DRM practitioner can support the work of other government bodies that develop strategies and adaptation projects for the benefit of sectors and communities. Support includes helping with:

- accessing risk information;
- assessing risk;
- identifying DRM measures as potential options for adaptation;
- developing criteria for evaluating projects based on disaster risk;
- identifying budget sources and other resources; and
- identifying standards and regulations that need revision.

Chapter 3.2 of this handbook, How to Integrate DRM into Adaptation Strategies, contains more details.

	ROLE OF DRM PRACTITIONER	OUTCOMES
EVALUATION AND FEEDBACK	Assist in policy review processes to help examine if DRM components were implemented	Policy relevance within a constantly changing risk situation is ensured



The final stage refers to activities for appraising the achievements, outcomes and consequences of a policy so that governments may learn to implement policies effectively, and policymakers may yet reform and revise if needed.

Whenever possible, the DRM practitioner can assist in policy review by tracking the DRM components of the policy, monitoring the use of the DRM-related budget allocation, and reporting on achievements as well as setbacks. The practitioner can study reports of climate-related disaster events that occurred during policy implementation to appraise whether the policy's programs were successful in reducing disaster risks and disaster impacts. Communicate the findings to help government make the necessary changes in the policy provisions or program implementation, or both.

The case study on climate change and disaster risk reduction in Philippine law is an example of how the climate change law recognized that effective DRM can enhance CCA, but that implementation was limited due to the absence of funding for DRM initiatives. Advocacy for a subsequent law on disaster risk reduction and DRM was successful in including provisions for funding for DRR and CCA, and also provided for the integration of DRR and CCA within development planning.

CASE STUDY

Climate change and disaster risk reduction in Philippine law

The Philippines had mechanisms to respond to the challenges of climate change. These included the Inter-Agency Committee on Climate established in 1991, and the Presidential Task Force on Climate Change created in 2007. However, these mechanisms were not well-coordinated, and advocacy for better climate governance began with the filing of several bills (proposed laws) on climate change. The thrust was to push for an evidence-based advocacy process and coherence in climate change governance.

The primary drivers of the advocacy effort included several lawmakers, the Provincial Government of Albay, the Department of Environment and Natural Resources, the Aksyon Klima Group of CSOs, as well as local scientists from the national meteorological service and specialized research institutions who developed the climate profiles for use in policy briefs and legislative hearings. The scientific community was invited to the series of roundtable discussions and public hearings on the climate change bills. Together, the advocates worked towards the following: a policy that will give attention to CCA in the national agenda; 'climate-proofing' of development projects, plans, programs, fiscal policies and budgets; the creation of oversight bodies on CCA in both houses of Congress; mainstreaming CCA; and the development of CCA policy and programs at local government level.

Resulting policies

The Philippine **Climate Change Law** (RA 9729) was enacted in 2009. It resulted in the development of the National Framework Strategy on Climate Change and the National Climate Change Action Plan. Together they served as the basis for climate change planning, research and development, and for harmonizing related policies and institutions.

> ...In view thereof, the State shall strengthen, integrate, consolidate and institutionalize government initiatives to achieve coordination in the implementation of plans and programs to address climate change in the context of sustainable development.
>
> Further recognizing that climate change and disaster risk reduction are closely interrelated and effective disaster risk reduction will enhance climate change adaptive capacity, the State shall integrate disaster risk reduction into climate change programs and initiatives...
>
> *Philippine Climate Change Act (2009)*

Unfortunately, the climate change law did not provide a fund for DRM initiatives at the time it was signed. This was partly due to the limited appreciation of the linkage between CCA and DRM despite the specific policy statement, both in the Philippines and globally. The limitations of climate financing in RA 9729 became a point of advocacy for its amendment and the establishment of a People's Survival Fund for CCA, and this time together with more DRM practitioners from the Office of Civil Defense, local governments. The policy discussions over the links between CCA and DRM were also carried into the advocacy for the bill on disaster risk reduction being formulated by the Philippine Congress. The advocates were now a fuller group of DRM practitioners, CSOs as well as those involved in the advocacy for the Climate Change Act.

The **National Disaster Risk Reduction and Management Law** (RA10121) was eventually enacted in 2010, which gave due attention to addressing vulnerability reduction, and the integration of CCA and disaster risk reduction in development planning. RA10121 included the provision of a fund for DRM (that will cover CCA initiatives as well), and civil society participation in the disaster risk reduction and management councils.

Some lessons learned from the advocacy:

- Well-informed policy advocates, such as supportive partners from national government agencies and the scientific community, are effective.
- Advocate using evidence of impacts to substantiate the need for policy intervention for DRM and CCA.
- Champions (lawmakers) within the policymaking body are important to gain recognition and support for the policy issue.
- Advocacy continues even after the Philippine Climate Change Law was passed so as to ensure improvement of its provisions and coordination with other policies.
- DRM practitioners and advocates can join forces with advocates for CCA policies to work towards common policy goals.

NOTES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Chapter 3.2

HOW TO INTEGRATE DRM INTO ADAPTATION STRATEGIES

OVERVIEW

Countries have begun to develop focused climate change adaptation strategies for sectors vulnerable to the impacts of climate change. A CCA strategy for a country is a general framework for addressing the climate change impacts through actions and investment (Lim, B. and E. Spanger-Siegfried eds., 2005).

Strategies are important to guiding the overall adaptation effort for elements at risk (communities, livelihoods, crops, livestock, infrastructure, etc.). Six general types of strategies for coping with the negative impacts of climate change are: prevention of loss; tolerating loss; sharing loss; changing use or activity; changing location; and restoration (Burton et al., 1993; also in IPCC, 1994).

Based on an assessment of climate change impacts, adaptation strategies present the broad framework for integrated planning, stakeholders who should be engaged in it, principles that guided the strategy development, a mix of measures that are consistent with the strategy, and the priority for investment. A strategy document may even identify supporting policies to be enacted or amended. Strategies are larger than action plans, which are formal statements of priority for adaptation activities, and would benefit from a national-level adaptation planning process that integrates CCA adaptation planning into national planning.

Countries have varied approaches to developing and implementing adaptation strategies. Some do not have CCA policies and still

develop adaptation strategies for vulnerable sectors. Some have a strategy for one sector or have a coherent strategy for several sectors. Some implement the strategy at national as well as local levels. Some countries have started to integrate the prioritization of CCA and DRM activities within joint action plans.

The **National Climate Change Adaptation Strategy for Sri Lanka 2011 to 2016** is an example of a national strategy developed for the sectors of: 1) agriculture and fisheries, 2) water, 3) health, 4) urban development, human settlements & economic infrastructure, and 5) biodiversity and ecosystem services. It promotes climate resilience and minimizes the impacts of climate change.

Considering that adaptation strategy ultimately focuses on the well-being and continued development of elements at risk it is important to plan for negative impacts expected from climate extremes related to climate change. This Chapter is about embedding the DRM perspective and measures within the CCA strategy.

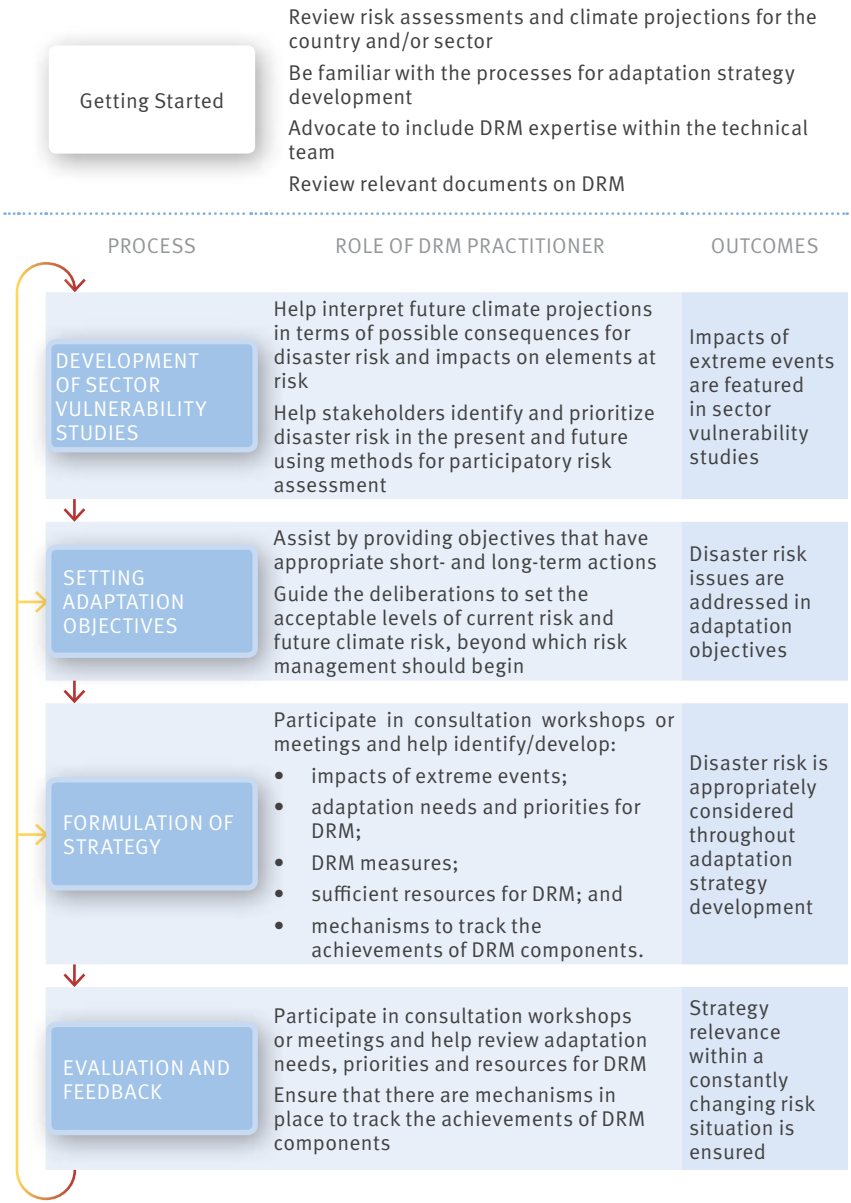
Often led by the national climate change focal point (usually the country's ministry of environment), the development of a strategy involves governments, civil society and the private sector. In practice, formulating a strategy can be a big challenge as CCA competes with other development issues for support from policy and interest groups. The DRM practitioner has a role to play in making sure that any CCA strategy is elaborated with sufficient emphasis on the DRM measures for extreme events.

THE GOAL OF THE DRM PRACTITIONER

The goal of the DRM practitioner is to ensure that:

- when CCA strategies are being formulated or revised, DRM measures are included that may reduce exposure and vulnerability to climate extremes.

FIGURE 5 The DRM practitioner's contribution to adaptation strategy



GETTING STARTED

From the start, it is important that DRM practitioners:

Understand the CCA situation in the country (any international commitments, risk assessments, etc.) to be familiar with how climate change will affect the country

DRM practitioners could collate and review climate-related reports, risk assessments, and plans and interventions made by various agencies and actors in respective communities, to be familiar with how climate-related hazards may be affected by climate change. A good starting point is the set of National Communications to the Conference of Parties (COP) who are signatories to the United Nations Framework Convention on Climate Change. Many of the current communications have climate vulnerability assessments and adaptation priorities, with some putting emphasis on disaster risk reduction and identifying important DRM measures for adaptation.

Get to know the strategy development process

DRM practitioners are advised to familiarize themselves with the basic approach for developing an adaptation strategy that is followed by different sectors in the country, and identify key actors and potential partners. It is important to identify the basic stages in the process, timeframes, and any opportunities to give briefings about DRM issues.

Promote DRM expertise within the technical team

The government may set up an interdisciplinary team or working group responsible for identifying, collating and reviewing climate information, vulnerability assessments, sector studies, existing adaptation efforts and possible sources of funding. The team members could represent a range of sectors

including the priority sectors, universities and researchers institutions, CSOs and the private sector. DRM practitioners can advocate with the lead agency for the inclusion of DRM expertise in the team and during consultations. At this stage, DRM experts with experience in the assessment of hazards, vulnerability and risk, and knowledge of participatory risk assessment tools are necessary.

Review relevant documents

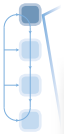
Review reports, journals, guidebooks, case studies, etc. to identify possible DRM measures that also promote adaptation. Sector adaptation strategies developed by other countries may have examples of disaster risk reduction and disaster preparedness measures. Local action plans for CCA and DRM in many cases are good applications of adaptation strategies that build upon local knowledge.

SUPPORTING DRM INFORMATION AND KNOWLEDGE REQUIREMENTS

Based on the identified hazards in the climate vulnerability assessments, the DRM practitioner could look at existing DRM plans and programs of the government and its line agencies for existing risk management measures. These are potential building blocks for meeting some adaptation priorities.

International agreements relevant to DRM contain priorities for integrating CCA and DRM, and some recommended steps.

Published studies of coping strategies by local communities will contain DRM measures that may be possible and feasible at smaller scales.



	ROLE OF DRM PRACTITIONER	OUTCOMES
DEVELOPMENT OF SECTOR VULNERABILITY STUDIES	Help interpret future climate projections in terms of possible consequences for disaster risk and impacts on elements at risk Help stakeholders identify and prioritize disaster risk in the present and future using methods for participatory risk assessment	Impacts of extreme events are featured in sector vulnerability studies

The main goal of this stage is to take stock of the assessments of current and future climate risks. At this stage, the team and stakeholders will determine the scope of the adaptation issues of interest, identify the links between climate and the priority sector or region, and discuss the implication of future climate and socio-economic scenarios. The outputs from this step include:

1. *A multihazard assessment that can be used in the description of the setting and situation analysis in the strategy.*
2. *A vulnerability assessment that examines whether vulnerable groups and economic sectors will continue to be vulnerable in the future, and whether there will be new groups or new sectors that will become vulnerable.*

The technical team will try to generate agreement on the impacts of future climate projections and risks with affected sectors and communities through a consultative process. Climate models have technical limitations that preclude the use of its outputs to represent local climates, due to finer details such as topography, vegetation and land use. The climate downscaling methodology is needed to produce a location specific climate change scenario. The output of downscaling is projections of temperature, precipitation and sea level rise. Dialogue between the climate scientists and practitioners can be utilized to enhance the interpretation of future climate projections in developing adaptation strategies. DRM practitioners of different expertise and other professionals working in the target sectors will be needed to facilitate the deliberations on translating the projected levels

of precipitation etc. into levels of risk for the different climate-related hazards (usually flooding, landslides, drought, heat wave and cold snap). The case study on Makassar's adaptation strategy for its water supply is an example of the major contribution of projections and dialogue to this process.

The technical team will have a lot of information to process. The DRM practitioner who is a member can assist in this stage by focusing on the impacts of the various disaster risks that the sector successfully faced in the past, and help to analyze for any alarming increases in disaster risk due to climate change impacts on temperature, sea level and precipitation. Table 2 has examples of the disaster impacts with several visible issues identified that require DRM approaches to manage the potential disaster risks that may arise. These include:

- flooding of agricultural areas, housing and roads due to heavy rainfall;
- destruction of crops, housing, infrastructure due to tropical cyclones; and
- death of crops and marine life due to increased temperatures and/or decreased rainfall.

During public meetings, DRM practitioners can raise questions or issues. For the initial set of meetings, the questions can first be about obtaining their risk perceptions in order to set a baseline for how the sectors currently appreciate the ideas and concepts of climate extremes and related hazards and risks. The questions may include the following:

- What are the key hazards, vulnerabilities and capacities existing in or for the locality or sector under consideration?
- Where are the high, medium and low risk areas at the present time?
- Who are the most vulnerable groups in the sector? What are the key livelihoods of these vulnerable groups?

CASE STUDY

Improving future water security in Makassar City, Indonesia

The Makassar municipal water company (PDAM) supplies water to around 62 per cent of the population of Makassar City, but its supply capacity is very sensitive to the occurrence of droughts and to high sedimentation due to soil erosion and landslides. The largest landslide, happened in March 2004, and was estimated to generate 250-300 million cubic meters of sediment covering the headwaters of the Jeneberang river, and resulting in a reduction of up to 48 per cent in the performance of the Bili-Bili multifunction dam until 2048. In early 2005, the extremely high suspension of sediments in the river water stopped PDAM's supply for 10 days and resulted in water shortages for around 350,000 people (Hasnawir et al., 2006).

The population of around 1.4 million in 2011 is projected to increase by 20 per cent by 2020, whereas water demand is projected to increase by more than 120 per cent, potentially increasing the risk of groundwater over-extraction in some areas. A master plan recommends the construction of new dams, infrastructure upgrade of the water treatment plants and changes to distribution system coverage in the next 30 years, but it does not yet consider the risks of climate change on the city's water resources as the assessments of these impacts had not been done for this region at a scale useful for the City's decision makers.

How were CCA strategies identified for water resource management?

A research project assessed climate change and its impacts on the sustainability of clean water supplies, and established alternatives for Makassar urban water services that are adapted to climate and population change. The project utilized the principles of risk management and a holistic approach to the assessment and management of water resources, accounting for all water sources (groundwater, surface water, stormwater and wastewater) and a comprehensive range of factors — including natural hazards — when assessing vulnerability. Key stakeholders, agencies relevant to DRM, are include the Bureau of Meteorology, Climatology and Geophysics and the Pompengan Central Management of Water Resources. They sent representatives to two workshops conducted in October 2010 and January 2011 that discussed: 1) key issues and concerns that need to be addressed, and aspects that need to be considered when addressing those issues; and 2) the direction of the project so that outputs meet local needs. The workshops also contributed to a common understanding of the challenges and alternative solutions, including vulnerability of the water system to future Mount Bawakaraeng landslides.

Climate change information specific to Makassar was obtained by analyzing the historical rainfall record during the last 60 years, conducting a survey on perceptions of climate change, and developing climate projections for Makassar City and South Sulawesi Province. The

climate projections were prepared using five regional climate simulations (Kirono et al., 2010). A framework was developed and applied to assess present and future bulk water supply and demand for Makassar, and considered factors including: population, water demand patterns, infrastructure, operation rules, hydrology and climate (Tjandraatmadja et al., 2012).

The projections include the range of changes in mean rainfall, temperature, potential evapotranspiration, and onset/retreat of the dry/wet season. The projections also include the likely change in variables relevant to DRM such as the extreme wet/dry daily rainfall, and the rainfall thresholds (both the intensity and event duration) that may trigger different categories of landslides and debris-flow at Mount Bawakaraeng (Hasnawir and Kubota, 2008).

Analyses suggest potential future reduction in stream flow of around 18 per cent compared to the present. Estimates of future soil erosion rates will be about as high as present rates. This implies that problems with water quality due to sedimentation induced by erosion are likely to persist in the future. The assessment indicated that:

- Problems related with seasonality will still occur in the future.
- Population and infrastructure will be the main factors affecting water supply sustainability.
- If future infrastructure conditions remain the same as in 2010, water shortages will be common from 2020 onwards for the areas supplied by the two major water treatment plants.
- If the master plan is implemented, the PDAM water treatment plants will be able to supply around 90 per cent of the demand by 2030. Specific areas were identified with seasonal reduction in water supply, or requiring additional water sources by 2044.
- The infrastructure upgrades, as outlined in the Masterplan, may only provide short-term security of supply and need further investment from around mid 2040s. Hence there is a need to consider alternatives other than upgrade of water treatment plants alone, such as demand management. The assessments assumed the existing capacity for Bili-Bili, if future landslides were to occur then investment timeframes would be shortened further.

What were the lessons for replication from the research project?

Risk assessments covering the impacts of climate change and hazards, in this case landslides, can be used to indicate whether adaptation measures such as infrastructure upgrades will be sufficient for the future, and if water resource managers will need to consider alternatives other than upgrade of water treatment plants alone, such as demand management.

The approach can allow for developing multiple adaptation strategies, targeting the local context, and identifying when the risk management measures will be needed.

TABLE 2	Potential climate change impacts to critical sectors in Tonga	
Sector	**Heavy rainfall**	**Decreased rainfall / drought**
Agriculture	Flooding of agricultural areas Crop damage and disease	Destruction of crops Food shortage for people and animals
Fisheries	Contamination of sea from run-off	Death of fish and other marine life
Water resources	Water contamination	Water shortage Water contamination
Human health	Higher rates of mosquito-borne diseases	More dust Water contamination Epidemic
Coastal areas	Soil erosion	
Housing and infrastructure	Flooding Flooding of roads	
Forestry		Death of trees

As the review of coping strategies is made, the teams will eventually assemble a long list of potential adaptation measures. **Adaptation measures** are individual interventions or packages of related measures that promote a chosen adaptation objective. The DRM practitioner can contribute to the identification of adaptation measures for priority sectors from current practice. Table 3 lists some possible DRM measures useful to CCA, categorized by priority adaptation sector.

After the initial meetings on risk perceptions and interpreting the impacts, and as the team and sector representatives have more experience working together on the strategy, the DRM practitioner can raise questions about risk management and existing coping strategies to identify measures that may be included among the adaptation options for the sector. Questions to be raised may include the following:

- Is there any consultative process existing in the community or sector and among the practitioners and institutions on managing climate risks?

	Increased temperatures	Sea level rise	Tropical cyclones
	Crop damage and destruction Increased breeding of insects Food shortage	Salt spray on crops	Water contamination
			Destruction of crops
	Water shortage	Higher concentration of salt in groundwater	Destruction of buildings
	More dust Heat stress Higher rates Epidemic of asthma	Unhealthy eating	Destruction of infrastructure
		Coastal erosion Loss of coastal vegetation	Epidemic
		Damage to houses near sea Loss of houses	(impacts apply to more than one sector)
		Damage to coastal trees	

Source: Gov. Tonga, 2010

- What type of risk reduction measures have already been identified for future management?
- What criteria are being used for evaluating risk reduction actions?
- Is there any plan existing for DRM for climate-related hazards?
- How are climate change and other change dimensions institutionally handled?

During discussions of solutions to manage the impacts, DRM practitioners can promote the perspective of promoting the safety and well-being of people, their homes, livelihoods, and the services they need. Furthermore, the practitioners can present any existing relevant programs that they know of for managing floods and tropical cyclones, and invite others to add to the list of options. These programs could be replicated to meet the challenges of a changing climate.

TABLE 3 Possible adaptation measures by sector

Sector	DRM measures useful to CCA
Water	• Introduce flexibility in water infrastructure designs and systems operations to anticipate changes in rainfall and flood return periods • Provide or adjust flood protection infrastructure to prevent contamination of water supply • Reduce the volume of stormwater runoff with green roofs, trees, wetlands, and porous paving • Preserve floodplains to provide protection against high-intensity or long-duration precipitation • Disaster preparedness that includes anticipation of disruptions to water supply and sanitation services
Agriculture	• Invest in flood control structures and water storage that can reduce the impacts of extreme climatic events • Crop insurance and other insurance schemes to protect and restore assets and productivity after a disaster or extreme climate event • Improve access to timely weather forecasts and response options
Health	• Incorporate early warning systems in disease surveillance and response systems • Locate healthcare infrastructure outside exposed areas • Adjust infrastructure designs of important healthcare facilities so that these are resilient to current and future risk
Transport	• Redesign or relocate road facilities • Add or redesign protective measures for road corridors and coasts • Increase drainage for road facilities against projected increases in precipitation and erosion • Ensure road access to hospitals and evacuation centers and distribution of relief where road infrastructure may be damaged during extreme events
Urban development	• Integrate flood risk management into spatial planning to protect groundwater recharge zones and floodplains • Adopt building codes and infrastructure standards to consider changes such as new flood return periods • Prepare disaster preparedness plans that consider disruptions to services • Develop measures that address the needs of vulnerable populations

	Other CCA measures
	• Diversifying water supply sources, including use of surface water and groundwater, reuse and recycling, and use of household-level water sources such as roof water harvesting
	• Breed fish species tolerant to high water temperatures • Breed livestock that are tolerant to adverse climatic conditions • Observe water management practices to improve resilience to changes in the hydrologic cycle
	• Strengthen data collection and analysis to support adaptation strategies and risk management • Estimate the health impacts of climate change to improve the planning and resource allocation
	• Increase attention to temperature variation as a factor in the selection of asphalt cements and asphalt emulsions to maintain pavement integrity
	• Alleviate urban heat-island effect by greening areas • Develop additional or redesigned urban drainage to alleviate the effects of increased precipitation • Improve energy efficiency in buildings to reduce energy demand, especially where energy supply may be falling • Reduce the need to travel

Source: Adapted from ADB, 2012

The DRM practitioner may highlight the raising of community resilience and community-based DRM as a possible strategy that jointly promotes DRM and CCA. Studies that describe the relevant local coping strategies may also be given to the team to study for potential inclusion in the strategy being developed.

The DRM practitioner can also promote the development of DRM guidelines for adaptation planning, lessons learned and good practice, and capacity building initiatives from integrating DRM into CCA strategies.

DRM practitioners can contribute to an institutional and capacity assessment by identifying the ways in which existing DRM programs and activities are accommodating future climate change considerations and are linked up operationally to other departments. Practitioners can offer their observations and ideas on:

- institutional structure and operations of the government agencies, CSOs, community-based organizations and local institutions relevant to risk management — what has worked in their experience and what had issues;
- mandates of the institution and overlaps (if any);
- existing policies, frameworks and plans for reducing exposure and vulnerability; and
- resource mobilization strategies.

DRM practitioners can also ensure that stakeholders are fully considering DRM within their adaptation strategies, such as:

- **Is CCA and DRM planning well-coordinated among the prioritized adaptation sectors**? Does each priority sector have focal points designated for DRM in all relevant government bodies, or representation in permanent coordination mechanisms for adaptation?

- **Should a coordination mechanism be established for CCA and DRM from policy formulation to policy implementation**? This could be in the form of a central institution with a coordination mandate and decision-making power over line ministries, such as the Office of the President / Prime Minister. This could also be in the form of a national council or committee, with membership from cabinet-portfolio agencies (ministries/ departments).

	ROLE OF DRM PRACTITIONER	OUTCOMES
SETTING ADAPTATION OBJECTIVES	Assist by providing objectives that have appropriate short- and long-term actions Guide the deliberations to set the acceptable levels of current risk and future climate risk, beyond which risk management should begin	Disaster risk issues are addressed in adaptation objectives

At this stage, the team will conduct consultations with each sector or community group to find out how they want to address their priority risks. After the consultations, the team will identify the objectives for adaptation per sector. The output of this stage is a shortlist of adaptation measures for prioritization by stakeholders in a public consultation process.

Developing the criteria and priorities involves scheduling workshops to present and discuss the findings of the situation analysis and vulnerability assessments with a forum of stakeholders convened by the team. The purpose of the workshops is to facilitate a thorough analysis of the key issues or problems by:

- identifying their root causes;
- identifying potential adaptation measures as solutions to the problems; and
- ranking the projects and activities.

BOX 7 Approaches to developing strategies

Win-win solutions refer to measures that address the targeted climate change risk while having other social, environmental or economic benefits.

No-regrets solutions refer to measures that should be undertaken anyway, regardless of whether climate change is an issue. No-regrets solutions also apply if the future climate projections are not considered reliable, due to conflicting findings by scientists, a lack of historical data available to validate the projections, or other technical reasons.

The DRM practitioner could participate in the workshops to bring forward risk-related concerns, and advocate for adaptation objectives that are specific to DRM. The DRM practitioner can contribute some objectives related to disaster risk, such as:

- maintain the current level of disaster risk;
- limit the increase in the level of disaster risk due to climate change;
- reduce exposure to climate extremes; and
- raise capacities for disaster preparedness.

The practitioner can also introduce the idea of acceptable levels of risk, and use this to identify when the impacts are projected to cross the threshold of what is acceptable, and therefore DRM will be needed.

The DRM practitioner can provide indicators related to adverse effects of climate change in terms of death, damage, loss, and vulnerability-related indicators such as interruption of basic needs, of livelihoods, of education and other services. The practitioner can emphasize the DRM measures that contribute to promotion of other highly-ranked criteria such as critical infrastructure, vulnerability reduction measures in the food, water and health sectors, and the protective structural measures. These measures to address current disaster risks are still considered as examples of important no-regrets adaptation measures (see Box 7).

	ROLE OF DRM PRACTITIONER	OUTCOMES
FORMULATION OF STRATEGY	Participate in consultation workshops or meetings and help identify/develop: • impacts of climate change; • adaptation needs and priorities for DRM; • DRM measures; • sufficient resources for DRM; and • mechanisms to track the achievements of DRM components.	Disaster risk is appropriately considered throughout adaptation strategy development

At this stage, the team will develop selection criteria, screen the adaptation options, and develop an implementation plan. Adaptation options are characterized in terms of costs, impacts and potential barriers. Through consultation meetings, stakeholders can contribute to developing criteria and methods for prioritizing options, and applying the selected criteria to come up with a ranked list of possible adaptation policy options and measures. In addition, institutional profiling and capacity assessments may be undertaken to understand how institutions are designed for managing risks, list the available resources and people with relevant expertise, and identify existing capacity gaps.

DRM practitioners can participate in consultation meetings and present the adaptation needs and priorities for DRM. At these meetings, the practitioners can also provide examples of DRM measures that can serve to adapt to climate change as well.

If possible, DRM practitioners can try to convince others that DRM is a good starting point for adaptation, especially where countries already experience disasters from climate extremes.

Taken together, the DRM and CCA measures are just options, to be considered as a range of activities that can be employed depending on suitability to the context. A strategy will list out these options

in order to provide that adapting sector or community with some initial choices to work with.

Another possible route to create commitment for the measures is through the development of an action plan. Based on existing adaptation strategies, the action plan is as formal statement of priority for activities/projects and accompanied with estimated costs. The purpose of an action plan is to ensure that these priorities are addressed and implemented. See the case study on Tonga's Joint National Action Plan on CCA and DRM 2010 - 2015.

In either case, a process for screening is undertaken using criteria developed for this purpose. Table 4 has sample criteria

TABLE 4 Sample criteria sets for screening adaptation options

Criteria used by NAPA Bangladesh working group to screen adaptation options (WARPO, 2006)	**Criteria used in screening adaptation options in drought-prone areas in Bangladesh (ADPC and FAO, 2007)**
Acceptability	Drought mitigation potential
Compatibility of the options	Suitability under different climate change scenarios
Adaptability	Environmental friendliness
Potential to reduce disaster risk	Economic viability
Cost-effectiveness	Increased productivity
Sustainability	Sustainability
	Social acceptability
	Gender integration
	Household income
	Employment opportunity
	Relevance to vulnerable community
	Applicability to multiple sectors
	Seasonal relevance
	Matching immediate local community needs
	Institutional support
	Expert acceptance

sets for screening options. The practitioners who participate in the development of a prioritization method and criteria for ranking options can contribute the risk assessment matrix as a participatory tool for complex decisionmaking and ask:

- Which actions can be implemented immediately to address disaster risk due to climate variability?
- Which set of actions can effectively manage any increase in risk levels due to climate change?
- Which actions can solve the most crucial barrier to reducing exposure or vulnerability related to climate extremes?
- Which actions will raise capacities for disaster preparedness?

	Criteria for analysing adaptation options for USAID projects (USAID, 2007)	**Economic criteria for screening climate proofing options for Avatiu-Ruatonga community, Cook Islands (ADB, 2005)**
	Cost-effectiveness Ease of implementation Acceptability to local stakeholders Acceptability to USAID Endorsement by experts Time frame for implementing the adaptation Institutional capacity required Adequacy for current climate Size of beneficiaries group	Benefit-cost analysis of structural measures for reduction, projected over 50 years • Against flood damage from heavy rainfall • Against storm surge Benefit-cost analysis of regulatory and voluntary building construction measures for new/renovated buildings, projected over 50 years • Against flood damage from heavy rainfall • Against storm surge

CASE STUDY

Tonga's joint national action plan for climate change adaptation and disaster risk management

Tonga was the first country in the South Pacific region to address CCA and DRM simultaneously through its Joint National Action Plan on CCA & DRM (Gov. Tonga, 2010). Climate change impacts are expected as heavier rainfall, decreasing annual rainfall, and rising annual mean temperature. Sea level rise and more destructive tropical cyclones are being considered as additional impacts.

How was the action plan made?

The risk assessment was developed based on historical data, climate change scenarios, and consultations with communities and representatives of critical sectors. The action plan used findings from the Initial National Communication to the COP as the source for the climate change projections and scenarios for the years 2050 and 2100.

Potential impacts to critical sectors were anticipated, analyzed and presented in consultation meetings. Excerpts of the collated impacts are shown in Table 2. Specialized computer models were used for assessing the potential climate change impacts and disaster risks, particularly in the water resources and agricultural sectors. These assessments were compiled into a situation analysis. A consultation process was designed to obtain the inputs from highly vulnerable communities and from representatives of government and non-governmental organizations working in critical sectors. The purpose of each consultation included the identification of:

- CCA and DRM issues
- The climate factor with the most severe impact in each of the communities/sectors
- The needs and priorities for adaptation and risk reduction

Following consultations, a decision was made to priorize issues that require additional or new resources to strengthen Tonga's resilience to climate change and disaster impacts. As many of the proposed actions were already covered by existing and planned government initiatives, the planning process provided an opportunity to review priorities and capture emerging issues.

How was DRM reflected in the Action Plan?

The development of the Joint National Action Plan on CCA & DRM is related to important national initiatives to strengthen Tonga's capacity for DRM. All of the goals are important to DRM, and have several DRM measures. Here are some examples of the goals and identified key actions:

- **Improved good governance for CCA and DRM**: Review building code to incorporate CCA and DRM criteria; conduct CCA and DRM mainstreaming training for key national stakeholders; and establish district emergency office and staff in outer islands
- **Enhanced technical knowledge base, information, education and understanding of CCA and effective DRM**: Develop and make available to the public coastal vulnerability maps; and document traditional knowledge on early warning, food preservation and land management
- **Analysis and assessments of vulnerability to climate change impacts and disaster risks**: Design site specific forms of coastal protection; provide training on the integration of CCA and DRM in the environmental assessment process; and improve/develop roadside drainage systems
- **Enhanced community preparedness and resilience to impacts of all disasters**: Enforce building code through retrofitting school building and tourist facilities; develop waste management strategies for post disaster situations; and assess and upgrade existing early warning and monitoring systems for all natural hazards
- **Strong partnerships, cooperation and collaboration within government agencies and with civil society, CSOs and the private sectors**: Provide resources and capacity to strengthen community participation in CCA and DRM activities outlined in the action plan; and integration of CCA and DRM into private sector plans

CASE STUDY

Livelihood adaptation option screening in Bangladesh

Bangladesh is one of the most vulnerable countries to climate change because of its disadvantageous geographic location, flat and low-lying topography, dense population, high levels of poverty, and reliance of many livelihoods on climate sensitive sectors. Many of the anticipated adverse effects of climate change are anticipated to aggravate the existing stresses that already impede development in the various ecosystems of the country. Considering these climate risks, the agricultural sector initiated the Livelihood Adaptation to Climate Change Project (LACC).

How did the screening process develop?

The screening process was developed in a consultative manner involving local people and their solutions (e.g. local rice varieties, local structural solutions of retention of water). Active inputs and validation were sought from scientific groups such as the rice research institutes, various researchers and water resource managers. This was facilitated by the disaster risk managers and Government Agricultural Extension Officers who were the day-to-day managers of risks.

The screening process started with the identification of adaptation measures ranging from current risk management measures, development measures, climate-specific measures and local solutions. Disaster risk management professionals along with the agriculture sector professionals and practitioners contributed their respective sets of risk management measures. For example, the flood forecasting and risk management professionals provided their measures from DRM and the agricultural sector professionals brought measures how they can incorporate those into their cropping plans and practices.

The next stage involved grouping together a combination of measures as potentially suitable adaptation options for location specific conditions. The listed options were evaluated with a set of criteria to shortlist the adaptation measures as follows:

1. The agro-ecological suitability of the adaptation option for the given ecosystem(s). Indicators included suitability of the adaptation option under the existing and near future climatic, geographic and topographic conditions and/or same agro-ecological zones, farmers' perception and experts' perceptions/opinions.

2. Economical and social benefits of the option (meaning it can be applied also by those with limited assets and contributes to their livelihood improvement). Indicators included the cost of inputs, quantity of yield, net benefits, capacity building requirements and employment opportunities for the landless.
3. Contribution towards increasing resilience against impacts of climate hazards. Indicators included risk reduction measures, early warning indicators, hazard resilience of innovation, cost for irrigation (proxy indicator for risk of electricity failure) and water use.
4. Contribution to climate change mitigation by reducing GHG emissions and/or enhancing carbon sinks. Indicators included chemical fertilizer use, energy use and option specific indicators such as direct methane emission.

After this, a validation stage involved discussion with external resources persons who have adequate scientific knowledge of a particular adaptation option to determine if the screened adaptation measures tallied with the future potential climate scenarios. Additional rounds of screening resulted in a short list of adaptation options that were forwarded for testing. The initiative provided for systematic testing, and monitoring and evaluation. Finally, the tested adaptation measures were taken as adaptation options for replication in similar settings.

What are the lessons from the case?

The process for screening adopted under the LACC initiative allowed the DRM practitioners to take up a set of adaptation options feasible for future implementation that was specific to the sector but also accepted by a wide set of groups. Local people found the list of options easy to understand and apply. At the same time, the options were supported by expert and assessment of the options.

DRM practitioners can take many lessons from this case and adopt or design climate risk management measures that are viable with the changing geo-physical and climatic conditions and have the potential to adjust gradually with the socio-economic, institutional and cultural contexts.

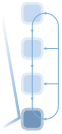
The case study on adaptation for livelihoods initiative in Bangladesh gives more detail on how these screening criteria may be developed.

When planning for implementation, DRM practitioners can contribute these points for consideration by the technical team:

- DRM measures for protecting assets and public investments in critical infrastructure could be included in proposals when possible. Practitioners can identify and help tap the expertise required for developing the technical components of the proposal.
- If funding and resources are being allocated to the different adaptation projects, practitioners can recommend or advocate for sufficient funding for each DRM measure, and that the NDMO or lead agency for DRM have sufficient resources to monitor the DRM measures being implemented.
- Provide for disaster simulation exercises to test for robustness of disaster preparedness plans against the expected changes in the hazards. If the screened option will be an experiment, design and carry out a pilot test to demonstrate effectiveness and feasibility. Provide for an evaluation of the results of pilot-testing and implementation of adaptation measures, to prepare for broader implementation and dissemination of successful adaptation options
- DRM practitioners can assist the team by identifying when projects would need to have institutional arrangements that include the lead agency for DRM or the NDMO. Endeavor to harmonize adaptation plans with other existing DRM plans, from national to local levels. Build consensus among stakeholders over the strategy and its DRM components.

- Set up incremental targets to manage climate-related disaster risks. Make provisions for systematic inclusion and implementation of screened results by identifying solid incremental targets. Keep future options open for reflective adjustment based on gradual learning from experience with implementing adaptation measures, and on improvements in climate modeling, climate monitoring and risk assessment.

	ROLE OF DRM PRACTITIONER	OUTCOMES
EVALUATION AND FEEDBACK	Participate in consultation workshops or meetings and help review adaptation needs, priorities and resources for DRM Ensure that there are mechanisms in place to track the achievements of DRM components	Strategy relevance within a constantly changing risk situation is ensured



The final stage refers to activities for project oversight, utilizing the indicators identified in the formulation stage, detailing who will be responsible for monitoring and evaluation, how it is going to take place and how often.

Whenever possible, the DRM practitioner can assist review processes by tracking and reporting on DRM measures identified in the strategy. The practitioner can study reports of climate-related disaster events that occurred during implementation to appraise whether the programs under the plan were successful in reducing disaster risks and disaster impacts. If possible, help the NDMO or lead agency for DRM to evaluate if it has enough resources to monitor the implementation of critical measures. Communicate the findings to help government make the necessary changes in the strategy.

NOTES

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Chapter 3.3

HOW TO PROMOTE DRM WITHIN ADAPTATION PROJECTS

OVERVIEW

This chapter is focused on adaptation projects and how to integrate DRM within them. Projects are an implementation mechanism of the adaptation process, translating adaptation action plans and strategies into tangible outputs on the ground. Such projects will already have a general framework in terms of goals, expected outcomes, activities, time frame and expected costs.

The project cycle is a way of viewing the main elements that projects have in common and how they relate to each other in sequence. Most governments in the region adopt a project cycle management approach to improve the management of projects (and programs). This approach ensures that all relevant issues and conditions, including DRM issues and conditions of possible degrees of exposure and vulnerability in the future, are taken into account within the design and management concepts, techniques and tasks of the project.

Projects have specific objectives to be achieved within a defined time period and with a defined budget. Unlike most development projects, adaptation projects should be set up to have a long, learning cycle in order to make it more responsive to needed adjustments over the long term. Of course, limitations set by available resources do not always permit this. In order to ensure that risks emanating from disasters do not pose an obstacle to achieving the project outcomes, it would be wise if DRM

considerations reflecting the project lifetime are integrated into the process of formulation and implementation of these projects.

An adaptation project is not necessarily about risk management, as shown in Table 3 in Chapter 3.2, but it will certainly contain an element at risk to be protected such as people, homes, crops, and infrastructure. Disaster risk management can be considered as important approaches for adaptation, especially in places where disaster events happen often. A DRM practitioner may have *opportunities* to contribute to formulating the specifics of these projects at different levels of government, for communities or for different economic/productive sectors. This chapter is designed to support the practitioner who is tapped to support adaptation projects with DRM inputs.

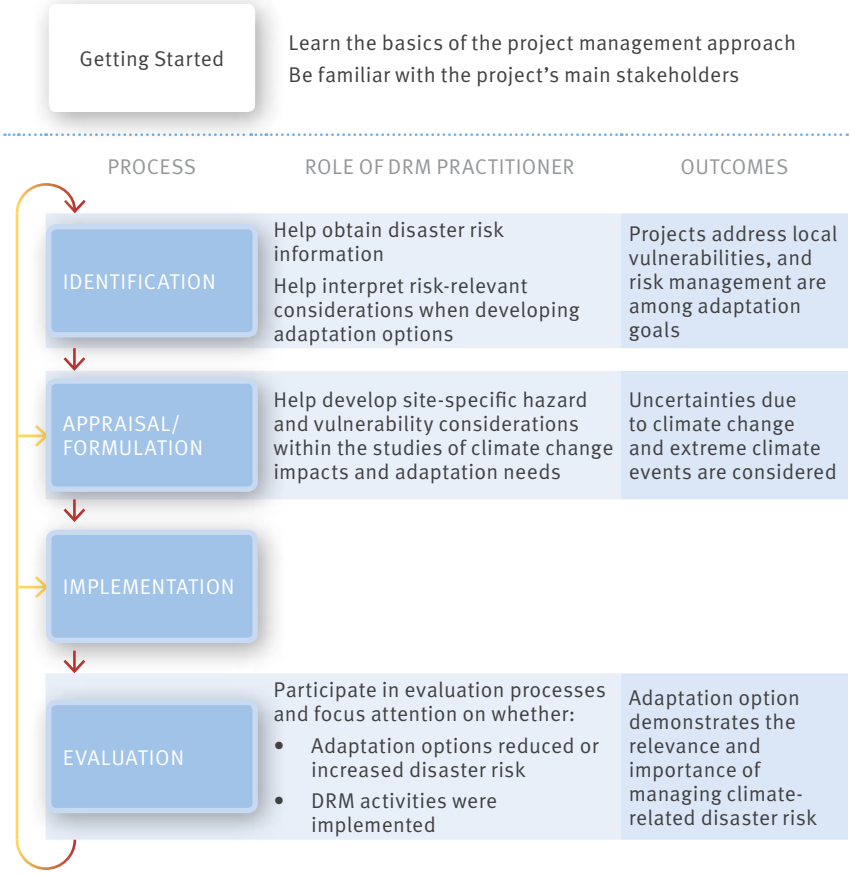
Adaptation projects are not always tied to a strategy, as it is possible that a specific sector has not yet developed its strategy. In such cases, if they are involved then practitioners will have opportunities to provide input into formulating the goals, activities and expected outcomes. In both cases, the role of the DRM practitioner is to identify the threats from all hazards to the proposed adapting livelihoods, crops, people and infrastructure.

THE GOAL OF THE DRM PRACTITIONER

The goal of the DRM practitioner is to:

- promote integrating DRM objectives into adaptation project design to reduce exposure to climate-related hazards, help reduce vulnerability to climate extremes, or at least to ensure that the projects do not increase either exposure or vulnerability.

FIGURE 6 The DRM practitioner's contribution within the adaptation project cycle



GETTING STARTED

From the start, it is important that DRM practitioners:

Ensure that they are familiar with the basic project management approach and approval processes that are followed in their countries. In many cases this will be a standardized process that is carried out by all sector agencies, and will be detailed in guidelines and training programmes, often developed by the ministry responsible for planning and investment. If this is not the case, follow up with sector departments responsible for planning as sector specific guidelines may be available. The DRM practitioner can seek information (including related documentation) on:

- the procedures for project approval and the agencies/ departments responsible for doing it;
- legal requirements to be met while designing and implementing projects (i.e environmental impact assessments); and
- standardized templates or checklists used for project proposals, planning frameworks, monitoring and evaluation, etc.

Ensure that they are familiar with the main stakeholders of the project. The formulation of projects is usually supported by a project manager to guide project design and implementation, and sometimes a by technical team. If a DRM focal point or expert is asked to support the formulation of a CCA project, then it would be ideal if she/he is a member of the technical team. This DRM focal point could contact scientists and researchers involved in building risk knowledge, representatives from community CSOs, as well as the business sector to ensure that both local and expert knowledge on disaster history and potential risks is factored into all decisions on the project's design and implementation. If a team is not formed, then the DRM practitioner could liaise with the person responsible for the design and successful execution of the project.

The DRM practitioner may continuously draw the attention of the project manager and project stakeholders to the relevance and importance of DRM. The practitioner can highlight examples of adaptation projects that have been negatively impacted by recent extreme climate events, and explain how various tools used for project management can be used to address climate extremes and other disaster risk concerns. The DRM practitioner may also caution the project manager and stakeholders against developing adaptation projects that unintentionally exacerbate exposure or vulnerability of communities. With some modification, the core messages detailed in Chapter 3.1 of this Handbook can be used as a foundation for this awareness-raising.

Note that this work is not the same as the risk-based approach to designing and implementing development projects for resilience to climate changes called "climate-proofing". Under climate proofing, activities added to an ongoing development initiative to ensure its success under a changing climate, and adaptation thus serves as means to achieve development ends. This handbook is more about "disaster-proofing" adaptation projects. | DEVELOPMENT ⁂ has Chapter 3.4 on how to integrate DRM concerns into development projects | Table 5 briefly compares the two approaches.

TABLE 5 Approaches of climate proofing and integrating DRM

	Climate Proofing development projects (source: GIZ, 2010)	**Integrating DRM into CCA projects**
Purpose	To account for climate impacts	To manage disaster risks
Target	Development projects	CCA projects
Key question	Do climatic trends, such as increasing temperatures or sea level rise, potentially have an impact onelements at risk?	Do risks from any hazard, including earthquakes and hazardous materials, pose a potential threat to elements at risk? Does the project potentially raise disaster risks triggered by any hazard?

SUPPORTING DRM INFORMATION AND KNOWLEDGE REQUIREMENTS

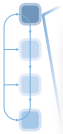
Governments require three types of risk information to assist in the design and implementation of projects intended to promote DRM in adaptation projects. These are:

Disaster risk information. Having an understanding of the context of local disaster risk in the administrative and geographical area where the project will be implemented will highlight to project managers issues related to disaster risk that will need to be addressed within the project cycle. Many countries in the region have national level risk profiles that are formulated using provincial level data. Although this will not be sufficiently detailed for use in project design, this level of data can be used to inform identification of projects and project programming. | see DEVELOPMENT ⁂, Table 1 on examples of risk information and where to find it |

Site-specific hazard and vulnerability data. Project managers will require hazard and vulnerability data that is specific to the location of the proposed project. This data is required to assess the levels of disaster risk associated with the project site and is used to inform decisions on the project design and implementation strategy. DRM practitioners can support individual line ministries and local governments in accessing available hazard and vulnerability data for the proposed project localities by collating and disseminating relevant data and assessments, and by seeking to redress major gaps in knowledge. DRM practitioners can also support the government by maintaining accurate and comprehensive database of impacts of disaster events, and by proactively identifying hazard and disaster risk assessments and collating them into a central, open repository.

Perceptions of community members of their risks and local coping capacities. Project managers enter into dialogue with community

members to have an understanding of their risk perceptions and local development priorities, as this serves as the baseline from which resilience grows. DRM practitioners could facilitate the dialogue using participatory tools from CBDRM.



	ROLE OF DRM PRACTITIONER	OUTCOMES
IDENTIFICATION	Help obtain disaster risk information Help interpret risk-relevant considerations when developing adaptation options	Shortlisted projects address local vulnerabilities, and risk management are among adaptation goals

The identification of adaptation options is based on an assessment of adaptation problems, needs and interests of possible stakeholders. It involves defining the change that is desired, exploring the issues to be addressed, and considering the capacity to effect the change. Ideas for projects and other actions are identified and screened.

Adaptation strategies have a list of recommended options per sector; a sector or community wishing to adapt may select from the list the option or options that are appropriate for the community that is targeted to implement an adaptation project.

Some countries may also have lists of priority projects under two programs of the United Nations Framework Convention on Climate Change that provide for financial and technical assistance to the Least Developed Countries. The first program encourages countries to define their National Adaptation Programme of Action to respond to their urgent and immediate adaptation needs. The result is a list of prioritized national adaptation measures, some of which are also DRM measures. Box 8 has some DRM projects prioritized by Bhutan.

The second program is the national level National Adaptation Plan process for identifying medium- and long-term adaptation needs, and developing corresponding implementing strategies and

programs. It aims to coordinate adaptation planning within the broader context of development planning, for all relevant scales and across sectors. The plans themselves will include adaptation programs, policies and activities. For more information, refer to the NAP technical guidelines (LEG, 2012).

The output of this stage is a shortlist of potential options to implement as a project. The final selection is performed during the Appraisal and Formulation stage.

The DRM practitioner's influence over the identification of DRM measures is primarily at the stage when the sector or area's adaptation strategy is being formed | see Chapter 3.2 on How to Integrate DRM into Adaptation Strategies |.

However, in case an adaptation project is being designed for a sector that is not currently guided by an adaptation strategy, the DRM practitioner can guide the project manager to consider adaptation options that are also DRM measures. For example, they may urge upland rural communities in Bhutan to adapt to climate change impacts not only by adapting their livelihoods but also to protect themselves against landslide and GLOF risk.

If an adaptation project will have to be physically located near a community or implemented jointly with members of a local community or sector, then following a participatory process for project cycle management will create several benefits. It brings together the insider's local knowledge and outsider's scientific/expert knowledge, enables development workers and local communities to trust and cooperate with each other, and reinforces information exchange and understanding of local risks. The DRM practitioner may emphasize that local communities have developed coping capacities (however limited) to face adverse climate-related hazards, that these are valuable input to the development of anticipatory risk management strategies, as well starting points for evaluating capacities for adaptation.

BOX 8 Bhutan's priority adaptation projects for disasters and infrastructure

The Government of Bhutan identified the following adaptation issues and priority projects based on the evaluation of historical information on climate related hazards, documented local adaptation practice, and inputs from multisector workshops and regional consultations:

- Safeguard generation of hydropower with improved upstream watershed management in critical and high risk areas
- Installation of early warning systems; hazard mapping of key watershed areas; installation of hardware; automated real time monitoring with automatic data transmission
- Artificial lowering of lake levels (esp. Thorthormay Tsho glacier lake) to reduce the risk of GLOF
- Implementation of Pho Chu Hazard Zonation Plan
- Creation of a national database on landslide prone areas and intensity of landslides to assess the risk of landslides
- Reforestation of catchment areas and slope stabilization of landslide and flashflood-prone areas
- Restrictions on collection of sand and boulders, and on overgrazing
- Improvement of soil conservation techniques
- Protection of river banks
- Re-location/resettlement of affected towns
- Improvement of housing construction technology to withstand natural hazards

If possible, the practitioner can also help strengthen the capacities of local communities and livelihood groups by facilitating training in CBDRM. Through the CBDRM approach, a community or livelihood group will have a basis for appreciating the need for resilience; it also helps build community cohesion, and can be a strong foundation for tackling bigger or longer-term challenges. The tools of CBDRM are also needed for project scoping.

The case study on resilience to floods in Quy Nhon, Viet Nam is an example of how community engagement was used to identify and validate, the importance of climate risk, and to give other inputs into the adaptation projects being developed for the city.

CASE STUDY

Using dialogues to build resilience to floods in Quy Nhon, Viet Nam

Since the mid-1980s, the small coastal city of Quy Nhon in Binh Dinh province, Viet Nam, gradually spread into formerly rural farming areas. Located in the estuary of Ha Thanh and Kon rivers and very close to the Thi Nai lagoon, the city in general is at high risk to climate disasters, particularly to seasonal flooding, droughts and groundwater salinization. Over the past decade Nhon Binh Ward in particular has steadily urbanized. It historically experienced between 3 and 5 seasonal flood events per year with most floods rising and falling to a height of 20-30 cm within a 24-hour period. However, new urban development was built upon filled land that consequently increased flooding in other areas. Development thus shifted flooding patterns, making prediction of water depth, timing of arrival and duration of inundation more difficult or impossible.

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How was the impact of climate change upon disaster risk assessed?

A "shared learning" dialogue process was the mechanism for resilience planning. Dialogues were organized by the city government and CSO partners. To work smoothly within the Vietnamese government system, these were structured as formal meetings approved by the provincial governments, with clear agendas and invitations issued by senior local government officials. Invited participants included: government officials at the provincial and city or district level; researchers and scientists; CSOs (e.g. Red Cross); government-organized mass

organizations (e.g. women's and farmers' unions); and community leaders at commune and ward levels. Conclusions were presented as recommendations to the Project Steering Committee, a standing committee of senior government officials from each of the departments who made all project decisions and headed by a Vice-Chair of the provincial People's Committee.

Participants and presenters at the first dialogue discussed a number of climate hazards already facing their city, especially related to hazards that the city has already been experiencing—flash floods, river breaches and storm surge—that affects most areas of the city, and felt most greatly in peninsular, coastal and floodplain areas.

Participants also discussed the future climate projections for Quy Nhon by 2050: the mean temperature increases of 1.3 ^{0}C to 1.8 ^{0}C during the hottest time of the year, the sea level rise of 30-33 cm that would increase the inundation of unprotected low-lying areas by almost 1.5 km^2, and the increasing rainfall during the rainy season, with longer, warmer dry seasons. Nhon Ly and Nhon Binh were identified as the most vulnerable wards.

Participants at the second dialogue reviewed the vulnerability assessment results and discussed the pilot resilience building projects including pilot projects on mangrove reforestation and land protection, raising awareness of poor households and developing skills in construction techniques that reduce disaster risks from floods and storms, and a sector study examining peri-urban development in Nhon Binh ward.

The city government recognized that the proposed city development plan does not consider the impact of extreme climate events. Eventually, the climate change impact analysis was introduced into the city development planning process. The city government also initiated an urbanization and flood modeling project to be completed in 2013.

What could be considered when replicating the process?

The dialogue in Quy Nhon opened up a process of learning and sharing that led to more informed and accountable decisions.

Fostering dialogue led to both technical innovation — pilot projects aimed at reforestation of mangroves and improved housing design — and new knowledge that makes the cost of development trajectories in the context of climate change more transparent.

	ROLE OF DRM PRACTITIONER	OUTCOMES
APPRAISAL/ FORMULATION	Help develop site-specific hazard and vulnerability considerations within the studies of climate change impacts and adaptation needs	Uncertainties due to climate change and extreme climate events are considered

Following project identification all significant aspects of the idea are studied, taking into account stakeholders' views, relevance to problems, feasibility and other issues. The outcome of the appraisal is a decision to take the project forward, or not. The project team will have to negotiate with community or sector representatives to accept the adaptation objectives of the proposed projects, given their own needs and priorities for the short-term.

Once a project is approved, detailed design and planning is undertaken. Adaptation priorities are identified from existing climate risk assessments, from stakeholders likely to be affected, and from the advice and needs of decision makers and scientific experts.

After determining the priorities among the climate risks, the project team will then define the project objectives, activities, outputs and expected outcomes. These will be reflected in an MNE system that has to take a long-term view of adapting to the challenges of the future climate in addition to managing current climate risks.

The tools used to study or "appraise" the project idea provide an important entry point to assess detailed information of disaster risk due to the analysis of relevance to problems, feasibility and other issues that is taken into account in this part of project formulation. Among other project appraisal tools used, the environmental assessment process provides a framework for the gathering and analysis of information on disaster risk. For example, the *Environmental Impact Assessment (EIA) Technical Guidelines Incorporating Disaster Risk Reduction (DRR) and Climate Change Adaptation (CCA) Concerns under the Philippine EIS System* (2011) describes the general process and provides

details on the checklists to be used for the environmental assessments required in that country that integrate both DRR and CCA. | For more information on other appraisal tools see DEVELOPMENT ⁂ Chapter 3.4. |

The DRM practitioner can help the project team develop site-specific risk considerations based on the assessments of hazard, vulnerability and capacity. Table 6 shows some important DRM considerations to be addressed that the practitioner can propose to include as the project's objectives are being formed. The practitioner can guide the team to develop a list of problem statements based on the collective risk analysis. Use the following guided questions to help stakeholders examine scientific data, climate projections or scenarios, and their own community knowledge:

- What are the most important climate-related hazards faced by the sector/community?
- How are hazards likely to change over time as a result of climate change?
- What secondary hazards also affect the sector/community at the proposed site of the project?
- What groups within the community are most vulnerable to disasters?
- Do local institutions have access to disaster risk information?
- Are local DRM plans being implemented?

The DRM practitioner can suggest tools such as participatory risk assessments to facilitate the discussion with livelihood groups and obtain a ranking of the different risks in order of priority. The DRM practitioner can also guide the project team to combine into one risk matrix the risk rankings from different groups to get an aggregated ranking, and to avoid increasing risks to other hazards (geological, technological) in order to favour risk management of climate-related hazards. The case study of Surat's flood resilience

TABLE 6 Examples of problem statements taken from the issues identified in Section 2

Changing climate extremes	Changing climate variability
• High levels of flooding at coastal areas by 2030s • High levels of riverine flooding in megadelta areas by 2030s • Increased frequency of storm surges by 2030s • Increased frequency of mudflows and avalanches by 2050s will require better warning systems for affected villages • Areas identified for industrial estates may coincide with expected expansion of the habitat of disease-carrying mosquitoes and other vectors	• Coastal settlements will be exposed to stronger winds and storm surge from tropical cyclones • Some parks and winter resorts are expected to have higher avalanche risk with the expected increase in snowfall • Drought is expected to occur annually, and will affect crop yields • The monsoon is expected to start one month earlier and last longer, affecting the planting season of many crops • Vast agricultural areas will be subjected to annual protracted floods unless flood protection measures are put in place by 2030s

efforts briefly describes a process from the formulation of a strategy to the identification of projects.

The step when defining project objectives, activities, output and expected outcomes is critical if the project team and stakeholders intend to be responsive to the identified risks and other needs. The DRM practitioner can help design DRM measures and corresponding targets, to be included among the other project activities. These will support the success of the adaptation project under development. Table 7 has examples of activities that can be suggested for projects under the sectors of water, agriculture, and urban settlements. | See URBAN Table 1 for other possible urban risk management measures |

TABLE 7 Examples of DRM measures that could complement CCA project activities, for water, agriculture, and urban settlement projects

CCA Project Type	CCA Activities	DRM Activities
Upgraded levels of service delivery and sustainability of potable water for drought-prone areas	• Develop integrated water supply and sanitation system • Identify secure sustainable water sources under climate variability • Develop water reuse and rainwater harvesting technologies	• Protect infrastructure from all hazards (fire, earthquake, flood, etc.) • Improve seasonal forecasts of precipitation and temperature • Improve hydrological models • Develop emergency plans to ensure continuity of service
Increased and sustained production of food crops in coastal rural villages	• Rehabilitate arable land • Organic composting and soil fertility maintenance • Training for farmers on diverse food crops	• Construct coastal flood protection systems • Improve drainage systems
Improved settlement planning along rivers that includes climate change considerations	• Develop assessment of climate change impacts on flood risk, water availability, temperature, drainage • Research and promote climate-resilient construction methods • Establish green space to reduce urban heat island effect	• Develop detailed hazard maps and risk assessments • Create or maintain flood plains and flood retention ponds as green areas • Upgrade flood protective infrastructure • Upgrade drainage and sanitation systems

CASE STUDY

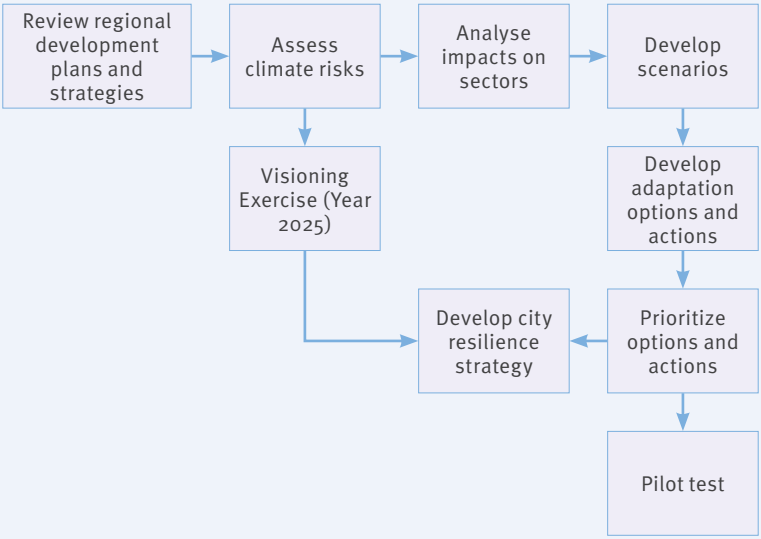
Living with floods in Surat, India

Surat is a coastal city and lies near the estuary of Tapi River. Surat receives an annual rainfall of 950-1,200 mm, with about 90 per cent of the rainfall falling between June and September. During these months the tides are the highest, and seawater often inundates the slum communities located along tidal creeks and necessitates evacuation, usually in mid-July.

How was the impact of climate risk on flooding assessed?

Different models and scenarios have been used to predict the impact of climate change on flooding in the city by studying the changes to the factors that contribute to flooding. They have included analyses of the rainfall pattern in the basin, river water peak discharge and sea level rise. The projections for the future are an increase of rainfall, which is expected to contribute to an increase in the 30-year peak discharge, and an increase in sea level rise.

FIGURE 7 The process for developing Surat's resilience strategy



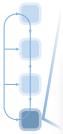
The following describe how climate risks associated with flood and other development sectors have been identified and managed:

- Establishment of a City Advisory Committee to guide and implement the process, sustain the activities and mainstream the projects in development practices
- Institutionalization of a Climate Change Trust within the Office of the Commissioner or equivalent to make available resources for the implementation of projects
- Tools/methods development and conduct of citywide vulnerability and capacity assessment
- Commissioning of sector studies informed by current and future climate risks for flood risk management and other sectors
- Engagement of communities through a series of consultation meetings to initiate dialogue on climate change issues and its impacts, share the risk assessments, analyse impacts on critical sectors, and create a platform for long-term engagement
- Organization of "Risk to Resilience Workshops" for scenario development, identifying short- and medium-term interventions, prioritization and planning. The identified projects are shown in Table 8

TABLE 8 Identified interventions for Surat

Interventions	Description
End-to-End Early Warning System for flash floods and local floods	The project aims to set up an advanced flood warning system for the city. It restructures the existing warning protocols outlined in the Surat City Disaster Management Plan, and intends to aid decision-making at the dam site, allow controlled low discharges (based on dam capacity and a three-day rainfall forecast in Tapi basin), and increase response time.
Urban Services Monitoring System	The project is an improved surveillance system and near real-time management information system linking public health, water supply, sewerage and solid waste services. This system can be upgraded to be used during emergencies such as floods.
Urban Health and Climate Resilience Centre	The goal is to improve urban health management through action research, better surveillance, and the development of operating procedures among city lifeline services departments. It will establish an outreach program to promote preventive health practices in other cities through publications, training, workshops, professional networks, research and consultancy.

As disaster risk is not constant and changes over time as a result of changes in climate as well as trends such as population growth and urbanization, the DRM practitioner could advocate for a project focal point/team to be assigned to identify, assess and monitor relevant disaster risk information on an ongoing basis, throughout the project's life cycle. Suggest the identification of a project-relevant baseline based on the latest risk information to enable comparison of pre- and post- project risk scenarios. | For more information on integrating DRM concerns into project management see the DEVELOPMENT ⁂ Chapter 3.4 |



	ROLE OF DRM PRACTITIONER	OUTCOMES
EVALUATION	Participate in evaluation processes and focus attention on whether: • Adaptation options reduced or increased disaster risk • DRM activities were implemented	Adaptation option demonstrates the relevance and importance of managing climate-related disaster risk

Monitoring and evaluation (MNE) is needed to determine whether the programme or project is likely to meet the needs of all stakeholders. The project team collectively reviews the objectives, activities and outputs and determine if one of the ultimate outcomes is a contribution to adaptation. The MNE system has to take a long-term view of adapting to the challenges of the future climate in addition to managing current climate risks.

The output of this stage is an evaluation that must clearly state how the outcomes of the initiative address the identified risks, vulnerabilities and adaptation priorities. The sequence from

activity to impacts is summarized together with assumptions as a logical framework. Finally, the project team will identify the indicators to evaluate whether outputs are achieved and the overall project goal and objectives are met. Baseline values need to be recorded to be used for:

- *setting realistic and timely targets; and*
- *measuring the outputs vs. milestones and objectives during monitoring.*

The DRM practitioner can help the project team through the general steps of developing MNE frameworks, and introducing the DRM considerations relevant to each step:

- Determine if information on risks is adequate or if an additional climate risk assessment is needed.
- Does the project build a foundation for long-term adjustment to changing climate conditions and the corresponding changes to climate-related hazards?
- Does the project reduce the impacts of climate change in terms of future exposure to climate-related hazards? Does it reduce the associated vulnerability?
- Does the project contribute to the achievement of development targets and maintenance of a desirable level of development in the face of climate change?
- Do these indicators the activities designed to address climate risk or vulnerability?

MNE of adaptation is still one of the weakest areas of adaptation practice. This is related to the practical difficulties in obtaining a baseline data and site-specific climate change projections, and the need to strike a balance between providing sufficient structure to assist in tracking and providing sufficient flexibility to be adaptive in the face of climate uncertainty and its potential impacts.

NOTES

SECTION 4

CONCLUSION

KEY MESSAGES

The DRM practitioner has an important role to play in achieving climate change adaptation.

Immediate action is required to counteract the growing disaster losses, both in terms of human lives and economic production, across Asia and the Pacific. Vulnerabilities and exposure in rural and urban areas continue to grow. The scope and the need for effective DRM action has never been greater. This handbook has given both strategic and practical options for operational implementation of DRM within a selection of climate change adaptation processes. The following are key messages to the DRM practitioner for this work:

THE DRM PRACTITIONER RECOGNIZES THAT DISASTER RISK MANAGEMENT IS ESSENTIAL FOR LONG-TERM SUSTAINABLE DEVELOPMENT.

Disasters not only destroy hard-earned gains, but they also restrict the potential for future development.

THE DRM PRACTITIONER UNDERSTANDS THAT DISASTER RISK MANAGEMENT SHOULD NOT EXIST AS AN ISOLATED ACTIVITY.

To cope with the expanding challenge of reducing disaster risk, it is essential for the DRM approach to be woven into all relevant development processes and tools. In effect, it is essential to strengthen resilience within government and, ultimately, society.

THE DRM PRACTITIONER PROMOTES THE MANAGEMENT OF DISASTER RISK FOR EFFECTIVE LONG-TERM ADAPTATION TO CLIMATE CHANGE.

The management of disaster risk should not be delayed pending the arrival of higher levels of certainty regarding the effects of climate change.

THE DRM PRACTITIONER RECOGNIZES THAT THERE IS NO FIXED PROCESS FOR ACHIEVING SUCCESSFUL INTEGRATION OF DRM INTO CCA.

Given an evolving understanding of climate change, its anticipated effects and the appropriate adaptation measures, DRM needs to be flexible and responsive to the changing context in order to achieve effective risk management within the adaptation process.

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GLOSSARY

Taken from IPCC (2012)

Adaptation	In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate
Capacity	The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals.
Climate change	A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer.
Climate extremes	The occurrence of either a weather or climate variable above or below a threshold value near the upper or lower ends of the range of observed values of the variable. For simplicity, both extreme weather and climate events are referred to collectively as "climate extremes."
Climate variability	Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate at all spatial and temporal scales beyond that of individual weather events
Coping capacity	The ability of people, organizations and systems, using available skills and resources, to address, manage, and overcome adverse conditions.
Disaster	A serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Disaster risk	Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery.
Disaster risk management	Processes for designing, implementing and evaluating strategies, policies and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life and sustainable development.
Disaster risk reduction	Denotes both a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster risk; reducing existing exposure, hazard, or vulnerability; and improving resilience.
Early warning system	The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.
Exposure	The presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected.
Hazard	The potential occurrence of a natural or human-induced physical event that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision and environmental resources.

Resilience	The ability of a system and its component parts to anticipate, absorb accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions.
Sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.
Vulnerability	The propensity or predisposition to be adversely affected.

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