# INTEGRATING DISASTER RISK MANAGEMENT INTO **URBAN MANAGEMENT**

DISASTER RISK MANAGEMENT
PRACTITIONER'S HANDBOOK SERIES

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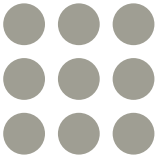

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**Integrating Disaster Risk Management into Urban Management** is the result of a collaborative effort made between 2011-2013. It draws on the knowledge and experience of many organizations and individuals across Asia and the Pacific.

This handbook was developed by the Asian Disaster Preparedness Center, Bangkok (ADPC), with funding from the Asian Development Bank (ADB). Ian Davis, Oxford Brookes University, and Rowan Fraser, ADPC, edited the handbook, with support from the ADPC writing team Atiq Kainan Ahmed, Senaka Basnayake, Marino Deocariza, Brianna Hunt Ficcadenti, Gabrielle Iglesias, Lucy Pearson, Arghya Sinha Roy and Khondoker Golam Tawhid.

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# CONTENTS


Section 1 Introduction 1

**1.1** About the series 3

**1.2** About this handbook 5

Section 2 The DRM Practitioner and Urban Management 7

**2.1** The DRM practitioner 11

**2.2** The DRM practitioner's contribution to urban management 12

**2.3** Urban management 19

**2.4** The outcomes of integrating DRM 23

Section 3 Integrating DRM into Urban Management 27

**3.1** Integrating DRM into building regulation 29

Case study: Better enforcement of building safety in Ahmedabad City, Gujarat State, India 42

**3.2** Integrating DRM into urban land use planning 49

Case study: Using earthquake risk maps for urban redevelopment planning and resettlement in Barangay Rizal, Makati City, Philippines 64

**3.3** Integrating DRM into informal settlement upgrading 71

Case study: Upgrading for resilience in Bang Bua informal settlement, Bangkok, Thailand 86

**3.4** Integrating DRM into critical facilities emergency management 93

Case study: Using disaster risk information in the emergency management plan for Mittaphab Hospital, Vientiane, Lao PDR 108

Section 4 Conclusion 111

References 114

Glossary 116

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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 risk. 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 as to how 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 Urban Management** promotes the adoption of a DRM approach to urban management in order to both protect urban development from the impacts of natural hazards and prevent future urban development from creating new risks or exacerbating existing risk.

This handbook addresses DRM practitioners who sit within:

- a municipal or local unit of the National Disaster Management Agency and are responsible for managing disaster risk in the urban area; or
- a municipal line department (e.g. housing, transport and environment) and are designated as the focal point for DRM.

The handbook provides DRM practitioners with advice for integrating DRM into four key urban management tools: building regulation, urban land use planning, informal settlement upgrading and critical facilities emergency management. It guides practitioners on how to engage municipal planning teams, urban managers, city officials and other public and private agencies that utilize these four urban management tools to influence or regulate urban development. The guidance in this handbook aims to:

- provide the DRM practitioner with the confidence to engage with urban managers for risk-based urban development;
- supply the practitioner with sound arguments to be used in advocating for the integration of DRM;
- outline key approaches, tools and strategies for successful and comprehensive integration of DRM into the designated urban management tools; and
- demonstrate the fundamental concept of integration, which involves embedding the stages of the DRM process into the corresponding stages of the target urban management process or tool.

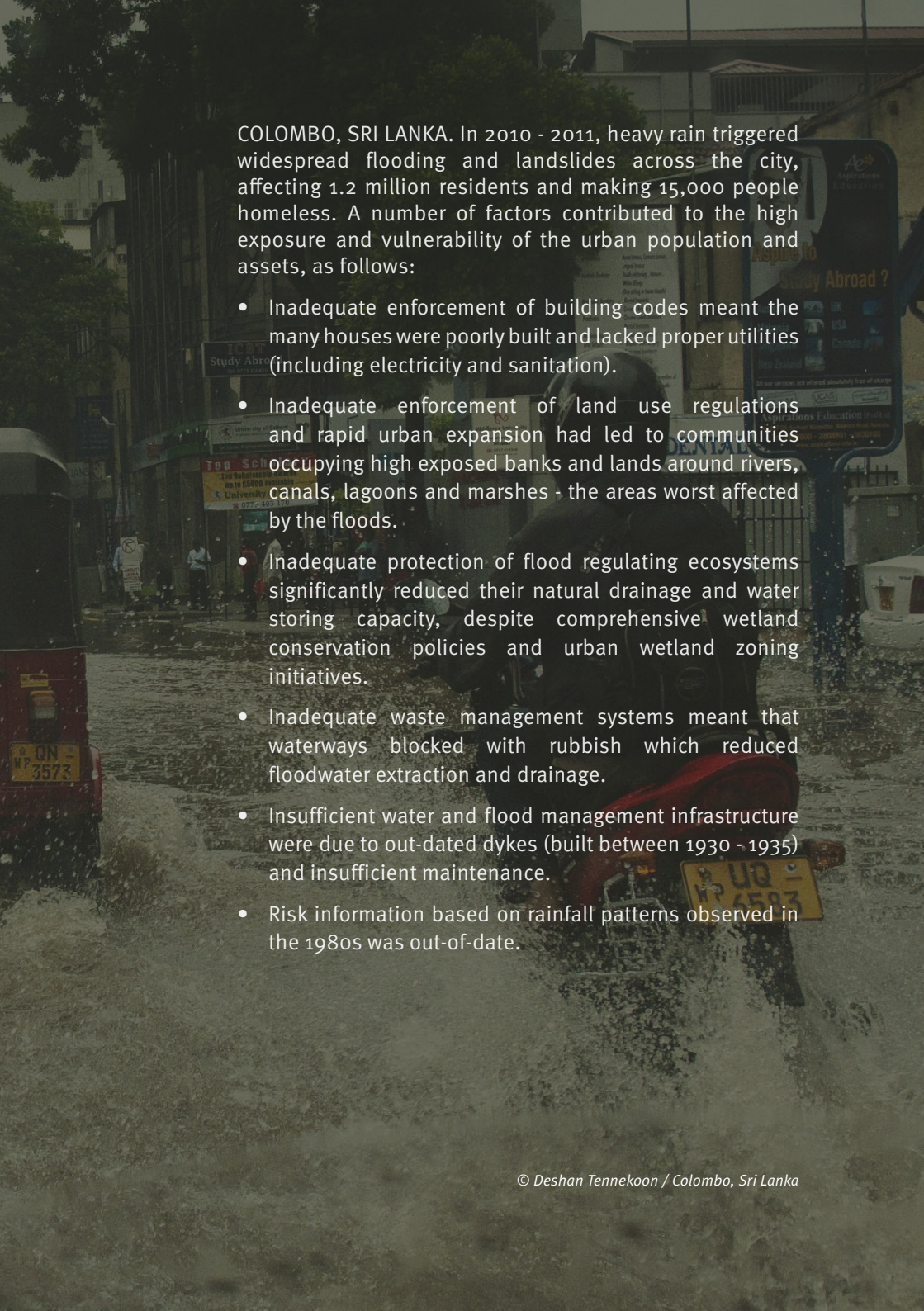
In **Section 2**, the handbook gives an overview of the key functions and roles of the DRM practitioner, and then discusses how the DRM practitioner works and what information and skills successful DRM requires. The section then outlines the challenges of managing urban development in Asia and the Pacific and various urban management tools for doing so. The section concludes on the anticipated outcomes of integrating DRM into urban management and the expected benefits to urban development in Asia and the Pacific.

**Section 3** provides detailed strategic and operational advice to the DRM practitioner on how to integrate DRM into building regulation (Chapter 3.1), urban land use planning (Chapter 3.2), informal settlement upgrading (Chapter 3.3) and critical facilities emergency management (Chapter 3.4).

**Section 4** offers the DRM practitioner key messages for successful integration of DRM into urban management.

**SECTION 2**

# THE DRM PRACTITIONER AND URBAN MANAGEMENT



COLOMBO, SRI LANKA. In 2010 - 2011, heavy rain triggered widespread flooding and landslides across the city, affecting 1.2 million residents and making 15,000 people homeless. A number of factors contributed to the high exposure and vulnerability of the urban population and assets, as follows:

- Inadequate enforcement of building codes meant the many houses were poorly built and lacked proper utilities (including electricity and sanitation).
- Inadequate enforcement of land use regulations and rapid urban expansion had led to communities occupying high exposed banks and lands around rivers, canals, lagoons and marshes - the areas worst affected by the floods.
- Inadequate protection of flood regulating ecosystems significantly reduced their natural drainage and water storing capacity, despite comprehensive wetland conservation policies and urban wetland zoning initiatives.
- Inadequate waste management systems meant that waterways blocked with rubbish which reduced floodwater extraction and drainage.
- Insufficient water and flood management infrastructure were due to out-dated dykes (built between 1930 - 1935) and insufficient maintenance.
- Risk information based on rainfall patterns observed in the 1980s was out-of-date.

*© Deshan Tennekoon / Colombo, Sri Lanka*

Urbanization affects disasters just as profoundly as disasters can affect urbanization.

*Pelling, 2003*

Over the past fifty years, towns and cities across Asia and the Pacific have experienced tremendous growth and are currently among some of the fastest growing and most dynamic in the world (McGill, 2001; UN-HABITAT, 2010). Over the same time period, the region has suffered an increasing number of urban disasters: floods, landslides and earthquakes in particular (UNESCAP, 2012). The impacts of these disasters on urban communities, economies, infrastructure and systems have been immense (UNESCAP, 2012).

In many urban areas, rapid growth and a lack of adequate urban management has resulted in urban development taking place in hazard-prone areas, using construction methods and materials that are not hazard-resistant. The growth of highly vulnerable informal settlements, with populations sometimes rising to over half the total municipal population, and the development of unprotected critical facilities such as schools and hospitals in high-risk areas are two outcomes of this.

For urban management to rise to the challenge of urban disasters, a systematic and risk-informed approach to urban development is needed, promoting the selection of resilient urban development pathways. All forms of urban development should be managed with the view of reducing risk and managing remaining risk in order to protect urban communities and assets, including informal settlements and critical facilities. Risk-informed urban management has the potential to significantly reduce the risk of disaster.

THE DISASTER RISK MANAGEMENT PRACTITIONER PLAYS AN IMPORTANT ROLE IN SHAPING SAFE AND SUSTAINABLE TOWNS AND CITIES BY FACILITATING THE ASSESSMENT AND TREATMENT OF DISASTER RISK WITHIN THE PROCESSES USED TO MANAGE URBAN AREAS

## 2.1 THE DRM PRACTITIONER

The DRM practitioner is an individual whose professional function includes contributing to the management of disaster risk within a sector, geographic area or organization. Some practitioners dedicate themselves full time to managing disaster risk, such as an officer based in an urban area's municipal or local Disaster Management Agency. Other practitioners may be appointed as the DRM focal point within a municipal line department, where their responsibilities are not limited to DRM, for example, a municipal engineer within the department of health may be the DRM focal point for the municipality's health sector. Box 1 describes what the DRM practitioner does, with whom, how and why.

**BOX 1 The DRM practitioner**

The DRM practitioner works …

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

## 2.2 THE DRM PRACTITIONER'S CONTRIBUTION TO URBAN MANAGEMENT

DRM aims to avoid, reduce or transfer the adverse impacts of natural hazards on people, property and the environment through activities and measures for prevention, reduction and preparedness. It involves undertaking a logical and sequential process for the judicious design, implementation and evaluation of strategies, policies and measures that aim to:

- understand disaster risk, considering hazards, exposure and vulnerabilities;
- reduce disaster risk through measures that aim to protect lives and assets;
- promote disaster preparedness, response and recovery practices; and thus
- facilitate and advance sustainable development (IPCC, 2012).

The DRM practitioner can contribute to the shaping of safe and sustainable towns and cities by facilitating the integration of DRM into urban management tools and practices. The DRM practitioner may do so by drawing upon a number of unique characteristics that provide the practitioner with a robust platform for managing disaster risks in urban areas. The practitioner's contributions include perspective, tools, skills, experience and the DRM approach.

**PERSPECTIVE** | The DRM practitioner thinks about natural hazards and looks at things from a risk perspective. This perspective is concerned with reducing the potential loss of lives and assets and thereby ensuring safe, healthy, and productive urban communities. Colleagues from other fields will bring different perspectives to urban management processes and each will make a contribution towards the achievement of sustainable urban areas.

**TOOLS** | The DRM practitioner uses specific tools, some of which are unique to the DRM field, in order to achieve the aim of reducing disaster 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 trainings, self-directed study and job experience. These skills can include public outreach and persuasion, technical analysis and planning.

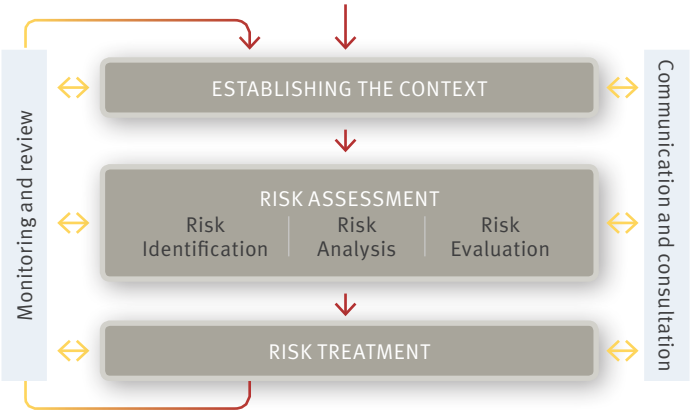
**EXPERIENCE AND KNOWLEDGE** | The practitioner can influence urban development by drawing upon personal experience and examples from around the region of sound DRM practices as well as the consequences of urban management decisions that ignore disaster risk.

**APPROACH** | To manage risk, the practitioner takes a DRM approach to their work, following a continuous process of gathering and analyzing risk information, identifying which risk can be reduced, and managing the remaining risk. The integration of DRM involves embedding the stages of this risk management process within the relevant stages of urban management processes.

The International Organization for Standardization has developed the ISO 31000 *Risk Management: Principles and guidelines on implementation*, an internationally recognized and followed process for comprehensively and systematically managing risk. The process consists of the following five stages:

1. **Communication and consultation**. A continual discussion with communities and public officials carries on throughout the DRM process. Generally, it ensures that all stakeholders both understand and contribute to the conversation regarding disaster risk. Issues include disaster impacts, the need for DRM, identification of risks, agreement on the level of acceptable risk, and the risk management measures required.

FIGURE 1 Disaster risk management process




*Adapted from International Organization for Standardization, 2009*

2. **Establishing the context.** In this stage, the social, cultural, political and economic environment within which DRM will be implemented is defined. This includes understanding: the responsibilities and capacities of government organizations; the role played by private companies and civil society organizations (CSOs); and how decisions are made. During this context analysis, the criteria are set for determining acceptable levels of risk, or the amount of risk a particular society is willing to allow.

3. **Risk assessment.** The overall technical, economic and social process of risk identification, risk analysis and risk evaluation is undertaken during the risk assessment stage. It involves technical professionals (social scientists, engineers, economists, urban planners etc.), as well as representatives of affected sectors and communities. Risk assessments identify historical and potential future hazards; study past impacts and the underlying drivers of risk; examine social, economic and environmental vulnerability as well as the exposure of people and assets to the hazards; consider the capacity of the society to deal with potential impacts; analyze the potential frequency

and intensity of future consequences; and evaluate whether the existing level of risk meets the criteria for what is acceptable.

Methods for risk assessment can be top-down, quantitative and driven by hard data, or they can be participatory and seek a more qualitative understanding of risk. Ideally they are both. The general components of any risk assessment are detailed in Box 2.

The DRM practitioner does not usually undertake the assessment but rather facilitates or commissions the assessment, or simply uses the information that the assessment generates. While the majority of municipal governments do not have up-to-date citywide risk assessments, hazard maps for parts of the urban area and partial risk assessments are becoming more common. They are often undertaken by specialist agencies such as water management authorities or meteorological agencies.

**BOX 2** Risk assessments

Regardless of the method employed or the coverage of the analysis, risk assessments are usually structured around four major steps:

1. **Establishing baseline data** involves gathering demographic and sector data (such as for the agricultural sector). Data should be understood spatially using Geographic Information Systems, or hand-drawn maps (i.e. data should be geo-referenced).
2. **Hazard mapping** includes gathering data on historic hazard events and projected future changes in frequency and intensity, as well as the nature and extent of any losses due to the hazard and the affected areas.
3. **Vulnerability and capacity assessment** involves evaluating communities, businesses, organizations, sectors, structures and systems to measure their susceptibility to loss or damage.
4. **Estimating potential losses** uses all of the information gathered to determine and rank risk areas. Ideally this includes a risk map showing zones of high, medium and low risk for a particular hazard risk for a particular hazard (or hazards).

DRM practitioners can advocate to urban managers for comprehensive citywide risk assessments. A citywide risk assessment is a comprehensive analysis of the different natural hazards to which the urban area is exposed and the vulnerabilities of the urban area to the potential impacts of these hazards (e.g. the vulnerabilities of urban communities, urban industries and commerce, institutional systems, infrastructure etc.). From this analysis, a risk map is produced that designates the risk level of different zones of the urban area.

Perhaps the most challenging aspect of undertaking a risk assessment is gathering the necessary data. The data required for a quality risk assessment will have to be collected from various sources, such as national DRM offices; government line agencies and statistical offices; meteorological, hydrological or seismological agencies; research institutes and universities; international development partners and local community groups. Acquiring sufficient and appropriate data can be a challenge, as often datasets will be incomplete, outdated or even nonexistent.

Regular updating of any risk assessment presents another challenge. Updating the assessment, and the data it is based on, is necessary because hazards and socio-economic vulnerabilities are changing constantly. The government must recognize that risk is constantly fluctuating, risk management is ongoing and so funds will need to be allocated for updating of risk assessments.

The information generated through risk assessments is crucial to ensuring quality DRM. The more accurate the risk information, the more adequately the risk can be addressed and treated.

4. **Risk treatment.** Specific measures to reduce or manage risk are identified and implemented during the risk treatment stage. This is a cyclical process of: deciding on the treatment type (whether to reduce existing risk or manage residual risk); identifying the measure; assessing its suitability through testing tools such as computer modeling, pilot projects,

drills and simulations; evaluating the effectiveness of the treatment; and modifying or generating new risk treatment until a consensus is reached on the level of risk acceptable.

Risk treatment 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. Table 1 gives examples of potential measures and their associated treatment functions.

5. **Monitoring and review**. As the risks from natural hazards are continually changing, the DRM process is undertaken so that continual improvements can be made at all stages. The purposes are: to analyze and learn lessons from hazard events, changes and trends; to detect changes in the context

TABLE 1 Examples of risk treatment measures and functions

| Measures | Reduces disaster risk | Manages remaining disaster risk |
|---|---|---|
| *Structural measures* | | |
| Barriers (e.g. sea walls) | ⁘ | |
| Strengthening of existing structures (i.e. seismic retrofitting) | ⁘ | |
| *Non-structural measures* | | |
| Early warning systems | ⁘ | |
| Evacuation planning | ⁘ | |
| Insurance | | ⁘ |
| Calamity funds (reserves and credit) | | ⁘ |
| *Environmental measures* | | |
| Barriers (e.g. mangroves) | ⁘ | |
| Landscape strengthening (e.g. grass and bio-nets for slope stabilization) | ⁘ | |

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.

Box 3 summarizes the contributions the DRM practitioner can make to facilitate the integration of DRM into the public development process.

**BOX 3** The DRM practitioner's contribution to development

**Perspective**

- Looks at things through a risk lens
- Focuses on reducing disaster risk for current and future hazards

**Tools**

- Risk assessment methods
- Damage and loss assessments
- Computer-based modeling
- 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 URBAN MANAGEMENT

Urban management is a broad area of work encompassing the use of a myriad of tools and strategies to guide and control urban development, including:

- master planning, land use planning, urban planning;
- city development strategies;
- economic growth strategies and visions;
- industrial and business park plans;
- social protection policies, including shelter policies and poverty reduction policies;
- infrastructure development schedules, plans and programs;
- informal settlement upgrading schemes;
- construction policies including building safety standards, building regulations and codes; and
- environmental policies and plans for urban parks, air, waterways, and natural resources.

By integrating DRM (i.e. the risk management process, including the collection of risk information and the selection of risk treatment measures) into urban management tools, DRM practitioners can influence the way that urban growth and development takes place. For example, using risk-based land use plans can ensure that critical facilities such as hospitals, water treatment plants and police stations are located in low-risk or safe areas of the city, or considering disaster risk during informal settlements upgrading to ensure that improvements to housing, walkways and utilities are resilient.

However, urban managers and urban management tools across Asia and the Pacific towns and cities area struggling to deal with the massive and varied challenges of urban growth. These challenges include the speed of urban growth, the inadequacy

of urban governance structures, the inherent difficulties of enforcement of policy, a lack of transparency in many municipal departments, unequal and unstable decentralization, and a general lack of funding, capacity, human resources and time. The result is that much of current urban development is taking place in locations that are prone to hazards such as along river banks, in low-lying coastal zones, on steep hillsides and in floodplains. This is especially the case with informal settlements because the cheapest land is often the most hazard prone. High populations densities in these settlements, along with chronic under-provision of basic utilities and services (water, sanitation, transport, health, etc.), make them particularly vulnerable. Slum dwellers usually build their own houses using construction techniques and materials that may not achieve building safety. High levels of poverty, and low health and education standards add further layers of vulnerability in these settlements. Similarly climate change will place on-going stress on many urban systems such as drainage and flood control, transport and mobility, and housing.

Urban development is both a problem and an opportunity for DRM. While there is widespread recognition of the expansion of urban disaster risk, due to the increasing concentration of human communities and assets in risk areas, it must be remembered that an estimated 60 per cent of the global built environment of 2030 has yet to be constructed (Secretariat of the Convention on Biological Diversity, 2012). If DRM can be successfully integrated into even a portion of this 60 percent, it will represent a huge advance towards safer living conditions for urban residents and resilient urban economies. However, in addition to improved urban DRM, this will require structural changes to urban governments, pro-poor urban policies and more flexibility and capacity amongst urban managers and policymakers (Pelling, 2003).

In response to these challenges, urban management must be strategic and realistic. The DRM practitioner, as this handbook shows, has a huge amount to offer urban management teams and such contributions will be valued in the long-run and as awareness

of DRM grows amongst urban managers, city officials and the public. This handbook selects only four of the many potential tools to which the DRM practitioner can effectively contribute. However advice given for these specific urban management tools can be applied equally well to others.

The four urban management tools that this handbook engages play are:

**Building regulations**
*Goal:* To control construction practices and materials and set safety standards
*Regulatory body:* National ministry for housing or building - occasionally local or municipal department of housing or building
*Enforcement body:* Municipal department of housing or building
*Use:* Almost all countries have some form of building regulation in place
*Application:* Country- or province-wide
*Main challenge:* Compliance and enforcement

**Urban land use plans**
*Goal:* To regulate the spatial distribution of urban systems and activities and ensure the equitable and sustainable use of land
*Regulatory body:* Municipal department of urban development
*Enforcement body:* Municipal department of urban development
*Use:* Most cities use some form of plan for controlling spatial lay-out
*Application:* Citywide
*Main challenge:* Compliance and enforcement

**Informal settlements upgrading initiatives**
*Goal:* To improve the living conditions of informal settlements and reduce poverty
*Initiating body:* Municipal department of housing or social affairs or CSOs
*Use:* Informal settlements exist in almost all towns and cities in the region and upgrading initiatives are active in most countries

*Application:* Usually to specific sites, but sometimes citywide
*Main challenge:* Political assent, funding, legal and institutional blocks

**Critical facilities emergency management plans**
*Goal:* To ensure continuity of operations during an emergency
*Regulatory body:* Management committee of the facility, or municipal department of the relevant sector
*Enforcement body:* Management committee of the facility
*Use:* Most critical facilities use basic emergency management plans
*Application:* Facility-specific
*Main challenge:* Operations and funding

Each of these management tools follows a process. This process may vary from municipality to municipality, but the overall stages remain broadly consistent. Integrating DRM involves the DRM practitioner carefully matching the risk management process to the relevant stage in the urban management process. In this way, the DRM practitioner embeds DRM into the sequence of decisions, analyses, outputs and outcomes of urban management. This requires that the DRM practitioner undertake specific tasks and make specific contributions and for each of the four urban management tools listed above, this is detailed in Section 3 of this handbook. The DRM practitioner's overall role is to facilitate the utilization of risk information in order to arrive at risk treatment measures.

In general, current urban management practices in Asia and the Pacific are only just beginning to address DRM and widespread integration of DRM into urban management is yet to come. The goal is that by integrating DRM into urban management practices, urban development in Asia and the Pacific will become increasingly resilient to disasters. However, the DRM practitioner who is familiar with both DRM and urban management can expect to be effective in advancing a more resilient urban environment.

## 2.4 THE OUTCOMES OF INTEGRATING DRM

The effective integration of DRM into urban management results in safe and sustainable towns and cities, which has two fundamental outcomes:

1. Firstly, risk-informed urban management should lead to the **protection of existing and new buildings, infrastructure and facilities against existing disaster risk**. This means that houses, schools, airports and roads are all protected against the adverse impacts of hazards.
2. Secondly, risk-informed urban management should lead to **avoidance of the creation of new disaster risk**. This means that new urban development projects, such as new highways, hospitals or parks are designed and implemented in such a way that they do cause communities or assets to be newly exposed to hazards, nor cause an increase in the vulnerability of communities or assets.

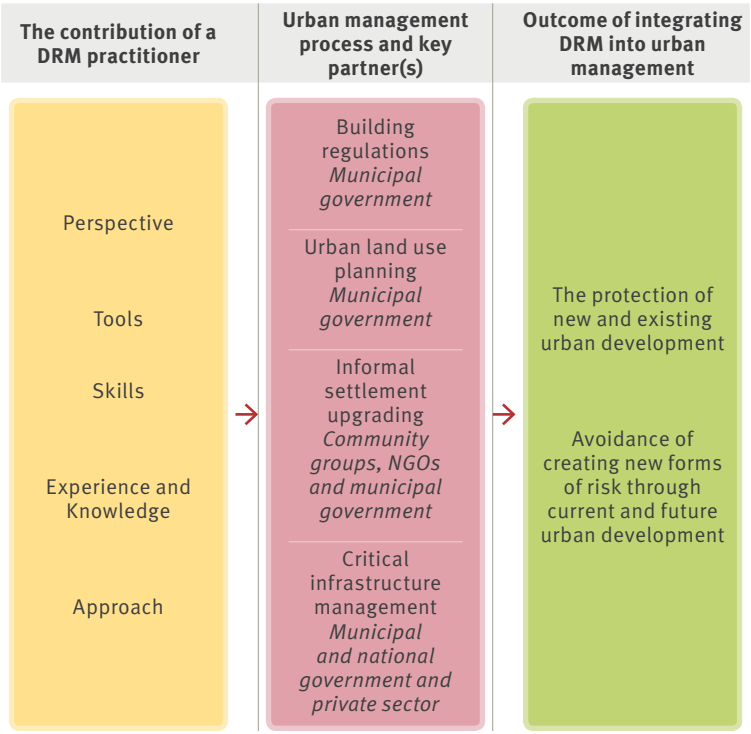
BOX 4 Word from the field

**Dr. K.Z. Hossain Taufique** and **Team**, Urban Development Directorate, Mymensingh, Bangladesh

*"Many towns and cities in Bangladesh face hazards and have experienced recent disasters. Earthquakes are common here, and we have a long history of dealing with these. One of our most vulnerable municipalities to earthquakes is Mymensingh, in the northeastern region of Bangladesh.*

*Our planning team has really engaged with the public and the planning process has been very participatory. We've used the participatory rapid/ rural appraisal (PRA) approach for this. We've completed PRA sessions with women's groups, and have organized an art competition for the children, to get their views on disasters and on the type of town they want to live in the future. We still need to do further work, but the ultimate goal of this is to produce a comprehensive framework for integrating disaster risk redcution into urban planning practices, so that we can become a resilient municipality."*

FIGURE 2 Contribution of the DRM practitioner to urban management



NOTES

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**SECTION 3**

# INTEGRATING DRM INTO URBAN MANAGEMENT

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Chapter 3.1

# INTEGRATING DRM INTO BUILDING REGULATION

## OVERVIEW

Effective DRM in urban areas requires that buildings and other forms of construction comply with building safety standards. These standards are set out in building regulations and seek to ensure that construction practices and materials used for residential, commercial and industrial buildings, including public facilities, can adequately resist hazard stresses (e.g., increased wind loads in cyclone events, increased and irregular movement during seismic activity, increased loads due to pooled water during floods, heavy rains on roofs), as well as resist everyday hazards such as fires.

Governments usually prepare building regulations at the national level. These regulations commonly take the form of a National Building Code. However, in some countries in the Asia and Pacific region, subnational governments (i.e. provincial or district governments) prepare similar policy instead. In both cases, building regulations are usually based on international standards (i.e. the International Building Code, various Model Codes etc.) and seek to establish or strengthen internationally recognized building practices. In yet other countries, the power to formulate building regulations lies with the local authority, and the district or subnational state government plays a guiding role. If the district government prepares model building regulations or guidelines, these may be adopted with suitable modification and in accordance with local requirements, and integrated into the urban development planning regulations.

Building regulations usually references risk maps for geographically distributed hazards, in the same way that land use plans do. In this way, building regulations and land use regulations act in tandem and are considered two of the main mechanisms by which disaster risk is regulated "on the ground". | see Chapter 3.2 for more information on risk-based land use planning |

While preparation of building regulations takes place at national or subnational level, implementation and enforcement is the task of local governments. In some countries, local governments are free to choose whether to adopt national or subnational regulation and in other countries local governments are legally obliged to adopt and implement national level policy. In both cases, enforcement at local level is a major challenge. Building safety enforcement agencies typically face resistance from homeowners and developers due to the expected cost increase and the time required to obtain compliance. Local governments themselves sometimes seek to escape compliance for the same reason. In addition, unethical conduct by urban officials can lead to a lack of compliance, especially when enforcement mechanisms such as inspection and permit evaluation are poorly organized and resourced.

Inadequate compliance with building safety standards makes residential, commercial and industrial buildings, as well as public and critical facilities, more vulnerable to disaster. Improving compliance is an important activity that DRM practitioners can contribute to by supporting enforcement mechanisms and advocating compliance to the public, private businesses and local government.

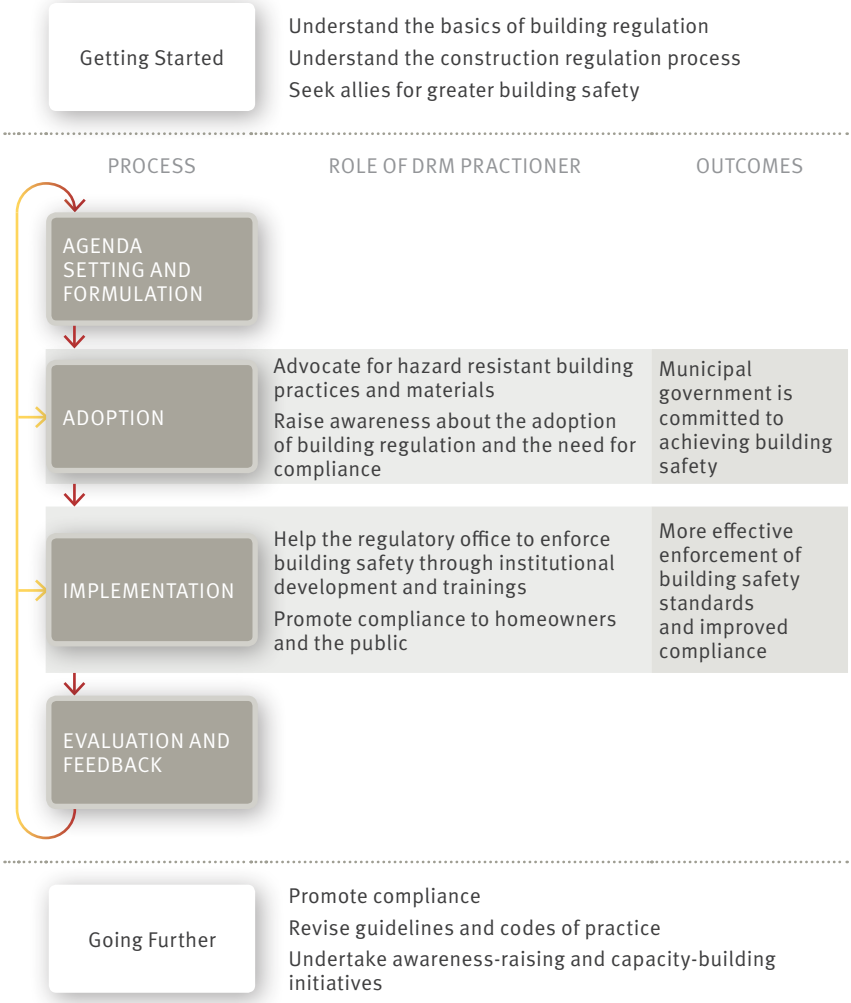
## THE GOAL OF THE DRM PRACTITIONER

The goals of the DRM practitioner are to:

- advocate for the formal adoption of building regulations by the municipal government;

- support increased compliance with building regulations by strengthening awareness of disaster risk on the part of the general public and construction sector; and
- support the enforcement office with hazard and risk information and related tools for improved enforcement.

FIGURE 3 The DRM practioner's contribution to building regulation



## GETTING STARTED

DRM practitioners can begin by identifying and gathering a basic understanding of the building safety policy enforced by the municipal government. Visiting the website or office of the municipal government's department responsible for building and housing, or meeting with a representative of this department should be sufficient. It will be helpful to obtain a copy of the policy, if available. For a better understanding of the provisions of the policy, especially in terms of specifications for hazard resistance, it will be helpful to meet with a reputable local engineering practice or with engineers employed by the department for building and housing.

A meeting with the department will also provide a venue for a discussion on the key stages and agencies involved in the building safety enforcement process. Seek to understand the steps in the process, including the main documents (building project application form, checklists, etc.) and permit types (sub- and super-structure construction permits, full construction permits), and project construction completion process. A further meeting with the building regulation enforcement office (which is likely to be an office of the department of building and housing) may be helpful and allow the DRM practitioner to both identify some of the main challenges of enforcement as well as identify an ally for improving building safety.

If the municipal government has not formally adopted a building safety policy, seek to understand what secondary policies are regulating construction. Even in the absence of a coherent policy, local government and local companies will use engineers to design buildings and will expect that some building standards be adhered to, even if minimal. These might be Professional Codes of Practice, Engineering Guidelines, or simply rules-of-thumb (i.e. a basic rule or principle of construction that the layman can use and require no expert knowledge). A local engineering office should be

able to provide information. In addition, such offices may support in a campaign for greater building safety because they will expect to benefit due to the increased demand for their services.

## SUPPORTING DRM INFORMATION AND KNOWLEDGE REQUIREMENTS

Regulating building safety at the local level requires a municipal agency with adequate resources, a willing public and an able

BOX 5 Advocacy and public awareness raising tool: Shake-table demonstration

The best advocacy and public awareness raising is done with a clear, direct message. Nepal's National Society for Earthquake Technology has developed a tool for show casing the necessity of good quality building construction; it delivers the message quickly and with maximum effect.

Two identical buildings are presented on a shake-table, one built according to building safety standards while the other built without any safety measures. To simulate the effects of an earthquake on the buildings, the table moves, replicating seismic activity, as the audience watches the performance of the two building types.

This activity can greatly help in convincing stakeholders that integrating earthquake-resistance into the building code is important and that enforcing such building codes matters.

*Source: National Society for Earthquake Technology - Nepal (NSET), 2013*

construction sector. DRM practitioners can contribute to the development of all three through advocacy and capacity building.

**Advocacy information**. A quantitative assessment of the number of non-engineered structures in the city, as well as the number of these that are exposed to natural hazards will provide a foundation from which to launch advocacy for better building safety policy compliance. Such an assessment might have been conducted by an international development agency, or a national or local monitoring board. Alternatively, it is sometimes possible to produce an estimation from hazard maps, census data and risk assessments if available. It is important that the reasons for non-compliance are identified. The DRM practitioner can talk with the department of building and housing, local engineers and homeowners associations in order to get an accurate picture of the nature and scale of non-compliance in the city.

## THE DRM PRACTITIONER'S CONTRIBUTION TO BUILDING REGULATION

*Whether at the national or subnational level, building regulation formulation will begin with a comprehensive review of existing building safety standards in the country. A component of this review will seek to determine how national building regulation compares to current international regulations (such as International Building Codes). Very often, an international standard is adopted by the national or subnational government and amended to suit national or subnational conditions. In some countries, local governments are mandated to set local building by-laws or policies that are amendments to national or subnational policies.*

Over the course of this process, the DRM practitioner can advocate to the policy review or formulation committee for improved building safety through the specification of hazard resistant building practices and materials. This can be achieved by highlighting to the committee the relevant specifications in the international standard or Universal Building Code, and identifying relative inadequacies in the national or subnational building regulation. | see DEVELOPMENT ⁂ 3.1, for more information about integrating DRM concerns into the policy formulation process |

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| ADOPTION | Advocate for hazard resistant building practices and materials<br>Raise awareness about the adoption of building regulation and the need for compliance | Municipal government is committed to achieving building safety |

*Once the building safety policy is set at the national or subnational level, local governments can either choose to adopt or are legally obliged to adopt it. For adoption, the municipal or local government will need to ratify the policy through its council.*

DRM practitioners may choose to encourage adoption by:

- **Getting in contact with key housing, urban development, physical planning and public works bodies in the urban area**. These agencies might not understand the importance of safety provisions, and the way that unsafe building practices can delay or weaken development goals and incur huge damages and the loss of life, property and economic activity. Consider communicating with them to generate or request support for adopting and enforcing the building code and by-laws.
- **Communicating with relevant professional bodies**. Local and national bodies such as professional associations of engineers, architects and masons, as well as scientific bodies such as earthquake safety associations or flood and hydrology expert groups are important stakeholders. Consider communicating

with them to generate or request support for adopting and enforcing the building code and by-laws.

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| IMPLEMENTATION | Help the regulatory office to enforce building safety through institutional development and trainings<br>Promote compliance to homeowners and the public | More effective enforcement of building safety standards and improved compliance |

*Following adoption of the building regulation at local level, a building regulation office will be tasked with implementation. This office may need to be formed and staffed. However, in many urban areas, this office will have been operational for some time as part of the municipal government. This office receives and evaluates applications for building projects, grants construction permits, inspects projects during and after construction, and signs off on completed projects.*

The adequate implementation of building regulations requires support from local government, the private sector and the public. The DRM practitioner's contribution to implementation involves supporting awareness raising, enforcement, and capacity building.

## AWARENESS RAISING

Adoption needs to be well broadcast and all stakeholders need to be informed. Communication options include public media (television, radio, internet, newspapers) as well as official channels such as municipal publications, announcements and mayoral notice boards. The DRM practitioner can contribute to this by focusing awareness raising on the specifications for hazard resistant construction set out in the regulations. This may be for:

- **New buildings**: DRM practitioners can promote awareness of the building regulations amongst homeowners, the private sector and local government. Promotion may focus on the

relative ease of ensuring that homes and other buildings are "built right" from the beginning, on the moral obligation of homeowners to protect families from hazards, or on the moral and economic interest of commercial and industrial building owners to protect their workers, stock and assets.

- **Existing buildings**: Adopting new or updated building regulations may mean that some existing buildings require retrofitting (strengthening of the core structure of an existing building so that it complies with building safety specifications). For the promotion of retrofitting the DRM practitioner may wish to focus on commercial and industrial buildings (especially critical facilities - | see Chapter 3.4 for more information of measures for strengthening critical facilities |), and the public sector using the same arguments given above.

BOX 6 Constructing new hazard resistant buildings does not cost that much more

One common obstacle to improving building safety standards is the perceived cost. Building structures to a higher safety specification entails an increase in project expenditure. This is mainly due to an increase in the volume or quality of material used, though associated costs such as hiring more highly trained masons and engineers can also contribute. However, erecting more robust and resistant buildings is far cheaper than often anticipated. Strengthening involves improving the sub- and super-structure of the building - typically the cheapest component of the building - through the additional use of reinforcing steel, concrete and brick. In general, this will only incur an additional 2-4 per cent to baseline building costs.

*Source: GFDRR, 2010*

## ENFORCEMENT

A systematic enforcement regime is a critical supporting requirement for effective implementation of the building regulations. In the region, most of the recent damage and loss of life in newer structures from earthquakes happened because of the inadequacy of government enforcement of code

requirements (GFDRR, 2010). Robust buildings and structures require sound engineering design, good quality construction and materials use. In the Asia and Pacific region, this is achievable through systematic government enforcement of a sound building regulation. Enforcement requires both: 1) the training and licensing of professional engineers; and 2) the control of construction practices and materials used. This in turn requires adherence by the construction industry, and support by the financial sector through housing finance.

A typical enforcement process begins when a homeowner, individual or organization requests a permit to build from the local authority. The building project's plans and documents are reviewed by the relevant department of the local authority. Sometimes changes to the building plans are needed. Upon approval of the permit, the party wishing to build is granted permission to go ahead with construction. However, the approval granted can be subject to various constraints and duties.

Local governments seldom achieve full enforcement and this is mainly due to a lack of regulatory mechanisms, a lack of human resources, a lack of capacity both within government (sluggish evaluation, inadequate inspection during construction etc.) and within professional bodies, and a lack of public awareness. Unethical conduct by officials is also a contributing factor.

DRM practitioners can play a key role in promoting and supporting enforcement by:

- collating and storing hazard maps and risk data, whenever available, either online or at the municipal offices, to be accessed both by the public when assembling and submitting building applications, and by the enforcement agency when evaluating building applications;
- providing simple checklists that consider hazards and risks when evaluating building applications | see Box 7 |;

- in collaboration with concerned engineers, helping to establish rules of thumb for non-engineered structures to be used by both homeowners during construction and enforcement officers when evaluating applications;
- building the capacity of municipal engineers ;
- in collaboration with concerned engineers or architects, suggesting cost-effective safe home designs that can be used by homeowners and are “pre-approved” by enforcement officers;
- helping design incentives that will attract private developers and homeowners both in terms of new buildings and retrofitting existing buildings | see Box 8 and Chapter 3.2 for more information on incentives |;
- advocating for regularized tenure for informal settlements and the gradual retrofitting and upgrading of structures and buildings in informal settlements | for more information see Chapter 3.3 |;
- in collaboration with local or national financial institutions, linking access to credit with new building projects approval based on factoring in safe building practices and materials (i.e. easier or cheaper access to loans for building projects with high safety standards);
- in collaboration with local or national financial institutions, linking access to credit with retrofitting requirements so that owners of existing building can more easily strengthen structures (i.e. easier or cheaper access to loans for retrofitting projects for existing buildings, especially critical facilities) | see Chapter 3.4, for more information on retrofitting critical facilities |;
- demonstrating the benefits of safe building by given incentives such as tax exemptions and product endorsements (e.g. the DRM practitioner can partner with cement factories which advocate for safe construction); and
- building the capacity of private sector engineers to undertake risk assessments.

BOX 7 Checklists for safe building

When submitting a building permit application, the applicant is required to complete several forms, one of which can be an assessment form or checklist. Making these forms a mandatory component of the application is an efficient and inexpensive way to ensure that disaster risk is considered in the evaluation process of the permits. However, it does require adequate knowledge on disaster risk (including up-to-date hazard or risk maps of the area) by the evaluation team in the municipality. The DRM practitioner can help in getting hazard maps and data for the urban area.

In Sri Lanka, the Urban Development Authority (UDA) and the Coastal Conservation Department (CCD) are jointly integrating DRM into the housing permit application process in coastal zones. The UDA and CCD have developed a checklist for housing approval to be filled in by the applicant. The checklist contains a section where the applicant is expected to enter hazard information. This includes information regarding the project site and whether this site is prone to different hazards. The applicant must specify:

- the type of hazard(s) the building project site is exposed to; and
- the degree of severity of the hazard, based on a multi-hazard map published jointly by CCD and the Disaster Management Center.

Based on this information, the checklist then specifies the type of building guidelines that must be followed during construction given the site's hazard profile.

*Source: Coastal Conservation Department of Sri Lanka, 2012*

## CAPACITY BUILDING

The DRM practitioner can request assistance from concerned construction professionals in order to prepare and deliver capacity building sessions or presentations focusing on the hazard and risk components of the building regulations. This may include:

- sessions for municipal engineers to highlight key hazards in the urban area, present the risk maps and risk data available, and build capacity for using specific safe building practices and materials;

- sessions for design and construction professionals (architects, engineers, masons, builders etc.) on safe building techniques and design; and
- sessions for foremen and construction supervisors on safe building technology and key hazard resistant building practices.

**BOX 8** Incentives for safe construction

Building regulation must be reinforced by tax policies and fiscal incentives for compliance. These incentives can be national, subnational or specifically municipal. Incentives can be for upgrading and retrofitting existing buildings or for new construction. Incentives include the following:

- Cost of retrofitting write-offs offer owners of existing buildings a tax write-off for the cost of the retrofitting. Write-offs can also be partial and are usually spread over a period of several years.
- Cost of improvement write-offs offer private developers and households a tax write-off for the added cost of building to a higher level of hazard resistance.

However, tax based incentives do not influence entities (enterprises, households, etc.) that are not registered, do not pay tax or escape paying taxes by bribery. Subsidies can help to incentivize such building owners by offering cash advances to support improved building safety.

DRM practitioners can support the establishment of such incentives by helping the building regulations office and relevant fiscal department to determine priority buildings, zones or criteria for such incentives. These can be based on: 1) the type of building (critical facilities, housing, etc.), 2) the location of the building, and/or 3) the level of exposure or the level of risk to which the building is subject. | For further information on incentives see Chapter 3.2 |

*Sources: ADB, 2012 and 2013*

CASE STUDY

## Better enforcement of building safety in Ahmedabad City, Gujarat State, India

In 2001, the Bhuj earthquake in Gujarat State, India, caused the collapse of 80 buildings, over 1,000 flats and 80 houses, including disruption to utilities and services and the deaths of nearly 1,000 citizens. Facing severe criticism due to the damage and loss of lives, the Ahmedabad Urban Development Authority (AUDA) and the Ahmedabad Municipal Corporation (AMC) took immediate steps to amend the General Development Control Regulation (GDCR) of Ahmedabad, and introduce new legislation. In this process, the Gujarat State Disaster Management Authority (GSDMA) played a key role.

### How was DRM integrated into the building regulations framework?

**Review of building codes**. The GSDMA commissioned the Indian Institute of Technology (IIT) Kanpur to review relevant codes for earthquake, fire and wind safety provision and make suggestions for modification. The IIT provided the GSDMA with a wide range of policy recommendations for improved building safety against earthquake hazards. The code was subsequently revised by the State government and following the adoption of the revised code, a public awareness raising campaign was undertaken. This involved the use of television, radio and pamphlets to explain the reason for the revision and the importance of adequate DRM provision for building safety.

**Gujarat Professional Engineers Act 2006**. In 2003, with no previous legislation to regulate the profession of civil engineers, GSDMA initiated a study to work out a system for licensing engineers through conduct of practical and written tests. After three years the Gujarat Professional Civil Engineers Act 2006 was passed and the Gujarat Council of Professional Civil Engineers was established to test the competency of engineers and issue licenses. Licensing and registration now have clear cut requirements in terms of qualification, experience, competence and responsibilities. Registration is valid for a period of five years and is renewable, but may be revoked if a person is found guilty of negligence or fails to carry out duties.

**Building safety checklist**. Changes have been made to the process of plan approval. Checklists for building approval have been created by AMC, consisting of about 160-200 fields, and are available online. These checklists simplify the process, and clarify the role of DRM in development.

**What should be considered when replicating Ahmedabad's actions?**

**Defining responsibilities**. It is the responsibility of the GSDMA to control and enforce the implementation of the National Building Code. While regulatory processes have been effective, enforcement is lacking. Regular inspection by trusted professionals should identify non-compliance or technical incompetence, and punitive measures should be taken against offenders to discourage this. The construction process must be monitored as closely as possible to ensure adherence.

**Easy to follow mechanism**. A simple, clear procedure will encourage compliance. Following distinct guidelines set out by the GDCR on the certification of professionals, plan approval, code of conduct and progress monitoring will ensure safe development.

*© Reinhold Behringer / Ahmedabad, India*

*Sources: Sheth and Kain, 2002a, 2002b and 2004*

EVALUATION AND FEEDBACK

*Building codes are evolutionary; they should be constantly updated as knowledge of seismology, geology and construction develop. In most countries, the national body mandated for building safety will periodically review the effectiveness of the policy provisions and make changes based on new knowledge and understanding.*

With climate change likely to modify rainfall patterns, storms and cyclones, as well as wind speeds, updating building codes for improved hazard resistance is increasingly important | see CLIMATE ❇ 3.1, for more information on climate change adaptation policies |. However, while evaluating specific engineering practices is beyond the ability of most DRM practitioners. identifying unsafe building practices based on rules-of-thumb is possible. DRM practitioners should continue to monitor practices when they can, and consider using these in regular advocacy for greater budget allocations to the regulatory office for improved enforcement and revisions of building regulations where necessary.

## GOING FURTHER

The DRM practitioner can also contribute to long-term building safety by:

- **Supporting ongoing capacity building for construction professionals** on the use of hazard resistant building practices and materials. Such capacity building could also be supported by ongoing building materials testing and improvement, or could focus on collaborating with engineering and architecture faculties for improved instruction in hazard resistant building design in university curricula.
- **Supporting the revision of regulations and guidelines for professional groups**. DRM practitioners can advocate for the revision of codes of practice for engineers, architects and masons, as well as the creation or revision of local legislation to ensure that the practice of construction professionals is properly governed in regards to building safety.
- **Reaching out to community groups and leaders for support**. DRM practitioners can leverage the respect and authority of community groups and leaders and make them champions of DRM. This can be especially effective with religious groups, where building safety can be viewed as a moral responsibility of individuals to their community. Efforts can also target homeowners associations with awareness raising messages on the importance of building safety for hazard resistance.

NOTES

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Chapter 3.2

# INTEGRATING DRM INTO URBAN LAND USE PLANNING

## OVERVIEW

A key instrument for regulating and steering urban development is urban land use planning. Across the region, governments at different levels and to varying degrees of sophistication apply land management controls to urban and rural areas via visions, objectives, strategies and measures set out in land use plans. These seek to find a balance between competing interests for the use and development of land in order to secure a sustainable and equitable balance.

While some countries prepare land use, physical or spatial plans at the national level, most countries mandate local governments to undertake this task | see DEVELOPMENT ⁂ 3.2, for more information on national physical plans |. Local governments and local civil society are usually best placed to find the necessary balance for good land use planning. Increasingly, land use planning is being seen as iterative and participatory with local groups and communities playing a more important role in planning and implementation. This approach is usually more successful.

The role of the DRM practitioner in this process is to support planners to obtain and use hazard, exposure and vulnerability data or information during the formulation of the land use plan. DRM practitioners can help to encourage implementation, as in the case of building safety policy | see Chapter 3.1 |, which remains poor in general. Implementation of risk-based land use plans depends firstly on achieving adequate coordination between

sector-specific agencies engaged with land management, and secondly, on institutional capacity for funding and compliance. The DRM practitioner can most contribute to the second (World Bank, 2013).

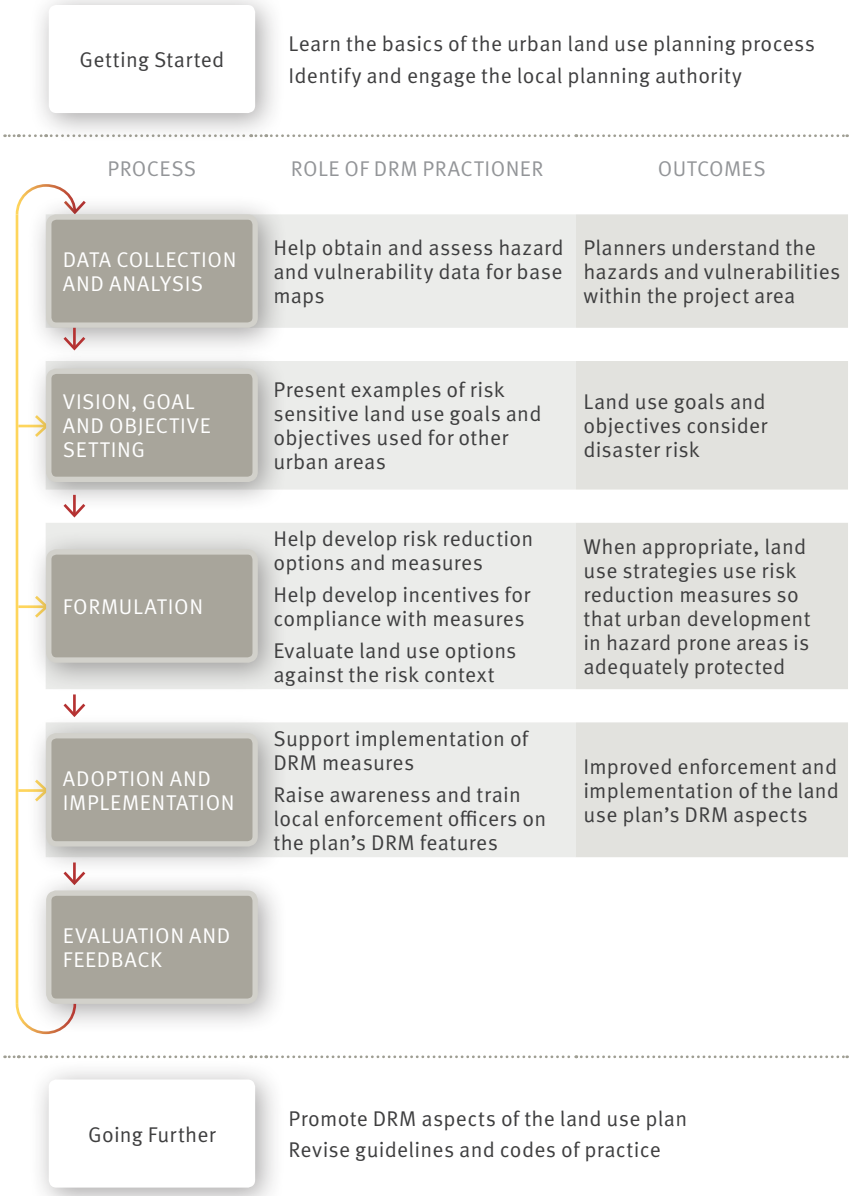
Land use plans are effective tools for the DRM practitioner. By regulating the location of activities (including housing development, infrastructure development, nature conservation and natural resource management) as well as stipulating conditions for these activities (building safety conditions, urban design conditions, etc.), land use plans provide the DRM practitioner with a tool whereby both exposure and vulnerability of assets and communities can be managed. While the concentration in this chapter is on preparing risk-based land use plans for the urban area, which is preferable, where time or finances are scarce, site-specific or hazard specific land use plans can also be effective in reducing risk (World Bank, 2013)

## THE GOALS OF THE DRM PRACTITIONER

The goals of the DRM practitioner are to:

- ensure that urban development takes place within a land use framework that carefully balances drivers like economic development, land markets and urban expansion against the need to ensure safe, sustainable and resilient urban areas; and
- ensure that land use instruments such as zonation and ordinance are used effectively to regulate and limit the hazard exposure and vulnerability of assets and communities in urban areas.

FIGURE 4 The DRM Practitioner's contribution to urban land use planning



## GETTING STARTED

The DRM practitioner may begin by learning the basics of the land use planning process practiced by the municipal government. Many urban authorities do not have technical capacity to draft land use plans themselves and will require external support for this. However, most will have a planning authority of some sort (bureau, office, department) that is tasked with managing the planning and urban development processes for the area. DRM practitioners can identify this authority and organize a fact-finding meeting to understand the basic land use planning process followed by the municipal government. The DRM practitioner can seek to:

- **Understand the local context in which the land use plan is developed**. Examine how land use planning fits within the urban area's development planning system and seek clarification on legal provisions made for land use planning. Some urban areas produce separate land use plans, and other areas include the land use plan within a wider framework of local, district or provincial development planning and programming. It is important to understand how the land use plan relates to this broader framework, as well as which agencies are involved and the time-frame or planning period. Given that DRM is a long-term concern, it is sometimes easier to integrate DRM into medium- and longer-term plans.
- **Review the current land use plan**, **if it exists**, focusing on the components of the land use plan and how they are related to each other. Most land use plans can be divided into three sections: 1) situational analysis; 2) goals and objectives; and 3) proposed actions and interventions. DRM practitioners should also examine supporting or related ordinances, maps, programmes, urban or master plans, and development project lists (e.g. infrastructure project lists) if available. Developing a good understanding of the existing land use plan and its context will help to identify issues, problems and areas that require attention, as well as opportunities for DRM integration.

A second meeting with the land use planning authority can be organized in which the DRM practitioner makes the case for integrating DRM into urban land use planning. Discuss the need for DRM and the role of land use planning in reducing risks. The DRM practitioner can seek to obtain official commitment to the integration of DRM into land use planning from the relevant authority. This may require advocacy and DRM practitioners are advised to use clear and reasonable arguments with strong empirical support to deliver their messages. DRM advocacy is most effective directly following a major disaster and it creates a "window of opportunity" for integrating DRM in development processes.

## SUPPORTING DRM INFORMATION AND KNOWLEDGE REQUIREMENTS

Planning teams require two main bodies of information to undertake a disaster risk sensitive land use plan: 1) disaster risk data (hazard, exposure and vulnerability data) or information; and 2) options and strategies for managing risk on the ground.

### DISASTER RISK DATA OR INFORMATION

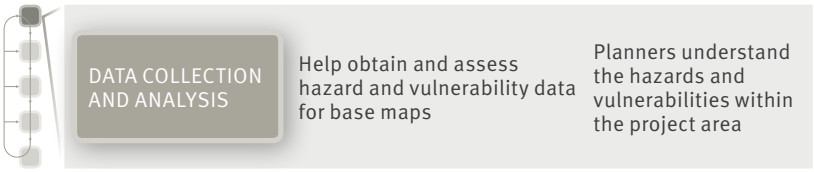
This can be provided via a number of different sources. The choice of source will be determined by what is available or affordable. Ideally, because the scope and nature of risk is always changing, a new, up-to-date disaster risk assessment should be conducted for each land use plan. These are usually undertaken by specialized technical agencies and require various forms of data or information that are sometimes hard or expensive to obtain. The DRM practitioner may be able to access specific DRM funds for undertaking a disaster risk assessment, but usually this is not the case. Since finding funds from the planning authority for a disaster risk assessment can be difficult, DRM practitioners will

need to pursue alternatives and think strategically. The process begins with discussions with the planning team on whether it has the capacity and resources to undertake a risk assessment, or at least identify the relevant hazards, during standard baseline data acquisition, surveying and analysis.

### OPTIONS AND STRATEGIES FOR MANAGING RISK

The DRM practitioner should have a broad understanding of possible DRM measures. Measures that can be used in the land use plan are either locational, to address exposure and regulate where urban development happens, or they are systemic or material, to address vulnerability and regulate how urban development happens. Measures need to be supported by incentives for compliance and one of the DRM practitioner's key roles is to help match DRM measures and appropriate incentives.

## THE DRM PRACTITIONER'S CONTRIBUTION TO URBAN LAND USE PLANNING




*The land use planning process begins by assessing different aspects related to land use in the planning area. These can include soil and vegetation assessments, land surveying and land suitability assessments, as well as socio-economic, infrastructural and industrial sector assessments. Sometimes data collection and analysis will be enabled by Geographic Information Systems (GIS). The aim is to generate a clear and holistic understanding of the current state of land use (GIZ, 2011).*

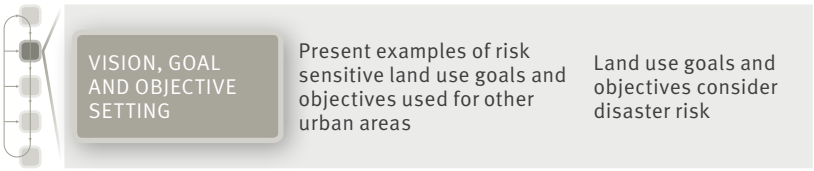
DRM practitioners do not need to understand the technical aspects of these assessments. However, they should actively engage the planning team and promote the gathering of as much disaster risk data and information as possible as part of the data collection and analysis phase. Useful questions to ask include:

- What existing disaster risk data (hazard, exposure and vulnerability) or information is available and how recent is it?
- If there is a lack of existing disaster risk information, what are possible ways to acquire it?
- Could disaster risk data be gathered during the general data collection phase? If so, will it be financially and technically feasible to do so?
- Will gathering disaster risk data during the data collection phase require a change in the data collection procedures followed?
- What are the best ways to gather disaster risk data during the data collection phase, and what are the tools needed to analyse this data in order to produce a disaster risk analysis?
- How is climate change likely to affect hazards in the area and what agencies can supply data and information on local level climate change?
- Are risk related questions raised in the design of relevant sectoral analyses such as public infrastructure, housing, industrial development and waste management?

From the data collection and analysis, the planning team should have a good understanding of:

- the key risks (hazards, vulnerabilities and capacities) in the planning areas;
- the high, medium and low risk zones;
- the zones that are prone to certain types of hazards;

- the most vulnerable groups and their location in the planning area, including the livelihoods of these vulnerable groups;
- the likely role of climate change in altering the intensity, duration or frequency of particular hazards; and
- the zones that have been identified as priority areas to plan and implement risk reduction measures.




*The planning team establishes a vision of future development in the planning area and sets goals and objectives for realizing the vision. These can be simple statements about the future social, economic and environmental conditions that the planners envisage for the urban area, or they can be more complex and detailed. These goals and objectives regulate and steer development by defining land use parameters for development. They are negotiated and often political and should be the product of dialogue and participation with civil society.*

DRM practitioner can discuss the disaster risk assessment with the planning team and support them to formulate land use goals and objectives that give due recognition to disaster risk. For example, rather than having "high growth" or "human well-being" as stated goals, making it "resilient growth" or "human well-being in resilient conditions" will help to open the way for the incorporation of DRM in the land use plan.

The following questions can help:

- Is the disaster risk significant enough to be mentioned in the land use vision?

- Given the risks, what are appropriate land use goals and objectives? How do these interact with overall urban development objectives?
- What are the key goals of past or current land use plans and how do these differ from land use goals that consider disaster risk?
- How can levels of vulnerability or exposure be positively or negatively influenced by the goals?
- Which goals provide the greatest opportunity for DRM?

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| FORMULATION | Help develop risk reduction options and measures<br>Help develop incentives for compliance with measures<br>Evaluate land use options against the risk context | When appropriate, land use strategies use risk reduction measures so that urban development in hazard prone areas is adequately protected |

*The planning team synthesizes the conclusions gathered from the assessments and formulates development options that will best achieve the objectives set. These options can range from simply prescribing the location of certain development activities (such as infrastructure projects) to comprehensive sectoral development policies. The body of the land use plan will usually contain both maps showing the intended spatial distribution of activities, and policy or ordinance giving specific instructions and specifications, often in relation to activities, land uses and/or zones within the maps.*

In order for a DRM practitioner to contribute effectively to this formulation process, familiarity with a number of land use tools and how they can support DRM is essential. The role of the DRM practitioner is to help land use planners to utilize the DRM components of these tools and put in place relevant incentives to support compliance. Tools include hazard zoning, urban form and densities, urban ecosystem management, planned resettlement, and critical facilities management (World Bank, 2012). These tools

can be used to varying degrees in both simple and comprehensive land use plans. | More detailed information is given in Chapter 3.4 |

TABLE 2 Example of land use planning based on flood probability

| Criteria used for flood zonation | Land use management policies |
|---|---|
| Zone 1<br>• Flood depth is less than 500 millimeters<br>• Flood duration is less than 30 days | In Zone 1 the following are allowed:<br>• Critical facilities such as schools and hospitals<br>• Residential areas |
| Zone 2<br>• Flood depth is less than 1 meter<br>• Flood duration is less than 60 days | In Zone 2 the following are allowed:<br>• Big buildings and big factories<br>• Residential areas |
| Zone 3<br>• Flood depth is between 1-3 meters<br>• Flood duration is 60 - 130 days | In Zone 3 the following are allowed:<br>• Agricultural activities<br>• Forestry |

*Source: Adapted from GIZ, 2011*

Such zoning can be supported by specific policies or measures that contribute to DRM as part of the land use plan. The DRM practitioner can contribute to the planning team's work by helping them to identify relevant policies. However, specifications for land use in particular zones is sensitive and often political.

There is a wide range of both physical (structural) and non-physical (non-structural) measures that can be included as policy for particular zones. Increasingly natural or green measures are also being deployed for DRM. Identifying the most appropriate, efficient and effective measures requires careful consideration and should be coupled with consideration of appropriate incentives. Because different measures are likely to be enforced and implemented by different municipal departments (e.g. Department of Housing, Urban Development, Environment, Energy, Water, Utilities etc.), participation from relevant departments in the formulation process is required.

TABLE 3 Examples of structural and non-structural measures for flood risk management in land use planning

| Measure type | Explanation | DRM rationale | Incentive |
|---|---|---|---|
| Density | Applying occupancy and density limits to areas or buildings | • Limit occupancy and floor area ratios in higher risk zones<br>• Encourage higher floor area rations in lower risk zones | Fiscal incentives, grants, floor area ratio allocation |
| Site selection | Avoiding development in high-risk areas | • Limit development in higher risk zones<br>• Encourage development lower risk zones<br>• Locate critical facilities in safe zones<br>• Strategically space hospitals and schools throughout the urban area | Fiscal incentives |
| Building form and design | Applying particular building code specifications | • Stipulate building controls such as high foundation walls, stilts, pilings, setbacks and minimum lot size depending on risk levels to protect existing and new development against flood | Access to finance, grants, subsidies |
| Green-space and ecosystems | Ensuring that relevant ecosystems are functioning | • Use zoning to conserve urban marshes, wetlands and waterways to enhance natural drainage capacity<br>• Zoning environmental buffer zones<br>• Use green-space for evacuation planning and safe havens | (municipal responsibility) |

Regulation is most effective when it is reinforced by adequate incentives that overcome obstacles to implementation. However, these incentives must not work at cross-purposes with other risk reduction or development tools. Finding the right mix of regulations and incentives and ensuring that they support overall disaster-resilient development is important.

DRM practitioners can support land use planners to match land use tools for DRM with incentives that will encourage compliance and complement development. This is best achieved by designing incentives at the same time and as an integral component of the land use regulation or measure. Designing incentives will require the involvement of municipal departments (department of revenues, taxation, utilities and services etc.) or national fiscal agencies, and banking and insurance institutions and other financial organizations. Cooperation from the private sector and community groups can also be beneficial. Incentives can be established at national or municipal level depending on the degree of support and can involve fiscal incentives, government subsidies and differentiated utilities services costs - if the utilities are publically owned. This requires strong government support. Possible incentives which can support land use planning measures for DRM include:

**Fiscal incentives**

- awarding tax breaks (e.g. land value tax, property tax, enterprise/commercial activity tax) to enterprises that undertake retrofitting of their existing building stock located in higher risk zones;
- awarding tax breaks (e.g. land value tax, property tax, enterprise/commercial activity tax) to enterprises that build in lower risk zones;
- awarding income tax breaks to household owner-occupiers that build in lower risk zones; and
- awarding income tax breaks to household owner-occupiers that undertake strengthening of their houses located in higher risk zones.

**Government subsidies, grants, and betterment opportunities**

- providing government subsidies to sectors or industries locating in lower risk zones;

- providing informal settlements with secured land tenure if they move to lower risk zones;
- providing informal settlements with better basic services if they move to a lower risk zones in which utilities and private sector will be more willing to invest; and
- providing special grants to hospitals and schools located in higher risk zones for retrofitting.

**Differentiated rates and services**

- allowing lower insurance policy premiums for properties in lower risk zones and higher premiums for higher risk zones;
- awarding higher floor area ratios to building projects which are located (or move to re-build) in lower risk zones;
- Pproviding easier and cheaper access to finance (small grants, loans, microfinance etc.) for development in lower risk zones; and
- Providing lower utilities services charges to households and businesses in lower risk zones (i.e. lower charges for water or electricity consumption).

The choice of incentives depends on institutional capacity, the availability of risk information, socioeconomic benefits to the community, and cultural orientation to risk. Given resource and time constraints, it may be most cost effective to design incentives which prioritise retrofitting of the most vulnerable buildings and critical facilities rather than tackle overall retrofitting of large urban areas.

Incentives for ecosystems management for DRM through land use land planning (i.e. conservation zoning, buffer zoning etc.) is becoming increasingly important (World Bank, 2013). Incentives for ecosystems management can focus on leveraging shared advantages. For example, restoring and conserving a degraded urban marsh or wetland because it can both contribute to better

BOX 9 Landslide risk maps for land use planning

Landslide risk maps were interpreted into risk scenarios for Patong Municipality, Thailand. City officials developed recommendations for risk management based on the level of exposure and risk of the various parts of the city with the objectives of impeding slope failure and reducing landslide risk. Recommendations included the demarcation of high-risk zones and prohibiting housing construction within them; applying protective cover such as vetiver grass, other appropriate vegetation and synthetic geo-textiles designed for protecting exposed slopes; and constructing rock cages (gabions), retaining walls, ditches and other structures to reduce erosion. Instead of relocating existing communities, local early warning capacity was improved for rainfall-induced land slide through training and the installation of additional rain gauges.

*Source: Dubot and Jayamanna, 2009*

natural drainage and thereby improve flood management and also provide food (e.g. fish, snails, water-based plants, water fowl) and livelihoods options (e.g. fishing, water produce harvesting, etc.) to local communities. Preferential taxes to groups who restore, conserve and use the wetland can be awarded (e.g.. local fisherfolk). Given that many ecosystems function at scales that go beyond individual municipal boundaries, such initiatives may require strong institutional coordination and cooperation.

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| ADOPTION | Support implementation of DRM measures<br>Raise awareness and train local enforcement officers on the plan's DRM features | Improved enforcement and implementation of the land use plan's DRM aspects |

*The plan is approved and adopted by the relevant entity or entities. This might be a municipal, district or central government agency. Following formal approval and adoption of the plan it becomes a legal document. Publication of the plan helps to ensure that all stakeholders are aware of their obligations under the plan and improves compliance.*

The DRM practitioner will have little scope for action except advocacy and awareness raising. Ensure that the adopting entities are aware of the relevance of DRM and the importance of a land use plan that includes DRM principles.

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| IMPLEMENTATION | Support implementation of DRM measures<br>Raise awareness and train local enforcement officers on the plan's DRM features | Improved enforcement and implementation of the land use plan's DRM aspects |

*The plan is implemented through the realization of the goals, objectives and measures and through general compliance with the regulations set forth in the plan and the incentives designed to support them. Depending on the scope of the land use plan, additional programmes may be established by the implementing agencies (such as sectoral or line departments of the municipal government, or private sector groups) for the realization of a certain component of the plan. Implementation is a slow process and usually happens over the course of many years, determined by the planning period for the plan.*

Publication and dissemination of the plan is the responsibility of the planning office, but the DRM practitioner can continue to raise awareness of the disaster risk components of the land use plan to ensure that they are well promoted and understood by communities and businesses. Awareness raising may involve public media campaigns highlighting the need for compliance in order to protect, and presentations to homeowners associations, professional bodies and key sector businesses during conferences and meetings. Awareness raising is most effective when it enables communities and businesses to understand the land use plan and how it will help to manage disaster risk in the urban area.

CASE STUDY

## Using earthquake risk maps for urban redevelopment planning and resettlement in Barangay Rizal, Makati City, Philippines

Urban redevelopment aims to physically transform an existing settlement in order to improve its overall quality of life. The City Government of Makati and Earthquakes and Megacities Initiatives (EMI) implemented the Risk-Sensitive Urban Redevelopment Planning in the neighborhood of Barangay Rizal in Makati City, Philippines. This neighborhood is highly vulnerable to earthquakes due to an active fault running through it, combined with unsafe and poorly constructed buildings in the neighborhood.

### How was earthquake risk integrated into the redevelopment plan?

A detailed earthquake risk map of Barangay Rizal and surrounding areas was produced. During the Redevelopment Plan's formulation (2008-2009), a series of planning workshops were held to ensure community ownership of the Plan and understanding of the high risk they faced. These workshops accepted opinions of the community and provided necessary education and training on disaster preparedness. Based on the risk information and input from the community, the Plan was formulated and included the following:

- A fault easement zone of 10 meters on both sides of the fault line. No form of development or structures is permitted in this zone, but it may be used as open space, a park, garden, playground or temporary market.
- Physical measures included a retrofitting programme for high risk structures, improvement of the road network for better traffic circulation and emergency evacuation, establishment of parks and open spaces, and a comprehensive relocation and rehousing programme for residents in high risk areas.
- Non-physical measures included a compensation scheme for those who were relocated from high-risk zones, added incentives to encourage engagement, improvement of socio-economic conditions through development of commercial centers and educational facilities, and enhancement of livelihoods, skills and entrepreneurship opportunities.

### What are factors for replicating this success?

**Clearly demarcated risk areas**: Initially the Plan encountered resistance from residents. This was in part due to a lack of understanding of the disaster risk by the community. Ensuring that risk maps and hazard maps clearly show dangerous zones is needed both to generate public support and for the planners to be able to clearly identify zones where the most drastic measures are necessary, such as relocation and no-build policies.

**Community dialogue**: Engaging communities in dialogue on possible measures is needed to increase ownership and understanding. DRM practitioners should understand the financial implications of applying a high-risk classification to a zone: property prices can plummet, individuals can lose substantial investments and insurance generally becomes more costly. Applying no-build and relocation policies to zones can have similar implications and discussion is needed for success.

**Prioritization of measures**: Elements in an urban redevelopment plan that require minimal resources can begin quickly. In Barangay Rizal these included traffic system improvements (road widening and clearing, traffic re-routing schemes) and capacity building for emergency management. However more costly measures such as expropriation, relocation and rehousing programmes require financial support and careful analysis of legal, political and financial implications.

*© Rowan Fraser / Makati, Philippines*

*Sources: Paran et al., 2010; JICA et al., 2004*

DRM practitioners can encourage municipal departments implementing or enforcing different DRM aspects of the land use plan to undertake trainings for their staff. It may also be necessary to play a coordinating role between departments as they collectively undertake implementation. See chapter 3.1 for more information on options for encouraging enforcement and implementation.

*Implementation and compliance need to be monitored. Monitoring requires that specific indicators are built into the plan and into any subsequent programmes to measure progress By analysing the levels of progress, the plan is evaluated. Based on the results of the evaluation, the land use plan is revised or a new plan is developed*

While evaluating specific land use practices is beyond the ability of most DRM practitioners, they can focus attention on the types of development occurring in high-risk zones and determine general compliance. DRM practitioners can continue to monitor practices when they can, and consider promoting good practices in regular advocacy as well as identify new risks over time.

## GOING FURTHER

Successful and comprehensive integration of DRM into urban land use management requires long-term support. DRM practitioners can consider:

- **Sustained public awareness raising of the need for land use planning compliance**. DRM practitioners can undertake ongoing public awareness raising campaigns using public media, including radio, TV and internet advertising, as well as flyers and brochures, in order to sensitize the public to the need for increased compliance with land use planning regulations in order to achieve lasting disaster risk reduction and increased safety. Such messages are effective if the public understands that compliance can save them the lives of their friends and families, as well as save them money and time, in the event of a disaster.
- **Incorporating DRM into supporting documents for land use planning**. These documents include codes of practice for land use planners and urban planners, as well as planning manual and guidelines, curricula for land use planning and urban development planning training courses and degree programmes, and certification examinations (i.e. for becoming a certified land use planner, or for joining national professional bodies such as National Planners Associations).

NOTES

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Chapter 3.3

# INTEGRATING DRM INTO INFORMAL SETTLEMENT UPGRADING

## OVERVIEW

Effective integration of DRM into urban management must consider informal settlements. These settlements, also called slums, shantytowns and squatters settlements, are areas where poor quality housing has been built on land for which occupants have no legal claim. They are characterized by inadequate access to safe water, sanitation and other infrastructure, poor quality housing, overcrowding and insecure residential status (UN-Habitat, 2006). These conditions make informal settlements highly vulnerable to many sorts of hazards including natural hazards. They are also typically highly exposed because they are often located in hazard-prone areas such as river banks and steep slopes. In some cities, informal settlements account for a larger percentage of the total urban population than formal settlements (UN-Habitat, 2010).

Increasingly, upgrading initiatives are community-driven and focus on supporting the development of community-based organizations to determine their own needs (Yap, 2010). Participation of the community is key and community-lead in-situ development is generally the most successful. These initiatives can be large-scale, comprehensive citywide upgrading programmes undertaken in urban areas all over the country or smaller projects in a single settlement. Initiatives can be backed by national or local governments, CSOs or community groups and supported by domestic or international funding or through some community-based saving scheme. Ideal upgrading initiatives are citywide and multi-sector; they focus on addressing the underlying causes of

informal settlements, reconciling land tenure issues and urban management (World Bank, 2013).

Given the diversity of initiatives, and the absence of a single formal process for upgrading, DRM practitioners need to be flexible and strategic when engaging in informal settlement upgrading initiatives. Communities benefit from the technical support of DRM practitioners. The DRM practitioner can help communities identify, understand and manage disaster risks, and facilitate the implementation of ground-level, low-cost DRM measures. Above all, this work will involve interventions that strengthen community capacity, build relationships and form collaborations.

## THE GOALS OF THE DRM PRACTITIONER

By engaging in informal settlement upgrading initiatives, the DRM practitioner aims to ensure that:

- upgrading initiatives adequately consider the level and nature of disaster risk, and promote the reasonable responsibility of communities and their leaders to manage and reduce those risks;
- communities are generally aware of the disaster risk to which they are exposed and adequate disaster preparedness and response plans are in place; and
- tools and instruments used for informal settlement upgrading include the adequate management of disaster risk by reducing existing risk, managing remaining risk and ensuring that new risk is not created.

FIGURE 5 The DRM Practitioner's contribution to informal settlement upgrading process

**Getting Started**

- Identify informal settlements upgrading initiatives
- Make contact with communities and stakeholders

| PROCESS | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| WINNING SUPPORT FROM COMMUNITY REPRESENTATIVES | Promote DRM to representative community groups<br>Link DRM with community priorities | Community recognizes DRM as a component of upgrading |
| GATHERING COMMUNITY INFORMATION | Support the gathering of disaster risk information<br>Undertake high visibility community risk mapping | Community understands its disaster risk |
| SUPPORTING ACTION PLANNING AND IMPLEMENTATION | Identify DRM measures<br>Support the implementation of DRM measures | Improvements made to housing and living standards adequately incorporate DRM measures |

**Going Further**

- Integrating DRM into the work programs of organizations dedicated to informal settlement upgrading
- Support linkages between formal and informal DRM and emergency systems
- Undertake ongoing awareness raising
- Undertake training for homeowners

## GETTING STARTED

The DRM practitioner can begin by gathering information on current and upcoming initiatives for informal settlements upgrading in the urban area. The municipality's department of housing, urban development or social affairs should have a list of informal settlements and relevant upgrading initiatives. The DRM practitioner can meet with the municipality's relevant department to gather information on upgrading initiatives. However, given the nature of community action, upgrading initiatives are not always approved or even known by local government. Similarly, meeting with community networks and housing groups can provide useful information (e.g. the Asian Coalition for Housing Rights).

Broadly, three types of upgrading are common across the region (Cities Alliance, 2011):

- **In-situ upgrading** involves public sector support given to communities in informal settlements to improve the settlement in its present location. Such improvements often include securing land and property titles to encourage household investment; installing or extending public utilities or infrastructure (e.g. water, sanitation etc.); providing public services (e.g. schools, health care, recreational facilities etc.); and developing a local governance or management mechanism.
- **Public social housing** is a relocation strategy whereby government moves informal settlement communities to subsidized housing, which is sold or rented to them at below market rates.
- **Sites and services** is a relocation strategy whereby governments provide sites, with services and utilities in place (such as water and electricity) to households for subsequent development by the household itself.

BOX 10 Examples of common in-situ upgrading initiatives and scope for DRM

**Comprehensive upgrading projects**

These initiatives require adequate support in order to supply the necessary land, buildings, services and credit. They offer significant scope for comprehensive treatment of disaster risk in informal settlements. Such projects include:

- international or national programs for upgrading with support from the local or national government;
- citywide (i.e. multi-settlement) upgrading projects with support from the local government; and
- single settlement upgrading projects.

**Small upgrading projects**

Smaller projects allow for specific DRM interventions such as improved water management, or better health facilities. They usually have a much smaller budget and require careful consideration to maximize DRM potential. Such projects include:

- housing improvements
- walkways and road improvements;
- improvements to sanitation, drainage and potable water supply;
- improvements to facilities such as schools and health clinics; and
- improvements to green-space (parks, gardens, plots).

**"Soft" upgrading**

The main entry point for DRM in these projects involves raising community awareness of DRM, protecting livelihoods from disaster and improving financial support to home owners/occupiers for improved home improvements. Such projects include:

- regularization and legalization of the settlement (i.e. land tenure, titling);
- improvements in education and health - including pollution and toxicity issues; and
- better use of financial systems, including loans and credit, savings groups, social funds, government subsidies.

*Sources: Wakely and Riley, 2011; Cities Alliance, 2008; Asian Coalition for Housing Rights, 2012; World Bank, 2013*

Given the high vulnerability of informal settlements, DRM practitioners can effectively contribute to almost all upgrading initiatives. However, before engaging local communities and program representatives, the DRM practitioner may consider prioritizing:

- settlements located along river banks and on hillsides because these are often the most exposed;
- upgrading initiatives which have achieved high-levels of public and political support because these are more likely to succeed; and
- settlements with well established community groups and representation because this will facilitate linking DRM with community needs, lend legitimacy to DRM decisions and generally lead to more sustainable, long-term management of disaster risk in these areas.

## SUPPORTING DRM INFORMATION AND KNOWLEDGE REQUIREMENTS

Organizations involved in informal settlement upgrading initiatives will require different data or information from the DRM practitioner depending on the type of initiative. Broadly, the DRM practitioner can contribute four types of information:

- **Risk information on the informal settlement**. For in-situ upgrading, it is necessary to understand the hazards and vulnerabilities of the informal settlement. This information can most easily be acquired by talking with community groups in formal or informal interviews, or by undertaking a community enumeration (see below: Support the gathering of disaster risk information).
- **Risk information for potential new sites**. For relocation initiatives, communities and governments need to identify safe land. DRM practitioners support site selection using

risk sensitive land use plans | see Chapter 3.2 |, referencing risk assessments undertaken at city level, or by talking with communities adjacent to potential new sites in order to understand hazard, exposure and vulnerability in these areas.

- **Specific grassroots, low-cost risk treatment measures**. For in-situ, and to a lesser extent for relocation initiatives, the DRM practitioner can engage with local communities to determine common grassroots, low-cost risk treatment measures, as well as introduce new measures and facilitate the coordination of measures to be implemented.
- **DRM services and systems**. Upgrading initiatives will be most successful at reducing risk when the informal DRM services and systems are linked to the formal ones. The DRM practitioner can support community groups, CSOs and local governments by educating them about the formal services and system available in the urban area and nationally, such as early warning systems, emergency response services and evacuation planning.

## THE DRM PRACTITIONER'S CONTRIBUTION TO INFORMAL SETTLEMENT UPGRADING

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| WINNING SUPPORT FROM COMMUNITY REPRES | Promote DRM to representative community groups<br>Link DRM with community priorities | Community recognizes DRM as a component of upgrading |

*Communities are at the center of informal settlement upgrading initiatives; they drive the design and vision of the project or plan. Governments, CSOs as well as international assistance can all participate in the project design and implementation, but the community and its needs determine the parameters of the project, the core activities and overall management.*

## PROMOTE DRM TO REPRESENTATIVE COMMUNITY GROUPS

Within any upgrading initiative, the DRM practitioner can approach the community in question and promote DRM. This is especially effective if the community has representative community structures in place so that transparent and collective decisions can be made concerning DRM within the community. Leaders of transparent representative structures can also negotiate more effectively with governmental authorities, CSOs and others for improved services. Such advocacy for DRM can focus on linking DRM with community priorities.

## LINK DRM WITH COMMUNITY PRIORITIES

Those living in informal settlements face considerable daily challenges and hardships. DRM is far more likely to succeed if it is tied into community priorities and perceptions. Given the day to day nature of living for most informal settlement dwellers, the gains for any investments of efforts must achieve results that benefit lives in the short term. For this to occur, the DRM practitioner needs to listen to community members, and base actions on community priorities. For example, if a community priority is to improve walkways through the settlement, the DRM practitioner can seek to ensure that this includes walkways for informal emergency services access and the provision of walkways along evacuation routes.

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| GATHERING COMMUNITY INFORMATION | Support the gathering of disaster risk information<br>Undertake high visibility community risk mapping | Community understands its disaster risk |

*During the project preparation and community organization phases of the upgrading initiative, information is gathered on the community and its living environment. This ranges from a discussion with community elders on key aspects of community life,*

*to a simple inventory of assets, houses and households, to a more comprehensive community enumeration. The community then uses the information generated to define specific upgrading activities.*

## SUPPORT THE GATHERING OF DISASTER RISK INFORMATION

Hazard information can be generated simply by discussions with community groups. The following questions can guide this:

- What hazards events do households face?
- How often do hazard events occur?
- What is the degree of impact of these hazard events?
- Which households are most effected? Which are least effected? Why?
- Which population groups are most vulnerable and why?

In larger or more comprehensive upgrading initiatives, an enumeration may be undertaken. This is the process by which communities count, list and document the lands they occupy and typically include household surveys, vacant land surveys and overall settlement profiles (Patel, Baptist and D'Cruz, 2012). The DRM practitioner can seek to ensure that enumerations include specific questions on historical hazard events, exposure and vulnerabilities, such as those listed above.

## UNDERTAKE COMMUNITY RISK MAPPING

Community risk mapping provides a powerful means of engaging community members to consider risks within settlements and how these risks can be managed through mitigation and preparedness planning, including evacuation planning. The DRM practitioner can help communities to use the disaster risk information gathered in order to identify areas of high, medium and low risk within the settlement area and to map these areas using colored pens and large sheets of paper.

Risk maps should identify key information, including dangerous places such as flood or landslide prone areas, gathering points on high ground or in safe shelters to be used during hazard events, and the locations of medical or emergency services. It is important that risk maps are developed through a participatory process of community consultation and engagement, which provides accurate information, and ensures greater ownership and understanding of the risk maps. Once completed, risk maps should be large and permanent, displayed like a billboard or large sign at important points in a settlement, often near water collection points or at main road junctions.

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| SUPPORTING ACTION PLANNING AND IMPLEMENTATION | Identify DRM measures<br>Support the implementation of DRM measures | Improvements made to housing and living standards adequately incorporate DRM measures |

*Community groups and upgrading initiative partners formulate an action plan detailing concrete steps for securing the desired change. Relevant parties then implement the actions identified in the plan by the defined deadline.*

## IDENTIFY DRM MEASURES

Action planning is an important process into which DRM practitioner can integrate DRM. The goal of action planning is determine what needs to be done, who is going to do it, by when and with what resources. Interventions are determined by the severity of settlement conditions, exposure levels, population and housing density, overall housing conditions, tenure status and community readiness. The DRM practitioner's role during this process is to guide the community to systematically consider disaster risk during throughout the action planning process. In some cases, information gathering and action planning essentially happen

at the same time, and sometimes action planning measures are identified first and then information is gathered around these.

If in-situ upgrading is not feasible, and the project team opts for relocation, the DRM can contribute by helping to identify low-risk sites and to ensure that building regulations for the site are followed. There is little point in relocating the community to hazard-prone sites. The DRM practitioner may need to engage with municipal housing departments on this point, to advocate on

BOX 11 Protected and secure housing for the poor is an investment with good returns

Governments often complain that giving support to communities for housing is an added expense that exceeds their small budgets. However, in all types of informal upgrading initiatives, governments are discovering that secure housing for the poor is both a social and economic investment in their societies.

In Thailand, under the Ban Mankong project (see Case Study: Upgrading for resilience in Bang Bua informal settlement, Bangkok, Thailand), the government's subsidy for urban poor housing development was about USD 2,000 per house. The initial government subsidy was in turn complemented by a further investment of USD 4,500 on average from each household in the form of a loan for housing and land, and then a further USD 1,000 in contributions from the community and other stakeholders. Total investment in each house was approximately USD 7,500. This is just for the physical asset (the house).

From its initial investment of USD 2,000 per house, the government can receive returns over the long-term. The house can now generate government taxes and becomes an asset for the urban area. There are also non-monetary benefits such as the improved legitimacy, security, social cohesion, health and welfare of the household that contribute to improved human resources of the urban economy. Ensuring that this investment is protected makes good financial, economic and social sense. By using DRM to increase the safety of residents and the physical integrity of the house, the government is making a long-term commitment to protecting its economic asset base.

*Source: Adapted from Asian Coalition for Housing Rights, 2012*

| TABLE 4 | Examples of grassroots, low-cost DRM measures for in-situ upgrading |
|---|---|

| Type | Action |
|---|---|
| Structural | • Increasing inclination of roofs (for better run-off without damaging roof constructions)<br>• Changing direction of roof inclination (so rainwater is discharged without causing damage that may potentially result in landslides)<br>• Installing provisional gutters as roof eaves (so rainwater is discharged without causing damage/landslides)<br>• Replacing mud walls with brick walls (to better withstand heavy rains and floods) and wooden pillars with metallic ones to better withstand earthquakes<br>• Improving electricity installations by covering cables and putting electric connections higher up, out of reach of expected flood levels<br>• Regularly replacing corrugated iron, wooden pillars and beams (to better withstand rain or earthquake impacts) |
| Environmental | • Planting grasses, shrubs and trees to prevent landslides<br>• Planting shrubs and trees to create windbreaks<br>• Using the natural environment as an information source to analyze risk situations (river level, clouds)<br>• Cutting down bigger branches and trees located close to houses (to minimize the risk of them falling down and causing damage during storms) |
| Non-structural | • Diversify income sources by taking (additional) jobs outside own settlement, or carrying out different jobs simultaneously<br>• Copying construction types and/or economic risk reduction strategies from neighbors<br>• Monitoring disaster-related changes (e.g. level of river, clouds) and establishing related information structures |

behalf of the community for safe site selection. Advocacy may be most successful if the DRM practitioner shows housing department officials using facts and figures that the new housing is a public investment in need of long-term protection, and not a public expense (see Box 11). | For more information about site selection see Chapter 3.1 and 3.2. In addition, if the identified works are large, or tie into greater infrastructure or capital expenditure projects see DEVELOPMENT ⁂ 3.4 for further guidance |

| | |
|---|---|
| | • Improving roof fixing (to better withstand earthquakes and windstorms)<br>• Repairing public infrastructure that passes through the settlement, such as wastewater pipes and drains (to avoid flooding and related contamination)<br>• Building provisional water channels with corrugated iron or cement (to discharge rainwater without causing damage/landslides)<br>• Building fences of recycled materials to hold back soil (reducing the risk of landslides) and/or to prevent children from falling (fences can be made of corrugated iron, mattress springs, wooden pillars and wire netting)<br>• Compacting soil (to reduce the risk of landslides and minimize damage caused by rain and earthquakes)<br>• Building retaining walls or embankments from old tires, stones and cement; old tires and soil; bricks and cement; stones only; nylon bags filled with soil and cement; and other materials (to reduce the risk of landslides). |
| | • Cleaning waste from slopes, drains, waterways and roofs (to reduce the risk of flood caused by blocked waterways and drainage systems)<br>• Clearing objects blocking the flow of rivers, such as tires, plastic sheets, mattresses and branches or other natural debris (to reduce the risk of flood) |
| | • Establishing local committees for risk reduction<br>• Including risk reduction activities in the work portfolio of the local executive committee, for example, monitoring of risk situation, distribution of plastic sheets, information on evacuation, clearing of waste from slopes, accessing help from government<br>• Asking for help (mostly for construction materials) from different organizations, political parties and/or the municipality |

*Source: Adapted from Wamsler, 2007*

For in-situ upgrading, the DRM practitioner can guide the community to consider the likely effects of upgrading on the risks faced in the community by:

- using the risk information generated earlier to identify high, medium and low risk areas and corresponding hazards;
- identifying the low-risk locations where works can be undertaken during upgrading;

- considering the possible effects (both positive and negative) of these works on known risks; and
- considering whether these works are likely to create new hazards.

When selecting measures, it is important to remember that households in informal settlements are already familiar with many simple DRM measures. However, many measures are only useful in the short term and for specific households. Some household measures may even exacerbate risk in the community as a whole over the long run. For example, households that cut down trees, especially on slopes, in order to strengthen houses can cause wider deforestation issues, possible leading to landslides. It is important that DRM practitioners guide community groups to select those measures that strike a balance between addressing current risks and avoiding future risks.

Grass-roots, low-cost measures are in many cases the only realistic option because formal retrofitting and the strict application of disaster-resilient building regulations will exceed the financial capacity of low-income families (World Bank, 2013). Once security of tenure is obtained, these DRM-based measures can greatly facilitate incremental improvements to housing and the development of disaster-resilient low-income housing areas. Table 3 illustrates the measures that are all practiced in informal settlements.

Community savings groups that build, use and manage their own savings are the fundamental building block of financial management in informal settlements. Under the upgrading initiative, a certain amount of funding will be available for implementation but the DRM practitioner may have to explore additional sources of funding for DRM components. This can include government and non-government subsidies, micro-credits, family savings, and mutual or self-help labor efforts.

In addition to low-cost, grass-roots DRM measures, DRM practitioners can consider utilities upgrading that reduce risk by lowering vulnerability, such as improved connections to potable water supplies, improved wastewater and drainage systems, and improved electricity supply. While community groups can implement components of these upgrades, a public or private sector utilities company may be best. DRM practitioners can help to establish a partnership for improved utilities services in the settlement in order to reduce vulnerabilities. Such partnerships will also bring advantages to the utilities company, in the form of expanded revenue.

When selecting DRM measures as part of the upgrading initiative, it may be necessary to sensitize urban managers to the importance of DRM. Practitioners can use the argument that improvements to low-income settlements are a good investment by the municipal government and worthy of protection. | see Box 7 |

## SUPPORT THE IMPLEMENTATION OF DRM MEASURES

The main role of the DRM practitioner during implementation is to ensure that communities (and contractors if applicable) can achieve implementation of the DRM measures. This may require working with masons, engineers or environmentalists to give trainings on specific construction or planting techniques for homeowners and those involved in implementation. However, most measures being straightforward and in the hands of the community, the DRM practitioner is mainly expected to coordinate and guide where needed.

CASE STUDY

## Upgrading for resilience in Bang Bua informal settlement, Bangkok, Thailand

The Bang Bua squatter community, in northern Bangkok, Thailand, is located on land owned by the Treasury Department, Ministry of Finance. The community is home to 264 families. The settlement was characterized by unstable housing built over polluted canal waters with poor basic public services and sanitation and exposed to flooding. Further issues included marginalization, a lack of social cohesion within the community, a lack of education, the threat of eviction, social disorder and low, unreliable income.

**How was community vulnerability reduced in the Bang Bua informal settlement?**

The Ban Mankong National Collective Housing Program aims at addressing physical and socio-economic vulnerabilities and providing housing security to urban slum dwellers whose tenure right on current settlements is insecure or not legally recognized. Under this program, Bang Bua community reduced vulnerability by:

- Factoring risk information into layout and design decisions: *Using Guidelines on Process and Steps in Community Layout and Housing Design* the community sought to ensure that design and layout considerations included risk information (Community Organizations Development Institute, 2009). The new community layout stipulated a minimum set-back from the canal bank. A shared community recreation area was also planned, as well as an elevated cement walkway along the canal that provides road access to the community in times of high water.
- Implementing structural strengthening: Structural measures focused on establishing a resilient structural housing design in compliance with building codes and in response to risk assessment findings. These measures permitted housing to be upgraded without relocation. This involved strengthening housing and providing access to electricity and water supply services as well as proper sanitation.
- Ensuring housing security: An affordable long-term leasing agreement was reached with the Treasury Department, and the existing community savings groups successfully mobilized the community fund reserve to ensure consistent payment.

**What are factors for replicating this success?**

During the 2011 floods, the Bang Bua community was the least affected informal settlement in the Bangkok area. The project's success is notable because it was:

- Centered on the community: Nobody knows the locality better than the community itself. The dominant role of community members in upgrading Bang Bua helped achieve housing safety and security and promoted a culture of cooperation. Increased awareness within the community of its vulnerability prompted increased commitment to engaging in the project, and guidelines on risk sensitive development were easily accessible and presented simply for all community members to understand.
- Implemented by the community: The Bang Bua community has used local builders and contractors in the construction, significantly reducing building costs as well as improving the building skills and practices of locally available human resources and enhancing a culture of labor sharing among community members, strengthening the community network.

*© Adipat Patmanothai / Bangbua, Thailand*

*Sources: ADPC and Action Aid Thailand, 2011; Community Organizations Development Institute, 2009*

## GOING FURTHER

In order to strengthen the integration of disaster risk reduction into informal settlements upgrading, DRM practitioner can consider:

- Integrating DRM into the work programs of organizations dedicated to informal settlement upgrading. DRM practitioners can consider communicating with local, national or regional CSOs that specialize in informal settlement upgrading initiatives and support the integration of DRM into their programs and initiatives by sharing experiences and encouraging further work.
- Strengthening connections between the informal and formal sectors. DRM practitioners can affect lasting change by seeking to form better connections between systems, groups, and practices in informal settlements with formal, mainly public sector counterparts. For example:
  - help community volunteers develop emergency support either by linking into formal emergency services (i.e. fire service, paramedic, policy services etc.) or by developing community-based fire services, "first responders" or emergency wardens;
  - facilitate the linking of formal early warning systems and informal early warning systems;
  - support improved road connections, by improving thoroughfare planning in around the informal settlement for evacuation and emergency services access; and
  - ensure that municipal government figures are invited to the completion ceremony of the upgrading initiative. This can reinforce connections and allow for informal interactions and lead to further governmental support for DRM-enhanced upgrading activity.

- Advocating for the revision of relevant shelter policy. DRM practitioners can advocate for the revision of local Shelter Codes, Housing Policy or pro-poor urban development schemes so that DRM is factored into the policy and seen as an implicit component of future housing development for poor communities. | see DEVELOPMENT 3.1 about integrating DRM into policymaking |
- Sustained programs for capacity building of informal settlement communicates. The DRM practitioner can continue to facilitate training for homeowners in DRM measures for ongoing housing improvements which may have begun as a result of the upgrading. Especially useful is joining households with more experience with household with less experience for knowledge transfer. In addition, the DRM practitioner can continue to raise awareness for disaster risk in the settlement by maintaining the risk maps in prominent positions and ensuring that community groups regularly monitor disaster risk and keep the community informed.

NOTES

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Chapter 3.4

# INTEGRATING DRM INTO CRITICAL FACILITIES EMERGENCY MANAGEMENT

## OVERVIEW

Critical facilities that are well protected from the impacts of hazards and continue to provide essential services during disaster response and recovery, are a crucial component of effective urban DRM. This is because critical facilities provide front-line support during response and recovery, in addition to their primary role of driving urban economic growth and social development (UNESCAP, 2006).

Critical facilities range from water treatment plants for water supply, hydropower dams and distribution stations to government buildings. Construction of critical facilities is usually defined by a municipal development plan (master plan, city development strategy etc.), which specifies which critical facilities, and more generally what critical infrastructure, needs to be built during the planning period. These facilities are large investments of public and private money. They are considered "critical" because any disruption of service or operations will have a negative impact on public order and safety.

In order to ensure continuity of operation and service, an emergency management plan is elaborated by an emergency management committee or planning team comprising staff from across the organization and with strong support from upper management. Typically, the team will include management, support services, emergency services and communications staff from the organization. It can also include community

representatives, municipal stakeholders and representatives from local emergency response services such as fire service or the police. Emergency management plans specify measures in the form of standard operating procedures, facility maintenance and improvement, staff trainings and emergency drills. Emergency management plans for critical facilities aim at protecting these investments against hazards. Sometimes, plans specifically target natural hazards, such as floods or cyclones, but it is more common for them to concentrate on one or a selection of the following hazards:

- fire
- hazardous materials incident
- pollution
- communications failure
- radiological accident
- explosion
- animal disease/agricultural hazards
- civil disturbance
- terrorist attack
- human error

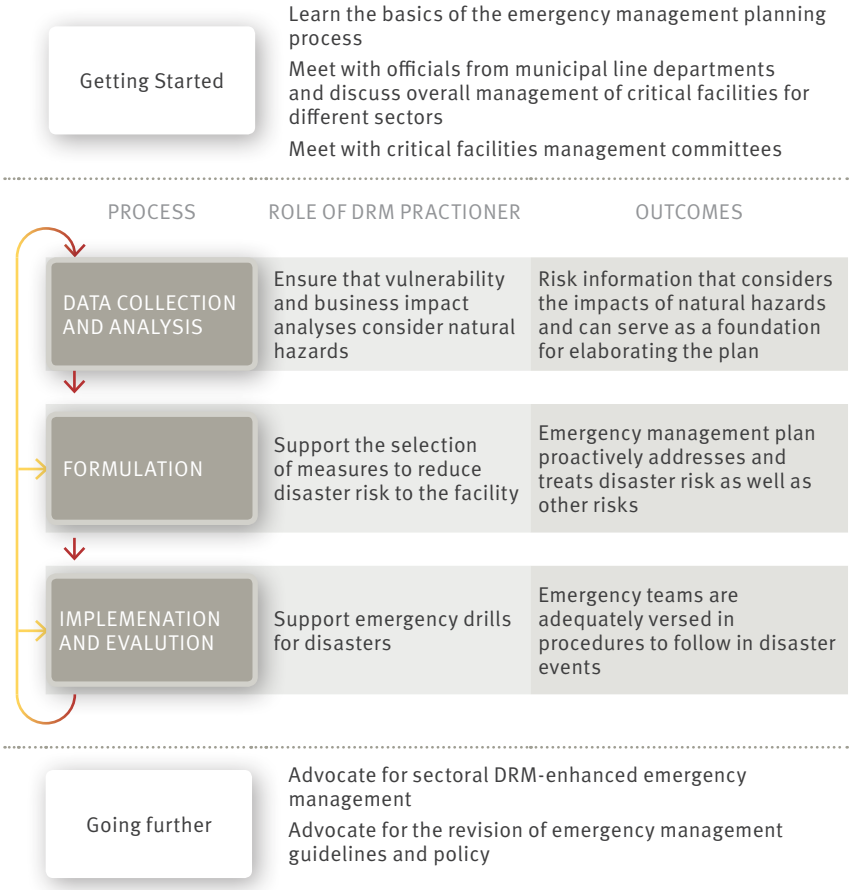
The role of the DRM practitioner is ensure that risk related to natural hazards is successfully considered during the preparation of the emergency management plan and that specific risk reduction measures for ensuring continued operations in the event of a natural hazard are incorporated. In this chapter, the focus will be on hospitals and health care facilities, schools, fire service units and police stations. However, the advice given can be applied to all types of critical facilities (including privately owned and operated facilities). In addition, the advice given in this chapter focuses on integrating DRM into the management of existing critical facilities; for information on integrating DRM into the appraisal and formulation of new projects | see DEVELOPMENT ⁂ 3.4 |

## THE GOALS OF THE DRM PRACTITIONER

The goals of the DRM practitioner are to:

- ensure that the emergency management plan is founded on a vulnerability analysis that includes natural hazards; and
- ensure that the emergency management plan lays out clear measures for strengthening the critical facility.

FIGURE 6 The DRM practitioner's contribution to integrating DRM in critical infrastructure protection



## GETTING STARTED

### LEARN THE BASICS OF THE EMERGENCY MANAGEMENT PLANNING PROCESS

Emergency management is the process of emergency preparation, impact reduction, response and recovery. Planning is only one component of emergency management; training, conducting drills, testing equipment and coordinating community activities are also vitally important to successful emergency management. An emergency management plan identifies hazards and vulnerabilities, determines critical components of the facility or organization for prioritized protection, and elaborates concrete protection measures. A range of staff from across the organization usually executes the plan, with support from upper level management. The fundamental aspects of the process can be grasped from a meeting with a mid-level official of the relevant municipal department (i.e. emergency operations department, office for occupational safety, office of civil defense, etc.) or the national agency tasked with overall emergency management.

### MEET WITH MUNICIPAL OFFICIALS TASKED WITH MANAGING CRITICAL FACILITIES SECTORS

The DRM practitioner can meet with mid-level municipal officials of the education department to discuss school buildings, the health department to discuss hospitals, the office of internal affairs or security to discuss the police and fire stations. The DRM practitioner may seek understand the following:

- Who owns the main schools, hospitals, police stations and fire stations? Is it public sector or private sector or a mixture of both sectors? What levels of government or types of private companies are involved (e.g. domestic or foreign)?
- In the urban area, which facilities are most vulnerable? Has there been an assessment or appraisal undertaken?

- Have there been any recent emergencies or disasters that have affected the critical facilities? What were the effects? What were the estimated costs?
- Is there an emergency management committee tasked with the overall management of particular types of critical facilities (e.g. schools)? If so, what is the committee's role and mandate?
- Is there any sector wide emergency management plans in place (e.g. an emergency management plan for all hospitals in the urban area)?

**BOX 12** Making the case for DRM enhanced emergency management planning

Successfully integrating DRM into a critical facilities emergency management plan requires upper management support. Ideally, the chief executive would direct senior management to get involved. When presenting the case for DRM enhanced emergency management, it is best not to linger on the negative effects of natural hazards (i.e. death, damage to equipment and property, loss in revenue). The DRM may instead choose to focus on the positive effects of thorough preparedness such as:

- it helps public sector organizations fulfill their responsibility to the public by protecting lives and property and enhancing public safety and well-being;
- it helps private sector organizations protect their employees, as well as share-holder interests;
- it facilitates compliance with regulatory requirements;
- it enhances the organization's capacity to recover from financial losses, regulatory fines, loss of market share, damages to equipment or products, or business interruption;
- it reduces exposure to civil or criminal liability in the event of a disaster;
- it enhances a organization's or municipal line department's image and credibility; and
- it may reduce insurance premiums.

The DRM can use these arguments when meeting with critical facilities operators and management committees to help garner support for DRM enhanced emergency management planning.

*Source: Adapted from FEMA, 1993*

### MEET WITH CRITICAL FACILITY MANAGEMENT COMMITTEES

In order to engage the operators and management committees of critical facilities, the DRM practitioner can prioritize the largest or busiest critical facilities and seek a meeting with the emergency management committee, or with a staff member of upper management. Discuss the state of emergency management planning for the critical facility, such as whether an emergency management plan exists, how up to date it is, and if it considers natural hazards.

DRM practitioners can also determine any legal provision made for controlling risk. Many countries subject companies to legal obligations and minimum requirements for risk and crisis management. According to these regulations companies are expected to maintain operations through any kind of disruption up to a crisis. For companies providing essential services such as sanitation and energy, management plans of the company's utilities should legally include some form of risk management.

## SUPPORTING DRM INFORMATION AND KNOWLEDGE REQUIREMENTS

In order to integrate DRM into emergency management planning for critical facilities, the DRM practitioner can seek to provide two main types of information:

- **Information on the natural hazards to which the facility is exposed and information on the facility's and organization's vulnerabilities to these hazards**. In emergency management, information on hazards, vulnerability and risk is generated using quantitative and qualitative assessments (most often in the form of a business impact analysis or BIA) and is the foundation of the emergency management plan. While assessments are

habitually undertaken for emergency management plans, they often fail to adequately consider natural hazards and vulnerabilities to these, focusing instead on fire (the most common of all hazards in emergency management) and other hazards. The role of the DRM practitioner is therefore to support the inclusion of natural hazards in this assessment so that relevant information can be generated and used in the plan formulation stage.

- **Strategies and measures for strengthening the facility's and the organization's capacity to withstand and recover from the effects of natural hazards**. Emergency management plans usually provide structural, non-structural and operational measures and strategies. The role of the DRM practitioner is to ensure that these adequately treat natural hazards as well as standard emergency hazards such as fire and power outage.

## THE DRM PRACTITIONER'S CONTRIBUTION TO CRITICAL FACILITIES EMERGENCY MANAGEMENT

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| DATA COLLECTION AND ANALYSIS | Ensure that vulnerability and business impact analyses consider natural hazards | Risk information that considers the impacts of natural hazards and can serve as a foundation for elaborating the plan |

*Upper management forms an emergency management planning team, or utilizes an existing management committee for this task. The size of the planning team depends on the size and complexity of the critical facility and its operations and resources. The planning team acquires budget for planning costs, and has upper management authority to undertake the planning. The team undertakes a review of internal plans and policies, engages with outside experts and groups and identifies codes and regulations.*

*The team's most important task is to assess the vulnerability of the facility and the probability and potential impact of each emergency type.*

The DRM practitioner can contribute actively during data collection and analysis in order to ensure that risk related to natural hazards is properly diagnosed and understood by the planning team. The practitioner can consider:

- Ensuring that all internal plans and policies related to natural hazards are included in the relevant review. Internal reports of previous disaster events and their impacts on this facility, if available, can be included in the review.
- Including natural hazard experts and groups such as hydrologists, meteorologists, and seismologists when meetings with outside organizations so that the planning team can acquire information on local natural hazards and any policy or guidelines for managing these.
- Ensuring that seismic safety codes; zoning regulations in relation to floods, landslides and other natural hazards; building codes with specific natural hazard specifications are identified by the planning team.

When undertaking a vulnerability analysis, the planning team begins by listing potential emergencies stemming from different hazards (see common hazards in the Overview above).

Typically, emergency management plans are drafted separately for each emergency type. For example, a hospital may have two emergency management plans, one for fires and one for power outage or failure. The DRM practitioner can advocate for the preparation of an integrated, multi-hazard emergency management plan at this stage. This can be an effective way of integrating emergency management for natural hazards. In emergency management planning, about 80 per cent of management strategy is common and can be deployed regardless

of hazard, and 20 per cent involves hazard-specific management strategies and measures.

When the planning team is identifying potential hazards, it is essential that the planning team recognizes, considers and analyses natural hazards as well as more common secondary hazards such as fire and technological hazards. If any form of hazard map of the area is available, it may be used to support the planning team to identify the types and characteristics of natural hazards acting on the facility's site. If resources are available, an engineer can undertake an analysis of the facility's site characteristics for flood, high wind (storm, hurricane etc.) and earthquakes, which will provide the planning team with more precise information. | see Chapter 2.2 for more information on diagnosing disaster risk |

Once relevant hazards are identified, the team estimates potential impact to humans and property, and estimates the probability of occurrence. This commonly takes the form of a business impact analysis (BIA) estimating the monetary losses likely to be suffered due to an emergency. The BIA assesses costs (i.e. loss of production, loss of materials or equipment replacement costs, etc.) linked to failures of certain components of the facility or its operations, and then allocates funding to treat vulnerabilities of these components and viable measures. The DRM practitioner needs to ensure that natural hazards continue to be considered for their impact on the property and operations of the critical facility.

| | ROLE OF DRM PRACTIONER | OUTCOMES |
|---|---|---|
| FORMULATION | Support the selection of measures to reduce disaster risk to the facility | Emergency management plan proactively addresses and treats disaster risk as well as other risks |

*The planning team formulates the emergency management plan. The plan includes a section on the core elements of emergency management for the facility. These core elements include typical*

*maintenance and facility improvement or development measures, as well as preventive measures to reduce wear and losses due to emergency events, operational measures, and management*

**BOX 13** Sector-wide approaches to earthquake emergency management for schools in Indonesia

Schools are important components of any DRM program for critical facilities. This is because, in addition to providing a general civic and academic education to their students, they can:

- raise the disaster awareness and preparedness of children (the next generation) through school lessons, activities and curricula
- raise the disaster awareness and preparedness of the community through adult education campaigns, trainings and workshops
- house victims of disasters and act as evacuation and logistics centers during disaster response and recovery

Emergency management for schools in Indonesia was improved as a component of the Indonesia Urban Disaster Management Project (1997 - 2003), initiated by the Asian Disaster Preparedness Center and implemented with the Department of Education of the city of Bandung, not far from Jakarta. This project took a city- and sector-wide approach to the emergency management of schools and sought to strengthen structural, non-structural and operational aspects of school buildings across the city by undertaking:

- Basic intensity zoning mapping and risk assessments for schools
- A campaign on earthquake awareness and preparedness for school children
- Training for school teachers on earthquake preparedness programming for school children
- Dissemination of information on earthquake preparedness for school children and adults in the form of leaflets, simple manuals and posters
- Design and implementation of resistant school building construction and retrofitting for post-earthquake reconstruction programs
- Training of engineers and local government officials on earthquake resistant school buildings
- Trainings of small contractors and craftsmen on construction of earthquake resistant buildings

*Sources: Kumar and Nandanwar, 2004*

*changes needed in order for the critical facility to continue operations in emergency events. Plans also include emergency management response procedures (often in the form of checklists), and supporting documents likely to be needed in an emergency.*

The DRM practitioner's main role during plan formulation is to guide the planning team in selecting appropriate and effective measures for reducing risk related to natural hazards. This can involve retrofitting the facility for improved functioning during emergency events. These can also be complemented by non-structural measures and operational measures. The DRM practitioner can consider the measures listed in Table 5. | see Chapters 3.1, and 3.2 for more information |

Because critical facilities are increasingly joint projects, undertaken in partnership between the public and private sectors, the responsible agent for implementation of risk reduction measures, including deadlines for completion and funding, need to be carefully considered during formulation. DRM practitioners may need to encourage commitment to DRM-enhanced emergency management planning by reminding management committees and stakeholders of the many benefits the plan will bring (see Box 12). Public-private partnerships in which the private sector operates the critical facility under lease from the public sector is the management arrangement most likely to cause complications. In these cases, the planning committee may have to refer to the original contractual obligations of each party, if sections on maintenance, upkeep or emergency are included, and legal advice may have to be sought.

After possible measures are identified, they are evaluated according to the capabilities and limitations of critical facility operators and owners, and assessed according to expected effectiveness. Capabilities include administrative, legal and regulatory structures, financial and human resources (e.g., a risk management department), and operational procedures and protocols, among other factors. Given limited resources and

TABLE 5 Overview of measures for critical facilities for reducing risk

| Measure type | Measure |
|---|---|
| Locational risk reduction measures | • Site selection: Locating new infrastructure facilities in low risk zones<br>• Relocation: Moving existing infrastructure facilities to low risk zones<br>• Redundancies: Developing redundant facilities (i.e. secondary and back-up facilities) in low risk zones |
| Structural risk reduction measures | • Protecting infrastructure facilities from hazards by establishing barriers (especially in the case of floods)<br>• Strengthening the structure and physical components of the facility |
| Operational risk reduction measures | • Establishing reserve capacity and reserve generation facilities<br>• Developing disaster management systems including contingency planning, evacuation planning and training, and early warning systems<br>• Identifying in advance alternative equipment for the infrastructure facility |
| Fiscal risk reduction measures | • Introducing insurance policies to allow operators to sustain physical damage to facilities by receiving compensation for the damage. This effectively shifts the risk from operators to insurance agencies. |

*Source: World Bank, 2012*

capacities, determine which risks will be treated and in which order. Each risk reduction measure may be assessed according to:

- the expected impact it will have on reducing risks and vulnerabilities;
- the probability that it will be implemented; and
- the existence of mechanisms for funding and leveraging of resources necessary to implement it.

DRM strategies should distinguish between pre-disaster and post-disaster actions. For many risk reduction actions, implementation is not feasible due to cost, acceptability and other factors. A disaster event changes such considerations given the need for reconstruction, the inflow of human and financial resources, and a renewed interest in reducing future disaster risk. Efforts to implement upgrading, and the use of new resistant technologies

BOX 14 Structural retrofitting measures for flood-proofing existing critical facilities

**Site modifications**

Determining measures for site modification requires careful considerations of hazard characteristics and the support of engineers. They include the following measures:

- Improving the site through the use of low banks is suitable for shallow flooding.
- A high earthen bank (levee) is most appropriate for collections of facilities due to its high cost and high consumption of land area.
- Floodwalls are freestanding, heavy walls designed to prevent the approach of floodwater.

**Retrofitting for dry flood-proofing**

Dry flood-proofing involves measures to render the building impermeable to floodwater:

- reinforcing the strength of the structural system of the facility to resist flood loads;
- reinforcing non-loadbearing walls to resist flood loads;
- installation of watertight doors and windows;
- watertight seals around points of entry of utilities lines such as water supply and sanitation systems; and
- methods to address seepage, especially an issue for long-duration flooding.

**Utility installations**

Damaged utilities components such as power generators, sanitation and water supply can contribute to overall costs and delayed re-occupancy of critical facilities. The following measures aim at protecting utilities components from flood damage:

- Relocate components to above flood level is the most effective protection measure and involves relocating utilities often housed in basements to mid-level, upper story or roof-top locations.
- Elevate components if located outside the building (i.e. on the grounds), external components can be elevated above flood levels.
- Protect components if components cannot be elevated, watertight enclosures or casings can be used.

*Source: FEMA, 2007*

often fall into this category. The start-up costs of taking such actions can be prohibitive, but when a disaster results in widespread damage the comparable cost of rebuilding versus the cost of upgrading may be negligible.

## IMPLEMENTATION

*The specified agents implement the emergency management measures described in the plan: structural renovations are made, training and evacuation drills are undertaken, non-structural and organizational changes are put in place. As the plan is implemented, the critical facility obtains an increasing capacity to withstand natural hazards.*

There is limited scope for effective action by the DRM practitioner during the implementation phase. The practitioner can play a general supporting role, and seek to maintain contact with responsible agents as implementation progresses and review progress reports. In terms of direct input, the DRM practitioner can focus on developing emergency drills for disaster events and ensuring that teams are adequately trained. These drills can focus on preparing and using checklists in the event of disaster and ensuring that management procedures internal to the critical facility are adequately understood (e.g. alert procedures etc.).

## EVALUATION

*The planning team or emergency management committee reviews the effectiveness of the emergency management plan. This is best assessed following emergencies, when the measures implemented under the plan will be tested.*

DRM practitioners can encourage that any evaluation fully assesses the effectiveness of DRM measures against natural hazards. This can be based on damage and loss reports prepared by the critical facility, municipal government or engineering firms following an emergency event triggered by a natural hazard.

## GOING FURTHER

Integration of DRM into critical facilities emergency management is a long-term and iterative effort. The DRM practitioner can contribute to this process by:

- **Advocating for sectoral DRM-enhanced emergency management**. After DRM has been successfully integrated into the emergency management plan for a specific health facility or school, for example, the DRM practitioner can campaign to take the initiative sector-wide. This requires strong political support from the relevant municipal line department, and ideally the relevant national line ministry as well.
- **Advocating for the revision of emergency management guidelines and policy**. Policy and guidelines for emergency management are set by national or local government. The DRM practitioner can advocate to the relevant government agency for the revision of these policy and guidelines in order that DRM becomes an inherent component. Additionally, the DRM practitioner can advocate for tightened legislation under which all critical facilities have to prepare DRM-enhanced emergency management plans. Such advocacy will benefit from clear facts and figures supporting the need for better emergency management of critical facilities and clearly identifying the benefits such changes would bring to urban communities and the economy..

CASE STUDY

## Using disaster risk information into the emergency management plan for Mittaphab Hospital, Vientiane, Lao PDR

In 2009, as part of the Hospital Preparedness for Emergencies program, the Disaster Committee of the management board of Mittaphab Hospital in Vientiane, Lao PDR, with support from the Ministry of Health, began to integrate disaster risk management into their emergency management planning process. Mittaphab is a major government hospital, the primary health service provider in the city during disaster and emergency events and the main referral hospital for provincial and district health facilities. However, despite the importance of the hospital, it lacked an adequate emergency management plan, relying only on protocols for fire hazard. Following a series of assessments, workshops and consultations with the hospital team, a multi-hazard emergency management plan based on disaster risk was developed.

**How was DRM integrated into the emergency management plan?**

- **Risk assessment**. The risk assessment evaluated the hazards that threaten the hospital site, facility and staff and can disrupt hospital operations. The assessment focused on the structural, non-structural and functional aspects of the hospital. The process was led by the Ministry of Health using a standard checklist to assess the safety levels of 145 components of the hospital. For each component a score was assigned according to its relative importance in contributing to the hospital's capacity to withstand disaster and continue functioning.
- **Formulation of an integrated emergency management plan**. Previously the emergency management team had produced an emergency management plan for fire hazard only; this plan was built upon to create an integrated, multi-hazard emergency management plan based on information gathered during the risk assessment and well-linked with local community plans and public safety agencies. The team developed the *Mittaphab Emergency Management Plan*. The plan aims at maximizing prompt and effective medical care during incidents that might otherwise disrupt the normal operations of the hospital. The objective of the plan is to optimally prepare the staff and institutional resources of the hospital for effective performance during disaster.

**What were the key factors for the success of the project?**

- **A willing and cooperative upper management**. The project benefited from strong support from upper management, which included the allocation of some funding and personnel to undertake the plan preparation, as well as commitment to implement the measures.
- **Strong support from the Ministry of Health**. The Ministry had a normative role to play. Undertaking DRM-enhanced emergency management was greatly facilitated because the Ministry had prepared national policies and guidelines on risk assessments, emergency preparedness and planning, and simulation exercises. This helped to provide the team with important technical guidance.
- **An existing emergency management committee with some experience in emergency management planning**. The Disaster Committee had previously prepared an emergency plan for fire hazard and was familiar with the basic concepts of emergency planning.

*© Phitsamai Khammanivong / Vientiane, Lao PDR*

*Source: Mittaphab Hospital, 2012*

NOTES

**SECTION 4**

# CONCLUSION

# KEY MESSAGES

**The DRM practitioner has an important role to play in shaping safe and sustainable towns and cities.**

Immediate action is required to counteract the growing disaster losses, both in terms of human lives and economic production, in towns and cities across Asia and the Pacific. Vulnerabilities and exposure in urban areas continue to grow. The scope and the need for effective urban DRM has never been greater. This handbook has given both strategic and practical options for operational implementation of DRM within a selection of urban management 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 ENGAGES URBAN MANAGEMENT TOOLS TO MANAGE RISK FOR BOTH THE EXISTING AND FUTURE URBAN FABRIC.

This demands an approach to DRM that is incremental, cyclical and undertaken over the long-term so that current and future urban development become increasingly resilient.

THE DRM PRACTITIONER PROMOTES THE CREATION OF INCENTIVES TO ENCOURAGE COMPLIANCE WITH URBAN DEVELOPMENT CONTROLS WHICH CONTRIBUTE TO DRM.

Without these, DRM may well be integrated into urban management tools, such as land use plans and building regulations, but may have little effect on the way urban development takes place on the ground.

THE DRM PRACTITIONER USES ADVOCACY TO GENERATE POLITICAL COMMITTMENT TO SUPPORT DRM WITHIN URBAN MANAGEMENT PROCESSES.

Clear political commitment to DRM from key actors, especially mayors, politicians and agency directors is important for effective DRM. Such commitment greatly facilitates the DRM practitioner's capacity to integrate DRM, especially when working with under-funded and over-tasked urban managers and agencies.

THE DRM PRACTITIONER RECOGNIZES THAT URBAN COMMUNITIES ARE THE PRIMARY AND LARGEST RESOURCE FOR DRM IN URBAN AREAS.

Therefore, effective DRM works with urban communities, aligns itself with their priorities and maximizes their capacity to understand and implement DRM.

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# GLOSSARY

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| **Capacity** | The combination of all the strengths, attributes, and resources available to an individual, community, society, or organization, which can be used to achieve established goals (IPCC 2012). |
| **Civil society organization** | Non-governmental and non-profit entities that seek to bring about positive social and environmental change. These include advocacy groups as well as organizations operating at the field level. Civil society organizations can be "multi-national" and international in nature, or small grass-roots groups (United Nations Global Compact, 2010) |
| **Climate change adaptation** | In human systems, the process of adjustment to actual or expected climate and its effects in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate (IPCC 2012). |
| **Critical facility** | All manmade structures or other improvements that, because of their function, size, service area, or uniqueness, have the poten¬tial to cause serious bodily harm, extensive property damage, or disruption of vital socioeconomic activities if they are destroyed, damaged, or if their functionality is impaired (FEMA, 2007) |
| **Disaster** | Severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery (IPCC 2012). |
| **Disaster risk** | The likelihood over a specified time period of severe alterations in the normal functioning of a community or a society due to hazardous physical events interacting with vulnerable social conditions, leading to widespread adverse human, material, economic, or environmental effects that require immediate emergency response to satisfy critical human needs and that may require external support for recovery (IPCC 2012). |

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| **Disaster risk financing** | Application of financial instruments as part of a systematic approach to managing disasters in order to anticipate, plan for, reduce, transfer, and respond to natural hazard events. It is intended to capture various financial mechanisms and policy options that enable greater financial resilience to natural hazards (ADB, 2012). |
| **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 (IPCC 2012). |
| **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 (IPCC 2012). |
| **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 (UNISDR, 2009). |
| **Environmental impact assessment** | Process by which the environmental consequences of a proposed project or programme are evaluated, undertaken as an integral part of planning and decision-making processes with a view to limiting or reducing the adverse impacts of the project or programme (UNISDR, 2009). |
| **Exposure** | The presence of people; livelihoods; environmental services and resources; infrastructure; or economic, social, or cultural assets in places that could be adversely affected (IPCC 2012). |
| **Hazard** | The potential occurrence of a natural or human-induced physical event that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, and environmental resources (IPCC 2012). |
| **Hydro-meteorological hazard** | Process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage (UNISDR 2009). |

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| **Informal settlement** | A residential area where a group of housing units has been constructed on land to which the occupants have no legal claim, or which they occupy illegally; ii) unplanned settlements and areas where housing is not in compliance with current planning and building regulations (unauthorized housing) (UN-Habitat, 2006) |
| **Landslide** | A mass of material that has moved downhill by gravity, often assisted by water when the material is saturated. The movement of soil, rock, or debris down a slope can occur rapidly, or may involve slow, gradual failure (IPCC, 2012). |
| **Land use planning** | The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long-term economic, social and environmental objectives and the implications for different communities and interest groups, and the subsequent formulation and promulgation of plans that describe the permitted or acceptable uses (UNISDR, 2009). |
| **Mitigation** | The lessening or limitation of the adverse impacts of hazards and related disasters (UNISDR, 2009). |
| **Municipality** | A city, town, or district enjoying some degree of local self-government or the governing body of such a unit (Collins Dictionary, 2013) |
| **Non-structural measures** | Any measure not involving physical construction that uses knowledge, practice or agreement to reduce risks and impacts, in particular through policies and laws, public awareness raising, training and education (UNISDR, 2009). |
| **Preparedness** | The knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate, respond to, and recover from, the impacts of likely, imminent or current hazard events or conditions (UNISDR, 2009). |
| **Prevention** | The outright avoidance of adverse impacts of hazards and related disasters (UNISDR, 2009). |
| **Recovery** | The restoration, and improvement where appropriate, of facilities, livelihoods and living conditions of disaster-affected communities, including efforts to reduce disaster risk factors (UNISDR, 2009). |
| **Residual risk** | The risk that remains in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained (UNISDR 2009). |

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| **Resilience** | The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions (IPCC 2012). |
| **Resilience** | The ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures and functions (IPCC 2012). |
| **Response** | The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduces health impacts, ensures public safety and meet the basic subsistence needs of the people affected (UNISDR, 2009). |
| **Risk** | The combination of the probability of an event and its negative consequences (UNISDR, 2009). |
| **Risk assessment** | A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods, or the environment on which they depend (UNISDR 2009). |
| **Secure tenure** | The right of all individuals and groups to effective protection from the State against forced evictions. Under international law, "forced eviction" is defined as "the permanent or temporary removal against their will of individuals, families and/or communities from the homes and/or land which they occupy, without the provision of, and access to appropriate forms of legal or other protection" (UN-Habitat, 2007). |
| **Storm surge** | The temporary increase, at a particular locality, in the height of the sea due to extreme meteorological conditions (low atmospheric pressure and/or strong winds). The storm surge is defined as being the excess above the level expected from the tidal variation alone at that time and place (IPCC, 2012). |
| **Structural measures** | Any physical construction to reduce or avoid possible impacts of hazards, or application of engineering techniques to achieve hazard-resistance and resilience in structures or systems (UNISDR, 2009) |
| **Sustainable development** | Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (UNISDR, 2009). |

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| **Urban agglomeration** | The built-up or densely populated area containing the city proper, suburbs and continuously settled commuter areas. It may be smaller or larger than a metropolitan area; it may also comprise the city proper and its suburban fringe or thickly settled adjoining territory (UN-Habitat, 2007). |
| **Urban development** | The development or improvement of an urban area by building (Collins Dictionary, 2013). |
| **Vulnerability** | The characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard (UNISDR, 2009) |

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