

GUIDANCE ON

# Land Use Planning



Tsunami Global Lessons Learned Project

**DISASTER  
RECOVERY  
TOOLKIT**

## **Citation**

2015, Disaster Recovery Toolkit, Tsunami Global Lessons Learned Project  
[www.adpc.net/tgllp/drt](http://www.adpc.net/tgllp/drt)

The Disaster Recovery Toolkit comprises of the following:

- 1) Handbook for Disaster Recovery Practitioners
- 2) Training Manual – Learning Workshop on Recovery and Reconstruction
- 3) Guidance on Critical Facilities
- 4) Guidance on Housing
- 5) Guidance on Land Use Planning
- 6) Guidance on Livelihood

ISBN 978-1-942960-00-3

**Copyright © Asian Disaster Preparedness Centre (ADPC) for  
the Tsunami Global Lessons Learned Project - Steering Committee, 2015**

Published by the Tsunami Global Lessons Learned Project Steering Committee  
(TGLLP-SC)

Dr. Kuntoro Mangkusubroto, Chair, TGLLP-SC

Mr. Satya S. Tripathi, Secretary, TGLLP-SC

This publication may be reproduced in whole or in part and any form for educational or non-profit purposes without special permissions from the copyright holder, provided acknowledgement of the source is made, ADPC on behalf of TGLLP-SC would appreciate receiving a copy of any publication that uses this publication as a source.

No use of this publication may be made for resale or for any other commercial purpose whatsoever without prior permission in writing from the Asian Disaster Preparedness Centre, SM Tower, 24<sup>th</sup> Floor 979/69 Paholyothin Road, Bangkok 10400 Thailand.



GUIDANCE ON

# Land Use Planning



Tsunami Global Lessons Learned Project

**DISASTER  
RECOVERY  
TOOLKIT**

# FOREWORD

■ Ten years have passed since the Indian Ocean Earthquake and Tsunami of December 2004. The consequences of this disaster have continued to unfold in the minds of individuals, the collective lives of affected families and communities, and within the framework of nations and the region as a whole. Indeed, the memory of this great tragedy is imprinted on the global mind. The loved ones of the more than 228,000 people who perished look back on this disaster every day. For the rest of us, the 10th anniversary provides an opportunity to reflect on the memory of these departed souls, and to think of those who were left behind in devastated families, communities and environments.

The recovery of the affected areas in the months and years since the event itself is an affirmation of human resilience and creativity in building solutions- and finding ways out- of the most challenging situations. It is out of respect to those who perished or suffered that we should take what lessons we can from such experiences, and use them to design better strategies for disaster response and recovery in the future.

With climate change proceeding apace, the notion of environmental vulnerability is becoming increasingly broad and hard to pinpoint: everybody is vulnerable, and because of this, our incentive to learn from what came before should be heightened.

The Tsunami Global Lessons Learned Project (TGLLP) was created with a view to gathering, learning from and sharing experiences relating to the 2004 earthquake and tsunami, and other disasters in the region that occurred between 1993 and 2013. The project sought to deliver three principle outcomes: a global lessons learned study, a Discovery Channel documentary tracking the recovery, and a disaster recovery toolkit for recovery practitioners.

The first of these outcomes was a report entitled *The Tsunami Legacy: Innovations, Breakthroughs and Challenges* which was officially released on 24 April 2009 at a ceremony at the United Nations Headquarters in New York. A few months later, in December 2009, a documentary on lessons learned, produced independently, was aired on the Discovery Channel.

At the launch of The Tsunami Legacy in 2009, an announcement was made regarding the development of a suite of handbook and guidance notes targeted specifically at recovery programme leaders and practitioners. The Disaster Recovery Toolkit forms the third deliverable, and it is this that has been developed by the Tsunami Global Lessons Learned Project Steering Committee (TGLLP-SC) in partnership with the Asian Disaster Preparedness Centre (ADPC). The 'Toolkit' is targeted at practitioners responsible for implementing recovery programmes, its objective to provide a 'how to' guide on development, implementing and managing complex post-disaster recovery programmes.

This document, *Guidance on Land Use Planning*, has been framed as a reference document to provide strategic guidance on incorporating DRR measures in land use planning during recovery and reconstruction. It also aims to accompany the handbook and the learning workshop module with key considerations on 'why and how' to bring DRR into land use planning during recovery and reconstruction.

Introducing this guidance, the TGLLP Steering Committee hopes it will help enhance the capacities of government agencies, especially central level agencies engaged in policy and strategy formulation for land use planning during recovery and reconstruction and supporting local level agencies, in undertaking recovery and reconstruction activities for the sector. The TGLLP-SC also hopes that the guidance will serve as a reference tool for development partners who work alongside the above agencies in land use planning during recovery and reconstruction.

- *Steering Committee of The Tsunami Global Lessons Learned Project*





# CONTENT

FOREWORD	2
ABBREVIATIONS	6
<b>INTRODUCTION</b>	<b>9</b>
1 Background	10
2 Purpose of this Guidance	11
3 Structure of this Guidance	11
4 Target Audience	11
<b>LAND USE AND POST-DISASTER R&amp;R</b>	<b>13</b>
1 Land Governance and Disaster Risk	15
2 Land Use Planning and Disaster Risk	16
3 Post-disaster Recovery and Land Use Planning	20
<b>RATIONALE TO INTEGRATE DRR INTO LAND USE PLANNING R&amp;R</b>	<b>27</b>
1 Preventing New and Re-development in Hazardous Areas	29
2 Conditions for Re-development in Hazardous Areas	30
3 Developing Risk-based Planning Systems	31
4 Environmental Protection	32
5 Addressing Past Planning Deficits	36
<b>KEY CONSIDERATIONS</b>	<b>39</b>
1 Emphasising Land Use DRR in Policies	41
2 Identifying Vulnerability and Exposure	45
3 Using Disaster Risk Information in Land Use Planning	46
4 Factoring in Environmental Issues to Reduce Exposure	48
5 Integrating DRR in Land Use Planning Tools	50
REFERENCES	56
ACKNOWLEDGEMENTS	57



# ABBREVIATIONS

<b>AADMER</b>	ASEAN Agreement on Disaster Management and Emergency Response
<b>ADRM</b>	Aceh Disaster Risk Map
<b>ARTF</b>	Afghan Reconstruction Trust Fund
<b>ASEAN</b>	Association of Southeast Asian Nations
<b>BMTPC</b>	Building Materials Technology Promotion Council
<b>BRR NAD-Nias</b>	Badan Rehabilitasi dan Rekonstruksi NAD-Nias (Indonesia) ( <i>Agency for the Rehabilitation and Reconstruction of Aceh and Nias</i> )
<b>CBA</b>	Community Based-Assessment / Communication-based Assessment
<b>CBO</b>	Community-based Organization
<b>CCA</b>	Climate Change Adaptation
<b>CFAN</b>	Coordination Forum for Aceh and Nias
<b>CSO</b>	Civil Society Organization
<b>CZMA</b>	CZM Authority
<b>DAD</b>	Development Assistance Database
<b>DALA</b>	Damage and Loss Assessment
<b>DRMS</b>	Disaster Risk Management Strategy
<b>DRR</b>	Disaster Risk Reduction
<b>DRR-A</b>	"Making Aceh Safer Through Disaster Risk Reduction in Development"
<b>ECHO</b>	European Commission for Humanitarian Aid and Civil Protection
<b>EIA</b>	Environmental Impact Assessment
<b>ERRA</b>	Earthquake Reconstruction & Rehabilitation Authority (Pakistan)
<b>GFDRR</b>	Global Facility for Disaster Reduction and Recovery
<b>GIS</b>	Geographic Information System
<b>GoTN</b>	Government of Tamil Nadu
<b>GPS</b>	Global Positioning System
<b>GSDMA</b>	Gujarat State Disaster Management Authority (India)
<b>HRNA</b>	Human Recovery Needs Assessment
<b>IASC</b>	Inter-Agency Standing Committee
<b>ICT</b>	Information and Communication Technologies
<b>IRP</b>	International Recovery Platform
<b>KPI</b>	Key Performance Indicator
<b>LIFT</b>	Livelihoods and Food Security Trust Fund
<b>MDF</b>	Multi Donor Fund for Aceh and Nias
<b>MDTF</b>	Multi-Donor Trust Fund



<b>M&amp;E</b>	Monitoring and Evaluation
<b>MHJ</b>	Ministry of Health
<b>MoU</b>	Memorandum of Understanding
<b>MPTF</b>	Multi-Partner Trust Fund
<b>NCRC</b>	NGO Coordination and Resource Centre (Nagapattinam, India)
<b>NDRF</b>	National Disaster Response Force (India)
<b>NDRF</b>	National Disaster Response Framework (USA)
<b>NWFP</b>	North-Western Frontier Province
<b>OCHA</b>	Office for the Coordination of Humanitarian Affairs
<b>ODA</b>	Official Development Assistance
<b>OSD</b>	Officer of Special Duty
<b>OSDMA</b>	Orissa State Disaster Mitigation Authority
<b>PAK</b>	Pakistan-Administered Kashmir
<b>PDNA</b>	Post Disaster Needs Assessments
<b>PHC</b>	Primary Health Centre (India)
<b>PONJA</b>	Post-Nargis Joint Assessment
<b>PONREPP</b>	Post-Nargis Recovery and Emergency Preparedness Plan
<b>PR</b>	Periodic Review
<b>RADA</b>	Reconstruction and Development Agency (Sri Lanka)
<b>RAN</b>	Recovery Aceh-Nias Database (Indonesia)
<b>RIAS</b>	Recovery Information and Accountability System
<b>R&amp;R</b>	Recovery and Reconstruction
<b>SAARC</b>	SAARC South Asian Association of Regional Cooperation
<b>SIFFS</b>	South Indian Federation of Fishermen Societies
<b>SIM</b>	Social Impact Monitoring
<b>SLF</b>	SL framework or SLA framework (according to IFAD)
<b>SNEHA</b>	Social Need Education and Human Awareness
<b>TCCC</b>	The Coca-Cola Company
<b>TCG</b>	Tripartite Core Group
<b>TGLL</b>	Tsunami Global Lessons Learned
<b>TGLLP</b>	TGLL Project (UNDP publications never wrote TGLLP)
<b>TGLLP-SC</b>	TGLL Project Steering Committee
<b>TRIAMS</b>	Tsunami Recovery Impact Assessment and Monitoring System
<b>UN ECHA</b>	United Nations Executive Committee for Humanitarian Affairs
<b>UNF</b>	United Nations Foundation
<b>UNISDR</b>	United Nations International Strategy for Disaster Reduction
<b>UNORC</b>	United Nations Office of the Recovery Coordinator for Aceh and Nias
<b>USD</b>	United States Dollar
<b>VTC</b>	Volunteer Technology Community





# INTRODUCTION

# 1 BACKGROUND

Over the past few decades, there has been an increasing trend in the rate of disaster events. At the same time, there has been a series of high impact disaster events (intensive risk events)<sup>1</sup> during the first decade of the 21st century across the world, notably in Asia.

It is commonly observed that, in addition to other vulnerability factors, a poor understanding of hazards present in a given location has compounded disaster risks, which could have potentially been mitigated by planning and development, including land use planning and development control regulations (e.g. building regulations). For example, mitigation could have been undertaken for settlements along flood plains, on steep slopes prone to landslides and in earthquake prone zones. Failure to mitigate can be attributed to a disconnect between development, scientific research, disaster management and environmental communities, a lack of information and understanding of hazards, weak governing capacities, and a lack of awareness on the role of land use planning in reducing disaster risks through structural and non-structural measures.

Past experience shows that post-disaster recovery and reconstruction of many cities and communities has been at the original location, with relocation only taking place during major disaster events.<sup>2</sup> Considering the repetitive exposure of communities to natural hazards, there is an increasing awareness of disaster risk reduction (DRR) measures during post-disaster recovery and reconstruction, which provides a window of opportunity to enhance the safety of affected communities. The 'Build Back Better' principle during post-disaster recovery and reconstruction should address underlying vulnerabilities and calls for avoiding ad-hoc reconstruction activities. Missing such opportunity exposes the communities to future hazards and traps them in a cycle of disasters.

Depending on the nature of hazard and extent of damage, communities have a choice to either reconstruct in the same area (*in-situ*) or resettle in a new location. In the case of *in-situ* recovery and reconstruction, planning should address the underlying risk factors that contributed to the event. In the case of resettlement, planning should reduce exposure

1 Intensive Risk Events: The risk associated with the exposure of large concentrations of people and economic activities to intense hazard events, which can lead to potentially catastrophic disaster impacts involving high mortality and asset loss (UNISDR).

2 For example: San Francisco, U.S (earthquake) 1906; Tokyo, Japan (earthquake) 1923; Kobe, Japan (earthquake) 1995; Bhuj, India (earthquake) 2001; Aceh, Indonesia (earthquake and tsunami) 2004; New Orleans, U.S. (cyclone and floods) 2005; Kashmir, India and Pakistan (earthquake) 2005; Irrawady Delta, Myanmar (cyclone) 2008, were rebuilt in the same area with only some resettlements.

and vulnerability to existing and future risk factors. In this context, land use planning can be a powerful disaster risk management tool.

## 2 PURPOSE OF THIS GUIDANCE

This guidance is a practical reference tool for incorporating DRR measures into land use planning in the post-disaster recovery and reconstruction context. It draws lessons from past disaster recovery and reconstruction operations, particularly the 2004 Indian Ocean tsunami and other recovery and reconstruction processes in Asia. This guidance emphasises the need for adopting a participatory and flexible approach to support the aspirations of the affected people, ensure a smooth recovery process, and support long-term development.

## 3 STRUCTURE OF THE GUIDANCE

This guidance aims to:

- Explore the nexus between land governance, land use planning and disaster risks, and current practices in land use planning during post-disaster recovery and reconstruction.
- Provide a rationale for integrating DRR into land use planning during post-disaster recovery and reconstruction.
- Outline key DRR considerations in land use planning during post-disaster recovery and reconstruction at the level of both policy and local level planning to support the broader goal of build back better.

## 4 TARGET AUDIENCE

The guidance serves as a reference for a wide variety of stakeholders, including government agencies and development partners. However it is primarily targeted at central level government agencies engaged in recovery and reconstruction, land use planning, strategy formulation, and who are supporting local level agencies in undertaking recovery and reconstruction. In addition, the guidance serves as a reference tool for development partners who work alongside the above agencies in supporting recovery and reconstruction.







# LAND USE AND POST-DISASTER R&R

# 1 LAND GOVERNANCE AND DISASTER RISK

Disasters are intimately connected to development choices made by individuals, communities and nations, which can pave the way for unequal distributions of disaster risk (UNDP, 2004). Disaster risks are historically constructed through human activities. Physical exposure to natural hazards is much higher in Asian countries than in the rest of the world (UNDP, 2004).

About 75 percent of the world's population lives in areas affected at least once between 1980 and 2000 by earthquake, tropical cyclone, flood or drought.  
*UNDP, 2004*

Recent studies on disaster risk trends and patterns reveal that disaster risks are increasing, highly concentrated geographically and unevenly distributed (GAR 2009). While there has been an upward trend in the number of disaster events and the number of people affected, there has been a decline in the number of people killed, which reflects a decrease in certain vulnerability factors as countries develop. However, the decrease in vulnerability has not been enough to compensate for the increase in exposure through population growth. In addition, underlying risk drivers, such as poor governance, ineffective land use planning, weak and inadequate infrastructure, vulnerable livelihoods and declining ecosystems contribute to a disaster scenario after an extreme natural hazard event (GAR 2009, UN Habitat 2009, UNDP 2004).

Land governance<sup>3</sup> plays an important role in shaping overall development patterns as well as disaster risk. Vulnerability to natural disaster risks stems from unsustainable land use, poor urban planning, landlessness, weak land administration and land-related discrimination, which reflect weak land governance (UN Habitat 2010). The table on the next page highlights the land characteristics and nature of vulnerability.

<sup>3</sup> Land governance concerns the rules, processes and structures through which decisions are made about the use of and control over land, the manner in which the decisions are implemented and enforced, and the way that competing interests in land are managed (UN FAO and UN Habitat 2009).



## LAND CHARACTERISTICS AND THE NATURE OF VULNERABILITY

Characteristics	Nature of disaster vulnerability
Unsustainable land use	Land/coastal zone degradation Severe erosion/landslides or landslips Flooding/inundation Marginal or unsafe settlements
Poor urban planning	Unsafe settlements Inappropriate and unaffordable zoning building codes and standards Weak institutional capacity
Landlessness	Lack of access to shelter solutions Lost livelihoods Social conflict
Weak land administration	Incomplete/lost/fraudulent/out-of-date land data Insecurity of land tenure Weak institutional capacity
Land-related discrimination	Insufficient access to land services and institutions of justice Insecurity of land tenure Lack of access to land Eviction/land grabbing

SOURCE: UN- Habitat 2010

While the scope of these Guidelines include the integration of DRR measures into land use planning during post-disaster recovery and reconstruction, it also equally emphasises related land issues so as to improve land governance and enhance the resilience of communities.

## 2 LAND USE PLANNING AND DISASTER RISK

Land use planning is a public policy exercise that designates and regulates the use of land in order to improve a community's physical, economic and social efficiency and well-being.<sup>4</sup> Land use planning decision-making takes place at national, regional or state levels, as well as city or local levels through centralised and decentralised planning systems. Policy provisions set by the national level guide the sub-national planning process in line with national development goals. More detailed land use planning takes place at the city or local level through the local government (with greater detail at lower levels). Local land use planning is generally developed in cities and towns, while rural areas are covered by regional plans. These guidelines focus on cities and towns while touching on some aspects of rural areas.

In the past very little consideration was given to the effects of natural hazards on the built environment at the time of planning, due to a lack of knowledge and understanding of hazards (discussed in the previous chapter). Though there are instances of communities having been sensitive to hazard risks through indigenous knowledge, thereby avoiding high-risk areas or adapting settlement and construction patterns to the local environment, factors such as rapid economic growth, scarcity of land, inadequate or nonexistent land use planning and weak enforcement mechanisms have led to unplanned development that does not take into account natural hazards and risks. Success and failures in land use policies can be directly observed in urban areas in most countries. According to International Federation of Surveyors (FIG 2010), over 70% of growth currently occurs outside the formal planning process, and 30% of the urban population in developing countries lives in slums or informal settlements.

4 Safer Homes, Stronger Communities: A Handbook for Reconstructing after Natural Disasters, The World Bank, 2010

Contemporary land use planning cuts across various sectors such as urban development, coastal zone management, natural resource management, environmental management, and agricultural and water resources. While land use planning concepts have changed from single objectives to multiple objectives, legal and policy frameworks have not been adequately flexible to incorporate changing planning goals or feedback in the development process. Inconsistencies between various sectoral policies and regulations, as well as their links to broader socio-economic development plans (land, agriculture,

## THE COASTAL REGULATION ZONE IN INDIA

With population growth, poor development planning, and exploitation of natural resources along the Indian coast leading to significant degradation of coastal resources, in order to protect and conserve coastal resources and the environment, the Ministry of Environment and Forests (MoEF) issued the Coastal Regulation Zone (CRZ) notification in 1991 under the Environment (Protection) Act of 1986. Prior to the CRZ notification, two other notifications were made: the Prime Minister's directive in 1981 to restrict developmental activities within 500m from the coast line, and the Environmental Guidelines for Development of Beaches (1984) from the Department of Environment and Forests (DoEF), mandating environmental impact assessments (EIAs) for construction 500m and beyond from the high tide line. However, these two regulations were not followed by state governments, which have local authority.

The CRZ Notification of 1991 and several later amendments attempted to regulate developmental activities by prohibiting certain activities along the CRZ area. However, the Coastal Zone Management Plan (CZMP) and its implementation through the Coastal Zone Management Authority (CZMA) were weak in most coastal states, leading to large-scale violations. In addition, significant constraints and problems were found by an expert committee, including the application of uniform regulations for diverse coastal environment, ambiguities and lack of clarity of terminologies in the notification, poor structuring of additional notifications, lack of awareness, lack of enforcement, lack of funding and an attitude of resistance. Acting on the expert committee report, the MoEF amended the Coastal Regulation Zone in 2011 to address the above-mentioned issues.

### SOURCE

Report of the Expert Committee on Coastal Regulation Zone Notification-1991, Ministry of Environment and Forests, 2005. [http://tnenvis.nic.in/images/mssrf\\_report.pdf](http://tnenvis.nic.in/images/mssrf_report.pdf)



urban development, environment, coastal zone management) have led to fragmented implementation of conflicting policies. The box on *page 13* illustrates the case of the Coastal Regulation Zone. Its implementation in India represents many of the issues faced by developing nations.

With an increasing frequency of recurrent disaster events and with improved understanding and knowledge of hazards and their characteristics, hazard and vulnerability assessments on the built environment are currently being undertaken in many urban areas. Vulnerability can be reduced through structural changes (developing hazard resistant buildings, dykes and drainage systems) and non-structural measures (improving emergency preparedness and response capabilities, early warning systems, land use planning, building codes and design, evacuation shelters, contingency plans and emergency response teams). While the above measures minimise vulnerability, they have a limited impact on reducing disaster risk if there is weak enforcement and capacity. It is also costly to retrofit once development has taken place without DRR considerations (WB 2011). The case of Jakarta is discussed in the box on the next page, describing how disaster risk increased (from extensive risk to intensive risks) as the city expanded rapidly, and explaining the measures taken to mitigate the hazards.

Legal and policy frameworks need to incorporate DRR into land use planning, as part of broader efforts in both development planning and recovery planning. A few Asian countries such as the Philippines, Indonesia and India have taken steps to address DRR. The California (U.S.) code incorporates natural hazard safety in the land use planning process. It has demonstrated that a combination of education, outreach, and mutually supporting policies linked to state-designated natural hazard zones can form an effective framework for enhancing the role of land use planning in reducing future losses from natural disasters.<sup>5</sup>

<sup>5</sup> Charles R. Real, California's Natural Hazard Zonation Policies for Land-Use Planning and Development, *Journal of Disaster Research*, 2010

## EXTENSIVE RISK TO INTENSIVE RISK EVENTS – JAKARTA CITY

Greater Jakarta, one of Asia's megacities, is home to approximately 29 million people. Around 40% of the city lies 1m to 1.5 m below sea level, and large parts of the city experience regular floods every year during the monsoon season. The city's population has tripled since 1970 with rapid growth, rural to urban conversion, and uncontrolled development leading to housing shortages and the expansion of squatter settlements. Rapid growth of the city also led to encroachment on lakes and other bodies of water, as well as shrinkage in water retention capacities. Vulnerability to flooding was further compounded by a lack of maintenance of the canal system, poor urban planning, and ground subsidence due to excessive ground water exploitation, resulting in an increased flood risk of 1:25 years and a return period of more than 1:5 years. Over the past several years, flood mitigation projects were implemented to improve the drainage capacities of the canals. However, over time, an extensive risk of yearly floods of the city reconfigured into an intensive risk of flood events.

The floods of 2002 and 2007 are considered to be two of the most severe events in the recent history of Jakarta. The 2007 floods inundated 70% of the city, causing severe disruption to day-to-day life and resulting in an estimated loss of USD 900 million.

While past structural mitigation measures had reduced risk, the city still faced a serious challenge. Land use planning and water management were not well connected within the overall planning process. Recognising the underlying vulnerabilities and multiplicity of issues including climate change-associated risks such as sea level rise, the Jakarta Flood Risk Management plan addresses both structural and non-structural measures. The Spatial Planning Law 26/2007 stipulates the requirements of open space and provides authority to the local government (provincial and district), to control zoning, planning of permits and implementation of incentives and disincentives.

### SOURCES

- 1 Cities and Flooding A Guide to Integrated Urban Flood Risk Management for the 21st Century, GFDRR 2012
- 2 [http://www.mlit.go.jp/kokudokeikaku/international/spw/general/indonesia/index\\_e.html](http://www.mlit.go.jp/kokudokeikaku/international/spw/general/indonesia/index_e.html)
- 3 Akinobu Murakamia et.al.(2005); Trends in urbanisation and patterns of land use in the Asian mega cities Jakarta, Bangkok, and Metro Manila, Landscape and Urban Planning 70 (2005) 251–259



### 3 POST-DISASTER RECOVERY AND LAND USE PLANNING

Post-disaster recovery planning starts immediately after a disaster event. Among other factors, the scale of recovery efforts depends on the nature of disaster, and the damage and the sectors affected. Sectoral recovery strategies need to establish close links and collaboration with other sectors. *(For more details on recovery planning, please see Chapter 2 of the Handbook for Disaster Recovery Practitioners).*

HB

Land-related issues, in particular, have significant impact on other sectoral strategies, from transitional shelter to recovery and reconstruction to overall outcomes. The table below summarises the potential impacts on sectors and associated land issues during the recovery process.

#### SUMMARY OF POTENTIAL DISASTER IMPACTS ON LAND AND HUMAN RELATIONSHIPS WITH LAND

Disaster impacts	Areas affected	Associated land issues
Destruction	Land Housing Infrastructure Land records	New suitable land for shelter, livelihoods and infrastructure Tenure security for house reconstruction Land and property disputes Hazardous land, risk reduction
Displacement	Shelter Protection Livelihoods	Site selection, planning and management Secure access to land for vulnerable groups Secure access to land for livelihoods Housing, land and property rights for displaced persons
Deaths	Shelter Protection	Secure access to land for durable shelter solutions Secure access and rights to land for widows and orphans Degraded Government response capacity

SOURCE: UN-Habitat, 2010

Pre-existing land related issues such as land use, land tenure and vulnerability (*see the table on the previous page*) are further magnified by disaster events and have significant impact on the overall recovery process. The central dilemma during the recovery phase is whether to rebuild in the same location or to relocate to a safer location. Settlement planning that is responsive to the wide range of needs and values for resettled or returning populations after disasters is a complex task. The decision of whether and what to relocate should be made fast, before ad hoc reconstruction overtakes the situation (Lundin 2011 and World Bank 2012). In a state of flux, governments and communities most often look at short-term needs while deciding between in-situ reconstruction or relocation, thus overlooking long-term ramifications. The section below further explores current practices of recovery and reconstruction.

## **IN-SITU RECONSTRUCTION**

In-situ reconstruction remains the preferred approach for rebuilding damaged housing and restoring infrastructure and services, as it often represents the cheaper, simpler and faster option for rebuilding affected houses while maintaining vital social, cultural and economic connections with the original site and neighbourhood (WRC 2011). In the case of cities, rebuilding occurs at the same location and with the same general form following all but the most catastrophic disasters, due to economic and social networks that are more resilient than buildings. The economic functions of the city will usually continue after the disaster and residents will try to locate their homes in a way that maintains pre-disaster social networks (Olshansky et al 2006). However, in practice, almost all urban housing reconstruction programmes involve at least some resettlement due to disaster risk mitigation considerations (such as site-specific vulnerabilities), loss of inhabitable land, serious urban management and land use issues, slum upgrading, and insecure or temporary tenures for residents in illegal pre-disaster squatter settlements (WRC 2011).



In general, most major post-disaster reconstruction efforts focus on rebuilding with a new or updated master plan with structural and non-structural mitigation measures, or with only structural mitigation measures. For example Aceh, Indonesia and Bhuj City, India developed new master/development plans after their respective tsunamis and earthquakes, whereas in Kobe the recovery plan was adapted from the city's 1995-2005 General Plan, approved four days prior to impact (Balachandran, B.R, ADB).

Planning restrictions on land use are common after natural disasters,<sup>6</sup> among various criteria in recovery planning. Cost-benefit analysis on the various risk reduction options will influence decisions on structural and non-structural mitigation measures. However, structural measures through enhanced building codes have been a primary means to mitigate the impact of future hazards. Hazard-resistant structures have been synonymous with the introduction of new materials and construction techniques during reconstruction, including reinforced concrete structures to replace traditional materials and practices. Without use of those materials, as well as proper training and proper construction practices, safety is often compromised. For example in Ghaen, Iran, building models promoted as earthquake resistant after the 1980 earthquake were inadequate and collapsed during the 1998 earthquake, as the buildings were deficient both in design and construction quality (ALNAP, 2008).

While many affected communities are susceptible to multiple hazards, risk reduction through hazard-resistant structures often focuses on the most recent incident, while ignoring other risk factors (including environmental risks). For example, it is not sufficient to only build earthquake-resistant structures in a community that is also prone to flooding, and which requires other structural and non-structural measures such as improved drainage systems.

<sup>6</sup> (ALNAP 2008)



In addition, planners are constrained by social, political, and economic issues. With reconstruction pressure and weak regulations enforcement during recovery processes, growth continues in high-risk areas. For example in Aceh, land issues posed a significant challenge not only due to damage to land records and changes in topography and boundaries, but also due to the reconstruction of permanent houses that began in many communities without a land use plan. Though land use planning is a powerful tool to address DRR, it has been underutilised during the recovery process (Smith 2009).

Most reconstruction programmes still occur with non-existent or inadequate land tenure records. With population growth and urbanisation there has been a significant increase since the 1980s of people occupying lands and buildings without tenure. People without land tenure are reluctant to invest in better construction, which contributes to unsafe construction (UN OCHA). Failure to address land tenure and security, particularly regarding tenants and squatters, tends to prolong the recovery progress (ADB 2008).

Since the priority during reconstruction is housing, many donors and NGO-funded reconstruction programmes tend to ignore associated infrastructure and services such as water supply, drainage, sanitation, power and lighting, roads, and solid waste disposal (ADB 2011; WB 2005). In recent years, there have been renewed calls for a multi-hazard approach and coordination among various stakeholders to address the gaps in recovery and reconstruction (*see the Handbook for Disaster Recovery Practitioners*).









## **RESETTLEMENT / RELOCATION**

Post-disaster resettlement is often reactive, characterised by short lead times for planning and consultation (UN Habitat). Mindful of the physical safety of the affected, most governments resettle communities to safer places, both voluntarily and involuntarily. For example, the post-tsunami setback notification resulted in a mixed response from communities in Sri Lanka, Tamil Nadu, India and Aceh, Indonesia. Some favoured resettlement due to fears for physical safety, while others preferred to return to the same place where they had economic, social and cultural links.

Resettlement may also magnify pre-disaster patterns of socioeconomic vulnerability, as relocation may have a negative impact on livelihoods. Tenants and squatters, who are the most vulnerable after a disaster, are often left behind during resettlement programmes.

Disaster risk management objectives require more complex initiatives in urban areas, particularly if relocation of communities is planned (WRC 2011). Options for resettlement should be based on reliable multi-hazard risk assessments and on available social support systems. Hazards such as an earthquake or cyclonic winds can affect broad areas and relocation may not be a valid option unless the specific site is very high risk. Studies on post-disaster resettlement suggest that resettlement should be considered as a last resort when there are less viable risk reduction options to future hazards (ADB 2008, WB 2012, ALNAP 2008). For example, after the 1992 earthquake and tsunami in Flores, Indonesia people returned to their original location after resettlement, and the only people left in the resettled sites were the ones who did not own any land (ADB 2008).

# **RATIONALE TO INTEGRATE DRR INTO LAND USE PLANNING R&R**

Land use planning during the reconstruction phase offers a unique opportunity to rebuild differently, while addressing exposure and vulnerability to current and future hazard risks as well past planning deficits (WB 2011). In the context of DRR during recovery and reconstruction, land use planning offers a tangible risk reduction opportunity and can support the overall recovery process. It is summarised broadly in the following areas and further discussed in this chapter:

- Prevent new and redevelopment in hazardous areas (*exposure prevention*).
- Allow new and redevelopment in hazardous areas with higher safety standards (*exposure/vulnerability reduction/enhancing emergency response functions*).
- Develop a risk-based planning system to address current and future risks, including climate change (*risk reduction/climate change adaptation*).
- Environmental protection (*vulnerability reduction*).
- Address past planning deficits to facilitate building back better and resilient communities (*risk reduction*).

‘The first day of the post-disaster period is also the first day of the pre-disaster planning period that should precede the next event.’  
*American Planners Association*

‘Extensive risk of today can become the intensive risk of tomorrow.’  
*GAR 2011*

It is important to note that changes in land use planning during recovery and reconstruction will have negative impacts on the affected community and overall recovery if there is lack of community participation and buy in. It is important to have close consultation with the community and other relevant stakeholders during recovery planning (*see Handbook for Disaster Recovery Practitioners*).

HB

## 1 PREVENTING NEW AND RE-DEVELOPMENT IN HAZARDOUS AREAS

Post-disaster events provide an opportunity to restrict development and reconstruction in high-risk areas, thereby mitigating exposure to future hazards and risk. However this is often difficult with limited information on the number of people affected, the resources required for resettlement, public opinion, risk reduction options and future risk. Restriction can be contentious and will have serious impacts on the community that has already been affected by a disaster.

The prevention of redevelopment will effectively cause the resettlement of affected communities, which should be carried out as a last resort only. Prevention can also lead to compensation issues and claims, decline in land value, and additional pressure on land catering to development needs. Prevention of new and redevelopment should be carried out based on damage, hazard, vulnerability and risk assessment information. Hazards such as earthquakes and cyclones are regional, affecting large areas, whereas hazards such as tsunamis, river floods, storm surges, liquefaction and landslides are confined to narrow or specific areas. Restrictions should be based on the specific context and return period of the hazard. Prevention or restriction of new and redevelopment is a viable option only when there are no practical, cost-effective mitigation measures. However, restricting development in hazard prone areas where mitigation is not possible, such as areas prone to liquefaction, pyroclastic flow, landslides and on those located on or near fault lines, can improve overall risk reduction measures. For example, in Aceh, around 12,000 families lost their land due to land subsidence, and reclaiming the hazardous land needed significant investment that was not economically viable. Therefore, resettlement was required.

While the primary focus is on future safety, poorly conceived or ad-hoc preventive measures without adequate or complete information adversely can affect the overall recovery process.





In the aftermath of the 2004 Indian Ocean tsunami, to ensure the safety of communities against future tsunamis, a buffer zone was introduced in most of the affected countries, which later become highly contentious (India: 500m from high tide line; Sri Lanka: 100m no-build zone for the western and southern coasts and 200m for the northern and eastern coasts; and Indonesia: 2km). Due to practical difficulties and pressure, restrictions were removed in Indonesia and Sri Lanka and partially lifted in India.

## 2 CONDITIONS FOR RE-DEVELOPMENT IN HAZARDOUS AREAS

During post-disaster reconstruction, it might not be possible to restrict new and redevelopment in areas prone to hazards on a regional scale such as cyclones and earthquakes, or to hazards with long recurrence intervals (return periods), except in the case of fault zones, liquefaction zones and landslide prone areas. In the given circumstances, new safety measures through structural mitigation and non-structural mitigation measures should be assessed, adopted and enforced.

Addressing DRR through land use planning in post-disaster recovery has not historically gained much attention, although it addresses exposure, vulnerability and past development-induced risk factors. Further, addressing DRR only through structural mitigation measures is a one-sided attack on the problem. It suffers from two major deficiencies: first, the design requirements may exceed cost effective engineering solutions and, second, it provides a false sense of security in which more development occurs (American Planners Association 2005).

In addition, risk reduction through structural measures alone, such as hazard resistant buildings (which are often resource intensive), can reduce structural vulnerability. However these measures might not reduce the overall exposure to all hazards and changing risk patterns due to unplanned development both pre- and post-disaster (*see box on page 15, Extensive Risk to Intensive Risk – Jakarta City*). This condition is noticeable in many megacities and rapidly expanding cities, where investment in risk reduction has improved preparedness, resulting in reduced loss of life when compared to previous events. Conversely, the number of people affected, scale of disruption to services and economic costs are rising, as seen in the floods in Jakarta.



### 3 DEVELOPING RISK-BASED PLANNING SYSTEMS

While land use planning concepts have undergone changes from single objectives to multiple objectives, legal and policy frameworks have not been adequately flexible to the complex, changing environment nor in incorporating feedback in the planning process. Most of the planning systems in developing countries are still weak in terms of how to deal with major challenges of urban sustainability in the 21st century: climate change, resource depletion, rapid urbanisation, poverty and informality (UN Habitat 2009).

For example, many of the planning systems in developing countries do not address disaster risk management. However, with the increasing recognition of the role of land use planning in DRR, countries in the region are taking proactive steps to mainstream risk reduction into land use planning through legal frameworks and through the development of technical guidelines. For example, in the Philippines the DRR and Management Act of 2010 puts an emphasis on mainstreaming DRR and including climate change in the development process, including land use and urban planning. The National Economic and Development Authority (NEDA), with support from the United Nations Development Programme (UNDP) and the European Commission for Humanitarian Aid (ECHO), developed guidelines for “Mainstreaming DRR in Sub-National Development and Land Use/Physical Planning in the Philippines”. The guide is intended to enhance regional and provincial planning analysis by recognising risks posed by natural hazards to vulnerable populations, the economy and the environment. Central to the plan is conducting risk analysis to identify areas prone to disaster risks, finding proper locations for development and identifying appropriate mitigation measures. Further, in the context of recovery, hazard mapping information is rarely



integrated into the planning process, as it is perceived to be a specialised activity undertaken separately. Risk reduction is often compromised by hastily planned and executed programmes (UN OCHA). With increasing frequencies of disaster events and climate change posing a significant threat, land use planning is gaining significance in supporting both climate change adaptation (CCA) and mitigation. Given the limited success of traditional approaches to mitigate the impacts of natural disasters, comprehensive disaster risk management frameworks continue to evolve, addressing development, DRR, environmental management and climate change adaptation. Post-disaster recovery and reconstruction should adequately address efforts to reduce exposure to hazards and future challenges imposed by climate change. Land use planning can be a key tool to address current and future disaster risks.

## 4 ENVIRONMENTAL PROTECTION

It is commonly felt that urban planning systems have changed very little in many parts of the world, especially in developing countries, and that they are often *de facto* contributors to urban problems rather than functioning as tool for human and environmental improvement. For example, rapid urbanisation modifies the environment and generates new hazards, including deforestation and slope instability, which can result in landslides and flash floods (UN Habitat, 2009). Currently, there is no formal field of planning among development, environment and disaster risk management communities. Instead the DRR approach is based on addressing specific issues. There is, however, an increasing recognition among the three communities of the role of land use planning as well as environmental protection. (UNEP 2010).

Disaster events can cause adverse effects and impacts on the environment and ecosystems that support lives and livelihoods. Specific actions undertaken during the emergency response and recovery phase, such as debris clearance, allocation of land for transitional shelters and for new and redevelopment, raw materials, and certain hazard mitigation measures often overlook basic environmental issues and can, therefore, further damage the environment (WRC 2011). The box on the next page, is a case study on the role of the environment and ecosystems in the aftermath of the 2004 Indian Ocean tsunami in Tamil Nadu, India, highlighting the issues and challenges presented.

## **ROLE OF THE ENVIRONMENT AND ECOSYSTEMS IN MITIGATING NATURAL HAZARDS**

After the 2004 Indian Ocean tsunami, countries in the region undertook studies to identify different options for coastal protection measures such as bio-shields (restoration of mangroves, coral and coastal forestation) and structural protection measures (seawalls, breakwaters and groynes). In the state of Tamil Nadu, India, immediately after the tsunami, there were proposals by the provincial government to construct seawalls along its 1000-km coastline. The neighbouring state, Kerala, which had previously built seawalls along 386 km of its coastline, was in the process of securing additional funding to build another 92 km of seawall.

While there were mixed reactions, experts pointed out that coastal engineering construction often lacked scientific studies, was based on inadequate understanding of beach dynamics and in most cases was poorly designed with no Environmental Impact Assessment (EIA) to gauge adverse impacts along the coast. Proposals received mixed responses from communities, as well. In one district of Tamil Nadu, fishermen were not positive about building seawalls as it might hinder their fishing activities, whereas residents in the Kanyakumari district of Tamil Nadu were in favor of seawalls (prior to the tsunami they had opposed it). In neighbouring Kerala, communities supported construction as it protected them from coastal erosion. Agricultural communities were concerned that the seawall might prevent rainwater runoff and lead to inundation of agricultural land and soil degradation.

While there were concerns on the structural measures, in general, there was broad support for natural protection measures such as mangroves and bio-shields. The recovery programme funded by the World Bank and the Asian Development Bank encouraged soft options such as bio-shields as a primary defense while recommending studies for structural measures. Though bio-shields like mangroves, coastal reefs and sea grass beds were recognised as important coastal ecosystems, shoreline stabilisers, such as sandy beaches and sand dunes, did not receive adequate attention. A study conducted by Praxis in 2005 in tsunami-affected communities noted that many coastal villages along Tamil Nadu were protected by the presence of sand dunes. Coastal dunes act as natural bio-shields. However there has been wide spread damage to coastal dunes due to development along the coast, including settlements, tourism, ports and mining.

### REFERENCES

- 1 Namboothri, et. al 2008. Beyond the Tsunami: Coastal Sand Dunes of Tamil Nadu, India- An Overview
- 2 Sudarshan Rodriguez et. al, Policy Brief: Seawalls.



**ECONOMIC VALUE OF ECOSYSTEMS IN MITIGATING HAZARDS**

Ecosystem	Hazard	Hazard mitigation value in USD
Coral reefs (global)	Coastal	189,000 per hectare/year
Coastal wetlands (U.S.)	Hurricane	8,240 per hectare/year
Luzhice floodplain (Czech Republic)	Floods	11,788 per hectare/year
Muthurajawela marsh (Sri Lanka)	Floods	1,750 per hectare/year

SOURCE: PEDRR, 2010

The table on the previous page provides information on the economic value of ecosystems in mitigating hazards and the potential benefits where land use planning can safeguard the environment.



While structural measures are resource intensive and their secondary impacts on coastal ecosystems remain poorly understood, developed countries such as Japan, which have experienced tsunamis in the past, have built seawalls along their coast to protect it from tsunami and other coastal hazards. During the 2011 Great East Japan earthquake and tsunami, the seawall which was extensively built along the coast line offered little protection. The recovery policy of the government (June 2011) notes “[The Great East Japan earthquake] taught us of the existence of tsunami that are physically impossible to defend against. It has become clear that frontline defenses alone, focused on tsunami breakwaters, coastal dikes, and tide barriers cannot provide protection from a tsunami of this magnitude. DRR planning should not be based on the premise that a large-scale natural disaster can be completely contained, but rather that the damage from such a natural disaster should be minimised. Future countermeasures against tsunamis will have to be transformed from “lines” of defense, such as coastal dikes and tide barriers, to “multiple defenses” that are “area-based,” encompassing rivers, roads and urban planning. While the tsunami showcased the effectiveness of natural bio-shields in mitigating impacts and the economic benefits of hazard mitigation, the lesson from Japan is that solely relying on structural measures needs careful consideration.

The nexus between natural hazards, environment, and development provides a strong case for promoting environmental protection in land use planning during recovery and reconstruction and for vulnerability reduction.



## 5 ADDRESSING PAST PLANNING DEFICITS

Contemporary urban planning systems in most parts of the world have been shaped by 19th-century planning methods (master planning) and many developing countries still continue to adopt this planning process. Currently, much rapid urban growth is taking place in countries that are the least able to cope in terms of the ability of governments to provide or facilitate the provision of urban infrastructure; in terms of the ability of urban residents to pay for such services; and in terms of resilience to natural disasters. Also, current forms of urbanisation are pushing the lowest-income people into locations that are prone to natural hazards, such that four out of every ten non-permanent houses in the developing world are located in areas threatened by floods, landslides and other natural disasters. If planning is to play a role in addressing the major issues facing urban areas, then current approaches to planning in many parts of the world will have to change (UN HABITAT 2009).

Disaster recovery is much more effective where land institutions have adequate capacity and where the rules and processes for making decisions about access to land and land use are clear and applied without political interference or corruption (FAO 2011). Where planning processes did not work before a disaster, it is unlikely that they will work at the time of recovery, when planning decisions ought to be made (WRC 2011).

Post-disaster recovery and reconstruction provides an opportunity to address and change previous planning and development decisions that have exacerbated land system vulnerabilities, such as inadequate planning, policy provisions, enforcement mechanisms, building codes and standards, environmental degradation, unsafe settlements, or inappropriate and unaffordable zoning. Not addressing planning deficits exacerbates preexisting vulnerabilities and hampers the recovery process.

## AN APPROACH FOR PRE-EVENT LAND USE RECOVERY PLANNING IN NEW ZEALAND

Pre-disaster planning is essential to achieve effective coordination among agencies and ensure a smooth transition between response and recovery activities. By working through issues and solutions before an event occurs, the process of recovery can be greatly improved, resulting in quicker and appropriately targeted reinstatement of affected areas. Furthermore, pre-planning for land-use recovery means that:

- Recovery is proactive, rather than reactive which can lead to poor decision making.
- Recovery incorporates principles of sustainability.
- Recovery begins without the need to think about and/or plan for land use changes.
- Future hazard risks can be reduced during recovery.
- Ideas and plans can be developed and discussed by communities and options analysed before an event.
- Landowners are provided with options for reducing hazard impacts.
- Consent can be gained in advance for disposal sites, including for contaminated materials (e.g. road slip material, building debris, volcanic ash disposal).
- Plans are developed proactively to reduce the impact of a hazard event.

### SOURCE

Becker, J.; Kerr, J.; Saunders, W., GNS Science Report 2006.

Currently, in order to address disaster recovery issues effectively, pre-event land use recovery planning is gaining significance.

*(see box on the next page)*

As the disaster event highlights, the need for safety standards among affected people, planners and relevant stakeholders need to make pragmatic decisions on integrating DRR into land use during recovery policy, planning and reconstruction. The following chapter discusses the ways in which DRR measures can be integrated into land use planning during recovery and reconstruction.









# KEY CONSIDERATIONS

It is important to seize the short window of opportunity during post-disaster recovery to integrate DRR measures into Build Back Better efforts. The World Bank Handbook emphasises the following guiding principles for land use and physical planning during post-disaster recovery and reconstruction (*see box below*). This chapter discusses key considerations for integrating DRR into land use planning during recovery and reconstruction, both at policy and local levels.

## GUIDING PRINCIPLES FOR LAND USE AND PHYSICAL PLANNING

- Laws, regulations, plans and institutional frameworks should form the basis of reconstruction planning. If existing instruments are not realistic, or are contributing to informality, use the reconstruction process as an opportunity to improve them.
- The planning process should incorporate active collaboration among the reconstruction agencies, the affected community, the private sector, and other stakeholders, thereby engendering their ownership of the planning process.
- The planning process should respond to issues of land rights and titling and to discrepancies in the administration of land records, address the needs of informal occupiers of land and work with them to identify viable alternatives.
- While addressing long-term development and DRR goals, land use and physical plans should be flexible and offer choices, rather than static “master plans.”
- Land use and physical plans integrated with strategic planning can address reconstruction, DRR, and long-term development, yet be readily translated into action plans and investment proposals, including those that promote private investment.
- The planning process needs high-level support, active leadership from the government agencies that will actually implement the plans, and involvement from local communities.

### SOURCE

Safer Homes, Stronger Communities: A Handbook for Reconstructing after Natural Disasters, The World Bank 2010

## 1 EMPHASISING LAND USE DRR IN POLICIES

A recovery policy and framework provides the basis for recovery and reconstruction planning and implementation in affected areas. It is important to ensure that the recovery policy should include DRR considerations in land use planning and that this is done in conjunction with existing policies. If required, suitable amendments should be made to address DRR concerns (*see Chapter 3 of the Handbook for Disaster Recovery Practitioners*).

HB

### HOW TO DO IT

Keeping in mind the long-term sustainable development of affected communities, land use planning in the recovery policy should emphasise Build Back Better with a focus on risk reduction along with other prospective DRR tools. The people involved in land use planning issues and other recovery issues should try to include DRR into the policy statements as part of the broader development objectives in the aftermath of disaster.

Land use planning should:

- Prevent new and redevelopment in hazardous areas when there are no viable mitigation options.
- Allow new and redevelopment in hazardous areas with higher safety standards (both structural and non-structural measures) through a risk based land use planning system.
- Put a temporary or permanent moratorium on reconstruction and redevelopment in high risk areas.<sup>7</sup>
- Offer directives on dealing with nonconforming structures.
- Promote environmental protection such as natural buffer zones and restrict reconstruction and development in ecologically sensitive areas.
- Address land tenure and rights which in turn improve the land governance and resilience of communities.
- Strengthen the land governance capacity of institutions.
- Create synergies between other sectoral strategies including livelihoods, infrastructure, environmental protection, and disaster risk management.

<sup>7</sup> The Moratorium should be relaxed based on the assessments' findings and validated through risk and environmental assessments



## LEVELS OF VILLAGE LEVEL PLANNING IN ACEH AND NIAS, AGENCY FOR THE REHABILITATION AND RECONSTRUCTION OF ACEH AND NIAS (BRR)

Activity	Rapid Site Plan	Minimum Settlement Plan	Better Settlement Plan
Community-driven process	X	X	X
Community land mapping	X	X	X
Community profile		X	
Topographical survey		X	X
Land reuse planning		X	X
House plots	X	X	X
Disaster mitigation	X	X	X
Infrastructure planning		X	X
Environmental analysis and plan		X	X

SOURCE: ADB

In general, a recovery policy should provide broad principles through a flexible DRR approach. For example, the Master Plan for Tsunami Recovery and Reconstruction in Aceh and Nias (2005) provided policies, strategies and draft spatial plans for the district level (*see the box on the next page*). Local governments were requested to build on the drafts in consultation with communities during the development of detailed spatial plans.



Recognising the importance of appropriate spatial planning for village level reconstruction, the Agency for the Rehabilitation and Reconstruction of Aceh and Nias (BRR) issued guidelines on village level planning in 2005, and an amended version in 2006 with three levels of planning in accordance with the size and complexity of reconstruction projects: Rapid Site Plan (less than 20 houses), Minimum Settlement Plan (20 to 150 houses), and Better Settlement Plan (more than 150 houses), and with specific levels of activities (*see table on the previous page*). The broad objective of the village plans was to restore original conditions with disaster mitigation. The plans consisted of house location and basic infrastructure such as clean water, access roads, escape routes, sanitation and drainage, green belts, communications, and power.



Similarly, in the case of the 2011 Great East Japan earthquake, the recovery plan provided recommendations with a mix of structural and non-structural mitigation measures for five types of regions.<sup>8</sup>

It is important to have broad consultations on policy decisions regarding land and land use with relevant stakeholders and the affected communities while framing the policy and further consultations during reconstruction. Though it may not be possible for the government to consult with all affected people, it is important to include outreach and consultation through various stakeholders such as NGOs and civil society organizations (CSOs) to receive feedback while framing policy.

Any particular decision on land use during post-disaster recovery will have significant impacts on vulnerable groups, namely the landless, tenants, and marginal land holders, as well as on land tenure in the case of resettlement.

<sup>8</sup> This is a shift from the previous approach of protection from tsunami through structural measures such as tsunami breakwaters, coastal dikes and tide barriers. The report calls for "harmonious coexistence" between humanity and nature through disaster reduction.



## SPATIAL PLANNING – TSUNAMI MASTER PLAN, INDONESIA

Spatial planning in Aceh posed one of the most significant challenges to recovery and reconstruction. Chapter 5 on spatial structuring in the Master Plan (2005) emphasised reconstructing cities, regions and settlements, as well as enabling community members to conduct their activities under safe and improved conditions. The Master Plan provided broad policy principles (listed below) with strategies and specific activities that were, in turn, to be adapted and developed by the local government, district and city level authority in consultation with local communities.

- Restoring and rehabilitating Nanggroe Aceh Darussalam Province spatial structure and pattern.
- Giving residents the freedom of choice for settlement.
- Participatory spatial structuring approach.
- Anticipating disaster mitigation in disaster areas and making areas safe from disaster.
- Involving community members and using social institutions in disaster and development activities.
- Highlighting cultural and religious characteristics.
- Spatial structuring as a combination of top-down and bottom-up approaches.
- Restoring local governments' role.
- Protecting citizens' civil rights.
- Accelerating the land administration process.
- Providing fair and affordable compensation.
- Revitalising natural resource-based public economic activities.
- Restoring environmental supporting capacity and anticipating natural disaster threats.
- Reconstruction of disaster-affected cities by restoring them to their initial state of order.

Given the scope and scale of the recovery and reconstruction phases, challenges, delays, and setbacks were encountered in many of the sectors due to delays of new spatial maps, issues related to land tenure, compensation, policy conflicts and weak governance. As the reconstruction work progressed, BRR took a flexible approach in addressing land issues.

### SOURCE

Master plan for the rehabilitation and reconstruction of the regions and communities of the province of Nanggroe Aceh Darussalam and the Islands of Nias, Province of North Sumatera, Government of Indonesia, April 2005

Lessons from past disasters highlight the importance of addressing land tenure and the needs of vulnerable groups.

Recovery policy is mostly drafted in the post-disaster phase under time pressure. As a result, issues of land and land use are often overlooked.

## 2 IDENTIFYING VULNERABILITY AND EXPOSURE

It is important to make use of damage assessment reports and risk assessment studies to understand and identify specific, underlying elements of vulnerability that have configured disaster risk.

The early use of available information allows planners to identify issues to be addressed through the recovery policy or plan, as well as issues which might require a closer look at the time of local level planning during recovery and reconstruction. Planners need to look beyond traditional development planning issues and should apply the DRR lens to identify elements in particular. For example:

- Damage patterns of various structures including housing, lifeline buildings, and critical infrastructure.
- Land needs and availability of safe areas for transitional shelter requirements and reconstruction (in-situ and resettlement).
- Risk areas and the need for temporary moratoriums.
- Requirements for hazard, risk and environmental assessments of the affected areas for local level planning.
- Identification of appropriate land for debris disposal.<sup>9</sup>
- Relevance of various existing land and land use policies and other regulations in the context of the disaster event.<sup>10</sup>
- Relevance of existing building codes and implementation.
- Non-conformity issues based on existing regulations and their impact during the reconstruction phase with new regulations (if any).
- Requirements for in-situ reconstruction or relocation needs, which may arise based on the above issues.

The national disaster management agency or its equivalent should coordinate with relevant city authorities, planning agencies and

<sup>9</sup> Improper handling and disposal of debris and solid waste can create a crisis within a crisis. Hence there is a need to identify appropriate land for disposal of debris.

<sup>10</sup> Inconsistencies among various policies and regulations (regarding land, agriculture, urban development, the environment, and coastal management) can delay the overall recovery planning process.





sectoral departments to analyse the findings from damage assessment reports and provide very specific recommendations from the damage assessment findings. It is also important to engage universities and professional bodies to provide their technical expertise during the process.

Assessments should capture explicit information on vulnerable groups, in order to identify issues early and provide targeted interventions. Identifying the land related issues of vulnerable groups can also minimise uncertainty and bottlenecks during the implementation stage.

Analysing damage assessment findings in order to provide specific recommendations is a challenging task. Available information might be incomplete. In addition, competing priorities and lack of time and human resources to undertake assessments during recovery policy formulation has been a major challenge.

### 3 USING DISASTER RISK INFORMATION IN LAND USE PLANNING

Risk information is crucial for DRR integration in land use planning during post-disaster recovery planning. If no prior risk assessment has been carried out, findings from the damage and environmental assessment, along with basic topographical, geological or relevant maps should guide land use planning. For example, in Aceh, Indonesia, settlement planning and housing reconstruction were carried out based on hazard risk mapping developed through community participation. Multi-hazard risk maps and coastal protection measures such as the DRR-Aceh (DRR-A) programme and *Aceh Nias Sea Defence, Flood Protection, Escapes and Early Warning Project* were developed as long-term interventions to support development. In the case of relocation, multi-hazard risk assessments and Environmental Impact Assessments (EIA) for the proposed sites should be carried out to identify appropriate structural and non-structural mitigation measures to reduce future exposure to hazards.

In general, undertaking a technical risk assessment study requires the involvement of professionals from various disciplines, which are often

lacking in many countries. It also takes a considerable amount of time and resources to develop a comprehensive risk assessment. In the post-disaster context, it might not be technically feasible to carry out a study to guide recovery planning (in-situ and for resettlement) within the time frame of the recovery and reconstruction interventions. Hence initial land use planning can be based on available past risk assessments and scientific studies (all hazards), damage (including from space-based information such as satellite images) environmental assessment findings, and through community-based maps. A comprehensive risk assessment can be initiated in parallel, linked with long-term development planning (*see the case of Aceh prior*).

As it might not be possible to prevent or mitigate all risk, determining an acceptable level of risk for various hazards is central for planning and allocation of resources, housing, infrastructure development and DRR. Caution should be exercised when defining the acceptable level of risk for hazards. Long-term risks such as climate change have direct cost implications. Land use planning and risk information can guide the application of land use planning tools such as zoning, density control, setbacks, acquisition, easement, open space, road width and access, along with other structural and non-structural measures to reduce vulnerability to future hazards. Potential application of each of the tools for specific hazards is further discussed in the following section.

As described, risk assessment is a multi-disciplinary effort at various levels. Applying risk information for land use planning should be undertaken at the local level in consultation with respective communities through participatory planning, since risk assessments in land use planning will create both positive and negative impacts on different aspects of recovery planning.

It is important to engage vulnerable groups during the risk assessment process at the community level to identify specific needs and issues that affect their livelihoods and safety. Further, any risk assessment and information (such as maps and reports) should have explicit reference to and adequate information on vulnerable groups for better recovery planning.



Risk assessment is currently an evolving area and there is limited expertise in many countries. In addition, decision makers and planners will require risk information in the appropriate scale and form. However, in many situations there is a disconnect between the scientific community and planners. Also, a comprehensive risk assessment during recovery may not be possible due to time constraints.

## 4 FACTORING IN ENVIRONMENTAL ISSUES TO REDUCE EXPOSURE

The risk assessment and EIA are carried out separately in many countries. However it is important to integrate these two frameworks to address deficits in the planning process. Adequate considerations should be made to restoring ecosystems during the recovery and reconstruction process while also minimising negative impacts on the overall environment. Considering the potential long-term benefits offered by ecosystems and the environment, land use planning should adequately include environmental protection measures through existing and new protection measures so as to reduce the exposure and vulnerability of communities – not only to current risk but also future risks including climate change. In addition to environmental protection and conservation, these efforts should be linked to broader recovery initiatives as well as the promotion of alternative livelihoods for communities which are heavily reliant on natural resources.

In order to address environmental considerations as part of the early recovery process, UNEP has developed the “Environmental Needs Assessment in Post-Disaster Situations – A Practical Guide for Implementation” (*see box on the next page*). Findings from the environmental assessment should provide inputs for overall recovery and reconstruction. At the time of local level planning, planners and environmental managers need to identify the key issues that can be addressed through land use planning.

## ENVIRONMENTAL NEEDS ASSESSMENT IN POST-DISASTER SITUATIONS – A PRACTICAL GUIDE FOR IMPLEMENTATION

Until very recently, post-disaster needs assessments were being carried out primarily to identify immediate and life-saving needs. In order to address environmental considerations as part of the recovery process, and in a bid to highlight the many ways in which environmental issues need to be considered during early recovery, UNEP developed the Guide to:

- Identify environmental impacts and risks caused by the crisis and relief operations as well as potential environmental pressures from recovery
- Identify the negative response related activities or coping mechanisms resulting from an emergency that can impact the environment or create new environmental risks.
- Assess institutional capacities at the national and local levels to mitigate environmental risks and manage environmental recovery.
- Provide a forward-looking plan that aims to build back better by integrating environmental needs within early recovery programming and across the relevant relief and recovery clusters.
- Provide a standard reference point for future environmental assessments in the post-crisis setting, in spite of the fact that this tool is expected to be modified to suit the needs of different situations.

SOURCE: UNEP 2008

It is important to engage local communities in environmental protection and restoration measures through complementary awareness and outreach programmes on safeguarding the environment and ecosystems.

Environmental considerations are often overlooked during developmental interventions. Hence, existing legal and policy frameworks related to DRR and recovery should recognise the importance of environmental protection and conservation, including thorough stronger coordination and enforcement mechanisms at all levels, as well as adequate safeguards and community ownership.








## 5 INTEGRATING DRR IN LAND USE PLANNING TOOLS

As discussed in the previous section, land use planning tools can help reduce exposure and vulnerability to natural hazards. The post-disaster recovery phase offers a limited window to intervene with land use planning before ad-hoc reconstruction takes place. Hence Building Back Better should focus on addressing the underlying risk factors including those associated with exposure.

The array of existing land use planning tools listed in the table on the next page can potentially be used to integrate DRR into land use planning during the recovery and reconstruction process<sup>11</sup>. Other tools have been discussed in the previous sections and can ensure complementary linkages. While the tools mentioned, though not an exhaustive list, are part of regular planning, they can also be applied in specific post-disaster contexts – guided by reliable risk assessment information – to reduce exposure and vulnerability to hazards during new or redevelopment, in the case of *in-situ* reconstruction or in resettlement areas.

It is important to use these tools in the context of risk information (such as maps) for multi-hazards rather than only for the specific hazards connected to recent events. Careful consideration is required when choosing different planning tools. Some mitigation measures can exacerbate other hazards, influence environmental degradation or have a direct effect on community land, livelihoods and housing. It is equally important that the tools support the priorities of other sectors, such as the environment and livelihoods. The section following discusses the application of these tools with some case studies.

## PROSPECTIVE TOOLS FOR DRR IN LAND USE PLANNING

TOOLS BY CATEGORY					
	Flood	Cyclone	Earthquake	Landslides	Tsunami
<i>Emergency Tools</i>					
Damage Assessment	X	X	X	X	X
Development Moratorium	X	X	X	X	X
Temporary Repair Permits	X	X	X	X	X
<i>Zoning Tools</i>					
Nonconformity Uses	X	X	X	X	X
Density Controls	X	X	X	X	X
Setbacks	X	X	X	X	X
Height Regulations	X	X	X	X	X
Coastal Zone Management Regulations	X	X		X	X
<i>Subdivision Controls</i>					
Subdivision Regulations	X	X	X	X	X
Road Width / Access	X	X	X	X	X
Open Space Requirements	X	X	X	X	X
<i>Design Control</i>					
Trees and Vegetation	X	X		X	X
Building Codes	X	X	X	X	X

## **EMERGENCY TOOLS**

As discussed, damage assessments (*see section 1 of this Chapter*) provide insights on the vulnerability and risk of the built environment, and can offer guidance on the application of specific tools during recovery and reconstruction planning. A development moratorium can be carefully applied in severely affected areas, or in high-risk areas based on the damage assessment in order to review the existing land use plan in relation to current and future hazards, address past planning deficits and restrict ad-hoc reconstruction activities. Temporary repair permits can be used to allow communities to repair and reoccupy their houses so they can restart their lives. Experience from the Kobe and Los Angeles earthquakes shows that in cases of low levels of building damage, it is better to repair than to rebuild. Repair is usually more cost-effective and less disruptive (Robert Olshansky et al. 2006).

The above tools are significant during the recovery phase, since this phase establishes the basis for carrying out land use in relation to other recovery interventions. Caution should be exercised when applying the above tools, as application might directly affect communities and recovery efforts. One of the important lessons learned from tsunami-affected countries, particularly Indonesia, India and Sri Lanka, is that initial restrictions on affected areas, such as a blanket ban on reconstruction based on buffer zones, causes confusion and setbacks to the recovery process.

## **ZONING TOOLS**

Zoning tools offer the benefit of addressing both exposure and vulnerability to hazards and risks for *in-situ* reconstruction and resettlement. It is important to assess the relevance of past zoning practices in the disaster recovery context and also plan to address future developmental needs. Zoning modifications should be based on damages, available risk maps (technical or community based) and future risks such as climate change. A few zoning tools are discussed with some case studies in the following.



Non-conforming uses and structures are a major issue within the development context. Post-disaster, there is a great level of uncertainty on how regulations will be dealt with. Non-conforming uses and structures arise when structures, buildings or areas do not conform to the existing zoning regulations due to changes in policies or other factors. The post-disaster situation provides an opportunity to address non-conforming structures through relocation or retrofitting. Density controls can facilitate development in high-risk areas during reconstruction with higher structural safety standards, thus offering to reduce exposure to natural hazards, certain vulnerability factors and overall risks. Density reduction can displace people, livelihoods and businesses and have a negative impact on economic recovery. Conversely, it can improve the overall living environment, disaster response capabilities and services. Densities can be increased in areas that are deemed safe to accommodate population needs. Setbacks can reduce the exposure of communities and individual households from hazards such as floods and fault lines, and can offer environmental protection. Setbacks and buffer zones were widely promoted in the areas prone to tsunamis. However, implementation faced significant challenges during reconstruction and in many cases regulations were relaxed. Regulations on buildings' height can also reduce exposure and vulnerability to hazards in areas with a high risk of cyclones, as well as earthquake hazards from soft soil and fault lines proximity.

## **SUBDIVISION CONTROLS**

Subdivision regulations, such as plot size and layout, road width and layout, open spaces and storm water facilities, can support and improve development at the site-specific level. In addition, they can enhance emergency response by addressing elements such as road access and open space for emergency evacuations, along with the overall character and standards of the area. For example, Kobe, Japan undertook a land readjustment project for road-widening, open spaces and other public facilities, to improve road access (perpendicular to the sea) for emergency or evacuation shelters. Similarly Bhuj, Gujarat, India engaged in sub-divisional planning, as discussed in the box on the next page.



## BHUJ PRE- AND POST-EARTHQUAKE TOWN PLANNING

The development plan for Bhuj was devised in 1976, covering 20 km<sup>2</sup>. Weak enforcement led to haphazard growth of the city. For example, through non-compliance with building control regulations, plot density was more than 100 plots in a hectare of land – four times more than the allowable FSI. There was a lack of open spaces and margins for buildings, and no proper street network. This posed significant challenges during post-earthquake rescue operations.

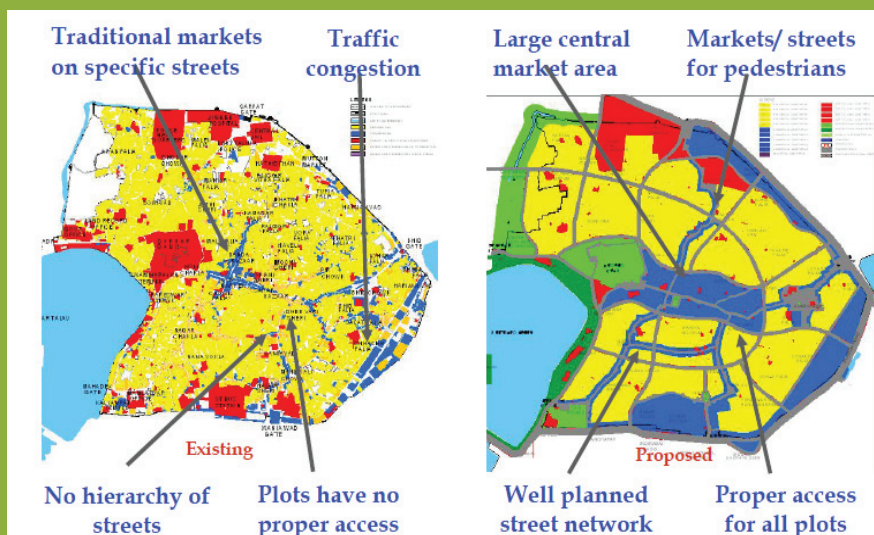
The city base map was outdated. In order to reconstruct Bhuj, the government, under the Gujarat Town Planning and Urban Development Act of 1976, undertook the development plan for Bhuj with an area of 56sqkm, as well as another three cities. One of the key features of this plan was a set of development control regulations to guide and regulate the reconstruction and future growth of the city. Technical studies on the following were conducted during plan preparation on land suitability, demographics, land market, development regulations, infrastructure status and needs, intensity of damage and seismic vulnerability. Particularly related to DRR, the government undertook a vulnerability assessment of buildings and graded them from G0 to G5, with G5 being the most severely damaged category. Soil studies were conducted based on three categories: good, fair and poor.

Under the following policy, subdivision control was undertaken to improve the plot layout, road network, open space, parking and markets through land readjustments.

- Plots less than 30m<sup>2</sup>, no deduction
- 30 to 100m<sup>2</sup>, 10 percent
- 100 to 200m<sup>2</sup>, 20 percent
- 200 to 500m<sup>2</sup>, 30 percent
- More than 500m<sup>2</sup>, 35 percent
- Standing buildings would be spared from deduction unless they were affected by proposed road alignments

Readjustment of land and sub-divisional zoning led to improved city planning (*figure below*).

### Bhuj Before and Post-Earthquake Town Planning:



#### SOURCE

1. B.R. Balachandran. The Reconstruction of Bhuj- Case Study: Integration of Disaster Mitigation into Planning and Financing Urban Infrastructure after an Earthquake,
2. Bhuj Area Development Authority [www.bhujada.com](http://www.bhujada.com)
3. Reconstruction & Renewal of Bhuj City: The Gujarat Earthquake Experience - Converting Adversity into an Opportunity Rajesh Kishore(ppt)

## DESIGN CONTROLS

Design controls can have significant positive effects by reducing vulnerability and mitigating natural hazards at the site-specific level. Carefully designed vegetation cover can protect the built environment from hazards such as cyclonic winds and storm surges, building codes with higher performance standards, along with land use planning can enhance structural safety, particularly in critical infrastructures. Performance standards can be used to provide site-specific development, and critical infrastructures such as hospitals and schools can be designed to higher safety standards for multi-hazard and environmental factors, as compared to other structures. For example, in Sri Lanka, the National Housing Development Authority issued guidelines on the design standards for structures built 500m to 2km along the eastern coastline or less than 3m from mean sea level. Similar design standards were issued in Indonesia and India.

With a need to address the competing demands of various sectors – and in particular those associated with land and land use issues – applying land use planning tools during in-situ reconstruction takes extensive consultation with local communities, in addition to those who will be affected by the changes and other stakeholders involved in recovery and reconstruction. It is important to have clear strategy on the application of such tools during the local level planning process with adequate incentives and compensation for the communities who will be affected.

As discussed in previous chapters, the application of land use planning tools to enhance safety and resiliency during recovery and reconstruction is often the most challenging task. It needs a concerted effort at all levels, from policy formulation to implementation. Often the policy guidelines are challenging to implement without participation and buy in from local stakeholders.



# REFERENCES

- ALNAP**, *Responding to earthquakes: Learning from earthquake relief and recovery operations*, 2008.
- ALNAP**, *Responding to urban disasters: Learning from previous relief and recovery operations*, 2009.
- American Planning Association**, *Planning for Post-Disaster Recovery and Reconstruction*, PAS Report No. 483/484; September 2005.
- ADB Note: International Experiences and Suggestions on Post-Disaster Rehabilitation and Reconstruction**, 2008.
- ADB**, *Earthquake and Tsunami Emergency Support Project (ETESP)*, Indonesia, 2010.  
<http://216.109.65.20/Projects/ETESP/default.asp>
- Benny, Hasanuddin Z. et al.**, *Post-Tsunami Land Parcel Reconstruction in Aceh: Aspects, Status and Problems, Shaping the Change*, XXIII FIG Congress, Munich, Germany, October 8-13, 2006.
- Demonstrating the Role of Ecosystems-based Management for DRR, Partnership for Environment and DRR (PEDRR)*, 2010.
- Joint UNEP/OCHA Environment Unit**, *Disaster Waste Management Guidelines*, 2011.
- Environmental Needs Assessment in Post-Disaster Situations – A Practical Guide for Implementation**,  
[http://postconflict.unep.ch/publications/UNEP\\_PDNA\\_draft.pdf](http://postconflict.unep.ch/publications/UNEP_PDNA_draft.pdf).
- Gavin Smith**, *A Review of the United States Disaster Assistance Framework: Planning for Recovery*, Disasters Roundtable Workshop (ppt), 2009.
- ISDR**, *Global Assessment Report on DRR*, United Nations, Geneva, Switzerland, 2009.
- ISDR**, *Global Assessment Report on DRR*, United Nations, Geneva, Switzerland, 2011.
- Master plan for the rehabilitation and reconstruction of the regions and communities of the province of Nanggroe Aceh Darussalam and the Islands of Nias*, Province of North Sumatera, Government of Indonesia, April 2005.
- McGranahan G. et al.**, *The rising tide: assessing the risks of climate change and human settlements in low elevation coastal zones*, *Environment And Urbanization Volume: 19 Issue: 1 Pages: 17-37*, April 2007.
- Namboothri, N., D. Subramanian, B. Muthuraman, A. Sridhar, S. Rodriguez and K. Shanker**, *Beyond the Tsunami: Coastal Sand Dunes of Tamil Nadu*, India, 2008. <http://www.dakshin.org/DOWNLOADS/SAND%20DUNES%20REPORT.pdf>
- Lizarralde G., Johnson C., and Davidson C.**, *Rebuilding after disasters: from emergency to sustainability*, 2008.
- Responding to earthquakes**, *Learning from earthquake relief and recovery operations*, ALNAP and Prevention Consortium, 2008.
- Robert B. Olshansky, Laurie A. Johnson And Kenneth C. Topping**, *Rebuilding Communities Following Disaster: Lessons from Kobe and Los Angeles*, *Built Environment Vol 32 No 4*-2006.
- Sudarshan Rodriguez, Devi Subramanian, Aarthi Sridhar, Manju Menon and Kartik Shanker**, *Policy Brief: Seawalls*, [http://www.dakshin.org/DOWNLOADS/Sea%20Walls\\_Policy%20Brief.pdf](http://www.dakshin.org/DOWNLOADS/Sea%20Walls_Policy%20Brief.pdf)
- The World Bank**, *Rebuilding a Better Aceh and Nias Stocktaking of the Reconstruction Effort*, Brief for the Coordination Forum Aceh and Nias (CFAN) – October 2005.
- The World Bank**, *Safer Homes, Stronger Communities: A Handbook for Reconstructing after Natural Disasters*, January 2010.
- The World Bank and the International Federation of Surveyors (FIG)**, *Land Governance in Support of the Millennium Development Goals*, 2010.
- UN FAO and UN-HABITAT**, *Towards Improved Land Governance, Land Tenure Working Paper 11*, 2009.
- Towards Reconstruction Hope beyond the Disaster*, Report to the Prime Minister of the Reconstruction Design Council in response to the Great East Japan Earthquake, 25 June 2011.
- UNEP**, *Opportunities in Environmental Management for DRR: Recent progress*, A practice area review in contribution to the Global Assessment Report on DRR.
- UN-HABITAT**, *Planning Sustainable Cities: Global Report on Human Settlements*, 2009.
- UN OCHA**, *Exploring key changes and developments in post-disaster settlement, shelter and housing*, 1982–2006
- Walter E. Lundin**, *Land Use Planning after a Natural Disaster*, *University of New Orleans Theses and Dissertations*, 2011.
- World Reconstruction Conference Proceedings**, 2011.

# ACKNOWLEDGEMENTS

— The development of this toolkit comprising of the Handbook, the Training Manual and the Technical Guidelines was made possible by the invaluable guidance, contribution and support of:

Budi A.A.  
Shahid Abdullah  
Viraj Abeyruwan  
Emma Allen  
Hanef Are  
Charlie Ayco  
Amara Bains  
H.K. Balachandra  
A. Balasooriya  
Brittany Benson  
Francis Bon  
Slamet C.  
U.W.L Chandradasa  
G.M. Chandramohan  
Gothami Chandratne  
H.M.U. Chularathna  
M.D.N. Cooray  
Rohan Cooray  
Philipp Danao  
John C. David  
Erik Davies  
Rathika De Silva  
John Devaram  
M. Dirhamsyah

Trevor Dhu  
Narayanan Edadan  
Nigel Ede  
Lowil Espada  
Yuzid Fadhli  
Said Faisal  
Colin Fernandes  
W.B.J. Fernando  
Annie George  
Biju Jacob George  
Mahesh Gunasekara  
Tendy Gunawan  
Maggy H.  
Suprayoga Hadi  
Jonath Har  
Maharani Hardjoko  
Hasma  
Mukhlis Hawid  
Vajira Hettige  
Eunice Ho  
Julia Hoeffmann  
Eivind S. Homme  
MHJ Miao Hongjun  
Moritz Horn



Ikaputra	Bill Nicol
Thamara Illeperuma	Nina Nobel
Nishani Jayamaha	Joe O'Donnel
Wathsala Jayamanna	G. Padmanabhan
Hemantha Jayasundara	Samantha Page
J.K. Jayawardena	Al Panico
Sunil Jayaweera	Jonathan Papoulidis
Luke Juran	Togu Pardede
H. Muhammad Jusuf Kalla	K.M. Parivelan
Adelina Kamal	C. Parthasarathi
Nishantha Kamaladasa	Parwoto
Geethi Karunarathne	John Paterson
Angela Kearney	C. J. Paul
Tessa Kelly	Prema Paul
Nalini Keshavaraj	Sugandika Perera
Shukuko Koyama	Ashok Peter
Wolfgang Kubitski	Poemvono
Sathish Kumar	S. K. Prabhakar
Sudhir Kumar	Heru Prasetyo
Nilantha Kumara	Firliana Purwanti
Shriji Kurup	Eddy Purwanto
Ahana Lakshmi	Nanang Puspito
Parissara Liewkeat	Usman Qazi
Lucky Ferdinand Lumingkewas	Felicity Le Quesne
Dammika Mahendra	Dyah R
Ashok Malhotra	J. Radhakrishnan
Kuntoro Mangkusubroto	Susana Raffalli
Ruby Mangunsong	Irman Raghman
Mia Marina	P. Joseph Victor Raj
Suresh Mariyaselvam	Prema Rajagopal
A.P.B. Melder	S. Ranasinghe
Bob McKerrow	Eng. Sujeewa Ranawaka
C.M. Muralidharan	Bhichit Rattakul
Jaiganesh Murugesan	Loy Rego
Jimmy Nadapdap	Jesu Rathinam
Hideto Namiki	Nugroho Retro
Nuly Nazila	Marqueza L. Reyes
Federico Negro	Alfa Riza
Ann-Kathrin Neureuther	Arghya Sinha Roy

Rudiyanto  
William Sabandar  
Nirarta Samadhi  
Prof. Santhakumar  
Trihadi Saptoadi  
Umadevi Selvarajah  
C.V. Shankar  
P.S. Shankar  
Keerthi Sri Senanayake  
Kristanto Sinandang  
Kiran Singh  
Arghya Sinha Roy  
Chitawat Siwabowon  
Pieter Smidt  
Soesmakyanto  
R.M.B. Somarathna  
Pannawadee Somboon  
Uditha M. De Soysa  
Dave Stomy  
Amin Subekti  
Bambang Sudiatmo  
Kishan Sugathapala  
Ravee Supanimitwisetkul

Agus Susanto  
Syihabuddin T  
Jerry Talbot  
Temmy Tanubrata  
Teampakasare  
R. Rajkumar Thambu  
V. Thirrupugazh  
Ahmad Tochson  
Beate Trankmann  
Satya S. Tripathi  
Sugeng Triutomo  
Archida ul-Aflaha  
Wayne Ulrich  
Coco Ushiyama  
Peter van Rooij  
Lorna Victoria  
V. Vivekanandan  
James Waile  
Buddhi Weerasinghe  
Hnin Nwe Win  
Weniza  
Wisnubroto  
Kirk Yates





## Strategic Partners

---



**World Food Programme**



Tsunami Global Lessons Learned Project