Tropical Coasts

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Addressing Coastal Security Through Natural and Man-made Hazards Prevention and Management

Engaging Local Governments in Disaster Risk Reduction

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Issue Editor

The last decade saw an increasing frequency and severity of disasters occurring in almost every part of the world, which have resulted in a large number of fatalities and massive property damage and economic losses. Countries in the East Asian region are no strangers to disasters and the associated damages. Owing to its geography, economic diversity and high proportion of population that can be potentially affected, East Asia is considered to be one of the most disaster-prone regions in the world. Disaster figures for 2007 released by the Centre for Research on the Epidemiology of Disasters, for instance, showed that Asia continues to be hardest hit by disasters; 8 of the 10 countries with the highest disaster deaths were in Asia. The increasing incidence of floods and cyclones that affected China, Indonesia, Myanmar, the Philippines and Vietnam; the earthquakes in Indonesia and Japan; the sandstorms in China and RO Korea; the forest fires in Indonesia; the oil spill in Guimaras (Philippines) and the harmful algal blooms in China all attest to the region's vulnerability to disasters. As centers of economic development, the coastal areas, in most cases, sustained heavy losses and damage when disaster struck, setting back years of development gains.

A growing realization points to the fundamental problems of inappropriate development as one of the main factors responsible for transforming a natural event into a human and economic disaster. It is now increasingly recognized that vulnerabilities are enhanced by rapid and uncontrolled urbanization, population growth and migration, poverty, poor planning, inefficient policies, environmental degradation, and development within high risk zones, among other factors. Some natural hazards are seen to be partly human-induced, including changing climatic patterns as a consequence of global warming and landslides aggravated by deforestation.

Addressing the causes of vulnerability by identifying actions and implementing appropriate programs to reduce risk and safeguarding sustainable development efforts is essential. Disaster risk reduction (DRR) has emerged in the international agenda as a vital defense in reducing vulnerability to hazards and the impacts of disasters. DRR calls for a proactive approach to disaster management – requiring the implementation of comprehensive and integrated approaches to create positive conditions for the effective reduction of risks well before and after disaster strikes. As our knowledge base grows, so does evidence of the cost effectiveness of DRR. The International Federation of Red Cross and Red Crescent Societies put the figures at US$2 to US$10 savings in disaster response and recovery costs for every dollar invested in DRR.

The Hyogo Framework for Action 2005–2015: Building the Resilience of Nations and Communities to Disasters (HFA), the global blueprint for DRR, sets a clear and expected outcome – "the substantial reduction of disaster losses, in lives, as well as social, economic and environmental assets of communities and states." With its five priorities for action, the HFA aims to build the resilience of nations and communities to disasters by strengthening institutional capacities at all levels and incorporating DRR into the sustainable development framework. Visible progress and successes in implementing the HFA at the international, regional and national levels, with assistance and support from various international and regional agencies and organizations as well as donors, have been achieved. Challenges and difficulties, however, abound. Three years after its adoption, vulnerability remains the central theme as the effects of climate change and sea level rise aggravate existing risks.

The challenges in implementing the HFA in the Asia-Pacific Region range from issues related to policy, legal and regulatory support, institutional arrangements and institutional capacity strengthening as well as implementing action programs on the ground. While high-level political commitment resulting from the adoption of the HFA by 168 Governments in 2005 provides an excellent opportunity to overcome these challenges, participation at the local government level is recognized as critical – having shown higher potentials for success in a number of instances. Although most of the decision and planning processes are carried out at the national, regional and international levels, the accomplishment of management interventions rely on local implementation. The local government's involvement is therefore imperative for the implementation of various action programs addressing a range of issues related to economic development and environmental management, including DRR.

These challenges and opportunities provide an entry point for mainstreaming DRR into integrated coastal management (ICM), a widely recognized framework for sustainable development. ICM has the needed governance and management framework as well as processes to allow the integration of DRR strategies. It helps strengthen local governance through a balanced, process-oriented and coordinated approach, from integrated planning to integrated management. As ICM focuses on local actions, it can facilitate putting into practice the priorities for actions identified in the HFA at the local level. Local governments implementing ICM can focus their efforts in integrating hazard management and DRR into the ICM program by mobilizing the necessary implementing arrangements, processes, tools and applications of ICM.

This issue of Tropical Coasts highlights how a gathering of local government executives bounded by the common mission of "serving as a network of local governments in East Asia, which, along with their stakeholders, shall promote the application of ICM as an effective management framework to achieve sustainable coastal development," can become an indispensable mechanism for knowledge validation, transfer and replication. The 2007 Forum of the PEMSEA Network of Local Governments for Sustainable Coastal Development (PNLG)* held in Danang, Vietnam, on 5–7 September 2007 focused on the theme "Addressing Coastal Security by Investing in Natural and Man-made Hazards Prevention and Management." The forum provided a venue for facilitating the exchange of information and experiences in DRR among local governments, national agencies, partner organizations, civil society groups and the private sector. It also provided a platform for the ICM sites to discuss how institutional strengthening in the context of DRR can be achieved and identify innovative solutions and opportunities to implement DRR options based on specific risk context and circumstances of the respective sites.

continued on page 63...

* The PNLG history and charter are featured in this issue's centerspread .

Tropical Coasts

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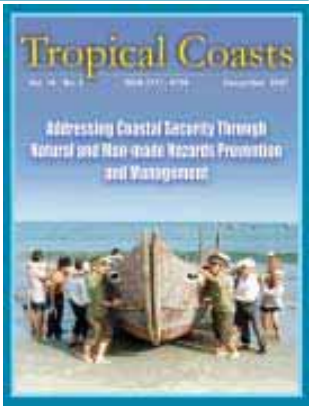
On the Cover

Addressing Coastal Security Through Natural and Man-made Hazards Prevention and Management

East Asia has been considered as one of the most disaster-prone regions in the world. In this issue, local governments and national agencies share their experiences in implementing disaster risk reduction initiatives.

Photo courtesy of Hai Chau, Vietnamnet.



in this issue

special feature

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Implementing the Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters

Introduction

This paper provides an introduction to the Hyogo Framework for Action (HFA) in the broader context of disaster risk and sustainable development in the Asia-Pacific region. The HFA is the global blueprint for disaster risk reduction from 2005-2015 with the intention to build the resilience of nations and communities to disasters. The HFA was adopted by 168 Governments at the World Conference for Disaster Reduction, which was held in January 2005, in the Hyogo Prefecture in Kobe, Japan.

To start with, the paper presents some global and regional data on disaster trends to develop an appreciation for the magnitude of the problem at hand and to demonstrate that disasters are not solely natural events but in actual fact, "products" of development. The paper provides an overview of the five priority areas of the HFA and clarifies the roles and responsibilities of national governments, international organizations and the UN/ISDR secretariat in implementing this framework. Finally, the paper concludes with a discussion on how the implementation of the HFA can be advanced at the regional and national levels in countries in Asia and the Pacific.

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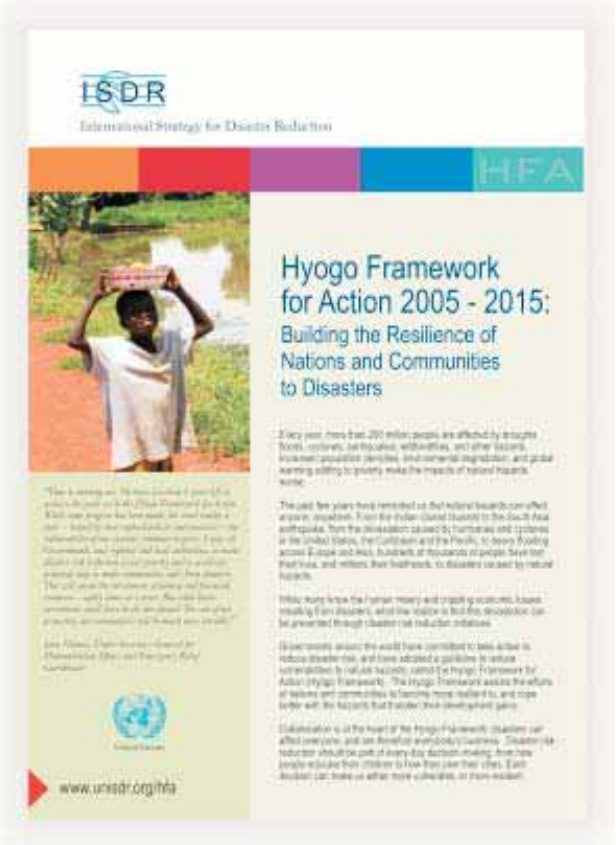
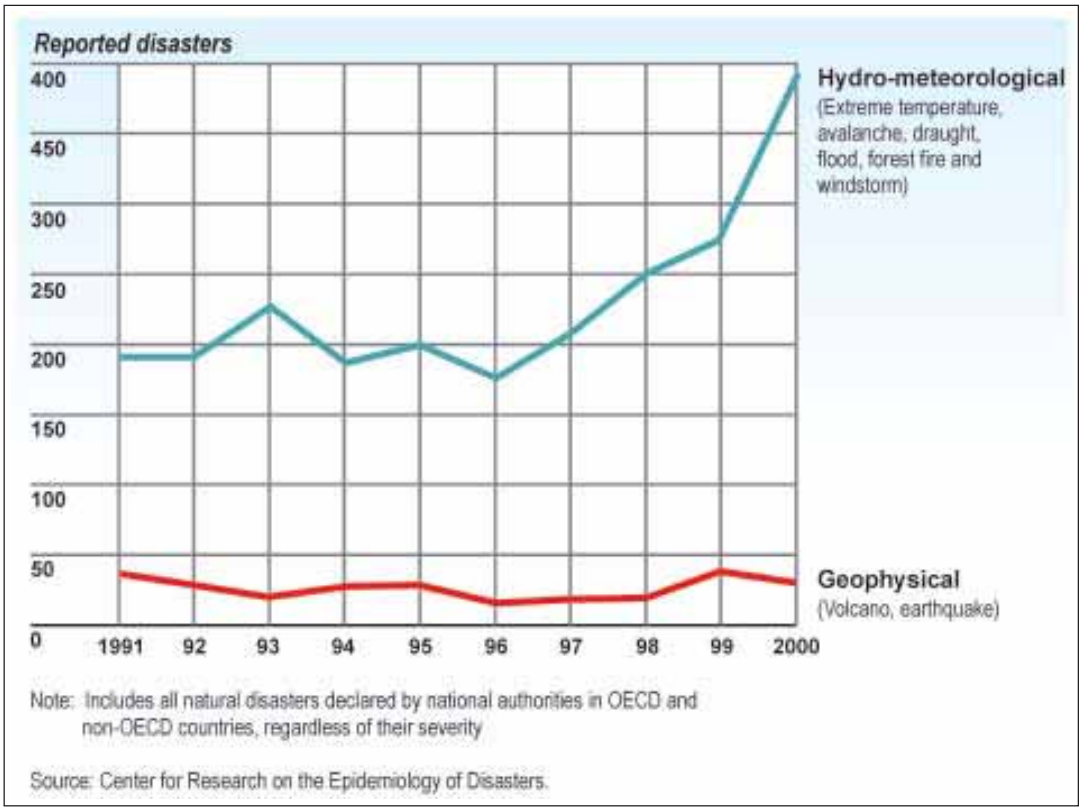


Global and Regional Data on Disaster Trends

Figure 1 demonstrates clearly that the frequency and severity of natural disasters is on the rise globally. While the decade of the 1970s shows approximately 1,100 reported disaster events; the year 2003 alone featured 500 events. Particularly, the number of hydro–meteorological events has risen, mainly due to the increased impacts of climate change, but also due to improved reporting capacity on natural disaster events in the media and by governments.

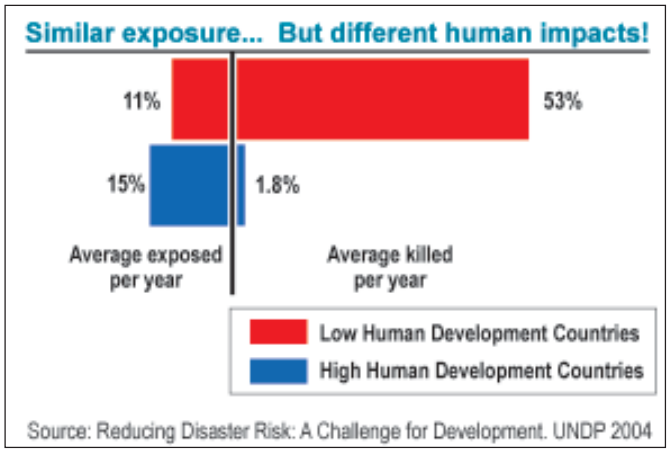
Also, economic and insured losses have risen drastically. In the 1950s, about US$5 billion losses occurred. Again, this figure has risen to US$60 billion in the year 2003 alone. This shows that disasters can have serious impacts on the development and on the ability of nations to achieve the Millennium Development Goals. The link between

Figure 1. Reported Disasters.



disasters and development is particularly well portrayed in Figure 2 which compares the number of people killed in natural disaster events with the number of people exposed to natural hazards in high and low human development countries — showing a dramatic contrast. Between 1980 and 2000, low human development countries concentrate only 11 percent of the world's population exposed to natural hazards, but 53 percent of the total deaths. High human development countries concentrate 15 percent of the exposed population, but only 1.8 percent deaths in the same period. In other words, countries with similar patterns of natural hazards have widely varying levels of disaster risk. These risks have been configured historically through different development paths and processes.

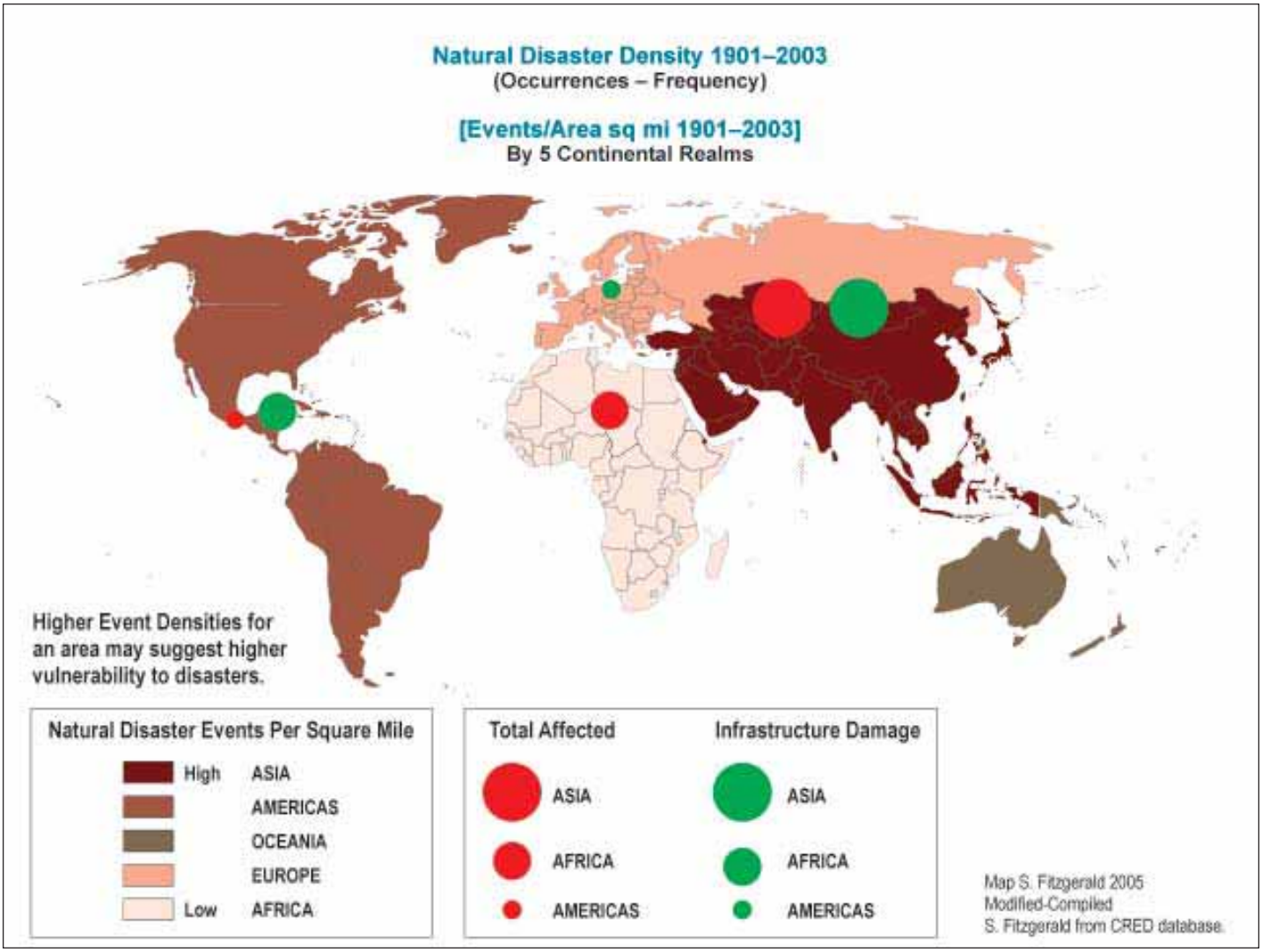
Figure 2. Disaster and Development Co-relation.



This leads to the conclusion that inappropriate development in itself is responsible for configuring disaster risk. If this is the case, disaster risk is not inevitable but on the contrary can be managed and reduced through appropriate development policy and actions. The answer to disaster risk, therefore, is not simply **more development** per se, since more and faster inappropriate development will simply increase risks and lead to greater social and economic losses.

Moving from the global to the regional perspective, we see that Asia and the Pacific is the world's most disaster-prone region. In the period from 1996 to 2005 alone, the region, in comparison to global statistics,

Figure 3. Natural Disaster Event Density (1901-2003).



reached peak figures in terms of the total number of reported disasters, people killed, people affected and the total amount of estimated damage. Also Figure 3 provides some insight on how the Asian region compares with other regions in terms of disaster impacts on a longer timescale (from 1901–2003). Undoubtedly, Asia shows the highest number of affected populations, as well as the highest damage to infrastructure development.

The UN International Strategy for Disaster Reduction

The United Nations System's responsibility in the area of disaster reduction falls within the overall framework of the International Strategy for Disaster Reduction (ISDR), which is the successor arrangement to the International Decade for Natural Disaster Reduction (IDNDR 1990–2000). The objective of the ISDR is to reduce disaster risk as an integral part of sustainable development worldwide by focusing on nations and communities. This is in recognition of the fact that disaster risk reduction is predominantly a development issue.

The ISDR system, which refers to the broad membership of many UN and non-UN organizations and partners, combines the strengths of many key players important for advancing disaster reduction. The

strategy is supported by the ISDR secretariat (UN/ISDR) based in Geneva (Switzerland) and New York (USA) with regional and thematic outreach offices in Addis Ababa (Ethiopia), Bangkok (Thailand), Bonn (Germany), Cairo (Egypt), Dushanbe (Tajikistan), Islamabad (Pakistan), Kobe (Japan), Nairobi (Kenya), Panama, and Teheran (Iran).

The ISDR secretariat is mandated by the UN General Assembly as the main coordinating mechanism for disaster reduction within the UN. Thus, the ISDR secretariat is not considered an "operational" agency but rather an advocate and facilitator for disaster risk reduction that works predominantly through its ISDR system partners. The focus of the secretariat is on advocating for disaster risk reduction, promoting the HFA, monitoring global progress made in achieving disaster risk reduction and the HFA, and exchanging lessons learned and good practices.

The Hyogo Framework for Action 2005-2015

The HFA is the result of the World Conference on Disaster Reduction (WCDR), held from 18-22 January 2005 in Kobe, Japan. The HFA provides the conceptual basis, the strategic goals and a set of priorities for action in the area of disaster risk reduction. The framework is widely considered as the first attempt to come to a common understanding of what disaster risk reduction is all about. For the first time, stakeholders from a variety of backgrounds — government, technical experts, the academe, civil society and others — have come together and agreed on what core activities need to be undertaken to be able to observe a perceivable reduction in disaster risk levels. And, importantly, the HFA represents the **collective commitment** of governments (168 all together), regional and UN organizations, local authorities, nongovernmental organizations and experts as well as International Financial Institutions (IFIs). However, States — in collaboration with civil society and local government — are primarily responsible for the implementation of the HFA with the support of other actors. The role of the ISDR in relation to the HFA is that it is the custodian of the implementation and follow up of the HFA 2005-2015.

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The overarching goal of the HFA is to substantially reduce disaster losses by 2015 — in terms of the number of lives lost, as well as the social, economic and environmental assets lost at the community and national level. It has three strategic goals that aim to:

1. Integrate disaster reduction into sustainable development;
2. Strengthen institutions and mechanisms to build resilience at national and community levels; and
3. Incorporate risk reduction into emergency management and recovery.

The HFA has the following five priorities for action:

1. Make disaster risk reduction a priority;
2. Know the risks and enhance early warning;
3. Build an awareness for a culture of safety and resilience;
4. Reduce the underlying risks factors; and

Box 1. The Five HFA Priorities for Action.

The following provides for each of the five HFA Priorities of Action a selection of the key measures that need to be in place in order to achieve the respective priority. They also serve as indicators for measuring progress in implementing the HFA.

Priority 1: Making disaster risk reduction a priority

- A legal framework for disaster risk reduction
- Multistakeholder national platforms for disaster risk reduction
- A national policy framework for disaster risk reduction
- Dedicated and adequate resources are available to implement disaster risk reduction

Priority 2: Improving risk information and early warning

- National and sector risk assessments based on hazard and vulnerability information
- Systems in place to monitor, archive and disseminate risk information
- Early warning systems in place for all major hazards
- Early warnings reach and serve people at the community level

Priority 3: Building a culture of safety and resilience

- A national public awareness strategy for disaster risk reduction exists that reaches all communities and people
- School curriculums at all levels include disaster risk reduction and instructors are trained in disaster risk reduction.

Priority 4: Reducing the underlying risks in key sectors

- Environmental protection, natural resource management and climate change policies include disaster risk reduction
- Specific policies and plans are implemented to reduce the vulnerability of impoverished groups
- Land-use development plans, zoning and building codes include disaster risk reduction and are rigorously enforced
- A programme is in place to protect schools, health facilities and critical infrastructure from hazards
- A procedure is in place to assess the disaster risk implications of major infrastructure projects

Priority 5: Strengthening preparedness for response

- Disaster preparedness capacities and mechanisms assessed and recommendations are implemented
- Disaster preparedness plans and contingency plans in place, and training drills and rehearsals are held to test and develop disaster response programmes
- All personnel and volunteers responsible for preparedness are equipped and trained
- Financial reserves and contingency mechanisms are in place to support effective response and recovery
- Procedures are in place to document experience during hazard events and disasters and to undertake post event reviews

5. Strengthen disaster preparedness for effective response.

An overview of the type of measures that are envisaged under each priority of action is shown in Box 1. They can be considered the minimum requirements that should be in place when strengthening the capacities for disaster risk reduction at the national and sub-national levels.

Past experience in disaster risk reduction has also led to the recognition of a number of basic principles that underpin or facilitate the achievement of effective disaster risk reduction[1]. Many of these are explicitly emphasized in the HFA as issues that cut across all the priorities of action, namely: multi-hazard approaches to disaster risk reduction; gender equality and cultural diversity; community and volunteer participation; and capacity building and knowledge transfer.

Experiences with Implementing the HFA

In terms of implementing the HFA, four levels of action can be differentiated. First, **national level implementation** through national policy frameworks, action plans, multistakeholder forums or platforms. These can be supported by the UN and other development

[1] See *Words into Action: A Guide for Implementing the HFA* (UN/ISDR, 2007).

partners. Second, **regional level implementation** through regional and subregional strategies and mechanisms often under the guidance (and support) of the Regional Platforms for Disaster Risk Reduction. Third, **global level implementation** through the Global Platform for Disaster Reduction (its first session was held in June 2007 in Geneva); and the joint global work programme of ISDR system partners. And finally, implementation through **thematic forums** such as the International Recovery Platform, the Global Forum on Urban Disaster Risk, or the Platform for the Promotion of Early Warning which have been established under the auspices of the ISDR.

The following will provide a brief picture of the progress achieved in the two years of HFA implementation at the regional and national levels in Asia and the Pacific since the World Conference for Disaster Reduction in 2005.

At the regional level, there has been considerable progress in building regional partnerships and networks, which contributed to greater coherence and more effective coordination of regional support to national-level HFA implementation. Of particular mention is the ISDR Asia Partnership, which has expanded in 2007 from the original six members to approximately 20, encompassing UN agencies, intergovernmental and other regional organizations. Also the number of regional disaster reduction frameworks and programmes has increased over the past two years, e.g., under ASEAN (Association of Southeast Asian Nations), SAARC (South Asian Association for Regional Cooperation), SOPAC (Pacific Islands Applied Geoscience Commission) and others, which all address one or more of the core priorities for action under the HFA. In the Pacific, the Leaders adopted a regional Pacific Framework for Action for Disaster Risk Management in 2005 which constitutes a well-developed policy framework for disaster risk reduction that is in line with the HFA and links disaster risk reduction to development. In South Asia, the creation of the SAARC Disaster Management Centre in 2006 and the SAARC strategic framework on disaster reduction build on progress already made at the national level to provide additional support for the cross-fertilization of national efforts. In Southeast Asia, a strengthened political commitment for disaster reduction resulted in the inclusion of disaster risk reduction as part of the priorities of the ASEAN Agreement on Disaster Management and Emergency Response (ADMER) in 2005 and the ASEAN Regional Programme on Disaster Management. The endorsement of the Asia Regional Platform for Disaster Reduction at the 2nd Asian Ministerial Conference on Disaster Risk Reduction that was held in New Delhi, India, in November 2007, marked yet another key milestone of regional progress.

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Also at the national level, considerable progress could be achieved in terms of the revision of legislation, institutional frameworks for disaster reduction, the establishment of National Platforms, National Disaster Risk Reduction Strategies and Frameworks and the formulation of the Strategic National Action Plans that are in line with the HFA and aim to make the shift from disaster preparedness and response towards risk reduction. Countries with demonstrated achievements include Bangladesh, Cambodia, Cook Islands, India, Indonesia, Mongolia, Nepal, Papua New Guinea, Philippines,

Republic of the Marshall Islands, Sri Lanka, Thailand, Vanuatu, Vietnam and others. Progress has also been reported in the context of establishing tsunami and multi-hazard early warning systems, public education and awareness campaigns, and last but not least, with mainstreaming disaster risk reduction into national development plans and strategies.

Despite these success stories, there are also a number of challenges and difficulties in implementing the HFA in the Asia-Pacific Region. At the policy and planning level, for example, we see great challenges in having disaster risk reduction recognized as a national priority — not only for the short period after a major disaster event, but permanently. This is often due to competing development priorities or domestic tensions and conflicts. Also, the fact that disaster risk reduction is not yet widely recognized as a development concern adds to this and impedes efforts to mainstream disaster reduction into sustainable development. Although in many countries the rhetoric and broader vision may be fully in line with the international risk reduction agenda, the actual commitment/ action focuses still too much on emergency response. Finally, policies and plans have only minimal impact without adequate financial resources and capacities and skills to implement them.

This list of challenges continues when we look at the legal and regulatory framework. In the past, legislation has been found to be important, but also that it does not guarantee success since it is often not adapted to the realities on the ground. Frequently, legislation for disaster reduction remains in the draft stage only. There are also problems of enforcement and, in some countries, there have been conflicting legislation related to disaster risk reduction. Also organizational structures and mechanisms can present challenges. The location and influence of the national coordinating body for disaster reduction is a decisive factor for success. Further to this, disaster risk reduction efforts have too often failed to take into consideration public administration aspects, such as clear roles, mandates and structures. In general, decentralized DRM systems have shown greater potential for success since they provide greater opportunities for participation at the local government level. In terms of resources and capacities, an over-reliance on technocratic/scientific approaches has been problematic. It must be understood that progress in risk reduction requires more than just the development of strictly technical skills. Crucial for success are also leadership, management, planning and knowledge management skills and a focus on local capacities and knowledge which have often been ignored in the past.

Regardless of these challenges, the high-level political commitment which could be generated as a result of the adoption of the HFA provides for an excellent opportunity to overcome some of them. In particular, two processes are recommended in this context:

1. The development and implementation of Strategic National Action Plans for Disaster Risk Reduction (so-called SNAPs or NAPs); and

2. The establishment of multistakeholder and multidisciplinary national platforms.

SNAPs are long-term planning documents that are linked and integrated into national development plans, sector strategies, corporate business plans and budgetary allocations. Ideally, they identify a country's disaster risk reduction priorities in line with the HFA and importantly in accordance with the available human and financial resources. Thus, SNAPs aim to provide realistic implementation plans, and this can be achieved if a thorough participatory multistakeholder process is followed during its development stage. The SNAP process, thus, is considered as important as the final planning document itself. Another minimum requirement of a thorough SNAP includes full ownership and official approval by the respective government, which takes overall responsibility for its design and implementation. In the Asia-Pacific, a range of countries have completed SNAPs or are currently in the process of developing strategic

action plans. These include Cambodia, Indonesia, Philippines, Republic of the Marshall Islands, Samoa, Thailand, and Vanuatu. Indonesia has even moved on to the next step, and is currently developing action plans in line with the HFA at the local level in selected districts that were affected by the 2006 Yogyakarta Earthquake.

The National Platforms have long been called for by the UN Economic and Social Council (ECOSOC) as important multistakeholder and multisector forums in support of disaster risk reduction. This call was re-emphasized in the HFA. Although in the Asian region, only a small number of National Platforms have been formally established to date (China, Iran, Japan and the Philippines), many more countries have recently expressed an interest in setting up platforms (Indonesia, Maldives, Sri Lanka and Nepal). In general, National Platforms can help:

- Build consensus on disaster risk reduction priorities at national and community levels;
- Increase national leadership and commitment for disaster risk reduction;
- Coordinate action to facilitate HFA implementation, assessment and monitoring and reporting;
- Facilitate the mainstreaming of disaster risk reduction into national development plans and sectors;
- Provide a framework for cross-sectoral reflection on disaster risk reduction and sharing of lessons learned, good practices and experiences; and
- Ensure national and local interests are reflected when regional and global disaster risk reduction priorities are being identified.

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Box 2. Technical Tools and Guidelines to Help HFA Implementation.

The UN/ISDR website (www.unisdr.org) provides access to information materials, including the selection of tools and guidelines below:

- ***Words into Action: A Guide for Implementing the HFA*** **(UN/ISDR, 2007).**
- ***Indicators of Progress: Guidance on Measuring the Reduction of Disaster Risks and the Implementation of the Hyogo Framework for Action*** **(2007).**
- ***Summary of Guiding Principles for National Platforms on Disaster Risk Reduction,*** **(UN/ISDR)**
- ***Integrating Disaster Risk Reduction into CCA and UNDAF Guidelines*** **(UN/ISDR and UNDP, 2006).**
- ***Reducing Disaster Risk: A Challenge for Development*** **(UNDP, 2004).**
- ***Living with Risk: A global review of disaster reduction initiatives*** **(UN/ISDR, 2004).**
- **A broad range of good practice and lessons learned publications on gender and disaster risk management; building disaster resilient communities; drought risk reduction, etc.**

The UN/ISDR has a range of tools and guidelines which can be helpful to national and local actors in implementing the HFA. An overview of some of these tools is presented in Box 2. The UN/ISDR outreach offices stand ready to assist partners with the application of these tools and guidelines. ■

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Disaster Risk Reduction in Asia – Emerging Trends and Solutions

Asia is well-known for its great diversities, but with these come the disparities. While Asia is home to more developed countries like Japan and Singapore, and strong emerging economies like China and India, it also hosts some of the least developed countries like Bangladesh, Cambodia, Lao PDR and Nepal. Trends show that in Asia there is a significant increase in the number of disasters, as well as in the number of fatalities and economic losses due to disaster events. There may be a direct correlation between economic achievements and disaster occurrences as very often in the race to economic, technological and scientific growth, social, cultural and environmental aspects are being sacrificed. As evident in the 2007 World Disasters report, more disasters were reported in the five-year period 2000–2005 than in the preceding years in the past decade. There are existing vulnerabilities as well as new challenges and sources of risks such as climate change, global warming, rapid urbanization and increasing migration to urban areas, environmental degradation, health hazards, increased complex emergencies and conflicts, and so on.

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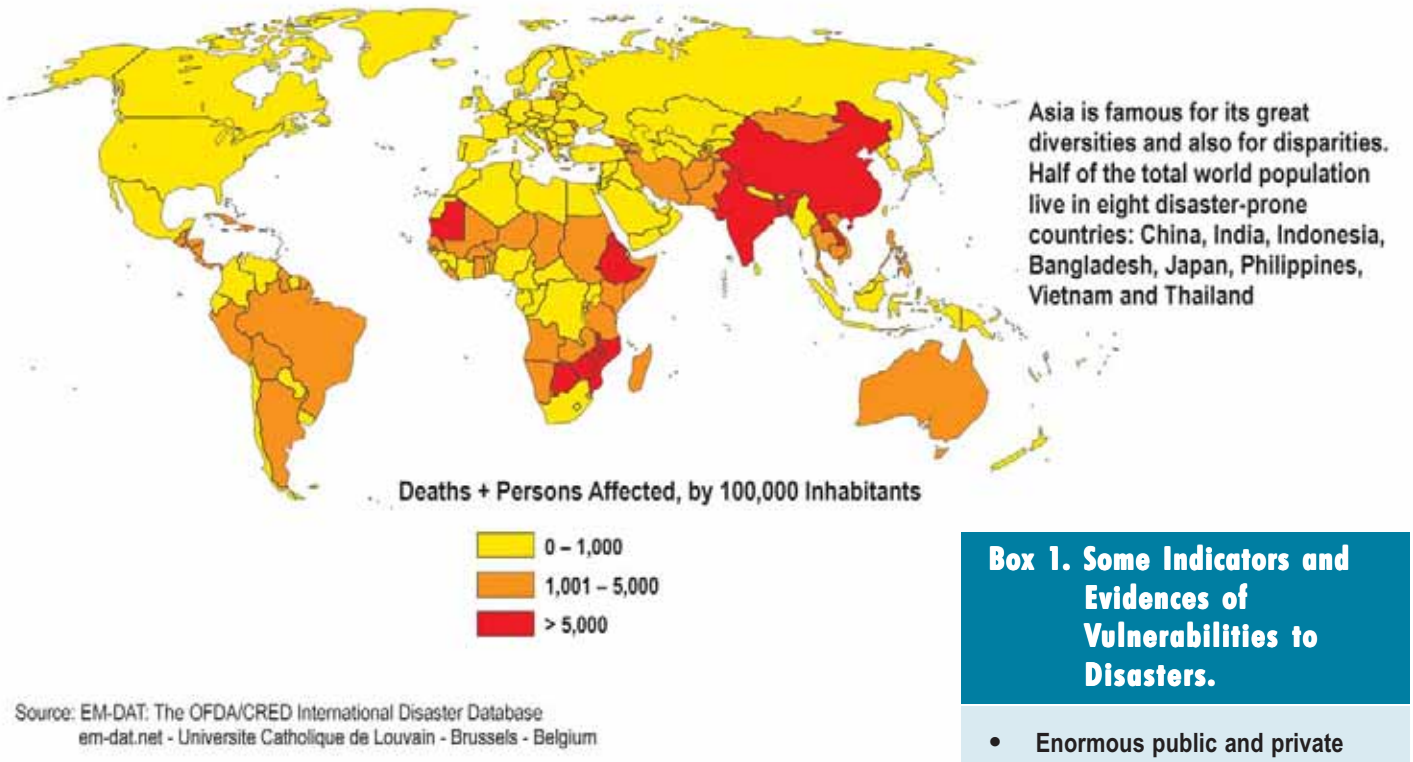
Before the introduction of the United Nations-initiated International Decade for Natural Disaster Reduction (IDNDR) in the 1990s, disasters were viewed as one-off events and responded to by governments and relief agencies without taking into account the socioeconomic implications and causes of these events. With significant advancement in the understanding of the natural processes that underlie the hazardous events, a more technocratic paradigm came into existence. According to the IDNDR, attempts have been made to resolve disasters and associated problems through public policy interventions and land use and by engineering knowledge applications. Gradually this attitude changed to add emphasis on preparedness measures, such as preparedness planning. The present understanding is that the disasters can be seen as a result of progression of vulnerabilities to hazards and that solutions can be found through building of capacities and improving the resilience of communities-at-risk. This way, disaster risks can be reduced and mitigated. Thus the terms "risk reduction," "vulnerability reduction," "capacity building" and "mitigation" began replacing the term "disaster management." It was a shift from short-term, reactive, charity-driven response to long-term, proactive, developmental initiatives.

During the first five years of the new millennium, coastal areas have emerged as one of the main economic zones that have a high potential risk from natural hazards. This was evident from the colossal economic and social impacts due to the unprecedented 2004 Indian Ocean tsunami and subsequent devastations created by cyclone events in the Philippines and Vietnam in 2006 and Karachi (Pakistan) in 2007.Therefore proactive disaster risk management in Asia has to become part of the development agenda to deal with the growing variety and intensity of hazards in general, and that coastal areas should receive special attention due to growing economic activities as well as emerging long-term risk scenarios associated with climate change, global warming and sea level rise in particular.

Figure 1. Deaths and Persons Affected by Disasters.



Box 1. Some Indicators and Evidences of Vulnerabilities to Disasters.

- Enormous public and private sector economic losses, destructions to property, infrastructure and lifeline facilities
- Deaths, injuries and disabilities
- Mass population displacements
- Extraordinary relief assistance
- Temporary shelter requirements
- Loss of livelihood
- Damage to health, infrastructure and inadequacy of health facilities
- Destruction to schools and high number of deaths among schoolchildren

Introduction

On 24 December 2004, as many as seven countries in Asia were devastated by a tsunami event, recognized to be the biggest natural disaster event the world has ever known. The magnitude is evident from the lives lost (more than 200,000), families displaced (several millions) or in terms of damages to assets and economic losses (combined estimated total of US$10 billion). Subsequent major events such as flashflood events in Mumbai (India) and Uttaradit (Thailand); cyclones and devastations in coastal urban areas in Karachi (Pakistan) and Danang (Vietnam), and many parts of the Philippines; and earthquake events in Pakistan, India and Indonesia have proved that there is an urgent need to push hazard mitigation practices up the development policy agenda in order to tackle the soaring reconstruction costs and to minimize significantly the losses to shelter, infrastructure and other economic gains of development. Essentially, governments of developing countries as well as developed countries now have to take serious note of the proactive approaches and practices for hazard mitigation in order to maintain sustainable development. This is more significant to developing countries where there is a potential for serious impacts on Gross Domestic Product (GDP) growth due to frequent occurrences of natural and man-made disaster events.

However, the focus of attention on mitigation measures is limited and usually does not extend beyond those who are directly involved in risk management activities. It does not get integrated into development practice nor in recovery programs after disasters, and certainly does not

extend to the development sector, including in areas where there is high potential for public and private investments. Despite the increased recognition of the effectiveness of proactive approaches to risk reduction, mitigation measures have not generated the resources and attention necessary to make them a mainstream requirement of development projects, which are often observed to be the key elements at risk. This is important particularly for infrastructure in urban areas, such as transportation routes, administration facilities, emergency service facilities, medical and health care facilities, education infrastructure facilities, community services, infrastructure and community buildings, commercial ventures, cultural assets, such as historic structures and museums, etc. As such, lifeline services are an essential requirement for the social and economic well-being of a community and to maintain the sustainability of the economy.

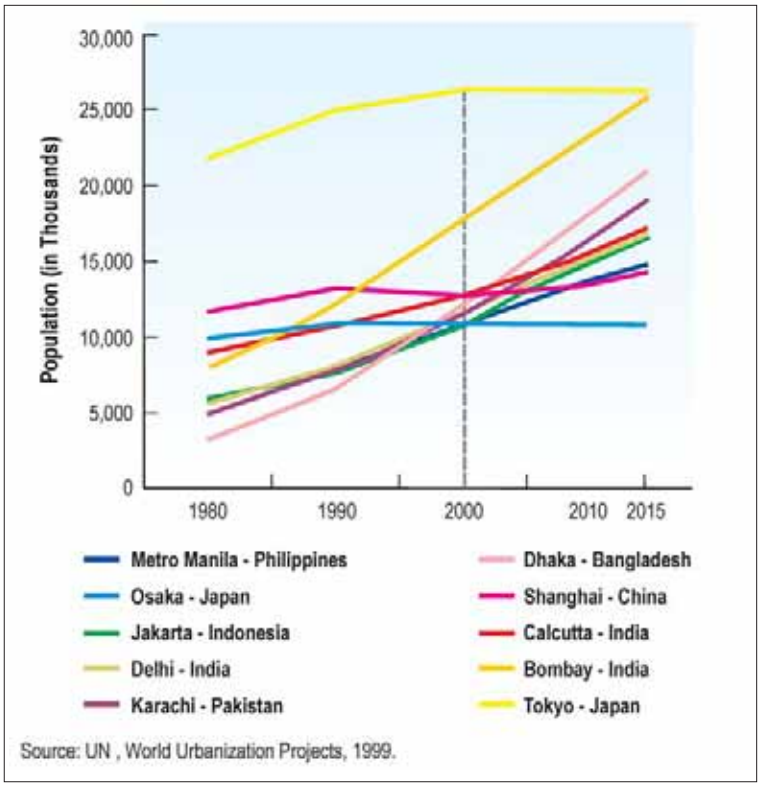
A failure in lifeline services can cause substantial insecurity in a community, leading to increases in illness and death, and the breakdown of communication, not to mention the interruption of economic activities long after a disaster strikes. When critical infrastructure fails, the ability of a community to rebound from a disaster is severely hindered. Further, where resources are limited, focusing on critical infrastructure essential to the entire community spreads the benefits of mitigation to a greater portion of the population (USAID, 2003).

Impacts of Urbanization

Asia is seen to be one of the fastest urbanizing regions in the world, with urban population soon surpassing that of the rural population. In 2000, 37 percent of the region's population was living in cities. This proportion is projected to rise to more than 60 percent within the next 25 years. Furthermore, it forecast that by 2020, out of the ten largest economies in the world, seven will be from Asia. When such global economic projections are placed in a wider socioeconomic context, the promises offered by economic achievements transform to increased risks to infrastructure and coastal populations, as a consequence of natural calamities and man-made hazards.

Due to such issues, there is an urgent need to make risk mitigation one of the essential components of urban governance and to create policy, legal and institutional arrangements to ensure safer urban communities. Under such circumstances, the cities in Asia with high vulnerability to natural and man-made hazards require a collective vision for all stakeholders,

Figure 2. Population of Ten Largest Cities in Asia and the Pacific Region (1980–2015).



Source: UN , World Urbanization Projects, 1999.

including vulnerable communities, an agreed strategic framework with identified action areas aimed at socioeconomic growth. There is an increasing understanding that cities are meant to offer positive conditions to improve the lives of their habitants. In reality, vulnerable communities located in marginal areas of cities have much to contribute in making these areas safer. Disaster resilience in all urban communities is an essential factor for achieving sustainability and improving lives.

When critical infrastructure fails, the ability of a community to rebound from a disaster is severely hindered. Further, where resources are limited, focusing on critical infrastructure essential to the entire community spreads the benefits of mitigation to a greater portion of the population (USAID, 2003).

There is a compelling need to bring a new awareness on urban vulnerability to natural and man-made hazards and build capacity in Asian cities to tackle the root causes of vulnerability. This may be done through innovative local solutions, so as to create an enabling environment and ensure safer urban communities in the future.

Climate Change Impacts and Long-term Needs for Adaptation

The scientific community in the developing countries in Asia has not yet taken adequate interest in conducting multisectoral studies to understand and prepare inventories of climate change impacts on coastal ecosystems. Also, there are no serious attempts by the authorities to plan and undertake an integrated climate change resilience approach to address long-term needs. Therefore there is a desire to improve general awareness on the issues from both aspects of governance and climate change resilience. At-risk communities obviously need to search for proactive ways to counteract possible consequences of the recurrent events of hydro-meteorological disasters due to climate change, as they can result in high socioeconomic setbacks to development. Such events can even contribute to the increasing vulnerability of the urban population, particularly those in poor communities.

It is therefore necessary to:

- Study the governance structure and see the areas where improvement is needed to enhance the resilience of the poor communities especially those living in urban coastal areas and low-lying areas;
- Study the development-related issues and consequences due to climate change;
- Look at primary (meteorological) events, secondary events (health hazards, slope destabilization, mass movements, flashflooding, etc.) recorded in built-up areas to analyze the trends;
- Forecast the consequences of sea level rise (as a larger number of major cities and industrial areas are located within the coastal belt) and its impact on urban development; and
- Develop ways and strategies to promote climate change resilience within built-up areas of all developing countries in Asia.

Some Observations and Future Trends

Increased rural to urban migration has resulted in a large

Long-term impacts to infrastructure and buildings due to water table fluctuations, salinity and pore pressure fluctuations, decay of pile foundations, etc., can create adverse conditions, which in most cases are not foreseen during the design stage.

number of people residing in hazard-prone areas (i.e., low-lying flood-prone areas, coastal areas, hill slopes, etc.), making them vulnerable to hydro-meteorological events, landslides, storm surges and flooding. The situation has been aggravated by reclamation projects for expansion of human settlements, in areas prone to flooding. In addition, flashfloods and landslides are increasing in hilly areas as a consequence of deforestation and uncontrolled development, which have a negative influence on the natural drainage systems of these areas.

The poor segments of the community are forced to live in substandard housing and weak infrastructure within built-up areas and in effect, they become the first victims and the most vulnerable to all kinds of disaster events. Disaster impacts on infrastructure associated with poor communities is expected to grow in the future due to land scarcity and because it is unaffordable for such groups to relocate to less vulnerable areas. In addition there can be adverse effects on large infrastructure investments due to potential hazard events.

In coastal areas, many high-rise buildings and large infrastructure facilities are located on problematic soils such as unconsolidated alluvial materials, requiring special techniques such as pile foundations to get stabilized. Long-term impacts to infrastructure and buildings due to water table fluctuations, salinity and pore pressure fluctuations, decay of pile foundations, etc., can create adverse conditions, which in most cases are not foreseen during the design stage. Existing research has not adequeately covered the geo-environmental problems associated with long-term climate variations. It is important to understand the trends and to propose ways to minimize risks. A case in point is the impact on urban drainage infrastructure (e.g., drains, culverts, bridges, etc.), which is becoming increasingly inadequate in terms of capacity due to the large volumes of floodwater during extreme weather conditions.

Impacts on livelihood can be high and the hardest hit will be the urban poor since their livelihood is often reliant on environmental conditions. Among those affected are the informal income groups and the unskilled workers. More specifically, livelihoods available to the poor will have been affected negatively due to loss of work opportunities, lack of accessibility to natural resources and decreased demand. Urban water supply is dependent on water reservoirs and deep subsurface water sources extracted through wells. The climatic variations have severe impacts on reservoirs and associated water supply schemes. Due to increasing sea levels, the aquifers are being encroached with saltwater intrusions. As a result, there is increased dependence by the urban population on commercial "bottled" water, which poor communities cannot afford. In such cases, city authorities need to allocate additional resources to satisfy the water supply needs of the city population, as well as to protect the sources of potable water to avoid pollution and increasing salinity.

Progression of Vulnerability

In the global context, about 50 percent of the cities are situated along major earthquake belts, river flood plains, landslide-prone mountain slopes or on tropical cyclone tracks. The situation in Asia is quite significant in this context as majority of megacities as well as primary and secondary cities are

located in hazard-prone areas. In addition, overexploitation of environmental resources often results in health disorders, inconveniences and high vulnerability to epidemics such as AIDS, SARS, etc. Terrorism, fatal accidents, chemical biological risks force a new threat to built-up areas. **The growing risk due to progression of different types of vulnerabilities has to be resolved** through emergency response and mitigation planning, creating safer shelter, infrastructure and lifeline facilities.

Socioeconomic vulnerability has to be addressed through solutions capable of tackling the root causes. Managing the problems associated with progression of vulnerability due to unplanned expansion of urban areas, poverty migration from rural to urban, lack of services and infrastructure is a big challenge for developing countries in Asia. The task is huge and governments are ill-equipped and under-resourced to provide solutions. Lack of economic opportunities; frequent destruction of assets, crops and harvests as a result of disasters; limited livelihood alternatives in the rural areas drive the at-risk population to the urban and semi-urban regions. Urban poverty is the transformation of what was once seen as dispersed rural poverty. **No doubt wherever it exists, poverty is the root cause of socioeconomic vulnerability.** Migration also leads to increased density of population in urban areas. The growth of slums, overcrowded informal settlements on marginal land, is a factor which contributes to increasing vulnerability. In such circumstances, cities grow in an unplanned manner and marginalized populations are pushed to vulnerable areas without adequate facilities. The essential component of the urban workforce lives in such areas and indirectly contributes to economic growth.

The growing risk due to progression of different types of vulnerabilities has to be resolved through emergency response and mitigation planning, creating safer shelter, infrastructure and lifeline facilities.

Among the major problems faced by many countries is the **non-consideration of risk reduction aspects in physical planning**. Often, spatial development plans are prepared without adequate consideration to the seismic aspect or flooding and the expansion of built-up areas can be directed towards the most prone area. The responsibility of authorities is to provide safer areas for living. Governments of developing countries, however, lack land use solutions to solve the scarcity of land, alternatives for soaring land prices which escalate due to difficulties associated with the implementation of land use regulations. The poor cannot afford to buy land in safer areas and there are no adequate measures to provide alternative formal settlements to shelter the urban poor.

In cities such as Mumbai, 60 percent of the population live in slums and occupy 7 percent of the land. Such difficulties are aggravated due to lack of mechanisms for participatory approaches and consultations prior to decision-making. Most **decisions taken in the absence of representation from vulnerable communities are unfavorable** to them. Hence governments at all levels, which should operate on the principle of participatory decision-making and working together towards common solutions, often fail to design action plans to address the problems associated with vulnerability. This institutional vulnerability has to be addressed for the creation of a safer environment with adequate essential facilities.

Another aspect of vulnerability is connected with **institutional vulnerability**. It is due to limitations or lack of institutional and legal frameworks, institutional capacity, and unavailability of technical information related to hazard environments, socioeconomic and physical vulnerabilities and assessment tools for ascertaining the potential risk. Lack of information

on hazard proneness and information on probable scenarios, absence of an early warning mechanism and unavailability of historical information on destructive events limit the capacity of the relevant institutions to assess trends. Increase in **physical vulnerability** is connected with weaker buildings and infrastructure that are vulnerable to the impact of various types of forces created by environmental hazards. Most of the engineered buildings, infrastructure and lifeline facilities do not conform to building code requirements. Further, cities lack a capable cadre of technical experts who can assess building plans against technical requirements for building structures that could withstand the forces due to natural hazards. Shelters occupied by the middle class often are owner-built — without adequate technical guidance from architects and engineers. Housing stock in crowded, informal settlements are substandard buildings and structures built using non-traditional building materials and are mostly temporary and semi-permanent in nature. These result in damage and destruction to all non-engineered buildings and structures in the event of a disaster. Mostly, it results from lack of technical guidance and essential credit facilities to undertake remedial actions to improve the situation. Other observed factors in urban areas is the inability of local governments to raise revenues and therefore, provision of adequate services continues to deteriorate with the expansion of informal settlements.

Strategies for Reducing the Risk

Despite the growing risk, most of the rapidly developing countries in Asia adopt a reactive approach to risk management. Any country which understands the problems due to escalation of risk due to natural and man-made hazards should adopt a long-term and proactive strategy for risk management. Some of the strategies that can be adopted are summarized below:

Participatory Approach in City-level Action Planning for Risk Reduction

Through the governance process, the local governments are encouraged to engage in a

Improved urban management can directly reduce the impacts of floods, landslides, earthquakes, fires and epidemics.

constructive dialogue with stakeholders and involve them in decision-making concerning development through a sustainable, proactive, risk reduction approach. But legal provisions to undertake such initiatives do not exist in many countries. Therefore, it is necessary to promote the establishment of **local-level disaster management committees** and to include wide representation from at-risk communities, civil society groups and the public. This can be an effective informal governance approach to risk reduction. It has proven to be successful in a few countries in Asia, such as the Philippines, where the knowledge and support of civil society stakeholders is considered an essential aspect in solving problems concerning the safety of the population. Each consultation is designed to maximize the partnership between government authorities and stakeholders and the bottom-up approach is promoted in decision-making.

Access to Information

India is going through a revolutionary process by allowing public access to information for planning and development. In this way, the public can log protests or suggest alternative ways to minimize potential risks. Hazard zonation mapping and risk assessment is considered to be the starting point in the process of vulnerability reduction but this information should be made available to the public. In the case of secondary cities, ward or community-level hazard assessments are being carried out using Probabilistic Risk Analysis (PRA) tools. Trained volunteers become the facilitators of the PRA and a wide range of stakeholder community groups is invited to take part. The assessment data is integrated to form hazard zonation maps and risk assessments at the local government level. The city-level risk maps, using Global Positioning System (GPS) and Remote Sensing (RS) techniques, transform community knowledge into formal products, which can be integrated in other maps, such as maps on land use, geology and soil condition, along with human settlement data, population density, income and revenue collection data, etc. All of which provides a better understanding of the vulnerability and growing risk to the population. In more developed countries, environmental risk is mapped at the community level, analyzed by technical institutions and the results, on which decision-making is based on, are verified through a participatory process.

In more developed countries, environmental risk is mapped at the community level, analyzed by technical institutions and the results, on which decision-making is based on, are verified through a participatory process.

Apply Community-based Approach to Address Local Needs

The aim of community-based disaster risk management (CBDRM) is to:

1. Reduce vulnerabilities and to increase capacities of vulnerable groups and communities to cope with and prevent or minimize loss and damage to life, property and the environment;
2. Minimize human suffering; and
3. Speed up the recovery process.

The participatory approach for scenario building, risk assessment and action planning can also generate the much needed awareness on issues, and help to build ownership in the risk reduction process. The most important mitigation interventions that have been undertaken in Asia through community-based approaches proved to be good solutions for upgrading the living

standard of informal settlements and also a viable solution for the lack of resources for implementation. In any disaster, people at the community level must use coping and survival strategies to respond to the situation long before outside help arrives. CBDRM responds to the growing recognition of the need for community participation to ensure sustainable disaster reduction.

The community-based approach also corrects the defects of the top-down approach in development planning and disaster management, which has often failed to address local needs and ignored the potential of indigenous resources and capacities. The action plans identify the long-, medium- and short-term actions for risk reduction and require the city governments to introduce budgetary allocations for mitigation in the annual budget process. Also, the development agencies, national and international agencies working in the area of community development can select actions from the wish list for implementation. Central governments and external funding institutions can encourage more communities by allowing direct access to development funds by communities for implementation of risk reduction interventions.

Safer Shelter Programs to Reduce Losses

One of the essential aspects of disaster impact reduction is ensuring safer housing and shelter capable of withstanding the forces inflicted due to hazard events. Most of the casualties during disasters are associated with the collapse of buildings. Therefore the quality assurance of housing construction and infrastructure is an essential part of urban risk reduction. The imperatives for promoting safe building construction in the context of disaster-related structural and non-structural risks are:

- Saving of lives of human beings and animals; and
- Saving of limited, costly and scarce resources of building materials and money (finances) from the loss of buildings, property and infrastructure.

Most of the buildings and infrastructure in urban built-up areas do not necessarily cover the provisions of the building code. Very few countries in Asia have appropriate construction regulations according to specific potential hazards. Also, the choices of building materials often do not take into consideration potential disaster impacts when strength specifications are made. More often, the buildings are built by the owners and the selection and use of unsuitable construction materials and construction techniques lead to added risks and vulnerabilities. Even if the technological solutions are made available, the perception on high costs for reinforcing and renovating vulnerable buildings exists and this cannot be changed easily. The general view is that the cost for reconstructing these after a disaster is much lower. The appropriate government institutions have to take initiative in promoting appropriate technology for construction in disaster-prone areas through demonstrations of model housing, school retrofit programs, and reinforcement of historical buildings, community buildings, etc.

Box 2. Long-term Strategies for Urban Disaster Risk Reduction.

- **Participatory approach in city-level action planning for disaster risk reduction**
- **Ensure public access to hazard information**
- **Apply community-based approach**
- **Ensure safer housing and infrastructure**
- **Ensure the involvement of the private sector**
- **Public awareness and social marketing should target people living in hazard-prone areas**
- **Support the implementation of the Hyogo Framework of Action and create more awareness on HFA**
- **Advocate strongly for decentralization of disaster risk management functions to the local government sector**
- **Mainstream disaster risk reduction into other sector-based programs to facilitate building safer communities**

Encourage Private Sector Involvement

In keeping with global trends, most developing countries in Asia have switched to market-based economic policies and recognize the private sector as a catalyst in the development process. In risk reduction, however, most stakeholders place the responsibility only on government administrations. Making the private sector a partner in development means that it should also shoulder some responsibility in converting negative vulnerable environments into positive safe environments. There is evidence that investment decisions are influenced by hazard risks and some of those decisions are made due to convenience, which is a factor for increasing vulnerability. When critical infrastructure falls, the ability of a community to rebound from a disaster is severely hindered.

Further, where resources are limited, focusing on critical infrastructure essential to the entire community spreads the benefits of mitigation to a greater percentage of the population. In Vietnam, for example, some of the more hazard-prone regions have received a disproportionately small share of private sector investment because of perceived risk (Benson and Clay, 2004). In Bangladesh, garment factories put up by the private sector in urban areas attract a lot of rural labor. When commitment of the vulnerable communities is high, it is realistic to expect private sector institutions to fill the funding gap for mitigation in order to supplement the efforts. This has been demonstrated in school retrofitting programs implemented by the National Society for Earthquake Technology (NSET) in Nepal and disaster-resistant model housing initiatives undertaken by the Center for Housing, Planning and Building (CHPB) and National Building Research Organization (NBRO) in Sri Lanka. If risk is always considered to be a part of an investor's consideration when initiating a disaster risk reduction project, and if they can integrate risk reduction measures into the design, the risk can be minimized. This will ease the resource constraints of governments to undertake specific risk mitigation interventions.

Activating and Motivating the Poor to Become Resilient

The population living in informal settlements indirectly serves as the skilled and unskilled labor force and plays a great role in city life. Often, they live on minimum daily wages; therefore food security, health and sanitation all depend on how conducive the environment is for the continuity of their employment. Any breakdown in such a situation severely affects them and recovery is difficult when setbacks are met in their daily life. On the other hand, uninterrupted external and internal labor market supplies ensure constant investment in labor-intensive businesses. Activating the poor and motivating them to become resilient against natural calamities is an answer to the key issue of poverty reduction. Therefore reduction of poverty is seen as another important goal of disaster risk reduction. In many areas, key information on the poor, housing situations, employment conditions and service delivery is not readily available and it is therefore difficult to launch programs aimed at building community resilience. Authorities need to be motivated to undertake risk reduction programs aimed at vulnerable communities. Mobilization of the poor through organized groups in disaster risk reduction initiatives is possible for their own benefit. Experience shows that these efforts are very successful if institutional mechanisms can be established for a more sustained participation of the poor in skill enhancement endeavors and risk reduction initiatives.

Risk Communication for Creating a Safety-conscious Public

The strategy for public awareness and social marketing should target people living in hazard-prone areas to make them realize and understand the specific vulnerabilities and risk that they are exposed to, compliance to warnings that are issued, and appropriate actions to protect their lives and minimize property damage. It is achieved through marketing the "risk message" to the affected audience by crafting outreach activities with an understanding of social and cultural

contexts. There are few examples from countries in Asia suggesting the effectiveness of such an approach. They demonstrate the employment of different approaches, tools and products in campaigns for different audiences. The Bangladesh experience shows the importance of design being culture-specific and the involvement of the community. The Sri Lanka experience highlights the need to use local languages and popular media through shows that feature drama, while Nepal has demonstrated the effectiveness of disaster safety day events to promote a culture of safety. There are experiences of similar safety day events organized at the city level in Sri Lanka, Bangladesh and Thailand.

To create a safety-conscious public, the risk communication process should be creative and culture-specific, should have the extensive involvement of the vulnerable community and should adopt customized approaches in response to the needs of the community.

Building the Capacity of Stakeholders

A fundamental goal of capacity building, as stated in the United Nations' Agenda 21, is to enhance the ability to evaluate and address the crucial questions related to policy choices and modes of implementation among development options, based on an understanding of environment potentials and limits and of needs perceived by the people of the country concerned.

Whatever the actions taken, **disasters are capable of exposing unattended vulnerabilities.** As a process and non-structural approach in disaster mitigation, capacity building interventions should address vulnerability and its root causes and be integrated into the development process so that it can contribute to sustainability, empowerment and community resilience. There are many approaches for building capacities, including training, public awareness, policy advocacy, community organizing, institutional networking, income-generating projects and emergency response. There are also multiple actors in the process. As the concept of capacity building encompasses the major aspects affecting the community — political, social, economic and cultural — capacity building should focus on multiple stakeholders, particularly on their strengths, needs and priorities. Such an approach to capacity building should combine formal training and informal education.

Countries in the region have demonstrated an array of capacity-building programs, methods and tools. In addition, they have demonstrated the effectiveness of networking among training institutions and universities to promote sharing of experience in the integration of urban disaster mitigation in regular academic disciplines at the undergraduate and postgraduate levels as well as in professional training and continuing education endeavors designed for public officials and bureaucrats.

Mainstreaming Risk Management into Other Sectors

In many Asian countries, a national level institution or ministry handles disaster management. It is the observation of the ADPC that the activities and functional responsibilities of such institutions are rarely decentralized or the authority of such institutions has not been adequately delegated to lower levels of governments or other sectors involved in development planning and implementation. This needs to be viewed as a hindrance for achieving disaster-resilient communities. The ADPC advocates strongly for decentralization of disaster management subject to the local government sector and integrating other sector-based programs as a routine practice to facilitate building safer communities.

Initiatives of the ADPC in Urban Risk Reduction in Asia

As a resource center dedicated to risk management capacity building, the Asian Disaster Preparedness Center, since 1986, has

successfully implemented a number of disaster mitigation programs in Asia. The Asian Urban Disaster Mitigation Program (AUDMP) is one of its key initiatives. The AUDMP, which was funded by the Office of the Foreign Disaster Assistance (OFDA) of the United States Agency for International Development (USAID), identified specific working models in the Asian context to reduce vulnerability to disasters. These working models were documented in detail to support their replication in many other communities and countries. There were a number of broad disaster axioms that were reconfirmed and supported by the experience of implementing the AUDMP — from its demonstration projects that created a safer built environment in both large cities and towns across Asia; to the information and awareness programs, training, and policy change activities; and new insights and initiatives that came directly out of the AUDMP experience.

The program was implemented with partner organizations in ten countries, namely, Bangladesh, Cambodia, India, Indonesia, Lao PDR, Nepal, Philippines, Sri Lanka, Thailand and Vietnam. It helped to establish strong networks of local governments, development agencies, regional and national disaster mitigation professionals and experts who continue to help replicate disaster mitigation models that are unique to the Asian context throughout the region. AUDMP has made a significant contribution in establishing disaster mitigation as an integral part of the development process in Asia in a way unique to the cultural, social and local context of each target country. It has adopted a set of innovative strategies to achieve success in risk mitigation.

The ADPC advocates strongly for decentralization of disaster management subject to the local government sector and integrating other sector-based programs as a routine practice to facilitate building safer communities.

At present, ADPC is implementing a program for hydro-meteorological disaster mitigation in secondary cities in Asia through funding support from USAID/OFDA. This program also promotes preparedness and mitigation activities in selected highly vulnerable secondary cities in South and Southeast Asia by building upon the successful elements of the AUDMP. This program demonstrates the long-term commitment of ADPC to urban risk mitigation and builds the institutional support that has already brought significant impact on the attitudes, knowledge and skills in the countries. Other similar programs include the Partnership Development for Disaster Risk Reduction (PDR-SEA) funded by the European Union and the Asian Program for Regional Capacity Enhancement for Landslide Impact Mitigation (RECLAIM) funded by the Government of Norway. Such practices and endeavors are expected to be strengthened further through the implementation of new programs that are dedicated to promoting preparedness and mitigation as a long-term proactive practice of countries in Asia. ■

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Natural Disaster Prevention, Response and Mitigation in Vietnam

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Introduction

Vietnam is a disaster-prone country; it often faces natural disasters of various types. Because Vietnam is located in the tropical monsoon area, it is also considered as one of the five storm-prone areas in the Asia-Pacific region. In recent years, disasters have occurred all over the country, causing enormous losses in human life, property, social and cultural infrastructure as well as environmental degradation. From 1997 to 2006, natural disasters including typhoons, floods and drought have caused significant losses, amounting to 7,500 missing persons and casualties and damages equivalent to 1.5 percent of the Gross Domestic Product (GDP).

Natural disasters in Vietnam have been increasing in terms of magnitude, frequency and severity. Global climate change has compounded this phenomenon.

The storm-prone Central Region of Vietnam focuses on "Preparedness, Adaptation and Mitigation" in addressing disaster-related issues in the region.

The Vietnamese Government and its people have taken appropriate prevention, response and mitigation measures to:

a. minimize human loss;
b. reduce the loss of the State and people's assets;
c. eliminate hunger and alleviate poverty;
d. protect the environment;
e. ensure sustainable development; and
f. contribute to natural disaster mitigation in the region and the rest of the world.

With a long coastline of 3,260 km, Vietnam spends much of the national budget to build and rehabilitate dike systems every year. This program is instituted to mitigate the impacts of natural hazards and to ensure sustainable development for people who are living near the coastal areas.

Geographical, Meteorological and Socioeconomic Background of Vietnam

The territory of Vietnam borders the People's Republic of China in the North, Lao People's Democratic Republic and Cambodia in the West, and faces the East Sea in the East and the South.

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The cycle is incomplete unless the lessons learned from previous emergencies are not incorporated in another round of planning and implementation stages.

Vietnam has a relatively diverse topography. It is made up of mountains, highlands, deltas, rivers, coastal areas, islands and peninsulas. Hills and mountains cover three-fourths of the land area. Plains account for the remaining 25 percent, consisting of the Red River Delta, the central coastal plain, the Southeast plain and the Mekong River Delta.

As its territory is separated by mountain ranges, Vietnam has dense river networks. There are 2,360 rivers: 13 river systems cover a basin area of 3,000 km^2 and above, and 9 river systems have a basin area of more than 10,000 km^2, namely the Mekong, Red, Ca, Ma, Thai Binh, Dong Nai, Ba, Bang Giang-Ky Cung and Thu Bon rivers.

The catchment area of the Vietnamese river systems is 1.167 million km^2, of which 835,000 km^2 are outside its territory (71.5%). The average annual flow is 835 billion m^3, of which 37.5 percent originates in Vietnam territory.

The territory is divided into seven economic and sub-climate zones, namely the Northern Mountains, the Red River Delta, the North Central Coast, the South Central Coast, the Central Highlands, the South East and the Mekong River Delta.

Vietnam is located at the edge of Southeast Asia where it is bordered by the Pacific and the Indian Oceans. It is also influenced by various continental and ocean air blocks. Therefore, the rainfall is high but fluctuates and varies throughout the country. The average annual rainfall is approximately 2,000 mm. The North Central Coast is often observed to have the highest average annual rainfall, whereas the South Central Coast has the lowest rainfall region.

High and steep mountain ranges plus high rainfall make these regions vulnerable to landslides and flashfloods. In addition, earthquakes occur in the northeast region although they happen infrequently and at low magnitude. Table 1 shows the type of natural disaster by regional areas.

Rapid population growth and urbanization have caused serious pressure and degraded the natural resources and environment. A total population reaching more than 85 million and a rapid population growth has led to land shortages, for both residential and agricultural purposes. Communities have encroached near river embankments, estuaries, and shorelines; they have also exploited natural resources and minerals in an uncontrollable manner, as well as cut down and burned forests. These are the factors that obstructed and limited riverine flows, impoverished the land, silted reservoirs, caused landslides in the mountainous and hilly areas, as well as mud- and rock floods. As a result, natural disaster risks have risen.

Economic growth averaged more than seven percent per year in the 1990s and is estimated to grow even higher in the next two decades. If not combined with natural disaster prevention, response and mitigation, this growth may cause more environmental pollution and ecological imbalance, which in turn increases disaster risks and unsustainable development.

Table 1. Types of Natural Disasters by Regional Areas (Phuong, 2007).

REGION	DISASTER ZONE	PRINCIPAL HAZARDS
NORTH	Northern Upland	Flashfloods, landslides, earthquakes
	Red River Delta	Monsoon river floods, typhoons, storm surges
CENTRAL	Central Provinces	Typhoons, storm surges, flashfloods, droughts
	Central Highlands	Flashfloods, landslides
SOUTH	Mekong Delta	River flooding from upstream, typhoons, storm surges

Damage caused by the Damrey Typhoon in July 2005 to Hai Hau in Nam Dinh Province.

The Cyclical Process of Disaster Risk Management

Vietnam is cognizant of the cyclical phases of risk management; measures which address specific targets at particular stages. These are both proactive mechanisms (measures in advance of an extreme event) and reactive mechanisms (measures during and after an event). The knowledge generated from each stage may and can prevent and mitigate impacts of a disaster, hence can alleviate vulnerabilities in a certain locale or increase resiliency of communities in the face of emergencies. In other words, the cycle is incomplete unless the lessons learned from previous emergencies are not incorporated in another round of planning and implementation stages.

Preparedness and Prevention Phase

The first stage to effective disaster risk management is preparedness and prevention, before a natural hazard wreaks havoc. They involve proactive measures which involve non-structural and structural components. Boxes 1 and 2 enumerate both methods as applied in Vietnam aimed at reducing the possibility of a natural hazard resulting in disasters. They involve early forecasting and warning systems, action plans, capacity development, information campaigns, improved dike systems and safe infrastructure.

Response Phase

The second phase involves measures during an emergency. It constitutes measures to: collect and process information from affected areas; make timely decisions for specific situations; establish forefront commands and task forces; and evacuate residents in dangerous areas. As such it is imperative to deploy human resources, equipment and facilities for disaster response that can carry out search-and-rescue operations effectively. The strategy is based on the adequacy of four metrics during a rescue mission: leadership, human resources, facilities and logistics. Here, the primacy of good coordination and cooperation among special forces, ministries, sectors, and communities must be established.

Recovery and Reconstruction Phase

The third phase constitutes a continuation of the search-and-rescue operations coupled with the collection of damage information. This stage, particularly, assesses the damage on and emergency relief needs of vulnerable groups, including the elderly, disabled, women, children, etc. This stage emphasizes the need to:

- mobilize resources for relief efforts;
- reconstruct and restore production;
- ensure sanitation and prevent epidemics;
- combine recovery activities with sustainable development planning; and
- promote community self-help and the involvement of international organizations in disaster recovery.

Box 1. Non-structural Methods in Disaster-risk Management.

Early forecasting and warning

- Enhance the quality of the forecast of storms, floods and other natural disasters in line with forecast capacities in the region and the rest of the world.
- Map disaster risks in areas, provinces, districts and critical zones for proactive prevention, disaster risk assessment and policy formulation. Preference is given to flashflood-prone areas.
- Modernize early warning systems from central to the local level. Ensure quick emergency response and coordination. Enhance the effective means of communication in the mountains, at sea and in remote areas. Central-level warning system is responsible for nationwide monitoring and provides general orientation. Regional warning systems monitor large areas and critical zones. Local warning systems are tailored to meet specific characteristics of localities, i.e., villages, communes and resident areas.
- Install more equipment to monitor the developments of storms, floods and other natural disasters. Apply modern technologies to the management, monitoring and control of storms, floods, coastline and river bank erosion, landslides, etc., particularly in the Mekong River Delta and central provinces.

Legal documents

- Review and amend legal documents and policies on natural disaster prevention, response and mitigation, make preparations in the creation of the Law on Natural Disasters.

Government's direction

- Strengthen the capacity of relevant government bodies in ministries and sectors, at both central and local level, especially in communes and villages.
- Improve preparedness according to the four on-the-spot principles (e.g., national guidance, resources, equipment and materials, and the right people are available to respond to natural disasters), especially in communes and villages.
- Develop short- and mid-term plans for disaster prevention and mitigation in the nation and critical zones and localities.

Search-and-rescue capacities

- Enhance the search-and-rescue capacity of organizations, individuals and communities, especially those in mountains, remote and border regions, islands and upgrade vehicles at sea and on rivers.
- Gradually improve capacities and facilities for professional search-and-rescue forces. Pay attention to ensure smooth communication.
- Participate in regional and international cooperation in search and rescue.

Integrate natural disaster prevention, response and mitigation into socioeconomic development programs

- Integrate natural disaster prevention, response and mitigation content into development programs, plans and strategies of sectors and localities. It must be in line with sectoral, regional and national development strategies, appropriate for local disaster features and ensure safe and sustainable development.
- Constructions must satisfy safety requirements, at the same time be environment-friendly, help to mitigate disaster risks and will not provide any agent for more risks.
- Include natural disaster risk assessment in the design and appraisal of all investment projects. The projects can only be accepted after providing safe solutions against disaster risks.
- Pay attention to simultaneous implementation of safety programs for high-risk residential areas, such as mountainous, riverside, coastal and flooding ones. Attach much importance to land use planning and production structure shift.

Raise community awareness of natural disaster prevention, response and mitigation

Implement simultaneous measures and methods to raise social awareness and capacities to respond to natural disasters:

- Include basic knowledge about natural disaster prevention, response and mitigation in the school curriculum; carry out practical activities in schools to help students know how to respond to disaster situations and support their family and community.
- Provide training for those directly involved in disaster prevention and mitigation activities, especially decision-makers, managers, planners, practitioners, and local officers.
- Frequently carry out such exercises as search and rescue, evacuation, dike protection, etc., for responsible officers in localities and sectors.

Box 1. Con't.

- Expand television and radio networks to remote areas, increase broadcast time, diversify means of communication in order to spread knowledge on disaster prevention and mitigation throughout communities.
- Encourage cultural organizations to raise public awareness as well as promote natural disaster prevention, response and mitigation by their artworks and programs.

Integrate social agenda to natural disaster prevention, response and mitigation

- Promote community involvement in formulating relevant laws, regulations, programs and plans. Disclose these documents after they have been approved.
- Promote community involvement in managing and monitoring the implementation of programs and projects.
- Develop and multiply the model "disaster safe villages" in which the communities are aware of potential disaster risks and consequences. Collect human resources and facilities; establish funds for disaster prevention and mitigation and other humanitarian foundations.
- Develop self-preparedness capacity in the community, mobilize on-site resources for proactive search and rescue.
- Promote mutual help and protection against disasters, encourage organizations and individuals to participate in relief efforts for affected localities by various efficient ways.

Information sharing and international cooperation

The following information is shared among different sectors, localities, regional countries and the rest of the world:

- Types of natural disasters
- Forecasts and warnings
- Information on search, rescue, and relief needs, and
- Experience in organization, management, direction, preparedness, response, recovery and reconstruction.

International cooperation includes:

- Information sharing in forecast technologies
- Research on disaster prevention solutions for each area
- Search and rescue missions, especially those at sea and in flashflood-prone regions
- Training, experience sharing, adoption of criteria and methods for disaster risk assessment
- Financial support for programs and projects on disaster prevention and mitigation.

Box 2. Structural Methods in Disaster-risk Management.

Dike systems, flood diversion and retarding structures

- Ensure safety for river and sea dikes at the designed flood level. Strive for river dike safety at the historically high flood level.
- Enhance quality of dikes, prevent degradation, and improve such critical zones as dike foundation and sluices underneath the dikes.
- Complete designed dike cross-sections, reinforce surface of dikes at Level III and higher levels.
- Use modern technologies and new materials for the construction, repair, upgrade and reinforcement of dike systems.
- Continue to plant trees in suitable places to resist waves.
- Flow clearance for flood discharge.
- Continue to build flood diversion and retarding structures as planned.

Reservoir and dam systems

- For existing reservoirs: inspect their conditions, repair and upgrade them to ensure safety. Build spillways for reservoirs lacking them, or those whose spillways do not ensure designed flood discharge. Inspect and improve their operation to ensure safety, particularly in case of heavy rains and floods.
- For reservoirs under construction: Concentrate resources to hasten the construction progress and ensure quality.
- Continue reservoir planning for flood cutting and multi-purposes. Make preparations for building approved reservoirs.

Socioeconomic infrastructure

- Constructions must meet requirements for flood discharge, safe from floods, storms and other types of disasters.
- Reinforce road system in flood areas with suitable materials.
- Use multi-storey buildings for government offices, hospitals and healthcare centers, schools and kindergartens, especially in communes and wards so that they can act as shelters if necessary.
- The planning and construction of information and electricity systems, warehouses, harbors must ensure safety standards in case of floods and storms.

Civil buildings

- Encourage private houses by providing support and low-interest loan programs. Each family should have at least a room safe from floods and storms

Berthing facility and shelters for boats and ships

- Continue the planning and hasten the progress of making shelters and berths for boats and ships.

Perspectives on the Solutions Instituted in Vietnam

The experiences of Vietnam in natural risk disaster management embody the tenets of addressing the overarching goals of sustainable development in the context of prevention, response and mitigation during disaster events. In them there is a realization that unless a state is able to address the institutional, social, environmental and economic conditions of its communities, it is bound to experience disasters one after the other. Herein lies the importance of contextualizing the conditions of a particular locale and its needs in terms of managing risks. The following discussion is based on these premises. Firstly, the general overarching solutions are articulated; and secondly, several solutions, particularly crafted for two regions are highlighted (below).

Developing Relevant Policies, Laws, and Regulations

Flood risk reduction policies and legislation enable a government to pursue a strategic course of action. In Vietnam, the creation of laws on natural disaster prevention, response and mitigation is based on the Ordinance on Flood and Storm Control. This strategy showcases the need to regularly revise and amend existing laws to reflect the changing conditions and capacities. It is also important to promulgate decrees and circulars to provide instructions on how to implement laws.

The capacities in terms of skilled human resources augur well in preventing or mitigating disasters from storms and flooding. When human resources particularly in advisory and administration agencies are developed and strengthened, losses and negative impacts in disaster events are alleviated.

It is now being realized that reforms in policies and laws must be in accordance with national socioeconomic development programs. Hence, authorities in Vietnam are being informed to issue policies, regulations and technical instructions that integrate:

- Disaster relief, recovery and production development as well as policies for areas living with floods, flood diversion and retarding areas, and those highly prone to floods, storms and other disasters;
- Research activities, investment, international cooperation, disaster insurance and mobilization of resources; and
- Planning, defining high-risk zones, establishing building codes in high-risk areas, and revising regulations on disaster forecasting and warning.

Improving Organizational Structure and Management

An effective institutional arrangement, likewise, is necessary to create effective disaster risk management approaches. Two strategies are deemed important in Vietnam's context. One, it is crucial to strengthen the effectiveness of current institutional arrangements. A lot is hinged on initiatives to review and revise the functions, duties of and cooperation mechanism among the Committees for Flood and Storm Control and the Committees for Search and Rescue at central, ministerial and local levels. In addition, these institutions must:

- Modernize facilities, meaning to upgrade offices and invest in

new equipment and technologies to meet the requirements of natural disaster prevention, response and mitigation activities;

- Complete the regulations on the operation of the committees of different levels and ministries; and

- Professionalize the officers in charge of natural disaster prevention, response and mitigation activities.

Two, it is necessary to establish specialized agencies for natural disaster prevention, response and mitigation. These agencies must operate based on mandates from several levels. Hence, a specialized agency must be constituted to assist the Prime Minister in performing the state management function in natural disaster prevention, response and mitigation, and to assume the role of flood and storm control, search, rescue and management of other types of disasters. Specialized agencies which assist the Chairman of the People's Committee at various levels in natural disaster prevention, response and mitigation must work under the direction of a higher management agency. The establishment of organizations to support disaster management, training centers, public service units, etc., is also needed.

Strengthening Human Resources

The capacities in terms of skilled human resources augur well in preventing or mitigating disasters from storms and flooding. When human resources particularly in advisory and administration agencies are developed and strengthened, losses and negative impacts in disaster events are alleviated. Likewise, effective strategies are being undertaken in Vietnam which include the creation of professional response forces and the organization of response units in communities. Other strategies include: enhancing the role of mass organizations (e.g., the Vietnam Fatherland Front) in disaster preparedness, response and damage recovery; and developing a volunteer network in training and information dissemination activities, relief and recovery.

The Cuu Long River Delta during a flooding event.

Ensuring Adequate Financial Resources

State budget ensures the implementation of natural disaster prevention, response and mitigation projects and disaster recovery. The national reserve can be used, if necessary. Often, the state delegates provincial and district people's committees to mobilize legally mandated resources and to secure investments in natural disaster prevention, response and mitigation. As such, Vietnam gives preference to and ensures lawful interests of organizations and individuals investing in natural disaster prevention, response and mitigation.

With the increase in frequency and severity of hazard risks, it is also imperative to gradually increase the budget for strengthening management capacity, new construction projects, planning, upgrade and maintenance of constructions and facilities for disaster warning, forecast, rescue and

disaster recovery. Vietnam also ensures to:

- Take advantage of ODA and FDI for disaster prevention and mitigation projects;
- Encourage organizations and individuals at home and abroad to invest in research and apply modern technologies, together with traditional methods. Strive for proactive planning;
- Encourage organizations and individuals at home and abroad to carry out humanitarian and charity activities targeting people and localities affected by natural disasters;
- Establish disaster insurance and self-help funds; and
- Encourage financial institutions to support disaster prevention and mitigation activities.

Developing Science and Technologies Related to Natural Disaster Prevention, Response and Mitigation

The focus on developing a systematic and integrated approach in researching and resolving practical issues is enhanced today more than ever. This involves multidisciplinary, multi-risk and multi-use mechanisms in the application of new science and technology, particularly in forecasting, warning, communication system and decisionmaking process.

For Vietnam to adequately address risks, it must also improve its capacity to study and monitor the earth's changes and natural changes within the region and its territory. Vietnam also takes measures to:

- Encourage the application of new technologies and materials; enhance the quality, appearance and environment-friendliness of constructions; and
- Develop sciences related to natural disasters, e.g., science on emergency situations, science on natural disaster management, science on natural disaster and sustainable development, science on disaster health care, science on post-disaster environmental recovery.

Strengthening International Cooperation and Integration

The need to diversify into other forms of cooperation and to increase international and regional integration in terms of natural disaster mitigation cannot be over emphasized. No state can cope singly when massive losses and destruction are at hand. Vietnam, for its part is trying its best to:

- Cooperate with neighboring countries in the establishment of agreements on water resources exploitation, protection and management, information sharing and rescue;
- Cooperate with countries in the region and the world in disaster warning, technology transfer, information and experience sharing and practical lessons; and establishing agreements and conventions, especially those on search and rescue;
- Strengthen cooperation with such international organizations, such as the United Nations Development Programme, the Asian Development Bank, The World Bank, and governmental and nongovernmental organizations in providing financial assistance, humanitarian aids, training and education, research and human resources; and
- Closely cooperate with international organizations in implementing the International Strategy on Natural Disaster Mitigation, the Hyogo Framework for Action and other programs.

Solutions for Each Region

The Central Coast and the South East

The principle of natural disaster prevention, response and mitigation for the central coastal plains and the South East is "avoidance and adaptation."

continued on page 62...

The PEMSEA Network of Local Governments for Sustainable Coastal Development (PNLG) — A partnership built on leadership and commitment towards strengthening coastal governance.

The PNLG, a self-sustaining network of local governments implementing integrated coastal management (ICM), is a first of its kind in the East Asian Region. The network, previously known as the Regional Network of Local Governments implementing ICM (RNLG), was established in March 2001 in Seoul, RO Korea, to serve as a forum for exchanging information and experiences in ICM practices among local governments of the region. Since 2001, the member local governments have taken turns in hosting the annual forum and study tours. Local governments who pledged to host the forthcoming forums are already initiating activities in preparation for the 2008 and 2009 forums.

The past forums were well attended by local government executives and representatives from the member and observer local governments, as well as regional/international experts from the United Nations Environment Programme-Global Programme of Action (UNEP- GPA), United Nations/ International Strategy for Disaster Reduction (UN/ISDR), Asian Disaster Preparedness Center (ADPC), Network of Aquaculture Centres in Asia-Pacific (NACA), Center for Disaster Preparedness (CDP), Victorian Coastal Council, Oil Spill Response and East Asia Response Pte Ltd. and representatives from the academe, who provided expert opinion on critical and emerging issues. Also in attendance were donor representatives, including the Swedish Environmental Secretariat for Asia (SENSA), which provided financial support to the 2007 forum, as well as private sector representatives and local participants from the host country. The study tours, which are a component of each forum, have provided an opportunity for the participants to appreciate the positive changes occurring on the ground as a result of ICM implementation at the host sites.

The transformation of the RNLG into PNLG was initiated with the adoption of the Bali Resolution on the Establishment of the PNLG during the 4th RNLG Forum in Bali, Indonesia, in 2005. The transformation was a proactive initiative of the local governments, which are seen as driving forces in the ICM scaling up process across the region. The achievements of the local government-initiated ICM programs have created an opportunity and a demand. The PNLG members play a critical role through sharing of experiences to encourage other local governments to develop and implement similar programs.

The PNLG was officially founded with the signing of the PNLG Charter by local government executives from 18 ICM demonstration and parallel sites in Haikou, PR China, on 13 December 2006. An additional five local governments representing ICM parallel sites in China signed the PNLG Charter during the 2007 PNLG Forum in Danang, Vietnam, on 5 September 2007, bringing the membership to 23 local governments from 8 countries across the East Asian region. The network also has seven observer local governments from DPR Korea and China.

The linkages among the local governments are effectively maintained due to the convergence of interest among its members and a commitment to work together. The positive results generated over its six years of operation have encouraged other local governments to join. It is anticipated that two additional local governments from the Philippines and Vietnam will sign the PNLG Charter during the 2008 PNLG Forum in Sihanoukville, Cambodia.

One unique feature of the PNLG is that the members abide by the Code of Conduct, which outlines their responsibilities regarding the adoption and implementation of good practices in ICM. The network's increasing visibility will generate interest among potential partners from the private sector and nongovernmental organizations to become associate members and render the network even more encompassing.

With the establishment of the PNLG Secretariat in December 2006 (pnlg.secretariat@gmail.com; www.pnlg.org), hosted by Xiamen Municipality, the PNLG hopes to carry on its mission to serve as a sustainable network and an advocacy group for local governments at regional and international forums to promote the application of ICM as an effective management framework to achieve sustainable coastal development.

PEMSEA NETWORK OF LOCAL GOVERNMENTS

Venue for knowledge sharing

- 1st RNLG Forum, Seoul (RO Korea), 15-16 March 2001
- 2nd RNLG Forum, Xiamen (PR China), 20-23 September 2002
- 3rd RNLG Forum, Putrajaya (Malaysia), 9 December 2003
- 4th RNLG Forum, Bali (Indonesia), 20-25 April 2006
- Inaugural Meeting of the PNLG, Haikou (PR China), 13 December 2006
- 2007 PNLG Forum, Danang (Vietnam), 5-7 September 2007
- 2008 PNLG Forum, Sihanoukville (Cambodia), 19-21 November 2008
- 2009 PNLG Forum, Bataan (Philippines), 23-25 November 2009

PNLG member local governments

- Sihanoukville, Cambodia
- Dongying, PR China
- Fangchenggang, PR China
- Haikou, PR China
- Quanzhou, PR China
- Xiamen, PR China
- Bali, Indonesia
- Badung, Indonesia
- Buleleng, Indonesia
- Denpasar, Indonesia
- Gianyar, Indonesia
- Karangasem, Indonesia
- Klungkung, Indonesia
- Sukabumi, Indonesia
- Tabanan, Indonesia
- Shihwa, RO Korea
- Port Klang, Malaysia
- Bataan, Philippines
- Batangas, Philippines
- Cavite, Philippines
- Chonburi, Thailand
- Danang, Vietnam
- Quang Nam, Vietnam

Observer local governments

- Nampho, DPR Korea
- Leting, PR China
- Lianyungang, PR China
- Panjin, PR China
- Qingdao, PR China
- Wenchang, PR China
- Yangjiang, PR China

Potential PNLG members

- Guimaras, Philippines
- Thua Thien-Hue, Vietnam

The Charter of the PEMSEA Network of Local Governments for Sustainable Coastal Development

Preamble

1. The Regional Network of Local Governments implementing Integrated Coastal Management (herein referred to as RNLG) was officially launched by the GEF/UNDP/IMO Regional Programme on Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) in March 2001 as a forum for exchanging information and experiences in integrated coastal management (ICM) practices among local governments of the region. For the past several years, we have witnessed how ICM practices lead to improved governance of marine and coastal resources, and resulted in on-the-ground social, economic and environmental gains in our communities.

2. The RNLG has proven to be a unique and valuable partnership arrangement among local governments, focusing on the special challenges of coastal cities, municipalities and provinces with regard to sustainable growth and development, and providing a vehicle for sharing practical experiences, technical skills and management know-how on ICM practices among its members.

3. The Sustainable Development Strategy for the Seas of East Asia (SDS-SEA), as adopted by our national governments in December 2003, recognizes the vital role of local governments in the collective effort of all stakeholders to reverse the continuing destruction and decline of our common heritage. The SDS-SEA challenges local governments in coastal areas throughout the region with the formidable task of reducing conflicting and non-sustainable usage of natural resources in their respective watershed and coastal seas, through the application and replication of ICM programs.

4. Our network, the RNLG, can make a valuable contribution to this regional effort, by encouraging non-member local governments to develop and implement ICM programs. We have the advantage of experience, skills and knowledge that are required for successful ICM application. Working within the framework of PEMSEA, we also have the advantage of accessing higher levels of government, international agencies, donors, and the private sector to support our cause and to ensure that local governments of the region are well equipped to turn environmental concerns into economic and employment opportunities and to facilitate their speedy resolution.

5. Therefore, the RNLG members decided to adopt the "Bali Resolution on the Establishment of the PEMSEA Network of Local Governments for Sustainable Coastal Development (PNLG)" on 27 April 2005, at Bali, Indonesia.

Wherefore, we, the representatives of the members of the PNLG, do hereby ordain and promulgate the following charter.

I. Name and Office

Name

6. The name of this organization shall be the **PEMSEA Network of Local Governments for Sustainable Coastal Development,** which shall also be known by its acronym **PNLG**.

Office

7. The principal office of the PNLG shall be located in Xiamen, PR China.

Relation with PEMSEA

8. The PNLG shall function as an integral part of PEMSEA and may receive financial and technical support within available funding allocations and in accordance with the administrative rules and regulations of PEMSEA, which may be in force.

II. Vision and Mission

PNLG Vision

9. The PNLG's vision states:
Coastal areas throughout the East Asian Seas region are managed in a sustainable manner.

PNLG Mission

10. The PNLG's mission shall be to serve as a network of local governments in the region, which, along with their stakeholders, shall promote the application of ICM as an effective management framework to achieve sustainable coastal development.

III. Goal and Objectives

Goal

11. The PNLG shall facilitate the sustainable development and environmental conservation of marine and coastal resources of the region through advocacy, knowledge sharing, forging multi-stakeholder participation and partnerships among local governments, national agencies, civil society groups including non-governmental organizations and people's organizations, and the private sector.

Objectives

12. The PNLG shall have the following objectives:
    (a) To enhance the capacity of local governments to plan, develop, and manage their coastal and marine resources for sustainable use;
    (b) To promote the application of ICM approaches, processes and tools in coastal planning, development and management;
    (c) To facilitate the linkage between scientific/technical institutions and local governments, in order to provide capacity building and scientific input to local government decision-making, policies and programs;
    (d) To implement innovative financing mechanisms and partnership arrangements for environmental investments with international and national financial institutions, private investors and operating companies, where appropriate;
    (e) To strengthen multi-stakeholder involvement in managing coastal and marine resources, in order to enhance societal and corporate responsibility for sustainable development of natural resources; and
    (f) To enhance local coastal governance, as well as inter-agency and multi-sectoral coordination mechanisms, in dealing with coastal and ocean management issues.

IV. Membership

Eligibility

13. The PNLG shall be open for membership to all local government units and other stakeholders that subscribe to the vision, mission, goal and objectives of the PNLG. The definition of local governments shall be consistent with the definitions provided in the respective countries of the East Asian Seas region.

Categories

14. The members of the PNLG shall be categorized into:
    (a) Regular Members, which are limited to eligible local government units in the East Asian Seas region; and
    (b) Associate Members, which may include local government units outside the East Asian Seas region, as well as local government associations, governmental and nongovernmental organizations, universities and academic institutions, the business sector, foundations, international organizations and donor agencies within and outside the East Asian Seas region.

Application and Acceptance

14. Application for membership to the PNLG shall be made in writing and submitted, together with the first year's annual membership dues as well as an official document expressing the intention to subscribe to the PNLG Code of Conduct through the necessary internal adoption process, to the PNLG Head of Secretariat, who shall then review the application according to the guidelines developed and approved by the General Assembly.

16. The PNLG Head of Secretariat shall notify all regular members of such application and transmit the same, together with his/her recommendation, to the Executive Committee, which shall then make the decision on whether to accept or deny the application. The decision of the Executive Committee shall be final.

17. The PNLG Head of Secretariat shall send the applicant a written notice of the decision of the Executive Committee. In the case of unsuccessful applicants, annual membership dues submitted will be returned.

Termination of Membership

18. Members may terminate their membership by notifying the PNLG Head of Secretariat in writing. Membership can also be terminated by the PNLG if any member fails to perform their roles and obligations and observe the PNLG Code of Conduct as referred to in Section V.

V. Benefits, Roles and Obligations

Benefits

19. The PNLG shall work towards achieving the following benefits for its members:
    (a) Participation in the annual network meeting/workshop;
    (b) Information exchange concerning specific knowledge, skills and good practices related to ICM program development and implementation;
    (c) PEMSEA publications and other information facilities;
    (d) Representation at the PEMSEA Partnership Council, Ministerial Forum and other concerned regional/ international forums and local government networks;
    (e) An invitation to participate in the EAS Congress;

(f) Website linkage with PEMSEA and member local governments of the network;
(g) Policy, technical support and training services of the PEMSEA Resource Facility, on a cost-recovery basis, including:

- PEMSEA training opportunities;
- PEMSEA's public-private sector partnership program for mobilizing private sector financial resources and expertise;
- Innovative financing programs for leveraging investment in environmental infrastructure improvements;
- PEMSEA ICM certification, leading to ISO certification; and
- PEMSEA certification for Port Safety, Health and Environment Management System, leading to ISO certification.

Roles and Obligations

20. The PNLG members shall:
    (a) Attend the network annual meetings at their own cost;
    (b) Exchange information, publication and experiences with other PNLG members;
    (c) Link websites with PEMSEA and other PNLG members where possible; and
    (d) Recruit new network members for participation in annual meetings and for development and implementation of ICM programs.

21. In addition, regular members shall:
    (a) Pay an annual membership fee of 500 US$;
    (b) Develop, implement, consolidate and sustain ICM programs within their jurisdictions;
    (c) Abide by the Code of Conduct for the PNLG members;
    (d) Sponsor and host at least one network annual meeting and study tour; and
    (e) Monitor environmental quality and submit a triennial state of the environment report.

Code of Conduct

22. Regular members shall subscribe to the Code of Conduct as follows:
    (a) To work towards the development and implementation of institutional arrangements for ICM implementation, including an interagency, multi-sectoral mechanism to coordinate the efforts of different agencies, sectors and administrative levels, and where appropriate, to develop: policy and legislative measures to support ICM planning and management; capacity building programs to enhance required human resource skills and tools; scientific input to policy and planning processes; and enforcement mechanisms to ensure compliance with adopted rules and regulations;
    (b) To formulate and implement coastal strategies and action plans that provide a long term vision and strategy for sustainable development of the coastal area, and a fixed-term program of actions for addressing priority issues and concerns;
    (c) To implement public awareness programs to increase the level of understanding of, and appreciation for, the coastal and marine resources of the area, and to promote a shared responsibility among stakeholders in the planning and implementation of the ICM program;
    (d) To mainstream the ICM program into the local government's planning and socioeconomic development program and to allocate adequate financial and human resources for its implementation; and
    (e) To conduct integrated environmental monitoring for the purpose of measuring the status, progress, and impacts of management programs against sustainable development indicators, as may be established, and to use the information in decision-making, public awareness and participation, and performance evaluation.

VI. Governing Body

General Assembly

23. The governing body of the PNLG shall be the General Assembly, which shall be composed of regular members in good standing, in accordance with Section IV.

Functions of the General Assembly

24. The General Assembly shall perform the following functions:
    (a) Elect the officers of the PNLG;
    (b) Establish and provide policy guidelines and enunciate programs designed to fulfill the goal and objectives of the PNLG; and
    (c) Approve proposed annual work programs, budgets and activities.

Quorum and Decision Making

25. In any meeting, whether regular or special, more than 50% of regular members shall be present in order to establish the quorum to transact business. Decisions shall be arrived at through consensus building. Members who are not able to attend the meeting can execute membership right by way of proxy.

VII. Officers

Election of Officers

26. The Officers shall administer the affairs of the PNLG in accordance with its goal and objectives. The regular members of the General

Assembly shall elect the President and the Vice-President from among the regular members.

Terms of Office

27. All officers shall hold office for a term of three years and until their successors shall have been duly elected and qualified. No regular member shall be nominated and elected to hold any officer position for more than one term.

President and Vice President

28. The President, and in his/her absence, the Vice President, shall represent the PNLG before international and regional meetings and forums. The President and the Vice President shall serve as chair and vice-chair in all meetings of the General Assembly and the Executive Committee.

Vacancy

29. An office shall be declared vacant in the event that an officer no longer represents the local government units, dies, becomes incapacitated, resigns, or his local government ceases to be a member of the PNLG. In case of the vacancy of the post of the President, the Vice President will automatically assume the position for the remaining period of the term. Vacancy of the post of the Vice President shall be filled for the remaining period of the term of office through appointment by the Executive Committee.

VIII. Executive Committee

Composition

30. The Executive Committee shall be comprised of the President and the Vice President of the PNLG, and the Executive Director of the PEMSEA Resource Facility, with the PNLG Head of the Secretariat serving as the secretary.

Functions

31. The Executive Committee shall ensure and oversee the implementation of the decisions of General Assembly, and report to the General Assembly.

IX. Secretariat

Secretariat Office

32. The Secretariat shall hold office in Xiamen, PR China and shall be managed by the PNLG Head of Secretariat.

The PNLG Head of Secretariat

33. The PNLG Head of Secretariat shall be appointed by the local government hosting the secretariat in accordance with the qualifications set by the Executive Committee.

Secretariat Functions

34. The activities of the secretariat shall include:
    (a) organizing the annual meetings of the PNLG;
    (b) implementing/coordinating the decisions and actions requested by the PNLG General Assembly;
    (c) informing network members of relevant activities, events and opportunities among its membership;
    (d) representing the PNLG within PEMSEA;
    (e) keeping and maintaining records of the members of the PNLG, including the membership data, status and other relevant information and documents;
    (f) collecting all dues, regular or special, and all donations to the PNLG and disbursing funds in accordance with the PNLG Charter and By-Laws;
    (g) preparing an annual financial and implementation report on the PNLG activities; and
    (h) in general, performing all duties inherent to the office of the Secretariat and such other duties as may be assigned to him/her by the Executive Committee from time to time.

X. Annual Forum

35. The PNLG shall hold an annual forum at its principal office or another place as may be designated by the General Assembly. The annual forum shall consist of:
    (a) General Assembly Meeting — annual meeting of regular members to discuss, evaluate and approve the proposed annual work plans, budget and activities of the PNLG and other related matters; and
    (b) Technical Meeting — annual meeting of all PNLG members including the regular and associate members for knowledge sharing, partnership building and monitoring of ICM scaling-up progress.

XI. Funds

Funds

36. The sources of funds of the PNLG shall be: (1) Membership fees; (2) Operational funds from local governments hosting the secretariat; (3) Grants and financial assistance from PEMSEA and other partners; and (4) Fund-raising and other revenue-generating activities.

Management of Funds

37. The funds shall be used for operations and implementation of activities aimed at achieving the goal and objectives of the PNLG, in accordance with the annual work plan and budget as approved by the General Assembly.

38. The secretariat shall be responsible for administrative procedures and management of the approved funds, in accordance with work plans and budgets of the PNLG as well as accounting and auditing rules and regulations of PEMSEA.

XII. Bylaws and Amendments

Adoption of the Bylaws

39. The Bylaws of the PNLG shall be developed to provide more detailed information and procedures for the implementation of the provisions of the Charter. The Bylaws shall be adopted by the General Assembly after reaching consensus.

Amendment

40. Every proposal to amend the Charter and any subsequent changes to the Bylaws shall be submitted in writing during the General Assembly meeting and shall be adopted after reaching consensus.

Badung, Indonesia:

Hon. I Ketut Sudikerta
Vice Regent
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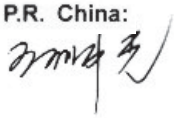

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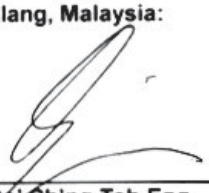

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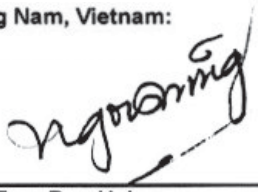

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Integrating Disaster Risk Reduction and Mitigation into the Danang Coastal Strategy Implementation Plan

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Introduction

Danang City is located in central Vietnam. The city is characterized by rapid urbanization and industrialization, earning its current status as one of the most important economic growth centers of central Vietnam (Figure 1). It is also an area that is increasingly exposed to natural disasters, particularly typhoons and flooding. On the average, the city experiences around three to four floods and at least one typhoon and one tropical low pressure per year. In recent years, the impacts from natural disasters have directly affected the city.

One of the key outputs of the Danang Integrated Coastal Management (ICM) Project is the Coastal Strategy, which was adopted by the People's Committee of Danang City in December 2001. The Coastal Strategy provides a broad management framework in addressing priority issues that threaten the sustainable development of Danang's coastal area.

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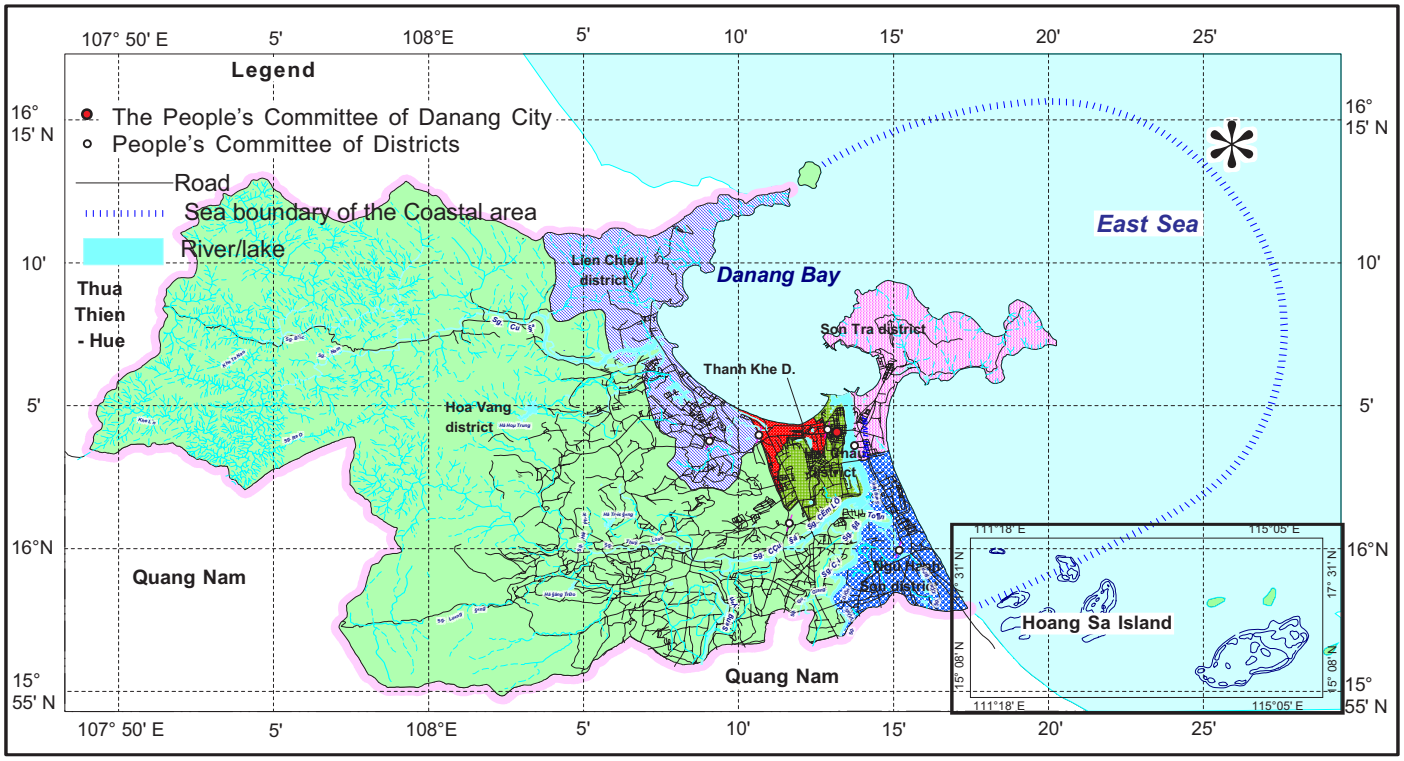
The Coastal Strategy Implementation Plan (CSIP) outlines the strategic actions needed to implement Danang's Coastal Strategy. Although the Coastal Strategy identified natural disasters as one of the risks that threaten the sustainable development of the city, the priority action programs in the CSIP did not focus much on disaster reduction. The reasons being: (a) the Coastal Strategy was developed in the context that there were not many serious natural disasters that Danang has been or will be exposed to; and (b) the city has many other important socioeconomic concerns that needed to be prioritized and implemented.

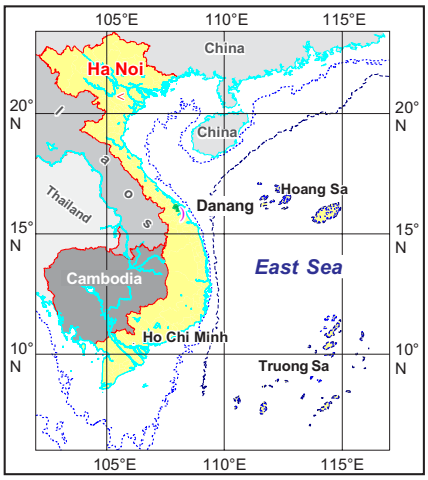
In recent years, the natural disasters that hit Danang City have caused very serious damage. This prompted the City to adjust some of the action programs identified in the CSIP in order to mitigate and reduce the impacts of natural disasters. This paper discusses the various mechanisms and approaches that Danang instituted to address disaster risk reduction and mitigation.

Vulnerability to Natural Disasters

Danang is usually affected directly by typhoons and tropical low pressures formed in the East Sea. The city also receives heavy rainfall particularly during October and November. Aggravating the situation is the limited drainage capacity of its many rivers and streams. For example, the area of the coastal plain affected by flooding is about 500 km^2, while the area of the valley that receives water from the Vu Gia and Thu Bon river system, where Han River originates, is very large — nearly 5,180 km^2, about tenfold of the flood-affected area. The drainage capacity of the plain is therefore very

Figure 1. Administrative Map of Danang City.





slow, therefore leading to flooding. In addition, some areas of the Han River, particularly near the sea, have filled with silt and sand deposits. There are also many construction works and structures along the riverbank, such as stone embankments, bridges and the port area, which affect the current and water flow near the estuary, further decreasing drainage capacity. Finally, the inappropriate exploitation of forest resources has reduced the natural function of the forests as buffers against strong winds and flooding. Box 1 provides information on the physical features (i.e., geographical, topographical and hydrological) of Danang.

Box 1. Physical Features of Danang.

- Lies between latitudes 15°55' and 16°14'N and longitudes 107°18' and 108°20'E.
- It borders Thua Thien-Hue Province in the north, Quang Nam Province in the south and west and East Sea in the east.
- Consists of six districts (Hai Chau, Thanh Khe, Lien Chieu, Son Tra, Ngu Hanh Son and Cam Le); one suburban district (Hoa Vang) and one island district (Hoang Sa).
- The Truong Son, Hai Van and Bach Ma mountain range makes up ¾ of the area of the whole city while the coastal plain makes up ¼ of the area, which is divided by many rivers and streams.
- Climate is a combination of the climatic features of the north and south but the typical tropical climate of the south dominates.
- Annual average temperature is 25.9°C.
- Annual average rainfall is 2,505 mm.
- Major rivers include Han and Cu De and other rivers include Yen, Chu Bai, Vinh Dien, Tuy Loan and Pho Loc. Han River is the lower section of the Vu Gia and Thu Bon River system, the biggest in central Vietnam.
- Water level at the upper reaches of the city is dependent on the season while the lower sections are affected by tidal regime, which is semi-diurnal.
- Forested area makes up more than 40 percent of the land area.

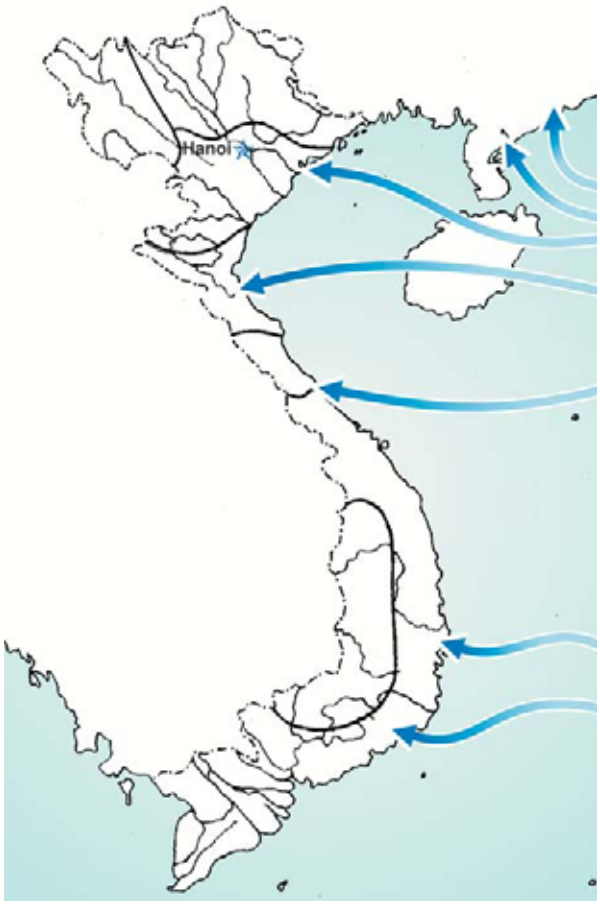
Natural Hazards that Threaten Danang

There are three major categories of natural hazards that threaten Danang. These include typhoons and tropical low pressures, monsoon rains and, possibly, tsunamis.

Typhoon and Tropical Low Pressures

Typhoons and tropical low pressures, either coming from other countries like the Philippines or from the East Sea occur from September to November each year (Figure 2). Statistics show that about 3–4 typhoons and 2–3 tropical low pressures have affected the central region annually. Danang in particular experienced at least one typhoon and one tropical low pressure each year. In the past four decades, however, typhoons have been increasing. In the '80s and '90s, there were about 16 and 12 typhoons that passed Danang, respectively.

Figure 2. Typical Typhoon Path in Vietnam.



Most of the typhoons and tropical low pressures that hit Danang are characterized by strong winds, heavy rainfall and storm surges. If heavy rainfall and storm surges coincided with the rising of the tide, flooding usually occurs. This is often aggravated by the intensity of the typhoon, as well as its direction and speed.

Monsoon Rains

The rainy season in Danang starts in September and lasts until December. The rainfall during the rainy season makes up 70 percent of the annual total rainfall. According to statistics, during the past 34 years, on the average, Danang has experienced eight heavy to very heavy rains, with total average rainfall of 150 mm.

The northeast monsoon often occurs during the rainy season and the beginning of the dry season. The northeast monsoon often causes heavy rains, especially so when it coincides with the tropical turbulence in the south of East Sea. Heavy rains can last for several days and often cause serious flooding in many areas, affecting both the environment and the population. In Danang, continuous heavy rains cause flooding, particularly in the inland where there is low drainage capacity.

On the average, there are 3–4 floods per year; the most per year was 6–7 floods. In the past two decades, the frequency of flooding has been increasing. From 1990–1999, four very strong floods have been recorded.

Tsunami

There are no records of tsunami occurrence in Danang City. In view of the frequency of earthquakes in the region and their impacts on the coastal areas, it is anticipated that tsunami is one of the potential risks that threaten the city. Being a coastal city, the potential damage would be enormous.

A chronology of disasters and their impacts are presented in Box 2.

Box 2. Chronology of Disasters and Their Impacts.

Floods

According to the hydrometeorology survey and monitoring data from 1976 up to the present, the historic floods in 1964, 1984, 1998 and 1999 have caused serious damage to the City. These occurred during the rainy season and were aggravated by the effects of the northeast monsoon and typhoons.

1964 (4-10 November) — The flooding was a result of the combination of cold air from the North and Typhoon Joan in Tuy Hoa - Nha Trang. The rainfall was recorded at 634 mm, causing massive flooding.

1984 (12-14 October) — The flooding was a result of a typhoon that landed in Khanh Hoa and combined with the Northeast monsoon.

1998 (18-21 November) — The biggest flooding event was caused by Typhoon No. 5 in combination with the Northeast monsoon. It rained heavily on 20 November causing flood in most of the communes in Hoa Vang District, Ngu Hanh Son district and the area along Han River.

1999 (1-6 November) — The flooding was caused by the Northeast monsoon in combination with the low East wind belt operating in the south and tropical low pressure. Majority of the places in the central region, particularly along the area of Vu Gia - Thu Bon Rivers were heavily flooded. In Danang, the rainfall reached 593 mm after raining for 24 hours, almost submerging the entire city.

Typhoons

For the past three years, Danang has made headlines due to the enormous damage caused by strong and powerful typhoons.

2005 Typhoon No. 8 (Kai Tak) made a landfall on 28 October at 10 am. It began as a tropical low pressure in the East Sea and became a powerful typhoon that directly affected Danang City. The total estimated damage was placed at VND 68 billion (approximately US$4.5 million).

Human losses include: 1 casualty and 51 wounded, 11 of which were seriously wounded. Damage to property included: 246 completely collapsed houses; 1,094 heavily damaged houses and 3,931 houses submerged in floodwater, where 1,850 houses were submerged in more than 1.5 m depth of water. There were 23 damaged schools with 167 rooms. Many agricultural areas as well as aquaculture sites were damaged. Also, about 10,000 trees collapsed; 123 tension poles were destroyed and 152 ships and boats were damaged. A significant number of establishments and factories could not operate.

2006 Typhoon No. 6 (Xangsane) formed in the western Pacific near the Philippines on 25 September. Over the next 36 hours, it grew from a tropical depression to a super typhoon that crossed the Philippines causing the deaths of 76 people and subsequently making a landfall in central Vietnam on 1 October. The typhoon was considered by Vietnamese authorities as the strongest that hit the country in several decades. Although Danang has mechanisms in place for emergency response and rescue, these were of no match against the strength of the typhoon with wind speed of 90 miles/hour and heavy rain, causing extensive flooding. Danang suffered enormous losses with total damage estimated at VND 5.290 billion (over US$350 million).

Human losses included 30 deaths and 61 wounded. Damage to property included: 14,138 completely collapsed houses; 42,691 seriously damaged houses; 65,271 uprooted houses; 55 sunken ships; 33 seriously damaged ships; 877 hectares of damaged rice fields, trees and vegetable crops; 2,760 destroyed classrooms; 605 seriously damaged institutions/ organizations/agencies; 18,466 hectares of collapsed forest; and 20,260 collapsed trees. Communications-related damage included: 4 groups of radio broadcasting stations lost contact; 35,836 subscribers lost contact; 75 corrupted transformer stations; 310 collapsed tension poles; and 351 km of broken middle and high tension electrical lines.

2007 Typhoon No. 1 (Chan Chu) was a strong typhoon that formed in the Pacific Ocean. After causing serious damage in the Philippines and leaving more than 30 people dead, Typhoon No. 1 moved towards mainland China on 18 May. When typhoon forecasts were received, there were 30 fishing vessels from Danang that were in the east and northeast of Hoang Sa Island. The fishing vessels moved towards the north to avoid the typhoon path, which was moving towards the west and northwest. The typhoon, however, changed its course. Although the typhoon did not hit Danang directly, it caused the sinking of 10 ships and the disappearance of 229 workers, 80 of whom were from Danang. The incident was considered a costly lesson learned for Danang.

On-site logistics ensure that sufficient food and medicine are available, and include the mobilization of local volunteers during search-and-rescue operations. This process is guided by the motto "the good leaves envelope the torn ones," which mainly dwells on the spirit of volunteerism and the goodwill of individuals, organizations and other groups to contribute and help out in coordination with the Typhoon and Flood Prevention Committee.

Responding to the Challenges

The following sections present the key measures undertaken by Danang in disaster risk reduction, response and mitigation.

Enhancing Policies and Organizational Mechanisms

The Government of Vietnam has had a number of legal documents that relate to reducing and mitigating the impacts of natural disasters. Danang City has likewise passed laws to implement the policies at the local level. In particular, Danang is considering passing legislation related to:

a. Identifying and planning in high-risk areas that are prone to flooding and exposure to typhoons;

b. Policies on moving the residents out of the high-risk areas such as along the riverbanks;

c. Identifying adaptation measures that would allow construction or development in areas affected by typhoons and floods;

d. Regulations in areas to be restricted and limited for construction works, particularly around big lakes and areas that are affected by floods;

e. Regulations to restrict construction works that may cause alteration of water flow and impede drainage capacity; and

f. Regulations for the preservation of natural resources that act as protection against natural disasters.

In support of disaster preparedness and response, responsible units at the local level were established.

At the City Level

The Flood Control, Search and Rescue Steering Committee was

To reduce the incidence of accidents due to fallen trees during typhoons, regular pruning of big trees is being undertaken in Danang.

established with one of the Vice Chairs of the People's Committee serving as Head and the leaders of relevant departments, agencies, districts, unions, association and the military serving as members. The Steering Committee is the highest unit that provides policy guidance and mobilizes human resources in a timely manner to prevent and overcome the impacts of natural disasters.

At the Commune Level

All the communes established Natural Disaster Prevention Teams. A team's main function is to mobilize and guide the local residents to implement the directions of the Flood Control, Search and Rescue Steering Committee.

Establishment of Vanguard Units

Many vanguard units were established with members mainly consisting of volunteer groups from the youth, officers, students and staff of various associations. All the organizations established their own typhoon and flood prevention teams. Vanguard units serve as the core forces in the prevention and mitigation of typhoons, floods and natural disasters in the City. They take charge in evacuating residents to safe places, disseminate information on the flooding situation and solutions for typhoon and flood prevention.

Other Organizations

Other organizations also provide support to the local government and various teams in responding to disasters. The armed and police forces are two of the leading forces in charge of rescue, especially in urgent situations as well as in ensuring security and helping the local residents overcome the consequences of the disasters. The Red Cross Association has the function to provide support in rescues, ensure hygiene, and control and prevent the spread of epidemic diseases during and after the disaster. The Dike Management and Typhoon and Flood Prevention Agency, a central agency, is in charge of deploying the directions from the Central level and cooperate with the locals in preventing and overcoming the consequences of natural disasters.

To instill a culture of safety among its residents and facilitating efficient coordination at the local level, Danang is guided by the "4 on-site" mottos.

- **On-site forces** are mainly owners of ships and boats and the local night-watch team. These forces are responsible for implementing activities to prevent floods and mitigate the impacts of floods and typhoons. In emergency situations, the Flood Control, Search and Rescue Steering Committee will mobilize rescue forces of the Border Army and the Police.
- **On-site command** requires the Flood Control, Search and Rescue Steering Committee to command directly the activities to prevent and mitigate the impacts of typhoons and flooding at the local level.
- **On-site rescue** involves the use of junk boats or sailing vessels owned by fishers or private individuals and waterway transportation units of the local government.
- **On-site logistics** ensure that sufficient food and medicine are available, and includes the mobilization of local volunteers during search-and-rescue operations. This process is guided by the motto "the good leaves envelope the torn ones," which mainly dwells on the spirit of volunteerism and the goodwill of individuals, organizations and other groups to contribute and help out in coordination with the Typhoon and Flood Prevention Committee.

Raising Awareness on Disaster Risk Reduction

The communities are directly and seriously affected when disasters strike. Public awareness therefore plays an important role in increasing the level of consciousness of the communities about the risks and teaching them to act properly to protect themselves and reduce their exposure to hazards.

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Actions called for in the communication strategy of the Danang Coastal Strategy mainly focused on raising public awareness on the protection and conservation of coastal and marine resources and environment. In recent years, public awareness activities included instilling responsibility and understanding among relevant and interested groups on disaster risk reduction.

The communication strategy now includes dissemination of:

- General information on risks and damage due to natural disasters and activities that support disaster risk reduction;
- Information to prevent and mitigate the impacts of natural disasters according to the "4 on-site" mottos.
- Awareness of the roles and responsibilities of relevant agencies and groups;
- Advantages of improving structural and building safety;
- Mechanisms in securing the agriculture and fisheries sectors;
- Understanding of early warning systems, procedures and timely evacuation of affected communities;
- Ensuring the health of communities in terms of protecting drinking water sources; and
- Preventing environmental pollution and the spread of diseases.

Incorporating Risk Reduction into the Planning/Zoning Scheme

The coastal use zoning scheme of Danang is focused on the sustainable use of the coastal and marine resources and environment and addresses multiple-use conflicts. Updating of the planning/zoning scheme is necessary to take into consideration sensitive and high-risk areas that are affected by natural disasters.

The city has recently identified high risk areas, particularly those affected by erosion, flooding and storm surges. Residents living near these

areas have been moved to safer places.

Incorporating risk reduction into the planning/zoning scheme requires:

- Identifying flood prone areas, depth of flooding, number of households affected and extent of flooding levels from historical data.
- Developing maps showing detailed flooding risk for the whole city. Identifying relative locations for setting up supplementary flooding pillars.
- Identifying possible relocation sites for residents affected by erosion, flooding and storm surges as well as areas for emergency operations.
- Identifying and promoting structural and engineering measures such as building of dikes, embankments and safer shelters/houses/buildings and critical facilities.
- Identifying areas for tree planting.
- Determining safer design and locations for setting up a communication network and electrical facilities.

Increasing the Green Cover

Expanding the vegetative cover of Danang City is one of the priority action programs identified in the CSIP. The local government is currently implementing programs that aim to increase the green cover of the city and as such will reduce its vulnerability to disasters.

Forests

Although policies on sustainable forest exploitation have been issued, which allowed some recovery of the forest in terms of increasing the forest cover, the protective capacity of the forest is still considered to be ineffective. Tree planting activities have been undertaken in earnest and indigenous trees have been planted. Plans are being implemented for reforestation in settlement areas that have sprouted in agricultural lands and mountainous areas, increased communication activities and local community mobilization to participate in forest protection activities. All of these activities helped expand the vegetative cover by more than 40 percent.

Green trees

Green trees that are used for urban greening can also serve as protection against natural disasters. Experience in Danang, however, showed that green trees can also pose threats to people and property during typhoons. Regular pruning of big trees is done to reduce the incidence of accidents due to fallen trees, at the same time protecting the trees from being uprooted during typhoons.

Danang is currently implementing the Green Tree Program. In this program, the types of trees are carefully selected. For example, those that are planted along the coast should have the capacity to endure strong winds. The City also chose strategic locations for the Green Tree Program, such as the tourism development zones along the Son Tra – Ngu Hanh Son districts. In this way, protection of the shoreline is not only provided but it also increases the aesthetic value of the area.

Regulations are also passed to prohibit the residents from planting various trees of their preference. Guidelines are provided to the residents on the recommended types of trees as well as planting techniques. For example, several layers of trees are planted along the coast to protect the shoreline from strong winds and storm surges.

Strengthening Technical Capacity

Strengthening technical capacity and identifying technological options are important to support the local government's programs in reducing risks. These can be in the form of:

Enhancing forecasting capacity

The timely release of accurate forecasts is an important factor in preparing the communities to respond to emergency situations. The City has increased investments

continued on page 55...

Risk Mitigation Through Effective Implementation of Integrated Coastal Management

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Introduction

With its picturesque scenery and well-equipped port, the coastal city of Xiamen in Southeast China has been praised as an International Garden City on the Sea. It covers a land area of 1,569 km^2 and a sea area of 390 km^2.

Over the last decade, Xiamen's economy has achieved a rapid and steady growth, with its Gross Domestic Product (GDP) increasing from RMB 25.02 billion in 1995 to RMB 116.24 billion in 2006. The marine industries (shipping, fisheries, aquaculture, tourism, coastal industries and mining) have made great progress, contributing RMB 15.868 billion in 2006, or 13.6 percent of the local GDP.

But the opportunities from an explosive growth of the marine economy are counterbalanced by risks. These risks – compounded by the threats from global climate change (e.g., frequent and severe weather disturbances, sea level rise, etc.) – come from both man-made and natural hazards.

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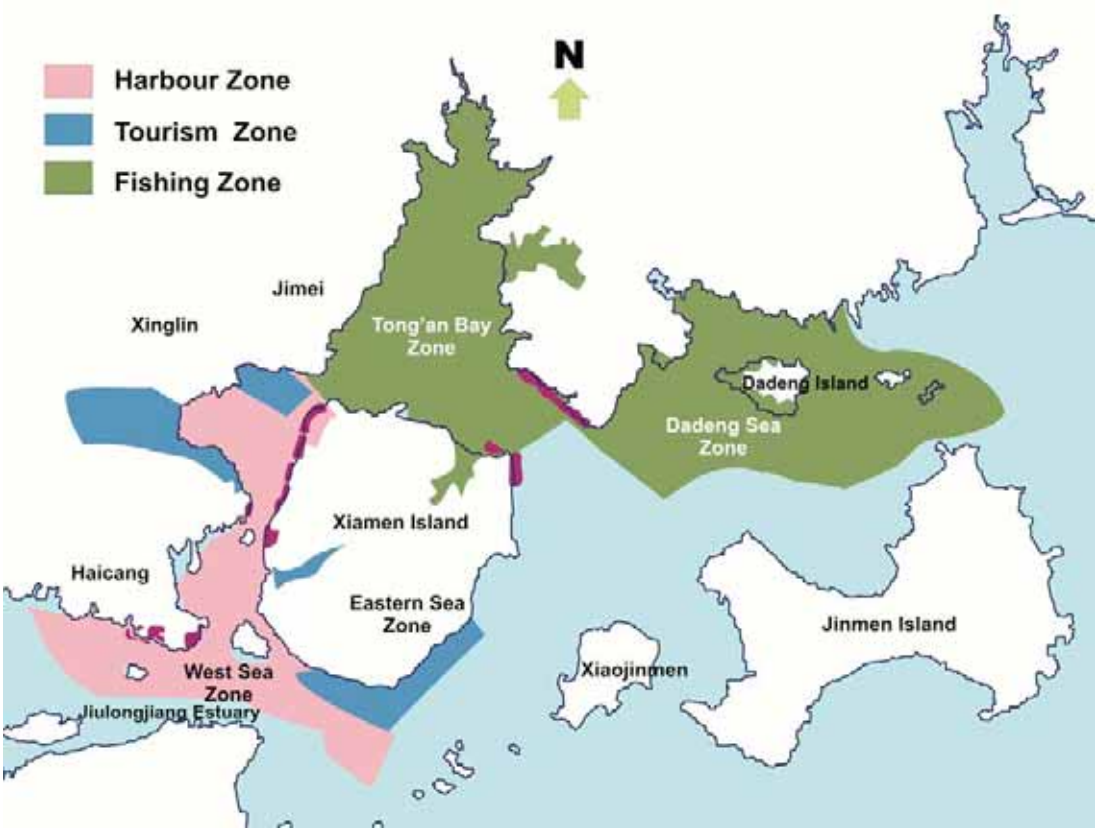
"Maintaining Marine Biodiversity through Rehabilitating Marine Ecological Chains" by releasing artificially hatched seedlings into the sea.

In this regard, Xiamen Municipality has taken a series of measures to keep its marine environment stable and healthy, for the purpose of reducing the probabilities and mitigating the impacts of hazards like environmental deterioration, red tide, storm surge, etc.

The Xiamen government, in collaboration with the GEF/UNDP/IMO Regional Programme on Prevention and Management of Marine Pollution in the East Asian Seas (the pilot phase of the Regional Programme on Partnerships in Environmental Management for the Seas of East Asia or PEMSEA), served as a national demonstration site for the application of integrated coastal management (ICM) since 1994 (Chua et al., 1999). Xiamen applied the ICM

Figure 1. Xiamen Marine Functional Zoning Scheme.



framework and processes and significantly improved its coastal governance (PEMSEA, 2006a). After more than ten years of successful demonstration under the framework of PEMSEA, the Xiamen ICM program has gained a lot of successful experiences on risk mitigation through effective implementation of ICM (PEMSEA, 2006b).

Protecting Marine Ecology and Environment Through Effective Development and Implementation of Ocean-related Plans

In order to maintain a healthy marine ecosystem, Xiamen Municipality developed a series of ocean-related plans, namely: marine functional zoning, marine environmental protection, coastal wetland conservation, coastal protection through afforestation and biodiversity conservation. These plans constitute a rather "complete" coastal planning system which provides a scientific basis for the implementation of marine ecosystem conservation.

In 1997, the *Xiamen Marine Functional Zoning Scheme* has intensified the protection of marine environment, wetland, coastlines and biodiversity by designating various use functions to different sea areas (Figure 1). The scheme was revised in 2003, to reflect the specific situations in Xiamen's sea uses and to meet the needs of social and economic development. The updated version has further emphasized the integration between Xiamen's master plan and sea uses, more rational use of the sea and strengthening measures for the protection of the ecological environment.

In 2006, the municipal government finished the revision and re-issuance of the *Marine Environmental Protection Planning*, which put forward a short-term goal to focus on pollution prevention and integrated management, i.e., on the control of the total load of sewage discharges and on measures for ecological restoration. The plan has set the targets to increase the rate of centralized domestic sewage treatment to 80 percent or higher and compliance with water quality

standards to more than 65 percent. The plan proposed to initially build up a user's fee and permit system, and a more complete system of marine environment monitoring, supervision and law enforcement. The plan seeks to apply more effective conservation and management to ecological functional zones and the coastal waters and to improve the integrated emergency early warning system against marine disasters. The plan, by adhering to the principle of putting priorities on both environmental protection and pollution control and prevention, has set down the mid- and long-term goals for ensuring a healthy ecosystem in the coastal waters.

Moreover, in order to strengthen defense capacities against marine disasters, Xiamen Municipality has developed plans such as the *Xiamen Program on the Management of Tidal Flat and the Construction of Shelter Forest, Xiamen Wetland Conservation Plan* and *Program on Transplanting of Mangrove Trees*, etc. These plans and programs have been playing important roles in the conservation of coastal wetlands and coastlines and the development of a belt of coastal forest that provides protection from strong winds during typhoons.

To conserve marine biodiversity, Xiamen Municipality developed the *Xiamen Planning on the Construction of National Nature Reserves for Rare Marine Species*. In the aspect of islands protection, the *Xiamen Planning on the Protection and Exploitation of Uninhabited Islands* and *Xiamen Planning on the Control of Uninhabited Islands* have been developed and implemented.

The development of the above ocean-related planning system has provided guidelines for marine ecological conservation. The implementation of various plans and programs has been playing an important role in regulating the exploitation of the sea, utilizing marine resources, and effective conservation and restoration of the marine ecological environment.

Strengthening Control over Land-based Pollution and Reducing Man-made Disasters

The first measure is to intensify monitoring of the marine environments. For timely information about the changes of coastal water quality and making effective response to water pollution, Xiamen Municipality has set up 85 monitoring stations in the waters under its jurisdiction and carried out a full-scale monitoring of water quality, sediment quality and ecological quality . Since 2005, more than RMB 10 million has been invested to establish an online monitoring facility that is capable of generating automated, digitized water quality data, and networking the water quality monitoring stations in Xiamen waters.

The second measure is to intensify sewage treatment and reduce the total pollution load discharged into the sea. In the last 20

Xiamen has intensified monitoring of its marine environment.

years, Xiamen Municipality has invested nearly RMB 2 billion in projects for sewage treatment and management. By 2010, another RMB 1.6 billion will be invested for networking and extension or rehabilitation of sewage treatment plants. At present, there are eight sewage treatment plants (for secondary treatment) which are designed to treat 687,000 tons of sewage per day. However, the plants can only accommodate 480,000 tons per day or 78.6 percent of sewage.

For timely information about the changes of coastal water quality and making effective response to water pollution, Xiamen Municipality has set up 85 monitoring stations in the waters under its jurisdiction and carried out a full-scale monitoring of water quality, sediment quality and ecological quality.

The third measure is to turn sewage into a resource through its reuse. The Xiamen Municipal Government encourages the industrial enterprises to recycle wastewater and to reduce wastewater to "zero-discharge." The government has been active (and successful) in two pilot projects in wastewater recycling: *Introducing Sewage Water up to the Hills and Integrated Utilization of Wastewater to Irrigate Plants*. To recycle and reuse sewage water saves freshwater, it also reduces pollution from land-based activities and the discharge of pollutants into the sea.

The fourth measure is to effectively control the pollution from marine and coastal projects. The first step is to set up a regulatory system through environmental impact assessment. No marine or coastal project is allowed to proceed without the approval and authorization by relevant authorities unless it is consistent with related programs and will do no harm to the marine environment. During the operation of a project, the environmental protection and safety precautions stated in the environmental impact assessment reports shall be strictly followed and subject to the supervision of the inspection departments.

By taking the measures to control and monitor pollution discharges into Xiamen's waters — in the course of its rapid economic development — the marine environment has been protected and the probability of man-made disasters reduced.

Maintaining a Healthy Marine Ecosystem through Ecological Protection and Restoration

The introduction of alien species is a vital ecological issue confronting coastal cities. The Xiamen Municipal Government has made great efforts in the prevention and elimination of alien species, including initiatives in strengthening the management of ballast water, the management of introduced aquaculture stocks and seedlings, and the elimination of harmful alien species such as the cord grass (*Spartina alterniflora*).

The restoration of biodiversity is one important step toward ecological restoration. In recent years, Xiamen Municipality has organized studies of biodiversity in Xiamen Bay, and launched the campaign on "Maintaining Marine Biodiversity through Rehabilitating Marine Ecological Chains" by releasing artificially hatched seedlings into the sea. The studies in breeding horseshoe crab and lancelet have been successful. To date, about 0.3 million of one-year-old larvae of horseshoe crab and 0.6 million lancelets have been

Xiamen has developed an emergency response mechanism for addressing pollution in its waters. Activities include the conduct of regular exercises on oil spill response and monitoring of red tide occurrence.

artificially hatched and eventually released into the sea. This measure intends to enhance stocks of rare and endangered species in Xiamen waters.

In 2006, Xiamen Municipality launched a pilot project in Houyu Islet to restore the ecological environment in uninhabited islands.

In 2007, the Municipal Government launched a large-scale campaign for mangrove ecosystem restoration in Tong'an Bay. The goals are to improve water quality (by filtering wastes that reach the sea); to increase the aesthetic value of the area (by beautifying coastlines); and to strengthen shoreline defense (by defending against severe typhoon and beach erosion). At the same time, the rehabilitation of the degraded sandy beach and the creation of artificial sand beach in some appropriate areas have been launched to establish a wetland ecosystem with higher biodiversity.

Reducing the Impacts of Various Disasters by Establishing an Early Warning System and Emergency Mechanism

Red tide is one of the serious marine disasters confronting coastal cities. To mitigate its impacts, Xiamen Municipality has instituted a mechanism to monitor both control sites and areas where red tide is known to occur. Xiamen became the first city in China to release forecasting and early warning information about red tide incidents through the news and media bureaus. Since 2005, an emergency and response mechanism has been set up, including the development of programs, namely: *Xiamen Program for Prevention against and Mitigation of Red Tide Disasters* and *Xiamen Program for Response against Red Tide Disasters*.

Oil spill accidents are one of the most common manmade disasters in the sea. Xiamen Municipality organized seminars to assess its capability to handle emergency response against oil spills in Xiamen Port. It also developed an emergency response mechanism against pollution from vessels. To increase capacity, regular exercises on emergency response against oil spill at the sea have also been conducted.

Among various natural hazards, typhoon is the most common in Xiamen. Therefore, Xiamen Municipality attaches great importance to defense against typhoons and have gained much experience. In 2005, the municipality has developed a program for preparedness against typhoon in the fishery industry and has formed a complete emergency response mechanism for typhoon occurrences. The mechanism has laid down a solid foundation for mitigating the impacts from typhoons and safeguarding the life and property of the people. The *Xiamen Program for Emergency Response against Storm Surges and Tsunami* was also developed.

Protecting Marine Resources by Stricter Law Enforcement

The marine environment needs not only construction and improvement, but also joint protection. In recent years, the Xiamen Municipal Government has formulated nearly 30 local laws and regulations concerning port management and supervision; the utilization, protection and management of marine resources; the prevention of marine pollution; marine environmental protection and marine nature reserves; etc. The city has established a team that handles law enforcement and supervision.

Xiamen Municipality has instituted a mechanism to monitor both control sites and areas where red tide is known to occur. Xiamen became the first city in China to release forecasting and early warning information about red tide incidents through the news and media bureaus.

Future Developments and Scaling up

The first step is to launch a special program for the management of the Jiulong River Basin, the Yuandang Lake, the Eastern and Western waters, and the uninhabited islands and for upgrading marine environment quality in the near future.

The second step is the integrated management of Maluan Bay, including a series of projects such as the opening and reconstruction of the causeway, construction of shore protection works, construction of a wetland park, rehabilitation of the water area and the development of the land inside the inner bay and infrastructure development. With the accomplishment of these projects, the bay will have an additional 14 km of coastline; 30 million m^3 of tidal capacity and more than 3 km^2 of sea area.

The third step is to launch the project on integrated management and development of the Wuyuan Bay. With the objectives of restoring, as much as possible, the ecological environments and of building up coastal seascape inside the bay, the project aims at making a total area of 10.76 km^2 under planning, dredging sediment in an area of 3.84 million m^2, restoring 1.3 km^2 of water surface and building a 7.3 km bay-ring road.

In 2006, Xiamen Municipality launched a management project for the Xiamen Eastern waters for improvement of the area's ecological and environment quality. It is estimated that with the accomplishment of the project, the tidal capacity will increase by 44 million m^3 and the capability of water exchange will be enhanced by 30 percent. The project aims to build up a beautiful urban coastline.

Solving Environmental Issues in the Jiulong River Basin through Transboundary Cooperation

As the most important source of freshwater to Xiamen, water pollution and ecological damage in the Jiulong River Basin are regarded as serious concerns, having social, economic and environmental consequences. Therefore, the Provincial Government of Fujian has developed a work plan for Integrated Management of Pollution and Ecological Damage in the Jiulong River Basin, and invested in environmental management projects, such as the management of pollution from livestock production, the disposal of solid wastes, ecological protection and conservation, etc.

The supervision team oversees strict law enforcement and supervision.

Xiamen Municipal Government also attaches great importance to transboundary cooperation in ecological conservation. To strengthen cooperation among the neighboring cities in the basin and develop regional economy, Xiamen formed a city–alliance with Quanzhou and Zhangzhou in 2003, which facilitated the joint protection and management programs for marine resources, freshwater resources, energy, etc. Since 2003, Xiamen Municipality has annually invested RMB 10 million and transferred money to Zhangzhou and Longyan in the upper reaches of the basin for environmental protection works, such as the integrated management of pollution from livestock production and waste management. The projects aim at mitigating the impacts of pollutants from the upper stream to the marine environment of Xiamen.

In the past few years, the river's water quality has significantly improved with a reduction of 235,137 tons of chemical oxygen demand (COD), 13,829 tons of ammonia nitrogen and 7,073 tons of total phosphates. The water quality of the Jiulong River Basin has improved since the implementation of the projects.

The alliance among Xiamen, Quanzhou and Zhangzhou established joint efforts in law enforcement and has resulted in the resolution of many key and critical issues, as well as ensured the reasonable utilization and development of Xiamen's sea areas.

Conclusion

Over the past few years, Xiamen has shown progress with regard to the maintenance of the stability of the marine environment, defense against and mitigation of the impacts of marine disasters, etc. In the future, Xiamen will continue to make efforts in reducing risks through effective implementation of integrated coastal management. ■

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continued from page 47

in equipment and in enhancing its forecasting capacity through:

- Utilization of remote sensing images.
- Establishing hydrometeorology monitoring station networks that are capable of forecasting typhoons and floods.
- Developing software models to predict typhoons. Seventy-two measurements to forecast the changes in sea level due to typhoon in the coastal areas encompassing latitudes 15°N to 17°N were developed and are currently operational.

Upgrading engineering and construction works

Planning and construction of the drainage system has taken into account the limitations in the drainage capacity of the City, particularly its major river systems. The differences in the water levels during high tide are taken into consideration including options for dredging of channels at the mouth of the river to improve the City's drainage capacity. Other measures include the construction of dike systems at critical locations that are prone to erosion; planning and construction of sheltered areas for ships and boats, and providing guidance on building standards and codes.

Strengthening rescue and communication efforts

Although there are a significant number of ships and boats in Danang, most are not suitable for rescue operations. Very few are adequately equipped. The local government has encouraged fishers to equip their boats and provide assistance during emergency situations. The local government also considered the experiences of fishers in rescuing people and where good practices can be applied in future efforts.

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The City acquired additional equipment to upgrade the existing communication system and facilities. Offshore fishing vessels are also required to install radio and other communication equipment to ensure that they can be notified in the event of typhoons. The City also looks at how mass media can be strengthened to ensure that information dissemination is efficiently and effectively undertaken.

Conclusion

The changing conditions in Danang with respect to its increasing vulnerability to natural disasters require adjustments in the Coastal Strategy and its implementation plan. Danang's efforts towards integrating disaster risk reduction and mitigation measures into the CSIP not only ensure that timely interventions are in place but it also illustrates the local government's recognition of the importance of addressing critical issues at the operational and strategic levels within the framework of integrated coastal management. ■

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Local Knowledge and Practices for Disaster Preparedness and Mitigation

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Introduction

The Hyogo Framework for Action is a road map for building resilient nations and communities to which 168 countries committed to from 2005 to 2015. In order to make disaster risk reduction a national and local priority, building a culture of safety and resilience and reducing the risk in the key development sectors, including the environment is an imperative. Building on local knowledge and practices in disaster preparedness and mitigation is a practical and valuable step in the process.

The importance of local knowledge and traditional wisdom was highlighted during the Indian Ocean Tsunami in December 2004. In Simeulue Island in Aceh Province, the community used their knowledge of sea behavior and the reaction of their buffaloes to evacuate 80,500 people from the shore to the nearby hills. Only seven people perished in the island while over 163,700 died in the rest of Indonesia.

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Community leader by the monitoring board.

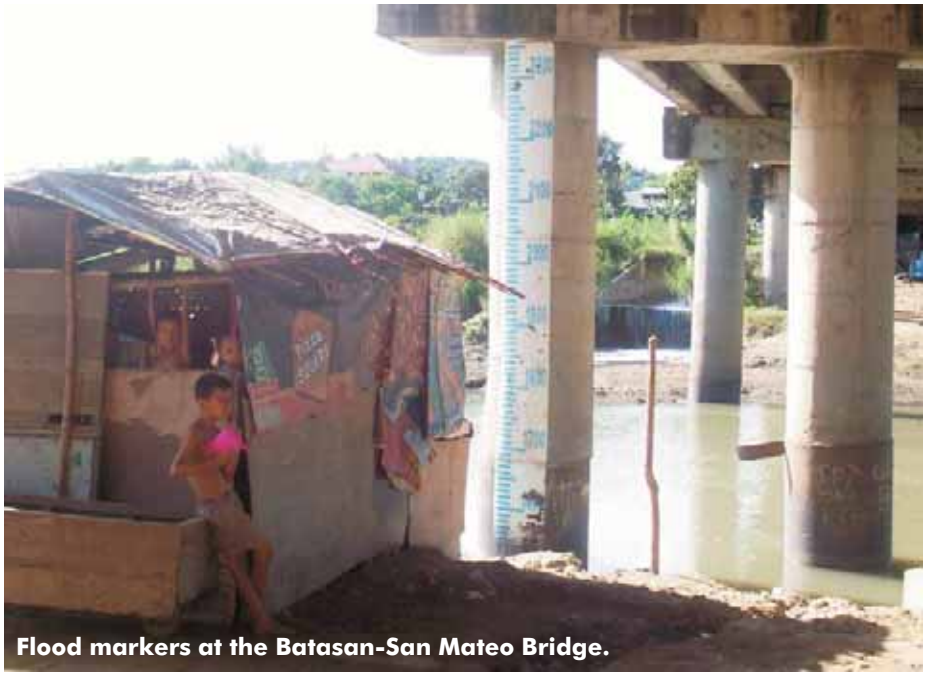
Local Knowledge and Practices and Community-based Disaster Risk Management

Indigenous knowledge is also referred to as traditional knowledge, indigenous technical knowledge and local knowledge. It is knowledge that communities developed over time, and continue to develop. It is based on experience, often tested over centuries of use. It is adapted to local culture and environment and is dynamic and changing. Indigenous knowledge is not confined to tribal groups or the original inhabitants of an area or to rural areas. All communities possess indigenous knowledge, whether rural or urban, settled or nomadic, original inhabitants or migrants. While communities have "local knowledge," outsiders bring "introduced knowledge" (IIRR, 1996).

While some refer to indigenous knowledge as exclusively traditional

knowledge, this paper takes on a broader reference to local knowledge which communities have and develop while living in their local environment and context. Traditional wisdom, local knowledge and practices are important capacities in disaster preparedness, mitigation and prevention. Some examples are sky and cloud appearance; movement and direction of the wind and current; plant and bird manifestations; animal behavior to forecast heavy rain, typhoon, flooding or drought; tree belts to protect settlements from strong winds; design and construction of houses (on stilts, having thick walls and having roof enforcements); riprapping along riverbanks for flood control and along slopes to prevent soil erosion; raising of homesteads using river soils and planting trees to prevent soil erosion; setting seasonal taboo or declaring fishing grounds off-limits to allow protection of resources.

Capacities are resources, means and strengths, which exist in families and communities and which enable them to cope with, withstand, prepare for, prevent, mitigate, or quickly recover from a disaster. In community-based disaster risk management, it is important to build on and strengthen existing capacities to reduce disaster risk and vulnerabilities. Though material resources may be lacking, communities will surely have local knowledge, practices, indigenous or local leaders, support systems and organizations which are useful in designing a fail-safe local warning system, relay warning and precautionary actions to undertake using local channels and forms of communication, and organizing and mobilizing the community in disaster preparedness, mitigation and prevention.



Flood markers at the Batasan-San Mateo Bridge.

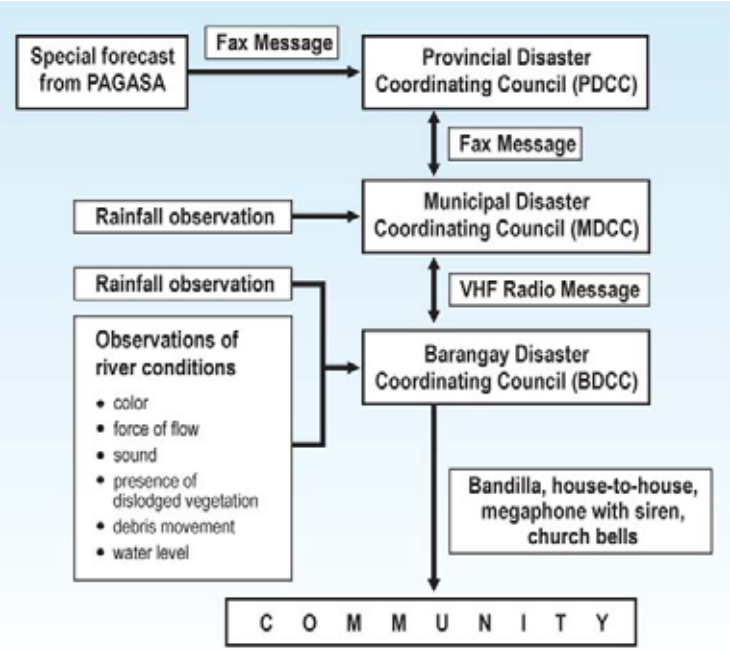
Combining Local Knowledge and Scientific/Technical Knowledge for Disaster Risk Reduction

Aside from traditional wisdom, local knowledge and practices in disaster preparedness should integrate relevant and available science and technology, especially in the light of changing climate patterns. Three brief cases from the Philippines on the application of local knowledge and practices combined with appropriate and available science and technology are presented below. These cover the disaster preparedness and mitigation in *Barangay* Banaba in the municipality of San Mateo, Rizal Province; Camiguin Province in Northeastern Mindanao; and Dagupan City in Pangasinan Province.

1. Disaster preparedness in Barangay Banaba, San Mateo, Rizal

Barangay Banaba is a village in the Municipality of San Mateo in Rizal Province, Philippines. San Mateo, a fast urbanizing town, is close to Metro Manila. Located at the junction of the Marikina and Nangka Rivers, flooding and erosion are the major hazards that confront the residents of Brgy. Banaba. Most of the residents of North and South Libis, the most frequently flooded areas in Brgy. Banaba, are informal settlers. To address environmental problems, the residents formed *Buklod Tao* (People Bonded Together) and the following are key local knowledge and practices applied in disaster preparedness and mitigation.

Figure 1. Coordinated Communication Flow in Warning and Evacuation System.



a. Aside from watching for dark clouds in the upper Montalban Mountains (which indicate that it is raining upstream), the community also monitors hourly rainfall intensity information through telephone calls to the Effective Flood Control Operational System (EFCOS) project which has telemetric rain gauge stations in strategic places along the Nangka River.

b. The community, together with the Metro Manila Development Authority, has put flood markers on the Batasan– San Mateo Bridge.

c. Several pigpens are set up by the riverbank and when the water rises, the cries of pigs alert sleeping families of impending floods.

d. Pigs are tied to the fences near the school and chapel. Once people are alerted, the children and women are then evacuated.

e. The community fabricated fiberglass rescue boats — from three in 1995 to six in 2005 — for search and rescue missions of people who were not able to evacuate on time.

f. While in the evacuation center, parents monitor the receding floodwaters. The floodwater is also used to clean the walls and floor of their homes by letting it sift through.

g. Bamboo poles, which are used to stack up sandbags, eventually grow and help arrest riverbank erosion.

h. During summer when water is scarce, household members dig by the riverbank to get clear water for washing and other household uses.

i. Mothers sew lifevests for children; children are taught how to use these through swimming drills, which in turn help improve the lifevest design. Recycled aluminum juice packs are also collected and made into disaster preparedness bags.

2. Non-structural disaster prevention in the island province of Camiguin

The island province of Camiguin was devastated by flooding and debris flow caused by Typhoon Nanang (international name Lingling) on 6–8 November 2001. The flood claimed 166 lives (excluding 84 declared missing), injured 146 persons and affected some 7,172 families. Damage to settlements, agriculture and infrastructure was placed to at least PhP 201 million. This disaster served as a wake-up call to build local and community capacity in disaster preparedness and mitigation. To prevent a repeat of the Typhoon Nanang disaster, two capacity-building projects were undertaken: 1. "Enhancing Local Government Capacities in Disaster Preparedness, Prevention and Rehabilitation Project" involving five municipalities and the provincial government of Camiguin from April 2002 to May 2003, and 2. "Basic Study on Non-structural Disaster Prevention Measures for Camiguin Province" from April 2004 to January 2005.

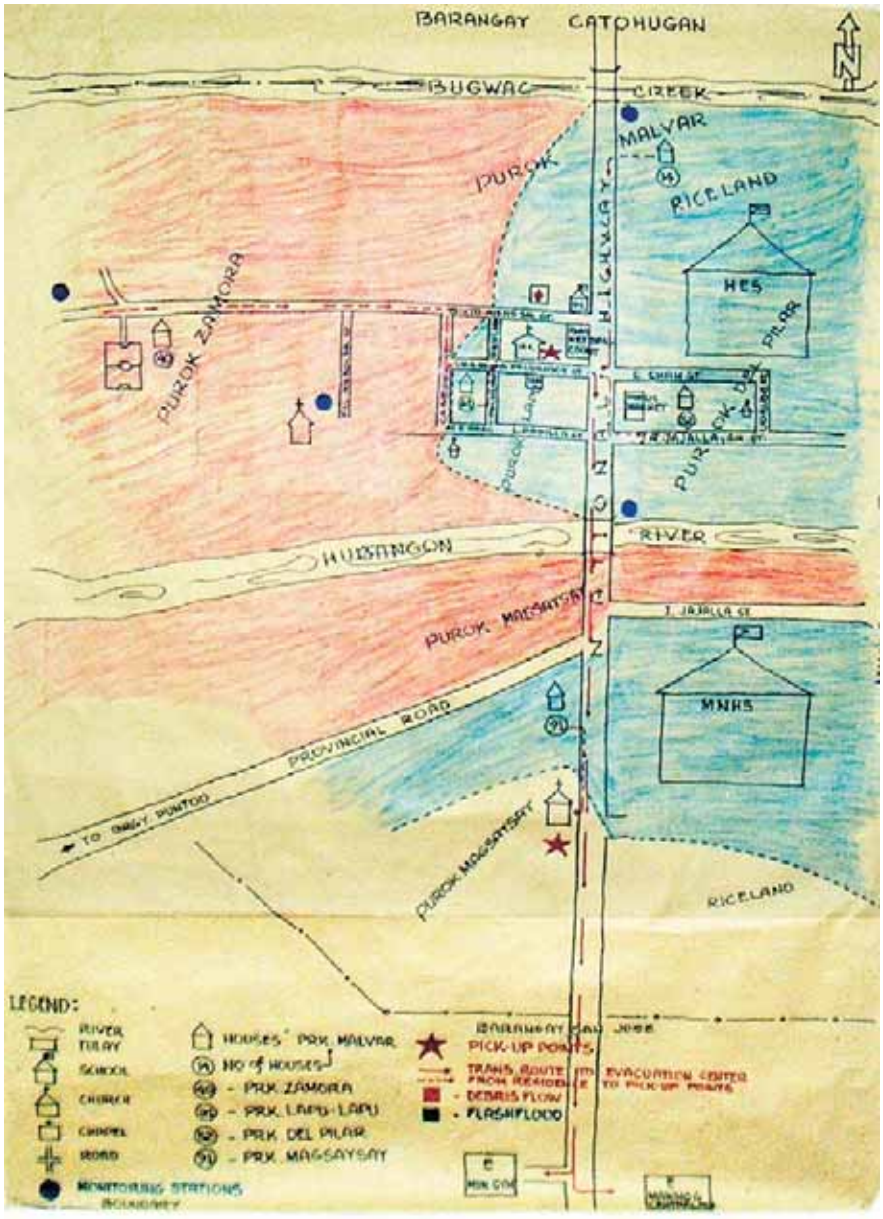
The project components covered social survey, institutional study, flood hazard and risk mapping, local hazard monitoring (provision of rain gauges, arrangements with the Philippine Atmospheric, Geophysical and Astronomical Services Administration or PAGASA for the provision of forecasts for Camiguin), public awareness campaigns (posters, pamphlets, warning boards, information education campaign), early warning systems (communication equipment, sirens), evacuation plan, disaster simulation exercise, disaster prevention manual, and disaster prevention training and planning.

Capacity building involved the province, municipalities and barangays and followed a participatory process which considered local knowledge and practices while providing hazard monitoring and communication equipment for a coordinated warning and communication system for flashflood and debris flow.

Coordinated Communication Flow in Warning and Evacuation System (Figure 1)

- Maps showing houses and community facilities were drawn by community members, and safe and unsafe areas were also drawn based on the hazard maps of the municipalities and barangays produced through field surveys.
- Observation of rainfall and river conditions – color, force of flow, sound, presence of dislodged vegetation, debris movement, and water level monitoring (also through flood markers) complemented installation of rain gauges.
- Use of *bandillo* (vehicle going around the barangay to give

Public awareness in Camiguin Island.



Flood and debris flow hazard map and evacuation route map of Brgy. Hubangon, Mahinog, Camiguin.

People being helped onto a vehicle during an evacuation drill.

warning and precautionary measures, house to house. The ringing of the church and school bells, and megaphones (with sirens) complemented the handheld radios and fax machines.

3. PROMISE Program in Dagupan City, Pangasinan

Dagupan City is located along the coast and situated at the eastern margin of the Agno River delta. It lies just a meter above sea level and is traversed by Pantal River, a major tributary of the Agno River. The city has a total land area of 4,008 ha. Dagupan is a subregional center for trade and commerce, finance, high-level health and education services of Region 1 in Northern Luzon. Floods, usually occurring during the rainy season from July to September, are a constraint to development that damage public infrastructure, private property, agricultural crops, fishponds, and affect other economic activities.

Dagupan City is the Philippine partner city for the Program for Hydro-Meteorological Risk Mitigation in Secondary Cities in Asia (PROMISE) of the Asian Disaster Preparedness Center funded by USAID. Four other cities have committed to be part of PROMISE namely Danang (Vietnam), Chittagong (Bangladesh), Hyderabad (Pakistan) and Kalutara (Sri Lanka).

To meet the goal of reduced vulnerability of urban communities through enhanced preparedness and mitigation of hydro-meteorological disasters, PROMISE major objectives for 2006-2007 are:

a. Adoption of specific hydro-meteorological disaster preparedness and mitigation measures to manage hydro-meteorological disaster risk by stakeholders in targeted cities.

PROMISE Dagupan involves children in its community preparedness activities.

Barangay officials use the "kanungkung" to relay warning for flood and disaster preparedness.

b. Increased stakeholder involvement and further enhancement of strategies, tools and methodologies related to community preparedness and mitigation of hydro-meteorological disasters in urban communities.

c. Strengthen networks and regional links among relevant risk management institutions/ organizations for improving potential and capacity for application and dissemination of lessons learned.

PROMISE Dagupan key program components include:

a. Participatory risk assessment and preparedness/mitigation planning;

b. Implementation of preparedness and mitigation measures (piloting community-based early warning and evacuation system; emergency simulation to test the early warning and evacuation system; evacuation drills; community-level preparedness and mitigation measures in eight priority barangays);

c. Training and public awareness — Disaster Risk Management Training; Training on Emergency Health, Search and Rescue, Medical First Responders; Disaster Safety Day, Academic Olympics with schoolchildren including slogan and poster-making contests; and

d. Mainstreaming disaster risk management in city governance.

The local warning system designed by the Dagupan City Technical Working Group together with barangay officers and the community is the use of the *kanungkung* to relay warning for flood and disaster preparedness. Although not part of the PROMISE project, Dagupan City's formulation and implementation of its Fisheries Ordinance No. 1768-2003 (Providing for the Sustainable Management Development and Conservation of all Dagupan City Waters and Coastal and Fishery Resources) is a mitigation measure related to the Hyogo Framework for Action Priority No. 4: "Reduce the underlying risk factors." A task related to this is under the environment sector, specifically: "4.1 Environment: Incorporate disaster risk reduction in environmental and natural resources management."

Challenge for Local Government Authorities

As shown in the abovementioned examples, local knowledge and practices in disaster mitigation and those which protect the environment, specifically integrated coastal resource management, are complementary, and often are identical interventions. Local knowledge and practices for environmental management may also be referred to as disaster preparedness, mitigation and prevention strategies or measures.

While implementing preparedness measures will save lives, to protect gains and progressively realize sustainable development for all, mitigation and prevention measures have to be implemented. Community mitigation practices or measures that protect the environment and secure livelihoods of people should be supported by local authorities. This will be a "win-win situation" for the people, the community, the local government, the country and the environment.

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continued from page 31

Measures to proactively take advantage of floods include: research and investment in the use of a 'rising water' environment as a natural resource and the full use of alluvial deposits; and developing aquaculture, fisheries, ecotourism, water transport, cultural and sports events during the flooding season.

Basic solutions include: planning in the development and construction of residential, industrial and tourism areas; and disaster prevention and mitigation structures (including road networks), in which the magnitude of a flood discharge must be taken into consideration. It is also important to transfer crop and animal husbandry structures to safe areas and make full use of natural conditions on land and at sea.

To prevent flood and saltwater intrusion and regulate water use and supply, the following solutions are being undertaken: strengthening dikes, taking advantage of and preserving natural sand dunes to protect against erosion and storm surges, salinity intrusion prevention, building reservoirs and other water resources structures to prevent droughts and inundation, controlling coastline and river bank erosion, dredging channels, building berthing facilities for boats and ships, and establishing and upgrading coastal information stations for storms, storm surges and tsunami warnings.

Information dissemination, training and education are promoted to raise awareness and response capacities of individuals and communities; while the rescue capacity of specialized and semi-specialized forces and local people, is enhanced. Policies are crafted to encourage people to participate in natural disaster prevention, response and mitigation initiatives.

The Mekong River Delta

The principle of natural disaster prevention, response and mitigation for the Mekong River Delta is to "proactively live with floods," ensuring sustainable development. Major solutions are predicated on how to control floods, take advantage of floods, and reasonably use land and forest resources and natural conditions in the region. Initiatives are taken to prevent or mitigate the effects of storms, thunderstorms, whirlwinds, saltwater intrusion, and droughts; and to protect the dike systems.

Specific measures for flood control and salinity control include: construction of residential clusters (away from flood-prone areas) and flood-resistant infrastructure; regulation of flood discharges of rivers and channels, construction of sea, estuary and ring dikes; and regulation of reservoirs and other structures to prevent saltwater intrusion and manage freshwater use and supply.

Measures to proactively take advantage of floods include: research and investment in the use of a 'rising water' environment as a natural resource and the full use of alluvial deposits; and developing aquaculture, fisheries, ecotourism, water transport, cultural and sports events during the flooding season.

Likewise, the capacities of individuals, communities and specialized and semi-special forces to participate in response-and-rescue operations are enhanced through policy reforms and promoted through information dissemination, training and education. ■

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Coastal cities, municipalities and provinces which experienced heavy losses and damage can be transformed into strong advocates of DRR. The City of Danang, is a good example of an ICM site able to mainstream DRR into its existing ICM framework. Danang City suffered enormously from the impacts of typhoon Xangsane that entered Vietnam in September 2006. With damage estimated at US$350 million, it was considered the strongest typhoon to hit Danang in 40 years. Seven years of ICM implementation had put in place a framework and a process where priority issues confronting the local government are addressed. The local government made timely adjustments in the Coastal Strategy and its implementation plan to ensure that DRR strategies are incorporated into the ICM framework – thus addressing DRR issues both at the strategic and operational levels.

Xiamen, one of the successful ICM sites of PEMSEA, owes its transformation into a clean and progressive coastal city in China to 14 years of implementing an integrated approach for coastal urban management and on the strong political commitment of its leaders – reaping in the process, a number of acclamations for its achievements. No major catastrophic events affected Xiamen over the past years. The local government, however, is implementing various initiatives that address DRR concerns under the ICM framework to prepare itself for the eventuality of disasters. Xiamen's success can be attributed to its effort of developing and establishing the necessary enabling conditions, underpinned by the dynamic process of ICM, to achieve a balance between conservation requirements and human needs for economic development.

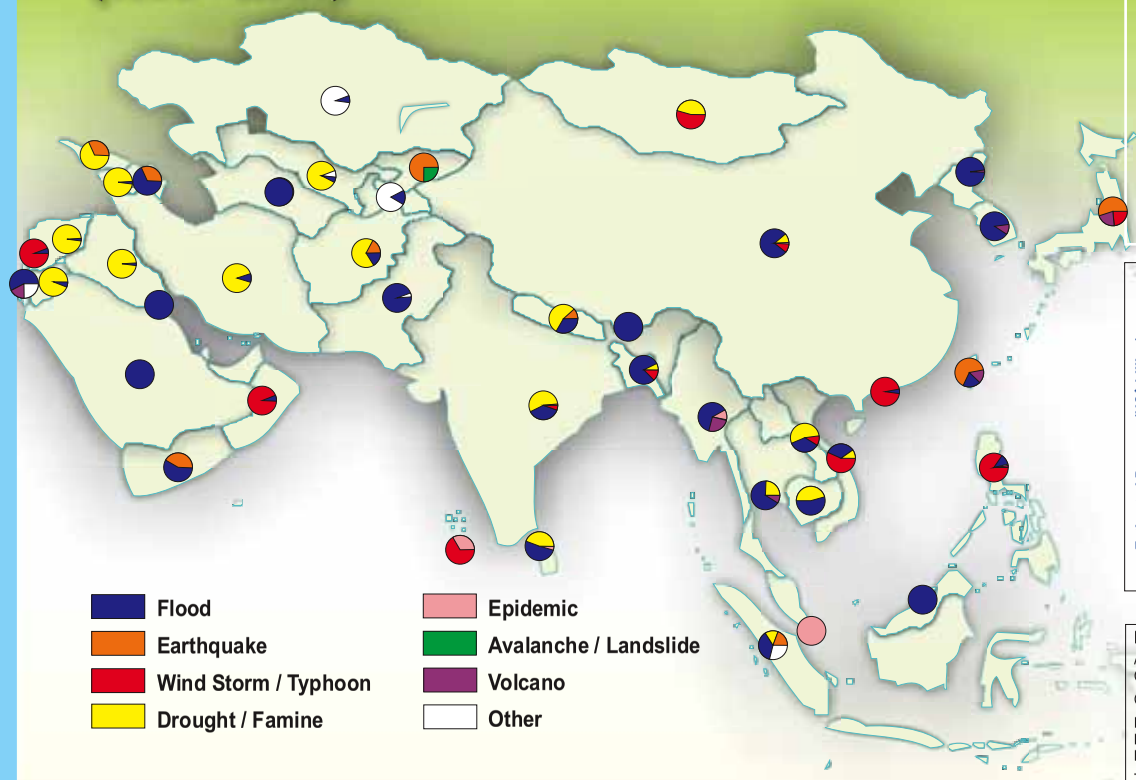
Other ICM sites like Batangas, Bataan and Cavite in the Philippines, Sukabumi and Bali in Indonesia and Sihanoukville in Cambodia have likewise established the necessary mechanisms towards integrating DRR into their existing ICM frameworks.

Initiatives in Camiguin Province and Dagupan City in the Philippines highlight the advantages of utilizing traditional knowledge and practices and community-based approaches for disaster preparedness and mitigation. Integrating these knowledge and practices with scientific knowledge is essential in identifying appropriate action programs for disaster risk reduction. The ICM framework and process, which is information-driven and science-based, strengthen the implementation of these practices to promote risk reduction.

The exchange of information and experiences on DRR has stirred interest from other local governments to consider developing and implementing ICM programs. The reputation of Guimaras as an emerging tourist spot in the Philippines, with its pristine sandy beaches and captivating coves and islets, was tarnished when two million liters of bunker fuel were spilled into its coastal area on 11 August 2006. The lack of interagency coordination during the oil spill response process created confusion with regard to how the disaster response should proceed. An ICM program that promotes policy and functional integration and helps the local governments develop strategies and action plans for addressing issues that affect sustainable coastal development, including natural and man-made hazard prevention and management, is a good incentive for a local government.

Spiraling interests for ICM implementation provide the enabling conditions for parallel implementation of the HFA at the local level. Scaling up efforts in DRR can be linked with the ICM scaling up process that PEMSEA is advocating across the East Asian region. The PNLG will continue to serve as an effective vehicle for enticing other local governments to follow suit, capitalizing on its growing experience, credibility and leadership. Such a concerted action can significantly boost the region's attempt to achieve its target of covering 20 percent of its coastline with ICM programs while at the same time delivering on the HFA – both set to be realized by 2015. ■

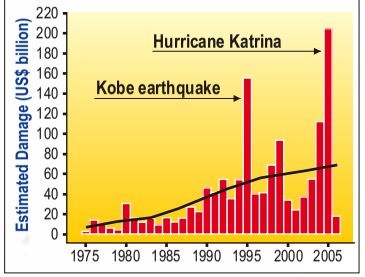
Distribution of People Affected by Natural Disasters, by Country and Type of Phenomena, in Asia (1975 – 2001).



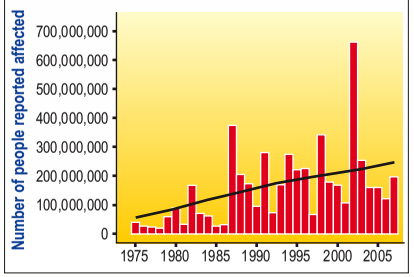
The last two decades has seen a significant increase in the number of disasters and in their severity, globally. These disaster events, in turn, have resulted in increased fatalities and economic losses. The East Asian region experiences a number of natural hazards such as floods, high winds, storms and tidal waves, which have likewise increased in frequency and severity in recent years. This phenomenon particularly affects the coastal areas of the region. With the increase in population and the migration of people to coastal cities, East Asia is now considered as one of the most disaster-prone regions in the world.

The high economic and social impacts (and costs) of disasters in the region have motivated cities and nations to address these hazards through risk reduction strategies. Disaster risk reduction — using the principles of sustainable development as the overarching framework — has emerged in the international agenda as vital in reducing vulnerability to hazards and the impacts of disasters.

Estimated Damage (US$ billion) caused by reported natural disasters 1975 – 2007



Number of people reported affected by natural disasters 1975 – 2007



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Number of disasters that occurred in Asia by Disaster Type (1999-2008).

Type of Disaster	Brunei Darussalam	Cambodia	PR China	Indonesia	Japan	DPR Korea	RO Korea	Lao PDR	Malaysia	Myanmar	Philippines	Singapore	Thailand	Timor-Leste	Vietnam	TOTAL
Drought	0	4	21	2	0	0	1	2	1	0	4	0	5	1	4	45
Earthquake	0	0	68	51	19	0	0	0	0	2	8	0	1	0	0	149
Epidemic	0	9	6	24	1	2	3	6	11	1	9	3	4	1	9	89
Extreme Temperature	0	0	6	0	2	0	1	0	0	0	0	0	0	0	0	9
Flood	0	13	130	73	15	14	19	9	23	12	51	0	43	5	47	454
Insect Infestation	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	2
Slides	0	0	32	29	5	0	1	0	4	1	16	0	2	0	3	93
Volcano	0	0	0	18	5	0	0	0	0	0	11	0	0	0	0	34
Wave / Surge	0	0	2	2	0	1	0	0	1	1	4	0	3	0	0	14
Wild Fires	1	0	3	9	1	0	3	0	4	0	1	0	1	0	1	24
Wind Storm	0	1	141	2	57	5	26	4	6	3	113	0	24	1	50	433
TOTAL	1	27	410	210	105	22	54	21	50	20	218	3	83	8	114	1,346