

Disaster Risk Management in Asia and the Pacific

ISSUES PAPER



Disaster Risk Management in Asia and the Pacific

Issues Paper

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ABOUT THIS STUDY

This is an issues paper from the ongoing joint ADB and ADBI study on Disaster Risk Management in Asia and the Pacific.

The study is being prepared under the overall guidance of a steering committee chaired by Bindu N. Lohani, Vice President for Knowledge Management and Sustainable Development of ADB, and Masahiro Kawai, Dean and CEO of ADBI. It is composed of the following heads of ADB's operations and knowledge departments: Klaus Gerhaeusser (Central and West Asia Department), Robert Wihtol (East Asia Department), Xianbin Yao (Pacific Department), Seethapathy Chander (Regional and Sustainable Development Department), Juan Miranda (South Asia Department), Kunio Senga (Southeast Asia Department), and Kazu Sakai (Strategy and Policy Department).

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Three workshops were held with the participation of policymakers, academics and ADB and ADBI staff. These include a brainstorming workshop in March 2012, an inception workshop in October 2012 and a technical workshop to discuss early drafts in February 2013. Individual acknowledgements will be provided in the final full report.

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I. BACKGROUND AND SCOPE OF THE STUDY

In 2015, two international frameworks draw to a close: the Millennium Development Goals (MDGs), and the Hyogo Framework for Action (HFA): Building the capacity and resilience of the community against disasters 2005-15—a program focusing on DRM. International debate is taking place on current progress with both frameworks to define future ways to effectively manage disasters and establish critical links to development policy and practice in the coming decades. This study seeks to inform this debate.

The study considers key trends, in terms of disaster incidence, sources of vulnerability, and social and economic impacts. This is followed by discussions of some of the major issues: compound disasters, production networks, and climate change, financing, governance, regional cooperation, and disaster information. This issues paper summarizes the main points of discussion and key recommendations.

HUMAN COST OF DISASTERS IN ASIA AND THE PACIFIC

The countries of Asia and the Pacific, both developing and developed, are particularly exposed to natural hazards. Of the ten disasters with the highest death tolls across the world since 1980,

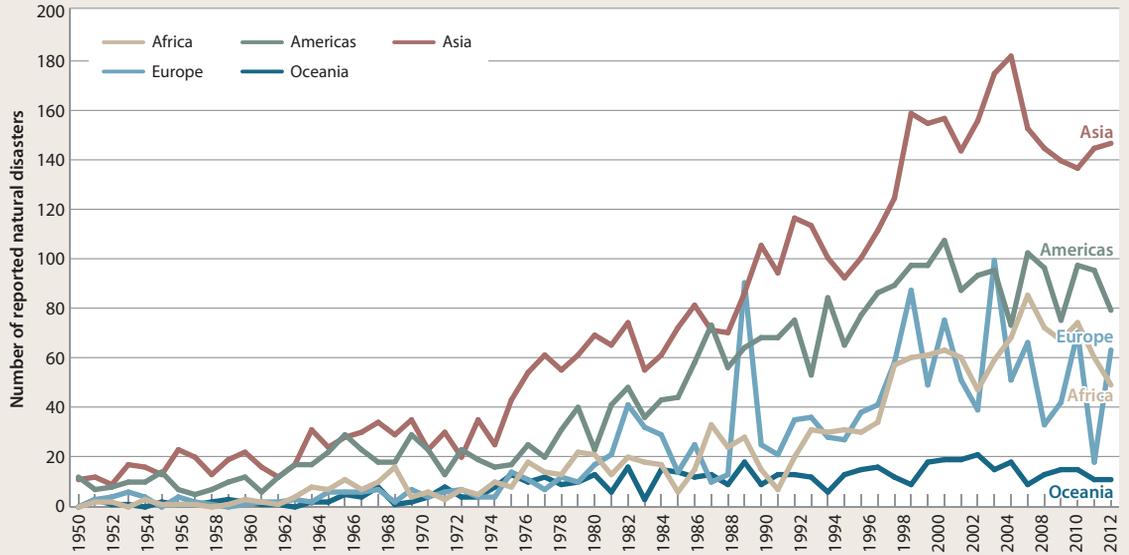
seven occurred in Asia. In 2011, 80% of global disaster-related economic losses occurred in the Asia and Pacific region. The losses caused by these disasters were immense, not only in terms of human lives, but also in terms of property destroyed. A conservative estimate of the average annual direct economic damage due to disasters in countries of Asia and the Pacific in the period 2001-2011 was US\$60 billion (UNESCAP database¹).

Nearly 40% of all the disasters triggered by natural hazard events in the world occur in Asia (Figure 1), but 88% of people affected reside in this region. Of the total number of people affected in Asia, the People's Republic of China (PRC) and India account for just over 40%, reflecting their population size and land mass. But after normalizing for population size and land area, Bangladesh, Philippines, India, the PRC, and Maldives (in this order) have been the top five countries affected since 2000.² Floods are by far the most frequently occurring disasters in Asia (Figure 2) and claim the highest numbers of victims.

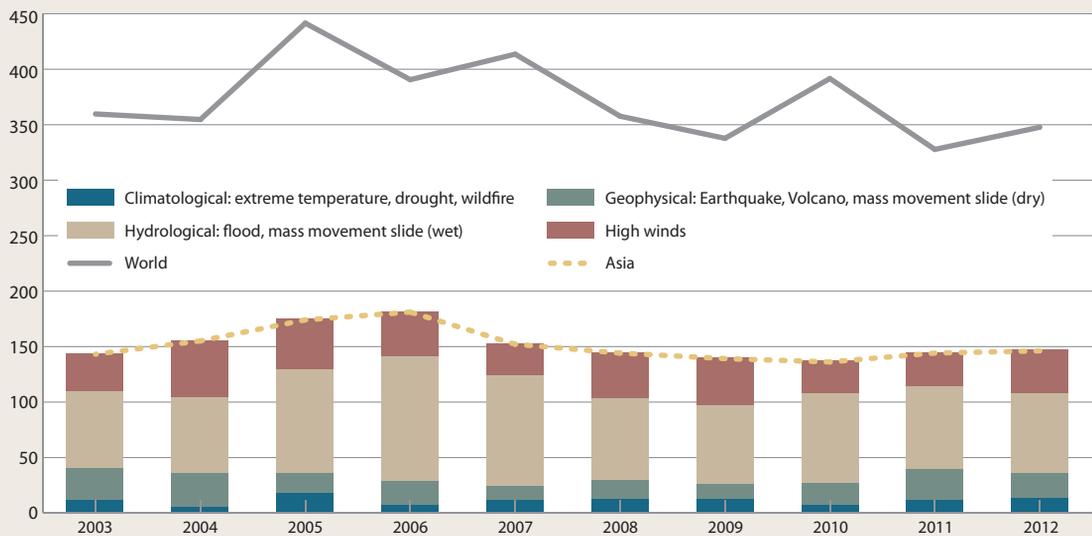
As human impact variability as well as frequency of occurrence is very high in the Asia and Pacific region, examining the data by impact per event can indicate whether severity and frequency are increasing over time. Severity of events can be defined by the physical characteristics of an event (e.g., Richter scale of earthquakes or Beaufort scale for tropical cyclones), but also by the scale of human impact. The impact severity ratios (i.e., number of victims per event) by hazard type presents a heterogeneous picture where floods show the most important increase in the numbers of victims per event compared to all other disasters (Figure 2). Economic losses from natural hazards differ widely between countries, even when accounting for intensity. In contrast, for every person in wealthy countries who died in a disaster in the last 50 years, almost 30 individuals died in poor countries.

¹ From UNESCAP database: <http://www.unescap.org/stat/data/statdb/DataExplorer.aspx>

² From EM-DAT database: <http://www.emdat.be/advanced-search>

Figure 1: Trends in Disasters by Continent

Note: Please refer to EM-DAT database for definitions of Asia and Oceania.
 Source: EM-DAT database: <http://www.emdat.be/advanced-search>

Figure 2: Share of Disasters by Type

Source: EM-DAT database: <http://www.emdat.be/advanced-search>

Trend analyses of impact and occurrence are interesting particularly from the perspective of whether their determinants can be established. In Asia, factors that play a role in determining the trends are a mix of physical characteristics of the event itself and the socio-economic context in which they occur. Earthquakes, for example, have short prediction times and therefore allow little time for protective action. In contrast, slower onset events such as droughts and floods are more predictable and generally cause fewer direct victims but their real cost is in the medium- and long-term and is usually not assessed. Population density, urbanization, and demographic profiles are context-specific factors that are likely to drive death tolls and victimization.

Reducing these and other risk factors is possible if DRM policies are based on evidence. To achieve this, reliable and time series data on impact is central. Global databases such as International Disaster Data Base (EM-DAT), NatCat (Munich Re), or Dartmouth Flood Observatory provide valuable insights into trends and patterns. Substantial progress has been made in standardizing classification systems and definitions at global levels by Munich Re and EM-DAT, but international norms are still needed. Furthermore, the effective national DRM policy will need higher resolution impact monitoring data and sample surveys of risk factors.

II. MAJOR ISSUES AND RECOMMEN- DATIONS

The study identified seven key issues central to the design and implementation of an effective DRM program for in-depth analysis. This section presents a summary of the analyses, with recommendations.

1. COMPOUND DISASTERS

Background

Over the past several years, the spate of disasters in Japan, the PRC, Haiti, and the United States (US) has stimulated a discussion of very large, progressive or cascading disasters, now widely known as “compound disasters.” According to Kawata (2011), compound disasters are multiple sequential disaster events that produce “more serious damage than individual disasters occurring independently.” This definition closely draws on the Great East Japan Earthquake of March 2011 as well as the scenario of a Tokyo metropolitan earthquake as the catalyst for widespread damage across the Tokyo region. Kawata also equates compound disasters with catastrophic disasters, defined by the number of casualties, the large area of damage, and multiple spawned secondary disasters.

The increase in occurrence of multiple large disasters is an inevitable consequence of increases in the population and spatial density in

existing urban centers, greater reliance on technological solutions to maintaining growth and development in hazardous environments and the fragility of social, economic, and risk management (consequence management) systems. There is a need to recognize that compound disasters are a result of a series of component disasters in communities that in their aggregate overwhelm existing abilities to respond.

Managing the risks of compound disasters is dependent on managing the potential disaster risks associated with various physical, social, and economic features that comprise communities: their structures, housing, infrastructure, health, education, social services, and business and industry. The critical elements of that risk management are effective land use and development regulation, the application of best practices in architectural and structural design, fostering a culture that supports government regulation, and building a capacity to respond systematically to disasters when they occur.

Increasing Risk of Compound Disasters

Urban and industrial development concentrates populations in and around older cities which lack the infrastructure to provide water, sanitation, and safe housing to new residents. Urban population growth has put ever greater pressure both physical and social support infrastructure. Increased risk resulting from continuing urbanization and densification without regard for natural or technological hazards, will result in extreme events for which states are not prepared. A moderate technological or natural hazard could trigger progressive infrastructure failures of water and sanitary systems, fuel supply, law enforcement, and fire suppression and housing that would create multiple compounding disasters.

Energy Dimensions

The pressures for economic development and the need for an expanding source of electric power pose a challenge to policymakers. No power source, whether nuclear, hydroelectric dams, or fossil (coal, oil, natural gas) can be produced without risk. There are risks in the extraction, processing, and transport of coal, oil, and liquefied petroleum gas (LPG), as there are in the building and maintenance

of hydroelectric dam structures. The utilization of nuclear energy as a source of power since the 1960s has enabled industrial growth in many countries but now leaves a legacy of hundreds of aging facilities in Asia, Europe, and the Americas. Expended fuel rods are stored at generating facilities as there is no ready solution for safe long-term storage or safe disposal. Human errors in design, location, or operation of these facilities have resulted in catastrophic or near-catastrophic disasters at Three Mile Island, Chernobyl, and Fukushima Daiichi. These aging facilities, many located in areas of seismic hazards that were not recognized during their design and construction, will continue to be potential hazards for several generations, hazards that could spawn compound disasters—release of nuclear material, loss of power generation capacity and resulting economic losses, mass contamination of populations and food supplies, and mass relocation of populations.

The Challenge of Compound Disasters

Infrequent but high impact disasters pose a significant challenge to DRM as the processes for prevention and resources for response may not be adequate. At a time when natural and technological threats are getting more complex, DRM needs to respond with approaches that reduce the risk of new and existing hazardous development while simultaneously building the capacity to respond to complex and compound disasters when they occur.

RECOMMENDATION: *Prepare for possible compound disasters and reduce the risk of large and compound disaster through a risk-based development planning process and fair assessment of the possible maximum damages which may occur under extreme events.*

2. SUPPLY CHAINS AND PRODUCTION NETWORKS

The recent growth of an intricate web of supply chains and production networks in Asia has important implications for DRM. The

successful functioning of East and Southeast Asia's finely constructed and balanced production networks and supply chains rests on the premise of there being no major disruptions to the system, including no natural hazard events. In the past two decades, pressures for industrialization and greater efficiency have led to the development of complex logistics systems and "just in time" supply chain systems linking parts manufacture in Asia and Latin America with product assembly plants in North America, Asia, and Europe. These technologies, while efficient, are dependent on telecommunications, information, and transportation systems that, if disrupted, can impact the world's markets. Disasters in Japan, the PRC, the Republic of Korea, or Latin America can disrupt manufacturing on other continents. Propagations of the economic impacts of disasters could be reduced through resilient logistical support systems, diversification of industrial locations for assembly and input supplies, and adoption of business continuation programs by individual firms.

For example, the 2011 Great East Japan Earthquake (and the tsunami and nuclear accident that it precipitated) and the 2011 Thai floods, both caused enormous disruptions to production networks and supply chains in the region, and extensive damage to the economies concerned. While direct physical losses resulting from the March earthquake and tsunami in Japan were estimated at US\$212 billion, and direct physical losses resulting from the June–December floods in Thailand were estimated at US\$40 billion, the full economic impacts of these disasters are likely to have been much higher. Through production networks, the impacts of a major disaster in one corner of the region can now be felt across the length and breadth of these networks (METI 2011).

Disruptions caused by the disaster to other countries in the region were mainly related to the degree of dependence of these economies on Japan for parts and materials. In 2010, Indonesia, Malaysia, the Philippines, and Thailand taken together were among the most dependent economies on parts, components, and industrial materials from Japan (imports 22% and exports 18%) (METI 2011).

Disruptions in the supply of these intermediary products following the Great East Japan earthquake had caused automotive and electrical components production in Japan to contract by 47.7% and 8.3%, respectively, in March 2011, year-on-year. But contractions

were also very evident for several other economies in the region. For the automotive sector, production contractions soon spread to the Philippines (-24%), Thailand (-19.1%), and Indonesia (-6.1%) during April to June 2011. For the production of electrical components, the highest contraction was likewise recorded by the Philippines (-17.5%), followed by Malaysia (-8.4%), during April to May 2011 (all percentages are year-on-year) (CEIC 2013).

Similarly, the disruptions caused by the Thai floods not only caused significant declines in Thai exports in electronics (-47.4%) and electrical appliances (-21.9%), in 2011 they also had significant impacts on Japan, where the manufacturing production index fell by 2.4% (from October 2011 to January 2012), led by a contraction in electrical component production of 3.7% during the same period (CEIC 2013).

The above short list of the impacts of two major disasters in 2011 in the region on its economies through production networks has come nowhere close to a full counting of the indirect costs involved. In view of the frequency of natural hazard events in Asia and the Pacific and the region's increased economic vulnerability through supply chains and production networks, it is important that such impacts are closely studied. It is also critical that both governments and private companies adopt effective remedial measures, in view of the likely impacts.

RECOMMENDATION: *Increase resilience in the logistic sector and promote the adaptation of business continuity plans to build disaster-resilient production networks in the Asia and Pacific region.*

3. CLIMATE CHANGE ADAPTATION

The Nature of the Problem

The best available science indicates that our climate is changing and there are and will be significant economic and social impacts. The symptoms of climate variability and change—rising temperatures, changing frequency and intensity of tropical cyclones, floods and

droughts, sea level rises, coastal erosion, and accelerated ecosystem degradation—have economic impacts that include the loss of agricultural production, increased damage to physical assets, greater protective infrastructure costs, high insurance costs, and increased costs of emergency services. To these can be added the social impacts of such weather changes, including the loss of livelihoods, higher injury rates, a decrease in fresh water availability, food insecurity, and increased risk of conflict. These potential impacts inevitably reduce the resilience of the affected communities. These effects have characteristics common to those tackled through DRM.

Links between Climate Change Adaptation and DRM

Addressing disaster risk across multiple scales and in multiple sectors, and integrating climate change adaptation (CCA) into today's planning decisions has now become government policy in many countries in the Asia and Pacific region (Anbumozhi 2012). This involves adaptation to future changes in climate extremes as some weather-related disasters are projected to increase in intensity, duration, and frequency. Adaptation to climate change should be regarded as being different, but closely related to DRR and not be seen as an alternative or conflicting approach when dealing with risk and uncertainty (Schipper and Pelling 2006).

Both DRM and CCA share the common goal of increasing community resilience. The main overlap between the DRM and CCA agendas is the management of hydro-meteorological hazards where DRM needs to take account of changes in weather hazards and both aim to reduce their impacts. On the other hand, CCA considers long-term adjustment to changes in mean climatic conditions, including the opportunities that this can provide, and how government organizations can develop capacities to stimulate and respond to a much longer-term process that has been a traditional focus of practical applications of DRM. Hence, scientific policy and practice on CCA needs to be better integrated with DRM, in order to create a solid foundation for action

Implications of Converging DRM and CCA Agendas

Over the past decade progressively more attention has been given to converging DRM and CCA agendas, conceptually and in practice at international, sub-national, and local levels. Despite the converging DRM and CCA agendas, the current institutional context discourages collaboration between and within levels of government. Governments have traditionally divided their responsibilities into discrete areas, such as emergency services, housing, infrastructure, agriculture, etc. This strict demarcation has led to a silo mentality within organizations that encourages narrow views of the issues and tends to overlook the broader cross-agency implications. These kinds of rivalries are exacerbated by issues such as CCA and DRM that cut across defined areas of responsibility.

RECOMMENDATION: *Formulate an effective international framework which integrates DRM and CCA with a specific focus on climate information exchange, supporting vulnerable developing countries, and promoting sectoral collaboration and international financing.*

4. FINANCING AND INSURANCE-RELATED INSTRUMENTS

Private capital markets have been under-utilized in Asia and the Pacific to hedge against, and financially cope with, sudden disasters. Disaster risk has the potential to interrupt the development cycle. In order to minimize such interruptions, financial resources are required to fund the implementation of DRM, and provide insurance-related instruments covering disaster losses. In the Asia-Pacific region, innovative instruments need to be made more widely available to help finance DRM as well as insure the uninsured.

Financing DRM

While in the region significant donor and multilateral development funds have been extended in terms of project loans for implementing DRM activities, innovative alternatives are required and are being explored. One alternative are social funds, which are block grants extended to local communities in order to enhance community facilities and infrastructure. Social funds overall have been rated as very flexible and particularly innovative lending instruments for strengthening community disaster resilience. Key reasons stated were the cost-efficiency of project implementation, well institutionalized community-based DRM and sound interaction with state and federal agencies on local areas needing interventions (World Bank 2012).

Risk Financing

In terms of insurance-related instruments, the Asia-Pacific region has generated a multitude of innovative approaches offering significant potential for protecting individuals, farmers, governments, and cities against disaster shocks in many different contexts.

There is wide institutional variety across micro-insurance systems, which are providing low-cost cover for disasters to low-income households, businesses, and farmers. Early experience with index-based crop and livestock insurance suggests that it can be a cost-effective alternative to indemnity-based agricultural insurance, and avoids moral hazard and adverse selection. The charge is to create public-private systems—backed by international expertise and capital—that can sustain major events, operate in countries with weak financial and regulatory institutions, and at the same time provide cover to those who cannot afford risk-based premiums.

Insurance and Alternative Risk Financing Instruments

These are already providing security to vulnerable governments in order to finance residual risk after effective risk reduction measures have been implemented. There is significant potential for

these instruments to supplement international assistance in assuring sufficient and timely capital for the recovery process. Figure 3 shows the range of options for risk financing as compared with risk reduction with shading indicating effectiveness. Risk reduction is highly effective for more frequent risk. For less frequent, yet more catastrophic risk with the potential to strongly affect government finance and the economy, a risk acceptance threshold may be passed. Beyond this threshold options such as contingent credit, sovereign insurance, catastrophe bonds and intergovernmental risk pooling become effective. By spreading risk across hazards and regions, regional, national and (potentially) global pools for public- and private-sector risks can greatly reduce the cost of risk bearing. Not all risk can be reduced or financed, and donor assistance will continue to cover the extreme risks.



In light of the significant costs of risk financing instruments, the challenge is to identify the appropriate layers of risk to cover, including a risk acceptance threshold, the lowest cost/risk solutions as well as better identify links to risk reduction. Scaling up of the current innovative financing systems will be key and external involvement of governments, donors, and multi-lateral development banks is required for supporting communities and local institutions, building risk culture, reducing transaction costs in terms of bringing the products to the people (e.g., by providing support for mobile phone infrastructure), as well as paying or subsidizing premiums.

Innovation

Innovation regarding financing and insurance-related mechanisms comprises technical breakthroughs, such as innovatively insuring farmers or governments against droughts or storms based on physical parameters (index-based [parametric] insurance) covering events that cause loss, rather than the loss itself, which substantially decreases transaction costs (Linnerooth-Bayer et al. 2011). At the same time, social innovation is as important. Social grants extended to communities provide for local ownership, transparency, and accountability effectively enhancing the local decision-making process. Communities are thus enabled to decide locally where and how to enhance community resilience with particular attention to smaller-scale, less media-compatible hazards and events that often evade attention (O'Donnell 2009). Also, community-based organizations have innovatively experimented with the provision of microloans and savings with disaster micro-insurance in various set-ups, which, with a number of caveats, provides a useful way forward.

RECOMMENDATION: *Facilitate the development of insurance and alternative risk transfer markets in Asia and the Pacific and incorporate incentives for risk reduction into the design of individual financial products.*

5. GOVERNANCE FOR DISASTER RISK MANAGEMENT

In responding to catastrophic disasters, government ministries need to define and coordinate responsibilities among them. The 2011 Great East Japan Earthquake and other disasters suggest that governments' capacity to manage disaster risks is critical in terms of prevention, preparation, response, recovery, and reconstruction. DRM governance is an important issue of concern and should be streamlined as part of the development agenda for most developing countries. The structure and quality of governance need to be improved at all levels from central to local governments and down to the community level, throughout Asia and the Pacific. Moreover, public involvement is critical in all aspects of DRM planning from central to local governments and to community levels, and non-governmental organizations (NGOs) too have an important part to play.

Existing evidence points to the crucial role of governance for an effective national DRM strategy and program, interpreted widely to mean all aspects of authority and coordination. This relates to DRM practices both at the national and local level.

At the local level, primary issues include:

- (1) **Linking local and national aspects:** Disasters are usually local phenomena, and the local governments along with the communities are the first responders. However, large-scale disasters require national or international efforts. Thus, for effective preparedness, it is important to have a specific link in terms of policy, plan, and action at the national and local level.
- (2) **Changing nature of disasters:** The nature of disasters, especially hydro-meteorological disasters, is changing, and becoming more of a local phenomenon (especially in terms of rainfall patterns). This is creating an increasing need for local capacities (both at the government, non-government, and community levels) to cope with such disasters.

- (3) **Diversity of the communities:** It is a well-accepted fact that the community varies from place to place, and its perception and ways of responding to disasters also varies. Therefore, it is important to decentralize policies and customize them according to local needs and priorities.
- (4) **Evidences of past disasters:** There is growing evidence from recent disasters that well aware and well-prepared local governments and local communities can minimize the impacts of disasters, even in the case of mega disasters like the Great East Japan Earthquake.
- (5) **Increasing global awareness of local needs:** Over the past two decades, there has been growing global and regional awareness about the effectiveness of focusing on local needs and priorities. Most of the global and regional frameworks, including the HFA, call for local capacity building and policymaking.

Sustainability and Up-scaling

Community involvement often faces the problem of sustainability over a longer period of time (Shaw and Okazaki 2003). Government, non-government, and international organizations implement various programs before and after disasters. Many of them are very successful during the project period; but the effectiveness of some of them gradually diminishes as the years pass. The gradual decrease of people's involvement in a project can have many reasons. The most common elements are partnership, participation, empowerment, and ownership of the local communities. Unless the disaster management efforts are sustainable at individual and community level, it is difficult to reduce the losses and tragedy. While people should own the problems and the consequences, and challenges of any risk reduction and/or preparedness initiative, it is necessary to see people's involvement in a broader perspective, which is related to policy and strategy.

It has been a common notion that grass root initiatives are the responsibilities of NGOs (Shaw 2012). NGOs have been the leading actors in this field for several years, and contributed to the development of the field. However, many NGO activities face the problem of sustainability over a longer period of time, especially once an NGO has withdrawn from the field. Continuation of community

activities over a longer period of time needs a policy environment at local level, as well as local institutions to continue the activities. The major challenges of the Community Based Disaster Risk Reduction (CBDRR) are: 1) sustainability of efforts at the community level, and 2) incorporation of CBDRR issues at the policy level. To be effective and to create sustainable impact, the application of CBDRR must go beyond the initiative of communities, NGOs, and a handful of local governments. As part of an advocacy effort for more responsive and effective governance, national and state level governments should explore the integration of CBDRR into their policy and implementing procedures (Shaw and Okazaki 2003).

Need for a Focal Point Agency

The focal point agency is expected to play a leading role to promote DRM at the national level. The agency should have authority to: formulate a vision; develop national policies; allocate budgets for government organizations; and demand compliance and actions for the organizations.

The focal point agency must strengthen coordinating functions, but this is a complicated process and never an easy task. The focal point agency must ensure that line ministries, departments, and related agencies coordinate policies, programs, and projects among organizations, some inside government, and others outside.

Various countries have developed governance risk management structures by creating focal point agencies, establishing national platforms, and promoting legislation in line with the HFA. In some countries implementing agencies have expanded their mandates for coordination. The focal point agencies have made various practical efforts in coordination, such as formulating technical committees.

There is no “one-size-fits-all” model for the focal point agency because of the intrinsic variability of disaster scale and type, socio-economic conditions, and geography. Three models are in place in Asia and the Pacific (see Figure 4):

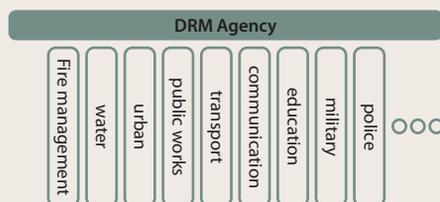
- (1) *Designation as a coordination agency without an implementation role:* This is required to neutrally coordinate various organizations and key stakeholders. These agencies usually

have limited internal capacity financing and staffing, and often face difficulties in coordinating and leading the organizations concerned within governments.

- (2) *Located in parallel with other line ministries in the government:* These agencies, as standalone coordinating bodies, do not have the authority or capacity to influence policy decisions for DRM at the highest level.
- (3) *Developed from implementing organizations:* These are located in disaster response organizations, such as fire management, and relief response organizations, and have expertise, budgets, and experts in some areas related to DRM. However, there are risks of bias on account of their original coordination mandates.

Figure 4: National DRM Structures

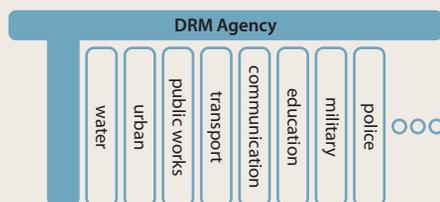
(a) Designated office



(b) Designated office in parallel with line ministries



(c) Implementing agency with expanding to coordination function



Source: Authors' compilation.

RECOMMENDATION: *Place DRM as a core part of national development strategies and programs. Strengthen the coordination role of national government through an enhanced legal framework and build up a flexible cooperation system among local governments.*

6. THE REGIONAL DIMENSIONS OF DISASTER RISK MANAGEMENT

The regional scale of engagement is an important sustaining factor for implementing DRM. Regional institutions such as the Asian Disaster Preparedness Centre (ADPC), Asian Disaster Research Centre (ADRC), and joint country subject-driven institutions such as the Mekong River Commission, International Centre for Integrated Mountain Development (ICIMOD), etc. have proven to be effective proponents of DRM. Their work shapes the policy elements of international DRM frameworks into more specific regional or national emphasis. Regionally-focused associations including the Association of Southeast Asian Nations (ASEAN), South Asian Association of Regional Cooperation (SAARC), Secretariat of the Pacific Community (SPC), etc., provide collaborative environments through which countries can refine their interests when presenting a collective view to international organizations such as United Nations (UN) agencies, international financial institutions, or bilateral assistance organizations.

Regional Institutions for DRM

Once established and sustained by country ownership and support, regional institutions are important for maintaining momentum of DRM accomplishments as individual countries inevitably encounter some limiting circumstances. Regional relationships can also be effective in advancing common DRM concerns despite individual national interests. One example is SAARC's role in facilitating countries' access to otherwise restricted hydrological information throughout the Ganges River basin. The Mekong River Commission has also fostered

the exchange of water flow forecasts and critical flood data among the countries sharing the Mekong basin.

At times of crisis, regional organizations can represent wider collective interests when bilateral country engagement or physical access may be difficult. ASEAN was instrumental in channeling humanitarian assistance into Myanmar following Cyclone Nargis in 2008. It also facilitated the distribution of relief materials in South-East Asia after the extraordinary consequences of the 2004 Indian Ocean Tsunami.

Recent Asian regional DRM conferences such as the Asian Ministerial Conferences on Disaster Risk Reduction and others demonstrate the value of developing or maintaining DRM political commitments and solidarity, at least in principle. However, without increasing national commitments, their tangible outputs leading to operational accomplishments in advancing DRM practices are more limited.

The Pacific countries and economies demonstrate a strong historical commitment to regional cooperation, consensus decision-making, and high environmental sensitivity. Regional political and technical institutions have provided solid foundations for DRM since at least 1993. Exemplary and productive relationships have been developed beyond conferencing in the combined development, climate, environmental and disaster risk activities pursued collectively in the Pacific. Common efforts are a hallmark of regional development strategies that involve a respected regional political body, technical institutions, international organizations, and nearly all external technical assistance agencies working through a common Pacific-based structure.

Regional Institutional Facilities

Diverse facilities, as well as bilateral and multilateral support, have contributed to cost-effective academic research, technical education, and information management activities with concentrated regional emphasis. Although there is no established Asian coalition for joint higher education academic research and training specific to DRM such as Peri Peri U. in Africa, or LA RED in Latin America, there are several internationally regarded academic institutions. These institutions

provide opportunities for DRM study and have archived experience to serve students from all over the region.³ Cultural affinities and shared geophysical conditions within Asia-Pacific are positive attributes for applied DRM activities. These shared interests are even more relevant in sub-regional geographical areas, or among neighboring countries in such critical areas as river basins, tropical cyclone zones, or active seismic locations. It was only after 350,000 deaths from the 2004 Indian Ocean Tsunami that the value of a regional Indian Ocean tsunami warning system was understood and installed by international organizations and direct beneficiary countries.

Regional Professional Links

The absence of any sovereign political authority in a region or within sub-regions provides latitude for targeted investment in principal institutions that can advance applied DRM practices across either risk-defined areas or zones. Multiple benefits can be gained from developing associated or linked educational, research, or applied technical institutional networks dedicated to DRM. Such combined professional linkages would be well placed to provide complementary DRM services benefitting from established international organizations or framework support, while focusing on the disaster risks of particular relevance to Asian and Pacific country interests.

When considered in strategic terms, and relative to previously identified regional or sub-regional DRM agendas, a networked system of DRM-engaged professional institutions could similarly provide the foundation for a regional DRM data development and management system. This would encourage improved data acquisition, common standards, cost efficiencies and multi-national engagement for shared regional benefits.

³ For example, Asian Institute of Technology in Bangkok, Bandung Institute of Technology in Indonesia, National University of Singapore, Kyoto University in Japan, Beijing Normal University in the PRC, BRAC University and Bangladesh University for Environment and Technology in Bangladesh, Tata Institute for Social Science and Roorkee (and other) Institute(s) of Technology in India, University of the South Pacific in Fiji.

RECOMMENDATION: *Further strengthen regional cooperation both for disaster response and DRR through improved institutional capacity and increased financial resources.*

7. DISASTER INFORMATION AS EVIDENCE

This study takes existing data on disasters as the point of departure, and carries out analysis on that basis. While a multitude of data sets are available, ranging from the internationally recognized ones such as EM-DAT to local data sets, the quality and range of coverage of these have been limited, preventing much firmer and finer evidence-based analysis and, ultimately, limiting policy recommendations.

Specifically, there is wide agreement on the need for better disaster risk models and impact profiles. Major progress has been made on prediction models and alert systems especially for climatological disasters using geo-spatial and climate data (e.g., “Pacific Risk Information System” [PRIS].) But there is still a major gap in terms of disaster risk models, especially models that can simulate the socio-economic impact of disasters. The main problem in this respect is a lack of systematic and dependable data on the impacts of disasters that would allow us to establish the pathways of impact of different types of disasters on communities. The availability of data and analytical products are determined by the availability of reliable data.

An inter-operable disaster data system focusing on socio-economic indicators that uses a harmonized methodology should be put in place at a regional level. This will allow countries to assess trends over time and between regions and set quantifiable targets for DRM. Risk models and vulnerability analyses can use this data to produce more credible products. Sustainability and credibility of databases should be ensured by involving competent technical institutions.

RECOMMENDATION: *Strengthen local, national, and regional disaster impact data systems to improve measurement and monitoring of the impact of various disasters and the effectiveness of existing and future DRM measures.*

III. SUMMARY OF THE STUDY

This issues paper from the study of DRM in Asia and the Pacific highlighted the rising human cost of disasters in the region and major policy issues for DRM. These include: compound disasters, production networks, climate change, disaster risk financing, governance, regional dimensions, and disaster information. These policy issues cover a variety of disciplines and much ground, but they have in common the interaction of three components of DRM: *risks, governments, and communities*.

- **Risks:** —as they are accepted, understood, and reduced by various stakeholders.
- **Governments:** —as they play a key supporting role in applying risk reduction measures that deliver a safer living, working, and natural environment.
- **Communities:** —as they teach and learn from each other, to build a “safety culture.”

Four implications from the issues paper are as follows: First, DRM requires a deep understanding of the threats and opportunities, and social and economic adjustments to livelihoods that invariably accompany natural hazard events such as tropical storms, bush fires, seasonal floods, and earthquakes. Second, risk reduction should tackle the “drivers of vulnerability,” rather than confining attention to the “consequences of the vulnerability.” Third, investment in strategic human capacity needs to be stepped up to meet future requirements for continuous DRM and CCA responsibility. These educational values are directly related to risk awareness, risk assessment, and risk acceptance or risk reduction. Fourth, it is important to integrate DRM into a country’s development strategy.

The discussion provided in this issues paper suggests the following recommendations:

- (1) Prepare for possible compound disasters and reduce the risk of large and compound disaster through a risk-based development planning process and fair assessment of the possible maximum damages which may occur under extreme events.
- (2) Increase resilience in the logistic sector and promote the adaptation of business continuity plans to build disaster-resilient production networks in the Asia and Pacific region.
- (3) Formulate an effective international framework which integrates DRM and CCA with a specific focus on climate information exchange, supporting vulnerable developing countries, and promoting sectoral collaboration and international financing.
- (4) Facilitate the development of insurance and alternative risk transfer markets in Asia and the Pacific and incorporate incentives for risk reduction into the design of individual financial products.
- (5) Place DRM as a core part of national development strategies and programs. Strengthen the coordination role of national government through an enhanced legal framework and build up a flexible cooperation system among local governments.
- (6) Further strengthen regional cooperation both for disaster response and DRR through improved institutional capacity and increased financial resources.
- (7) Strengthen local, national, and regional disaster impact data systems to improve measurement and monitoring of the impact of various disasters and the effectiveness of existing and future DRM measures.

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Disaster Risk Management in Asia and the Pacific

Issues Paper

This issues paper aims to help ADB DMC governments integrate Disaster Risk Management into their national developmental strategies and examine how emerging economies of Asia can cooperate to improve their disaster risk management practices, in view of increasing risks of compound disasters, climate change, and expanding production networks. It is intended to contribute to ADB's ongoing efforts to mainstream disaster risk management into its lending strategies, strengthen the governance for disaster risk reduction and disaster response in the region, improve the effectiveness of post-disaster reconstruction, and develop new financial instruments to help meet the costs of such activities through international, particularly regional, cooperation. Lessons from recent events both in pre-disaster risk mitigation and post-disaster response are identified and concrete recommendations for action are suggested.

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ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.7 billion people who live on less than \$2 a day, with 828 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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