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### **NATURAL DISASTERS DIALOGUE FIRST MEETING**

#### **NATIONAL SYSTEMS AND INSTITUTIONAL MECHANISMS FOR THE COMPREHENSIVE MANAGEMENT OF DISASTER RISK PHASE I**

WORKING PAPER

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## Executive Summary:

The Regional Policy Dialogue has commissioned a two stage research program focused at understanding national, integrated, government-directed systems. The first phase of this research is to compile and analyze the existing literature and studies on national systems and institutional mechanisms for the comprehensive management of disaster risk. This report is the Phase I report. The report is based on a review of existing literature, three case studies completed by the authors, and consultation with experts on existing practice in Latin America on natural disaster programs. Phase II research will analyze selected country systems in more depth and provide specific policy recommendations.

Most natural hazard policy in the Latin American and the Caribbean focuses on establishing efficient disaster response for the immediate post disaster period with appropriate civil defense measures. While disaster response is important, it fails to address the causes of disaster losses. Those causes are rooted in the complex interaction of human settlement and the natural environment. To protect people and their assets, natural disaster policies must deal with a broad set of issues. In developing countries, those issues are tied to the network of policies addressing economic development.

Most commentators believe that for a national disaster system to be comprehensive, national governments must be an active participant in the creation and implementation of a formal system. There is however disagreement in the literature regarding the advisability of depending on national governments as the appropriate foundation for a comprehensive program. Those holding this view favor reducing natural hazard risk through community-driven projects and programs developed by non-governmental organizations. The two approaches to risk management need not be mutually exclusive. The task facing policy makers today is to create an effective national system with a comprehensive vision that engages senior government policy makers and accommodates, supports local decision making and initiatives, and promotes the institutional conditions necessary for the constructive involvement of private-market initiatives.

The creation of a comprehensive disaster management system involves integrating the key components of disaster risk management: risk identification, risk mitigation, risk transfer, preparedness, emergency response and rehabilitation and reconstruction. A comprehensive risk management program addresses all these components.

Risk identification includes hazard assessment, vulnerability studies, and risk analysis. Hazard assessment identifies probable location and severity of dangerous natural phenomena and the likelihood of their occurring within a specific time period in a given area. These studies rely heavily on available scientific information, including geologic, geomorphic, and soil maps; climate and hydrological data; and topographic maps, aerial photographs, and satellite imagery.

Vulnerability studies estimate the damage that would result from the occurrence of a natural phenomenon of given severity. Vulnerability studies estimate physical, social and economic vulnerability. These studies include indirect losses such as business interruption and secondary effects such as accentuated poverty, higher unemployment or increases in levels of external debt.

Risk analysis integrates information from the hazard assessment and the vulnerability studies to generate estimates of the probabilities of expected loss for given hazardous event.

Mitigation refers to policies and activities that reduce an area's vulnerability to damage from future disasters. These structural and nonstructural measures are in place before a disaster occurs. Structural mitigation projects can be very successful from a cost-benefit perspective, but have the potential to encourage a false sense of security if not coupled with public awareness programs. Nonstructural mitigation measures include a range of activities from enforcement of building codes to controversial policies in land use planning.

A fundamental distinction between the risk management policies in many developed countries and in developing countries is the role of risk transfer. In some developed countries, the government undertakes a major commitment to shift a portion of the risk of financing reconstruction after a disaster from the government to another party, generally an insurance company.

It is no coincidence that insurance is an economic tool used by wealthy countries. It requires sophisticated financial institutions to operate. In many developing countries, the lack of institutional regulatory structures impedes the supply of insurance.

Many countries may be too small to provide adequate risk diversification to properly support a national insurance scheme. Proposals to create regional insurance markets hope to increase risk diversification and potential market size thereby making the market more attractive for the insurance industry and lowering the cost of insurance. Other options for risk diversification include catastrophe bonds or directly assessing the international reinsurance markets.

With small middle classes and limited medium-sized businesses, the most frequent purchasers of insurance in developed countries, there is a small natural clientele for insurance in most developing countries. Government policies need to be directed to increase demand for insurance if an effective market is going to be developed. Requiring insurance for governmental buildings and legislating mandatory insurance for households and small and medium businesses are two tools to increase demand for natural hazard insurance. Insurance is not an option for the very poor. There is much that can be done to encourage informal and formal risk sharing by the poor outside the establishment of a formal insurance program.

Preparedness involves building an emergency response and management capability before a disaster occurs to facilitate an effective response when needed. Key disaster preparedness activities include early warning systems, public awareness programs, and the development and testing of emergency evacuation plans. In contrast to structural mitigation measures that are often the product of major policy decisions at a national level, preparedness projects tend to be oriented towards the actions of individuals and individual organizations.

Emergency response refers to actions taken immediately before, during and after the onset of a major disaster or large-scale emergency to minimize the loss of life and harm to people and their property and enhance the effectiveness of recovery. Best emergency response comes immediately post-event with sufficient resources to limit the loss of life and property.

Reconstruction and rehabilitation refer to programs that provide longer-term assistance for people who have suffered injuries or incurred losses due to a major disaster. The most important recommendation for reconstruction and rehabilitation

projects is that they should proceed in ways that reduce future vulnerability and promote development objectives.

### *Integrating Key Elements of Risk Management into a National System*

The general foundation for a national disaster system is the creation of a formal national disaster strategy and an organizational structure for integrating disaster management efforts. This organizational structure typically includes a ministry or sub-ministry responsible for disaster affairs that houses a National Disaster Management Office, some form of National Disaster Council to identify priorities and channel resources, and an Operations Control Group responsible for preparing and coordinating emergency response.

Looking broadly at the formal and informal, public and private institutions involved in the management of disaster risks across the globe, disaster risk management institutions and practices adopted in different countries depend on factors like historical circumstances, economic development, political landscape and cultural diversity. As important cases in point, Japan and the US are culturally quite diverse, but the similarities in the evolution of their disaster management systems are striking. Both countries have in place comprehensive programs at the national level to manage disaster risks. Another parallel between Japan and the US, and perhaps the most innovative, is the creation of public/private insurance systems to further recovery. Japan and the US have pioneered loss-sharing programs that involve governmental and private market institutions. These programs underline the importance of integrating hierarchical and individualistic social organization in a national system, but in ways that reflect national cultures.

France, Hungary and the UK, as important cases in Europe, have varied approaches to national systems. France is well known for its publicly backed insurance system that provides disaster security to nearly all property owners in France. The French system relies on the mandatory bundling of natural hazard risk in existing property insurance. The French system has been effective in designing a comprehensive risk transfer program, but less effective in encouraging mitigation. Hungary is moving towards a decentralized program with extensive reliance on local communities to cope with natural hazard risk. It is exploring how the private market can play a more active role in the process, as opposed to the centrally planned system that existed prior to 1989. Both France and Hungary contrast sharply with the UK with its Anglo-Saxon tradition of individualistic governance. The UK relies almost exclusively on private insurance to both pay for post disaster losses, as well as to motivate individual risk reducing activity. There is little government involvement in funding post disaster losses. Rather, the government focuses its efforts on structural mitigation measures.

Turning to countries in the developing world, Fiji and India face extensive natural catastrophe exposures from cyclones, floods, droughts, earthquakes and tsunamis. In India, despite the recently announced formation of a national Disaster Management Authority, the government is active mainly in aiding states in their response to catastrophes. India appears to be developing a more loosely networked system that directly involves stakeholders in a less centralized approach to risk mitigation or transfer. Alternatively, Fiji has moved towards a government-directed integrated system for disaster risk management that includes a strong national program and plan.

### *Insights from Country Experiences*

Drawing from the experiences of selected countries and recommendations of the policy makers involved in national disaster systems, some key guidelines for effective disaster management systems emerge:

- First of all, successful national systems have an explicit and appropriate national disaster strategy. Appropriate national disaster strategies integrate with national policy on development and environmental protection and are based on vulnerability assessments.
- Second, successful national systems integrate key players into the disaster management process. Such players include, inter alia, the finance ministry, local community leaders, NGOs and private-market actors.
- Third, successful national systems have provisions to ensure sufficient resources for key players to carry out their responsibilities.

### *Political and Financial Sustainable National Systems*

It is important for national systems not only to function well but also to survive periods in which relatively few catastrophic events occur and remain viable during and after major hazard events. The key elements of a sustainable system are:

- The more a national disaster system integrates with overall development goals, the easier it will be to maintain political interest in the system.
- Supporting a national disaster strategy with legislation increases the likelihood it will be sustainable.
- At some fundamental level, individuals and governments underestimate natural hazard risk. Sustainable national systems have active programs to maintain an adequate perception of risk, particularly in periods when few disasters happen.
- Sustainable programs have constituencies that support the political agenda needed to implement and carry out a program. There is a built in prejudice against changing existing programs, particularly if the changes impact existing power structures. One way to develop the needed support is to frame the natural disaster system as a poverty issue.
- Finally, a key part of political sustainability is providing the structures to make different organizations and individuals accountable for their disaster management responsibilities when events strike.

### *Financial Sustainability:*

The best way to ensure financial sustainability of national systems is to ensure the continued political impetus behind the system. Other methods include committing to long-term financing contracts with external parties and responding to pressure from the international finance and donor community:

- Long-term contracts with reinsurance companies, investors, or international financial institutions are one way to ensure continued financial support for the system.
- The actions of the international donor community can play a decisive role in the sustainability of national programs.

*Conclusion:*

A comprehensive approach requires the commitment of the national government. That commitment needs the attention of those directing development policies. As well, the role of risk transfer as a centralizing policy initiative is important. The task is to create an effective national system with comprehensive vision that engages senior government policy makers, accommodates and supports local decision making and initiatives, and promotes the institutional conditions necessary for the constructive involvement of private-market initiatives.

# 1. Introduction

This report was commissioned by the Regional Policy Dialogue initiative of the Inter-American Bank to examine national systems and institutional mechanisms for the comprehensive management of natural disaster risk. Latin America and the Caribbean are only too familiar with the devastating impact of hurricanes, floods, earthquakes, landslides, volcanic eruptions, and other natural disasters. With an average frequency of 40 significant disasters a year, the region is second only after Asia in the number of disasters impacting the region.

Most natural hazard policy in the region focuses on establishing efficient disaster response for the immediate post disaster period. The primary emphasis in the region is on responding to disasters with appropriate civil defense measures. The current situation reflects the traditional role that disaster policy played. Disaster management was once focused equally on war readiness and planning for disasters: it was the concern of the military. The common name for natural hazard response as “civil defense” reflects this military heritage.

While disaster response is important, it fails to address the causes of disaster losses. Those causes are rooted in the complex interaction of human settlement and the natural environment. Recurring natural events become disasters because populations exist in harm’s way in structures inadequately prepared to withstand anticipated natural hazard events. To protect people and their assets, natural disaster policies must deal with a broad set of issues. In developing countries, those issues are tied to the network of policies addressing economic development. The best protection from natural disasters is an economically viable country with strong democratic institutions. Just as the reduction of poverty requires a comprehensive mix of policies that involve many components of society and government, reducing the toll of natural disasters requires a comprehensive approach that accounts for the causes of a society’s vulnerability to disaster. Not only must a comprehensive strategy be articulated, the political and economic will must be created to sustain the policies.

A national disaster system is the interaction of the institutions, financial mechanisms, regulations, and policies that constitute a country’s approach to disaster risk management. This interaction can be formal or informal. Most commentators believe that for a national disaster system to succeed in being comprehensive, national governments must be an active participant in the creation and implementation of a formal system. This view is well expressed by the Asian Development Bank in its handbook on disaster management (Carter 1992).

There is however disagreement in the literature regarding the advisability of depending on national governments as the appropriate foundation for a comprehensive program. As described in the classic analysis of the political economy of large disasters by Prof. Albala-Bertrand, focusing natural disaster policy through existing government systems enhances narrow power structures and draws focus away from local concerns and initiatives (Albala-Bertrand 1993). Those holding this view favor reducing natural hazard risk through community-driven projects and programs developed by non-governmental organizations. Such an approach to risk management is not guaranteed to



be comprehensive, but applies directly to identifiable needs and the empowerment of local populations.

The two approaches to risk management need not be mutually exclusive. The task facing policy makers today is to create an effective national system with comprehensive vision that engages senior government policy makers and accommodates and supports local decision making and private-market initiatives.

The Regional Policy Dialogue has commissioned a two-stage research program focused at understanding national, integrated, government-directed systems. The first phase of this research is to compile and analyze the existing literature and studies on national systems and institutional mechanisms for the comprehensive management of disaster risk. The report will group the research around the following three topic areas: the characteristics of existing national systems and institutional mechanisms, political sustainability of national systems, and the financial sustainability of national systems. The work will describe each component of these topics as it relates to the principal phases of disaster risk management and highlight promising and problematic practices.

While it is helpful to discuss specific programs in terms of promising and problematic practices, these must be understood in the context of the specific country or region being discussed and the perspective of the policy maker interpreting the practice. For example, a practice that permits the integration of probabilistic risk from catastrophe events into macroeconomic planning models is a promising practice for those interested in engaging development planners in the dialogue. For those interested in creating decentralized projects, a complicated macroeconomic modeling process that diverts significant institutional energy and financial resources from locally directed initiatives is a problematic practice.

Phase II of this project will include a deeper analysis of national systems. As the first phases defines the components for a national system, the second phase explores the policy alternatives for a sector-by-sector analysis to understand how these sectoral arrangements can be integrated into a wider plan. Phase II will also focus on the economic incentives and financial instruments within the national system. In Phase II, the report will focus in detail on the impediments to creating a national system, and provide recommendations to overcome those impediments.

This report constitutes Phase I of this project. It is based on a review of existing literature, three case studies completed by the authors, and consultation with experts on existing practice in Latin America on natural disaster programs. The report proceeds as follows. The next section examines the components or phases of disaster risk management and discusses existing practice with respect to each component. Section 3 discusses how selected countries in the Americas, Europe, and Asia integrate risk management phases into a national system. Section 4 draws out the lessons learned from the country studies, providing guidelines for effective national disaster systems. Section 5 discusses how to make these systems politically and financially sustainable. Section 6 concludes.

## 2. Elements of Comprehensive Disaster Management

In the risk management literature, the key elements of risk management are divided into two phases: the pre-disaster phase and the post disaster phase. The report, *Facing the challenge of natural disasters in Latin American and the Caribbean: An IDB Action Plan*, introduces the table replicated below (IDB 2000) that divides the key components of disaster risk management into two phases: actions required in the pre-disaster phase and actions needed in the post-disaster period. The pre-disaster phase includes risk identification, risk mitigation, risk transfer, and preparedness; the post disaster phase is devoted to emergency response and rehabilitation and reconstruction. A comprehensive risk management program addresses all these components. The remainder of this section will discuss these key elements of the risk management process in more detail.

Key Elements of Risk Management					
Pre-Disaster Phase				Post-Disaster Phase	
Risk Identification	Mitigation	Risk Transfer	Preparedness	Emergency Response	Rehabilitation and Reconstruction
Hazard assessment (frequency, magnitude and location)	Physical/structural mitigation works	Insurance/reinsurance of public infrastructure and private assets	Early warning systems. Communication systems	Humanitarian assistance	Rehabilitation/reconstruction of damaged critical infrastructure
Vulnerability assessment (population and assets exposed)	Land-use planning and building codes	Financial market instruments (catastrophe bonds, weather-indexed hedge funds)	Contingency planning (utility companies/ public services)	Clean-up, temporary repairs and restoration of services	Macroeconomic and budget management (stabilization, protection of social expenditures)
Risk assessment (a function of hazard and vulnerability)	Economic incentives for promitigation behavior	Privatization of public services with safety regulation (energy, water, transportation, etc.)	Networks of emergency responders (local/ national)	Damage assessment	Revitalization for affected sectors (exports, tourism, agriculture, etc.)
Hazard monitoring and forecasting (GIS, mapping, and scenario building)	Education, training and awareness about risks and prevention	Calamity Funds (national or local level)	Shelter facilities. Evacuation plans	Mobilization of recovery resources (public/ multilateral/ insurance)	Incorporation of disaster mitigation components in reconstruction activities
<b>Building and Strengthening National Systems for Disaster Prevention and Response:</b> These systems are an integrated, cross-sectoral network of institutions addressing all the above phases of risk reduction and disaster recovery. Activities that need support are policy and planning, reform of legal and regulatory frameworks, coordination mechanisms, strengthening of participating institutions, national action plans for mitigation policies and institutional development.					

## 2.1 Risk Identification

Risk identification includes hazard assessment, vulnerability studies, and risk analysis. Hazard assessment identifies probable location and severity of dangerous natural phenomena and the likelihood of their occurring within a specific time period in a given area. These studies rely heavily on available scientific information, including geologic, geomorphic, and soil maps; climate and hydrological data; and topographic maps, aerial photographs, and satellite imagery. Historical information, both written reports and oral accounts from long-term residents, also helps characterize potential hazardous events. To be most successful, hazard assessment requires data and scientific teams trained to evaluate the data. In some countries, the lack of extensive historical data on catastrophic events makes hazard assessment difficult. In the case of floods and landslides, human factors can drastically impact the environment, and historical data may be of little value. For earthquakes and tropical cyclones, the international research community has collaborated significantly to pool resources and scientific knowledge to develop global and regional hazard maps. Much work remains to be done on flood and landslide mapping. In these areas, best approaches involve using available data to establish preliminary maps to identify highest-risk areas and justify the investment of funds to refine the maps.

Vulnerability studies estimate the physical, social and economic consequence that result from the occurrence of a natural phenomenon of given severity. Physical vulnerability studies analyze impacts on buildings, infrastructure and agriculture. The Applied Technology Council, for example, publishes detailed vulnerability curves for the resistance of 50 different types of structural facilities to earthquake hazards (ATC 1985). Social vulnerability is much more difficult to quantify but no less important. Social vulnerability studies estimate the impacts of especially vulnerable groups such as the poor, single parent families, pregnant or lactating women, the mentally or physically handicapped, children, and the elderly. Social vulnerability studies take into account the public awareness of risk, the ability of groups to self-cope with the catastrophes, and the institutional structures in place to help them cope (Coburn 1991).

Economic vulnerability studies estimate the potential impacts of hazards on economic assets and processes. These studies include indirect losses such as business interruption and secondary effects such as accentuated poverty, higher unemployment or increases in levels of external debt. These impacts are also difficult to estimate ahead of time because there is very little data available on indirect and secondary impacts of catastrophic events and, looking at historical data, it is difficult to attribute economic impacts to the factors that caused them. The United Nations' Economic Commission for Latin America and the Caribbean (ECLAC) contributed significantly in this effort by publishing reports since 1972 on the economic impacts of catastrophes in Latin America and the Caribbean (Caballeros and Zapata Marti 2000).

Finally, the third stage of risk identification is risk analysis. This stage integrates information from the hazard assessment and the vulnerability studies in the form of an estimate of the probabilities of expected loss for given hazardous event. Formal risk analyses are time-consuming and costly, but shortcut methods are available which give adequate results for project evaluation (Bender 1991). In addition, a preliminary cost-

benefit analysis can be used on a project-by-project basis to determine the value of investing in more detailed risk identification before designing a project. In the United States and Europe, a large part of the funding for risk modeling comes from the private sector: major reinsurance companies commission projects from private modeling firms such as EQECAT and RMS ([www.eqecat.com](http://www.eqecat.com) and [www.rms.com](http://www.rms.com)). These private sector initiatives however require a guarantee that investment in risk identification will lead to the development of insurance markets.

In Latin America and the Caribbean several international partnerships have formed to help provide risk assessment studies. These include a joint World Bank-OAS project in St. Lucia, St. Kitts & Nevis and Dominica (Vermeiren and Pollner 1994) and a World Bank study on Mexico (Kreimer et al. 1999). The Natural Catastrophes and Developing Countries Project at the International Institute for Applied Systems Analysis (IIASA) also developed a methodology for incorporating natural disasters into macroeconomic projections as a function of a country's underlying social and economic vulnerability and presented results for Argentina, Honduras, and Nicaragua (Freeman et al. 2001). Although these projects are useful, they are isolated examples and do not diminish the need for national strategies for risk identification.

Some excellent resources on risk identification include *Environmental Hazards: Assessing Risk and Reducing Hazards* by Keith Smith (Smith 1996) and the brochures produced by Swiss Re and Munich Re, available on their web sites ([www.swissre.com](http://www.swissre.com) and [www.munichre.com](http://www.munichre.com)). Those looking for even more detail will find it in the documentation to FEMA's HAZUS model available on-line at [www.fema.gov/hazus/](http://www.fema.gov/hazus/). Resources on vulnerability assessment include *At Risk: Natural Hazard, People's Vulnerability and Disasters* by Piers Blaike (Blaike et al. 1994) and *Vulnerability and Risk Assessment* published by the UNDP/UNDRO (Coburn et al. 1991).

## **2.2 Mitigation**

Mitigation refers to policies and activities that reduce an area's vulnerability to damage from future disasters. These structural and nonstructural measures are in place before a disaster occurs.

### **Structural mitigation measures**

Structural mitigation reduces the impact of hazards on people and buildings via engineering measures. Examples include designing infrastructure such as electrical power and transportation systems to withstand damage. Underground transmission lines, for example, are protected from hurricane damage. Levees, dams, and channel diversions are all examples of structural flood mitigation.

Structural mitigation projects can be very successful from a cost-benefit perspective. In the field of landslide mitigation, a study in the state of New York showed that improved procedures from 1969 to 1975 reduced the cost of repairing landslide damage to highways by over 90 percent (Hays 1981). Experience of the city of Los Angeles, California, indicates that adequate grading and soil analysis ordinances can

reduce landslide losses by 97 percent (Petak and Atkisson 1982). Argentina's Flood Rehabilitation Project invested \$153 million in structural improvements that spared an estimated \$187 million of damages during the 1997 floods (all in 1993 dollars), generating a 35 percent return on investment to date (World Bank 2000).

Structural mitigation projects, however, have the potential to provide short-term protection at the cost of long-term problems. In areas in Viet Nam, flood control systems have exacerbated rather than reduced the extent of flooding; sediment deposit in river channels has raised the height of river channels and strained dike systems. Now when floods occur, they tend to be of greater depth and more damaging than in the past (Benson 1997b).

Furthermore, structural mitigation projects have the potential to provide people with a false sense of security. The damages from the 1993 flooding of the Mississippi River in the United States were magnified because of misplaced confidence in structural mitigation measures that had encouraged development in the high-risk areas (Mileti 1999, Platt 1999, Linnerooth-Bayer et al 2000). To avoid this problem, structural mitigation projects should be accompanied by appropriate land use planning and public awareness programs.

### **Nonstructural mitigation measures**

Nonstructural mitigation measures are non-engineered activities that reduce the intensity of hazards or vulnerability to hazards. Examples of nonstructural mitigation measures include land use and management, zoning ordinances and building codes, public education and training, and reforestation in coastal and upstream and mountain areas. Non-structural measures can be encouraged by governmental and private-industry incentives, such as preferential tax codes and deductibles or adjusted insurance premiums that reward private loss-reducing measures. Nonstructural mitigation measures can be implemented by central authorities by legislating and enforcing building codes and zoning requirements, by NGO's by initiating neighborhood loss-prevention programs, or by the private sector in providing incentives to take loss-reducing measures. Nonstructural mitigation measures are particularly appropriate for developing countries because they usually require fewer financial resources.

One controversial area in nonstructural mitigation is land use planning. Unplanned growth in major cities caused devastating losses in Turkey's heavily urbanized north-eastern region in 1999; in Orissa, India where cyclones left 8 million homeless; and in Mozambique where flooding in 1999 devastated the capital city of Maputo (Sanderson 2000). According to ECLAC, 75 percent of the losses of goods and services during Hurricane Mitch resulted from land use issues like building too close to rivers or constructing roads and bridges in known vulnerable areas (ECLAC 1998). On the other hand, land use planning requires intense political support if it affects property values or involves the relocation of communities. Less costly and less controversial land use initiatives involve passing hazard disclosure laws for real estate purchases and/or promoting insurance policies with premiums that scale with risk.

The best practices in nonstructural mitigation are those that directly integrate with development goals. An innovative model recently developed in the Grau region in Peru identifies hazards, assesses regional development objectives, and then integrates a non-

structural approach to disaster mitigation into the overall development program. This “microzonation” approach focused on land-use planning and infrastructure (Kuroiwa 1991). The World Bank has tailored neighborhood improvement programs to the needs of the most vulnerable by helping residents of low-income urban areas improve their houses individually or with community help (WorldBank 2000).

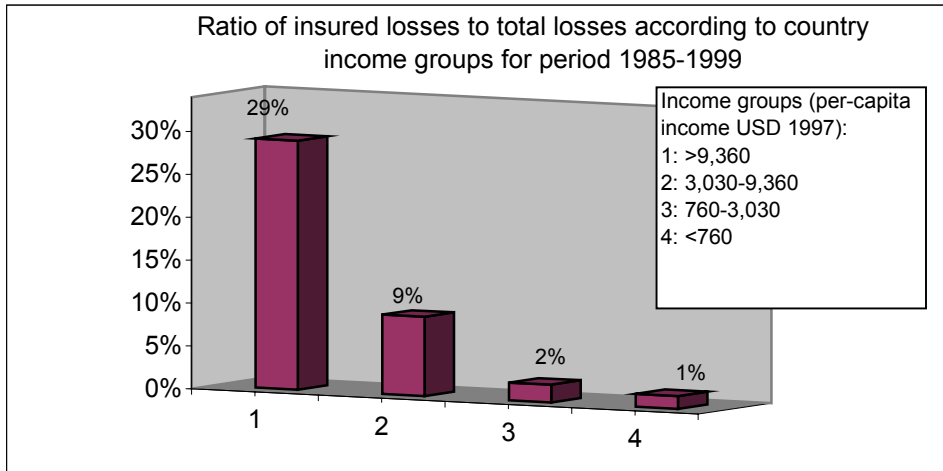
One good source on mitigation measures appropriate for each hazard is *Environmental Hazards: Assessing Risk and Reducing Disaster* by Keith Smith (Smith 1996). FEMA also maintains a web site on both structural and nonstructural mitigation measures: <http://www.fema.gov/mit/index.htm>. The Caribbean Disaster Mitigation Project has published extensively on mitigation practices in that region (<http://www.oas.org/en/cdmp/publist.htm>). A work that identifies exemplary mitigation practices in Asia is: *Disaster Mitigation in Asia and the Pacific* prepared by the Asian Disaster Preparedness Center of the Asian Institute of Technology (Davis and Gupta 1990).

## **2.3 Risk Transfer**

A fundamental distinction between the risk management policies in the developed world and in developing countries is the role of risk transfer. In developed countries, the government undertakes a major commitment to shift a portion of the risk of financing reconstruction after a disaster from the government to another party, generally an insurance company.

The use of insurance, the primary risk transfer tool, has five key advantages: it permits the spreading of risk between parties; it reduces the variance of risk for each person; it permits the segregation of risk; it encourages loss reduction measures; and it provides a tool to monitor and control behavior (Freeman, Kunreuther 1997). Insurance is not the only option to transfer risk. In dealing with natural disasters, a recent innovation in transferring risk of loss from catastrophes is a hedging instrument known as catastrophe bonds. These bonds have been used in some developed countries as an alternative to transfer the risk from natural catastrophes. Collectively, insurance and catastrophe bonds may be described as “catastrophe hedges.” An extensive discussion of the use of catastrophe bonds in developed countries with some insight as to how they may work for developing countries can be found in a recent IDB paper (Andersen 2001).

Risk transfer is critical component of a comprehensive program for most developing countries. Japan, France, Spain, the United Kingdom and the United States use risk transfer to link the components of their natural disaster risk strategy. As shown in the chart below that groups countries by average income, insurance is a major component of the risk management strategy of the wealthier countries. In the higher income countries, 30% of the loss from natural hazards is insured. In the poorer countries, insurance covers 1% of the losses from natural hazards.



Source: MunichRe 2000, topics, p.24-25

Existing insurance programs have limited range. They are not used to finance the post disaster reconstruction of government owned buildings. In most of these countries, the government relies on its power of taxation to fund reconstruction of government owned facilities. As well, the government continues to fund the needs of the poor after a disaster. The poor are not part of the formal insurance programs. In most of these countries, the program is designed to transfer the risk of property owners and businesses from the government to the insurance program. In countries with strong middle classes, and active private owned businesses, the use of the program can be an effective policy tool to reduce the governmental obligation to fund post disaster needs.

*Promising and Problematic Practices of Risk Transfer Strategies*

Shifting the risk of post disaster reconstruction funding from the government and providing incentives to mitigate risk are the main attractions of a national risk transfer policy. Advantages and limitations of commercial risk transfer are summarized in the text box below.

### **Box 1: Advantages and Limitations of Commercial Hazard Insurance**

from “Adjustment to Hazard: Sharing the Loss” in *Environmental Hazards* (Smith 1996).

Advantages of commercial hazard insurance:

1. It guarantees the victim some predictable recompense after loss. Such compensation is more reliable than disaster relief and it also appeals to those opposed to excessive government regulation because it depends on the private market.
2. If property owners in hazard areas pay premiums which reflect their actual risk and insurance payments fully compensate the victims, then insurance provides an equitable distribution of costs and benefits.
3. Although insurance is designed to redistribute losses, it can also be used to reduce hazard impact by encouraging the adoption of measures designed to minimize damages. If residents in hazardous areas pay the full-cost premiums for their risk, insurance provides an economic disincentive for locating in such areas. Once properties have been built, it is possible, in principle, for insurers to offer lower premiums to policy-holders who take measures to reduce risks to their property. Such measures might include special construction methods and building materials. In extreme cases insurers could require property owners to retrofit risk-reduction measures before accepting any premium.

Limitations of commercial hazard insurance:

1. In practice, property owners in hazard areas rarely pay premiums which reflect their actual risk. One reason is that for many environmental hazards the database is insufficient to devise a realistic premium based on predicted average annual losses at a specific site. Unless premium rates are scaled directly according to the risk, hazard-zone occupants are not likely to bear the full cost of their location.
2. In the private residential sector a great deal of development is undertaken by speculative builders rather than by the eventual occupants of the property. Only if insurance premiums became sufficiently high to make the properties initially difficult to sell is it likely that developers would be deterred from building on such sites in the first instance.
3. Private insurance may be unobtainable in very high-risk areas, although this does not necessarily discourage development.
4. Even when commercial hazard insurance is available, there is frequently a low voluntary uptake. Even when insurance policies are taken out, a significant number of policy holders are underinsured and are unlikely to be fully reimbursed by the company in the event of a loss.
5. Although insurance can, in some circumstances, be employed to reduce losses, the existence of *moral hazard* is thought to increase damages. Moral hazard arises from the tendency of some insured persons to reduce their level of care and thus change the risk probabilities on which the premiums were based. Moral hazard can be lessened by the imposition, and subsequent policing, of local planning regulations designed to strengthen buildings against hazard impact.

There is considerable worldwide activity in promoting different schemes to use the government as a tool to provide catastrophe-risk-shifting for homeowners and others. The creation of the recent Turkish Catastrophe Insurance Pool (TCIP) is a good example. All existing and future privately owned property is required to contribute to TCIP. The payments made will contribute to a fund that will pay homeowners up to \$28,000 in the event that a catastrophe damages their homes (Gulkan 2001). Proposals are being explored in Mexico, the Caribbean, Central America and Africa to engage the government in providing risk-transfer options for farmers, homeowners and businesses in case of natural-catastrophe losses (World Bank 2000). The Caribbean Disaster Mitigation Project (CDMP) commissioned a study to explore insurance options for small states in the region (Pollner 2000). The World Bank has proposed the creation of a new insurance program for Honduras, and the Inter American Development Bank pursuant to the Puebla



to Panama Initiative is considering regional insurance options for Central America. The use of insurance as an effective policy tool to enable countries to better deal with risk is a major theme in the current development literature. The most recent World Development Report on Poverty devotes considerable attention to the role of insurance in enabling countries to better deal with risk, including the risk from natural catastrophes (World Bank 2000).

The reduction of risk works to the benefit of both the developing countries that directly bear the losses from catastrophes and the international aid community whose mission is to assist the long-term development and reduction of poverty in these countries. By harnessing the private sector experience to cope with catastrophe risk, the international aid community frees itself and its resources to implement its broader agenda of development policies.

As indicated by the low existing levels of insurance penetration in the developing countries, there are barriers to the creation of catastrophe insurance markets. These barriers are related to both the demand and supply of insurance.

### *Barriers to Supplying Catastrophe Insurance*

It is no coincidence that insurance is an economic tool used by wealthy countries. It requires sophisticated financial institutions to operate. Insurance requires a complex series of laws, regulations, and administrative agencies. Those include the proper financial structure of insurance companies to ensure their financial capacity to pay future claims, the actuarial science (including the required information base) that underpins the setting of premiums and reserves, legal knowledge about insurance contracts and the protection they provide, the functioning of insurance distribution networks, claims payment practices and proper legal institutions to enforce sophisticated contractual agreements. In many developing countries, the lack of institutional regulatory structures impedes the supply of insurance.

Designing major institutional reforms to permit the proper operation of financial institutions is very difficult. For example, the reform of the banking sector in Mexico increased its fragility to financial crises. The financial crises suffered by Mexico in 1995 can be traced to a weak banking system, its fragility traced to the privatization process used for the banks, some aspects of the financial liberalization program, and the weak regulatory institutions (World Bank 2000). The components necessary to the implementation of an adequate regulatory scheme for insurance industries is known. Guidelines on proper regulatory practices are maintained by regulatory agencies in developing countries. The National Association of Insurance Commissioners in the United States has detailed information on proper regulatory practices (see [www.naic.org](http://www.naic.org)).

In addition to the regulatory issues there are issues related to the fundamental structure of the market for insurance. For example, many countries may be too small to provide adequate risk diversification to properly support a national insurance scheme. Proposals to create regional insurance markets hope to increase risk diversification and potential market size thereby making the market more attractive for the insurance industry and lowering the cost of insurance. A larger potential market subject to a uniform regulatory scheme may encourage the international insurance industry to help develop viable markets. Regional proposals, like the World Bank initiative for a Central

American insurance market, are based on overcoming impediments to the supply of insurance.

### *Demand for Insurance in Poorer Countries*

In truth, the problem with developing risk transfer as an effective policy tool is more related to a lack of demand for catastrophe insurance. In poorer countries, large scale businesses can and do buy catastrophe insurance. In Mexico, nearly 100% of industrial enterprises buy insurance. With small middle classes and medium-sized businesses, the most frequent purchasers of insurance in developed countries, there is a small natural clientele.

Professional risk bearers, like insurance companies, are fully capable of modifying their products to adapt to local needs. However there will be little willingness on their part to do so if no demand exists for the modified products. One approach to creating demand is to make insurance mandatory. Turkey has taken this strategy in requiring homeowners insure themselves. Another approach is to demonstrate the benefits of insurance by taking out policies at the government level, for example by insuring government-owned buildings and infrastructure. Recent initiatives of the World Bank have focused on insuring government assets as a way to provide protection and stimulate interest in risk transfer (Pollner 2000).

Because of the relatively high administrative costs associated with insurance for small values, insurance is not an option for the very poor. There is much that can be done to encourage informal and formal risk sharing by the poor outside the establishment of a formal insurance program. The main strategy for the poor to deal with external shocks requires a poverty-sensitive policy that focuses on the following components:

- Helping poor households maintain their consumption.
- Ensuring that poor people do not lose whatever access they have to basic social services.
- Preventing permanent reversals in the accumulation of human and physical capital.
- Averting self-defeating behavior, such as criminal activity, prostitution, and exploitative forms of child labor (World Bank 2000).

Among the most effective programs are workfare programs introduced or expanded in the disaster area in conjunction with post disaster reconstruction.

A good collection of articles on risk transfer is *The Financing of Catastrophe Risk* compiled by Kenneth Froot (Froot 1999). A good resource describing risk transfer options for the Caribbean is the World Bank report “Catastrophe Risk Management Using Alternative Risk Financing and Insurance Pooling Mechanisms: The Insurance Market and the Case of the Caribbean Region” (Pollner 2000).

## **2.4 Preparedness**

Preparedness involves building an emergency response and management capability before a disaster occurs to facilitate an effective response when needed. Key

disaster preparedness activities include training programs for response personnel, exercises and drills of emergency plans, informing citizens through education programs, hazard detection and warning systems, identifying evacuation routes and shelters, maintaining emergency supplies and communications systems, establishing procedures for notifying and mobilizing key personnel, and taking individual household measures such as clearing attic space to move belongings in the case of a flood.

In contrast with elements such as mitigation that are often the product of major policy decisions at a national level, preparedness projects tend to be oriented towards the actions of individuals and individual organizations. Programs must therefore focus on the community level and a national system should include mechanisms to coordinate between preparedness projects.

One promising practice involving local communities in disaster preparedness is a pilot program launched in Honduras by the Central American regional disaster prevention agency, CEPREDENAC, with support from Germany's aid agency GTZ. Areas involved in the program suffered fewer casualties during Hurricane Mitch and recuperated more quickly; people in vulnerable areas were promptly evacuated, citizens were mobilized for rescue missions, food was distributed, and repairs promptly begun on damaged schools (Bate 1999).

One methodology successfully used to coordinate preparedness programs on the community level is the Awareness and Preparedness for Emergencies on a Local Level (APELL) methodology developed through the United Nations Environment Program. Originally created to create awareness of hazards in communities close to industrial facilities, it was implemented in Baranquilla, Colombia to further community disaster preparedness and ensure that all existing plans contribute to the overall integrated, co-operative plan (APELL 1995).

Disaster preparedness requires significant political will. "It ties up facilities and people that are apparently doing nothing, other than waiting for an event that no one wants and many believe will never happen." (Smith 1996) It is inherently difficult to maintain impetus for diverting resources into preparedness projects if many years have passed since the last disaster event. Outdated plans and warning systems, however, have the potential of being worse than no provisions at all. Continued public awareness programs are therefore a key ingredient in increasing and maintaining disaster preparedness (Foster 1980; Garb and Eng 1969). Public awareness is increasingly important as populations become more mobile and newcomers are less aware of local risk conditions and traditional mitigation techniques (UNDHA et al. 1994).

Many programs exist to increase public disaster awareness. Broadcasting agencies can contribute to increasing public awareness by designing announcements and disaster-related programs. Inclusion of disaster awareness in school programs is one particularly efficient and economical strategy. Other successful practices include advertising at popular sporting events, on shopping bags, or during community programs, hosting workshops, or organizing National Disaster Preparedness Days.

An excellent resource for disaster preparedness is FEMA's website on disaster preparedness publications: <http://www.fema.gov/fema/publicat.htm> including pamphlets on home/family and business/industry disaster plans, disaster supplies, and emergency preparedness checklists.

## 2.5 Emergency response

Emergency response refers to actions taken immediately before, during and after the onset of a major disaster or large-scale emergency to minimize the loss of life and harm to people and their property and enhance the effectiveness of recovery. Examples of emergency response activities include hazard detection and warning, evacuation of threatened populations, shelter of victims, emergency medical care, search and rescue operations, security and protection for property, and family assistance. Other examples include the construction of temporary levees, closure of roads or bridges, provision of emergency water or power supplies, and attending to secondary hazards such as fire or the release of hazardous materials. The quality and timeliness of disaster response are typically functions of the planning and training done during the pre-disaster preparedness phase.

From decades of experience, it is clear that the best emergency response comes immediately and with sufficient resources to limit the loss of life and property. The major issue for emergency response lies in the timely and coordinated response of different relief groups. Experience in numerous disasters reveals the need for a strong, centralized system to mobilize emergency efforts and channel aid resources to victims (Red Cross 2001).

In his seminal work, *Disasters and Development*, Fred Cuny recommends that the emphasis on speed or “emergency response” should shift to developing a response relevant to needs at an intermediate or advanced phase of recovery. Cuny summarizes other important emergency response lessons, which include considerations of livelihood protection for the poor, education and local participation, the appropriate actors in emergency and relief efforts, and issues related to longer-term rehabilitation (Cuny 1983). Another excellent work with similar recommendations is *Rising from the Ashes* (Anderson and Woodrow 1989).

One good resource on emergency response is the website hosted by the Caribbean Disaster Emergency Response Agency (CDERA): [www.cdera.org](http://www.cdera.org). For emergency response related specifically to hurricanes, see [www.huracan.net](http://www.huracan.net).

## 2.6 Reconstruction and rehabilitation

Reconstruction and rehabilitation refer to programs that provide longer-term assistance for people who have suffered injuries or incurred losses due to a major disaster with the objective of facilitating the return of these communities to their pre-disaster condition. Disaster rehabilitation involves short-term activities to restore vital support systems and long-term activities to return life to normal. Rehabilitation encompasses repairing and reconstructing houses, commercial establishments, public buildings, lifelines, and infrastructure; restoring and coordinating vital community services; expediting permitting procedures; and coordinating activities among governments.

Recovery can take a few weeks or several years, depending on among other factors on a disaster's magnitude and the reconstruction resources available.

The most important recommendation for reconstruction and rehabilitation projects is that they should proceed in ways that reduce future vulnerability and promote development objectives. It is much more affordable to incorporate structural mitigation components into new structures than it is to retro-fit existing ones. Reconstruction periods are an ideal time to take mitigating measures and ensure that one does not recreate prior vulnerable conditions. One good example is the reconstruction and mitigation program undertaken in Peru by the NGO Caritas. In consultation with affected communities, this NGO promoted the use of local, earthquake-resistant materials for housing reconstruction. To directly assist the neediest households, Caritas used a work-for-materials program in which locals received materials in exchange for participation in communal projects. An earthquake the following year proved the success of the project: most houses built during the Caritas project withstood the earthquake measuring 6.2 on the Richter scale (Schilderman 1993).

Successful reconstruction projects involve the cooperation and participation of the local communities and stakeholders. The September 1985 Mexico City earthquake provides a good example of a participatory process for effective reconstruction that reduced future vulnerability. As a part of this approach, social teams representing and including victims were created in the redesign and reconstruction of housing (Kreimer and Echeverria 1998).

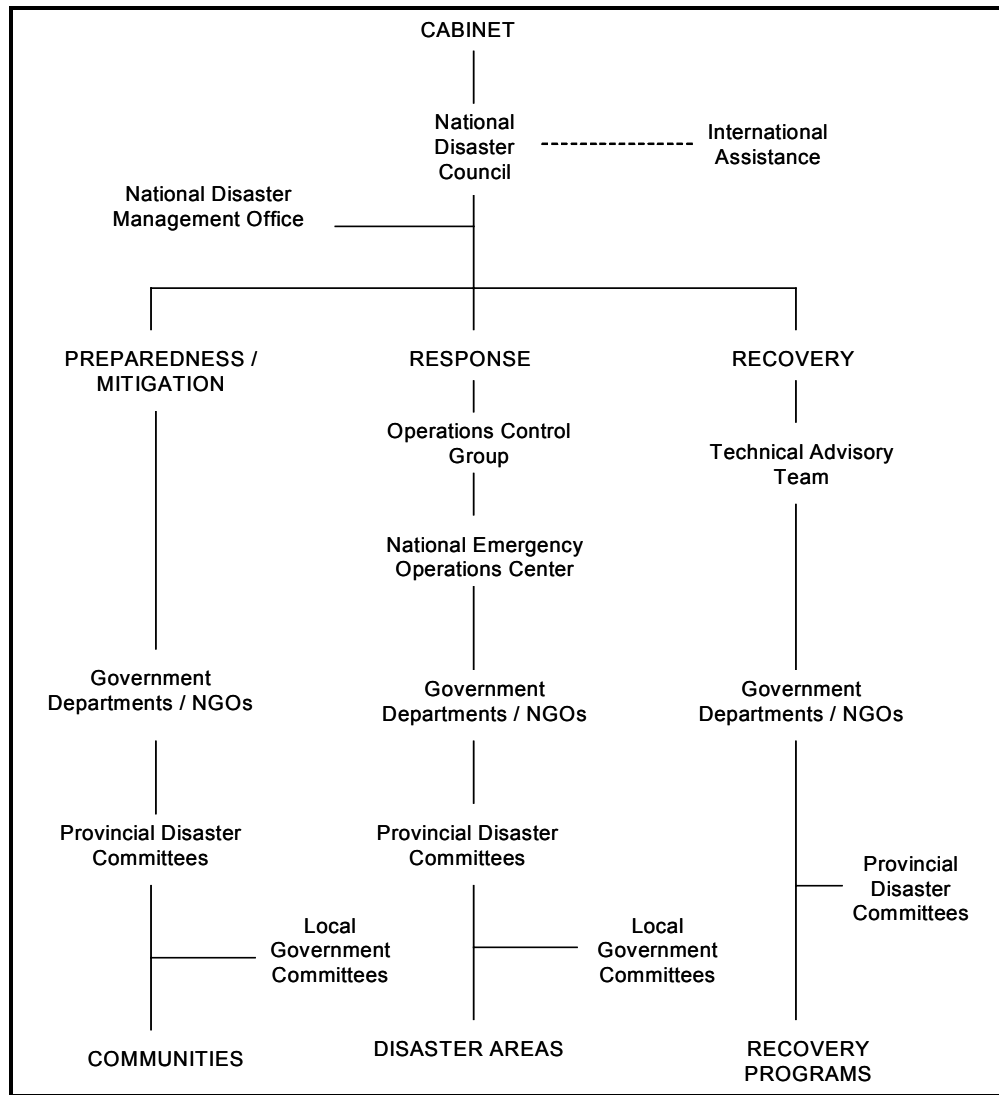
In the reconstruction and rehabilitation process, one can not ignore the importance of providing for livelihood protection throughout the recovery process. Years of poverty reduction programs can be overturned if the poor need to deplete their productive assets to maintain sustenance-level consumption levels during the aftermath of an event. In contrast, successful reconstruction and rehabilitation programs simultaneously address both the need to provide income support and the need to reconstruct. After the floods in Gujarat, India work-fare community reconstruction projects provided both needed work and income protection for poor families as well as necessary reconstruction activities (Bhatt 2000). Similarly, after the 1985 earthquake in Mexico City work-fare programs created more than 175,000 jobs for victims of the event (Kreimer and Echeverria 1998).

### **3. Country Experiences with Disaster Management Systems**

The previous section describes the six elements of disaster management. Many countries have developed programs at the national level to integrate these elements and coordinate the efforts of the public sector, NGOs, and private sector actors. These national disaster systems appear in the form of institutions, financial mechanisms, regulations, and policies that constitute a country's approach to disaster risk management.

The Asian Development Bank published a handbook for disaster managers based on the experiences of its member countries in the disaster management process (Carter 1992). This handbook sets out recommendations on how to structure a national disaster system, how to design appropriate national disaster strategies and supporting legislation, and how to develop effective programs.

The handbook proposes that the general foundation for a national disaster system is the creation of a formal national disaster strategy and an organizational structure for integrating disaster management efforts. This organizational structure typically includes a ministry or sub-ministry responsible for disaster affairs that houses a National Disaster Management Office, some form of National Disaster Council to identify priorities and channel resources, and an Operations Control Group responsible for preparing and coordinating emergency response. As described in the Case Studies accompanying this report, the basic recommendations described in the handbook are reflected in the recent program instituted in Nicaragua. Although this organizational structure takes form in many different ways, a basic template emerges, as shown in the Figure below.



As shown in the Figure above and will be discussed in the country experiences and in more detail in the next sections, key to the success of these national disaster systems is the active participation of all important institutional players in the process. Key institutional players include ministries such as the ministry of finance, ministry of health, ministry of education, organizations such as military units and civil defense,

regional and local government entities, NGOs such as the Red Cross, international aid and finance organizations, private sector actors, and local communities.

It should be kept in mind that the government-directed system described here, even if it is fully implemented, is not the only way in which societies manage disaster risks. Indeed, private citizens and social groups are managing risks outside of government-directed systems in their choices on where to live, what crops to plant, how to respond to neighbors in need, in helping in rescue operations, and on and on. Private industry is also developing and implementing risk-management strategies along side government, and insurance industries may even be taking the lead in assessing risks and vulnerability. On the formal and informal levels, the specific risk management institutions and practices adopted in different countries depend on factors like historical circumstances, economic development, political landscape and cultural diversity. Insights on the tradeoffs involved between different national systems emerge from the comparative analysis of these systems. The current section therefore briefly presents and discusses selected features of national disaster systems in nine developed and developing countries. Because of the similarities in their economic development and exposure to natural disasters, the section first compares national systems in Japan and the US. The analysis then turns to Europe, contrasting the more hierarchical systems of France and Hungary with that of the predominantly market-based system of the UK. The section describes two geographically and culturally diverse countries in the developing world: Fiji and India.

There is considerable activity in Latin America and the Caribbean as well. Appendix A of this report presents a list of programs and systems for IDB member countries in the region. A discussion of the experiences of developed countries that have formally addressed disaster management issues for years and Asia, where disasters cause more damage than in Latin America, helps frame the policy tradeoffs in designing national systems.

The section concludes with a summary of insights derived from the comparative analysis and the following section presents and explores in depth the lessons learned from the experience of these countries.

### **3.1 Japan<sup>1</sup> and the United States**

Like most Latin American countries, Japan and the US are vulnerable to many types of catastrophic natural disasters, including especially earthquakes, windstorms and flooding. While they are culturally quite diverse, the similarities in the evolution of their disaster management systems are striking. Both countries have in place comprehensive programs at the national level to manage disaster risks. The US Federal Emergency Response Agency (FEMA) is renowned for its efforts at centralizing and coordinating the disaster management components at the national level (see the Appendix B of this report for more details on the US case). In Japan, the 1978 Large-Scale Earthquake Countermeasures Act created both a national program and also set the institutional conditions for more private market involvement by designating responsibility for disaster prevention and establishing national and regional disaster prevention programs, preparing

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<sup>1</sup> This discussion is based on Elahi (2001) and EQE (1995).

for prompt crisis management and recovery, and establishing a public-private scheme for the distribution of the financial burden.

The program that emerged in Japan from this law was greatly centralized and bureaucratic. The coordination was set out under the auspices of several national governmental ministries, and as the Kobe earthquake highlighted, depended on overly diffused responsibility between the authorities involved. It was three days before national civil defense forces reached the site of the earthquake, mainly because authority for sending civil defense troops rested with the provincial governors and not the central authorities. Ironically, the Japanese have not given the power to their central government for disaster response that one finds in the US.

Another parallel between Japan and the US, and perhaps the most innovative, is the creation of public/private insurance systems to further recovery. Japan and the US have pioneered loss-sharing programs that involve governmental and private market institutions. These programs underline the importance of integrating hierarchical and individualistic social organization in a national system, but in ways that reflect national cultures. In Japan, earthquake risk insurance is offered by private insurers as a part of fire insurance policies. Since insurance premiums are set according to earthquake risk zones, premiums can be prohibitively expensive to many living in Japan's high-risk areas. This is the case even given substantial taxpayer support to the system. The reinsurance system, which has a maximum commitment fixed each year by the Diet (parliament), transfers a portion of the risks to the taxpayer in the case of large losses, a part to the Japanese Earthquake Reinsurance Company, and a part to the policy holders through pro-rated payments. To transfer the risks more widely, even outside of Japan, some insurance companies have issued catastrophe bonds.

A similar but importantly different public/private partnership exists in the US to cover flood losses. The US is generally reluctant to provide services that can be offered by the private sector, but in contrast to Japan, the partnership arose out of the failure of the private market to offer sufficient cover for flood risks. The National Flood Insurance Program (NFIP) is unique in that policies are offered by the private sector, but the national government assumes the risks and automatically plays the role of reinsurer. An important and contrasting feature of the NFIP is the effort made to couple insurance with incentives for mitigation. To attract participation in the program, premiums have in the past been subsidized and offered only to residents of communities that enact land-use regulations and comply with other mitigation measures. Once a community agrees to participate in the program, homes and businesses located in the 100-year flood plain are required to purchase flood insurance as a condition for a federally insured mortgage on their property. Moreover, the NFIP puts far greater emphasis on deductibles as a way of encouraging policyholders to take loss-reducing measures. A notable difference, thus, in the public-private insurance partnerships of these two countries is the greater emphasis on incentives for individual responsibility found in the US.

The US and Japanese governmental agencies also interact with market actors in other important ways. With research support from the government, the private market in both countries is taking initiatives for prevention. For instance, Japan Railway has pioneered UrEDAS (Urgent Earthquake Detection and Alarm System), an information system that detects the arrival of P-waves near the source and estimates the location and magnitude of the earthquake. Since 1994 the Tokyo Gas Company has operated SIGNAL



(Seismic Information Gathering and Network Alert), which will automatically shut off the gas supply when microcomputer meters detect a seismic intensity of 5 on the JMA scale.

An important initiative by FEMA is the development of HAZUS, a multi-hazard tool with models for estimating potential losses from earthquake, wind and flood hazards. The HAZUS methodology includes: categorization of building and infrastructure inventory; estimations of potential hazards, damage to buildings and lifelines, and induced damage from floods, fire and hazardous material release; and estimations of social and economic losses. FEMA's development of HAZUS is an effort to place multi-hazard risk models in the public domain.

### **3.2 France<sup>2</sup>, Hungary<sup>3</sup> and the UK<sup>4</sup>**

Turning to Europe, this subsection presents an overview of disaster management practices in France and Hungary and a brief comparison with the U.K. We select these three countries because of their similar catastrophe exposure, mainly flooding and windstorms, but contrasting economic circumstances, political cultures and disaster management styles. France is well known for its publicly backed insurance system that provides disaster security to nearly all property owners in France. Hungary also has a system of disaster security for all that is funded by taxpayers. Hungary is only recently involving private insurers. As a relatively poor country in economic transition from a planned to a market economy, Hungary is important for the lessons it offers with regard to the dangers of over centralization and planning. Both France and Hungary contrast sharply with the UK with its Anglo-Saxon tradition of individualistic, liberal governance.

The French constitution establishes the principle of "the solidarity and equality of all French citizens facing the expenses incurred through national calamities." This solidarity principle is the cornerstone of French policies for aiding victims in their recovery from floods and other natural disasters. Dating back to 1982, private insurers are required to offer catastrophic natural disaster insurance bundled with property insurance, and to charge a fixed rate set by the French treasury. Since over 90% of all businesses and homeowners carry property insurance, the mandatory bundling of catastrophe insurance guarantees wide distribution. In fact, the insurance operates as a tax on property to fund the French national fund. Because rates are not differentiated by risk level, there are cross subsidies from persons in low-risk areas to persons in high-risk areas. Private-insurer risks, in turn, are partly ceded to the French national fund, the Caisse Centrale de Reassurance, to which the state gives its guarantee.

It is widely recognized that the French system constitutes a disincentive for individual and local community risk-reduction measures. A recent and imaginative decree to counter this problem sets a deductible that increases with the number of disasters in the same area. This means that the compensation a household or business

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<sup>2</sup> The French case is based on Gilber and Gouy (1998), Michel-Kerjan (2001) and Linnerooth-Bayer, et al. (2001).

<sup>3</sup> The Hungarian case is based on Horváth, et al. (2001) and Vari, et al. (2001)

<sup>4</sup> The UK discussion is based on Linnerooth-Bayer (2001).

receives will continually decrease in high-risk areas, leading to incentives to relocate or take other mitigating measures.

Still moral hazard remains from the lack of market-style incentives that accompany risk-based premiums, and the French have relegated mitigation to the government. The government sets land-use restrictions and other mitigation measures. Since 1982, the government has carried out a survey of areas susceptible to natural disasters, and has instituted controls of construction in these areas. Still, the required, accompanying risk prevention plans have never been successfully implemented. To date, there exist only about 5000 such plans compared with 36,000 French municipalities, many of which are at risk from flooding, earthquake, subsidence or avalanche. Two reasons have been given for this: First, the cost is high; second, communities resist risk estimates because they can affect property values.

While the French notion of solidarity is echoed throughout central Europe, it contrasts markedly with the disaster management philosophy of the UK. A notable feature of the British system is its limited public assistance to uninsured disaster victims and to local governments for repair of their public infrastructure. Given the relatively low natural disaster risk relative to the capacity of the insurance industry the central government also does not engage in reinsuring private insurers. In addition to relying fully on the market for private relief measures, the British government only enters into disaster management for activities clearly classified as public goods, for instance, building flood barriers. Fitting with this more individualistic attitude, insurers are increasingly active in encouraging private mitigation efforts by rewarding private loss-prevention measures with lower premiums.

Without any anticipation of public relief, there is an unusually high penetration of natural hazard insurance in the UK (some estimate this at close to 70 percent), which is greatly facilitated by the automatic bundling of an all-perils cover into household insurance policies similar to the French system. What is remarkable about this solely private arrangement is that the insurance companies have an unwritten agreement to avoid risk-based premiums in favor of a standard premium for disaster cover. This has resulted in substantial cross-subsidies across regions and perils making insurance affordable to the poor, who mainly populate high-risk flood plains, and has alleviated the government from political pressure to compensate poor victims after an event. As efforts intensify within the industry to estimate the risks of disasters, insurers are moving towards risk-based premiums that will inevitably lead to reduced cover for low-income households and ultimately to demands for more government compensation in the wake of a major disaster.

While government relief to victims is contradictory to the individualist doctrine of self responsibility, it fits closely with the more paternalistic views of hierarchical cultures. Nowhere is this more apparent than in Hungary, where the government has traditionally and obligatorily compensated victims of flooding by up to 100 percent of their losses. Indeed, until the transition from communist governance in 1989, central government control and planning dominated the political landscape in Hungary, and a cursory look at Hungary's recent past raises an important warning against the dominance of the public sector in disaster risk management.

In Hungary, flood mitigation and defense have and remain the responsibility of the National Water Authority, which is today a part of the Minister for Transport and

Water Management, and twelve regional water authorities. Until recently, this centralized state system has dominated all activities in Hungary on mitigating, preparing for and responding to floods. During the state socialist period, the water management authorities were a large and powerful bureaucracy, the staff numbering more than 30.000. Not surprising, this unchecked authority expanded its resource base by advocating and carrying out extensive and expensive dike-building programs throughout the country. To date, over 4,000 km of levees protect ninety seven percent of Hungary's flood risk areas. The overriding management philosophy was to protect the Hungarian territory rather than to institute land-use controls or less costly, non-structural measures.

The institutional setting has changed with the 1999 Hungarian Catastrophe Act. If a catastrophe is declared by the central government, a Governmental Coordination Committee is established that harmonizes the activities of a number of actors, including civil defense organizations, the Police, the Army, central government agencies, local governments, volunteering NGOs, businesses, and citizens. This authority is not mandated to address issues of mitigation or post-disaster recovery, as was the earlier National Water Authority responsible for flood response, so Hungary is actually moving away from a its earlier comprehensive disaster management program.

The recovery process in Hungary, which has also been dominated by the central government, is placing more responsibility on private insurance systems. Traditionally most public infrastructure and private property damage have been repaired or rebuilt by the national authorities. For example, in the recent 2000 floods on the Tisza River, the government compensated victims close to 100 percent of their property losses. As flood losses rise in Hungary, this generous system is becoming prohibitively expensive for the government. The government is looking to the private market, in this case insurance companies, to assume some of its traditional responsibility.

In Hungary, the insurance industry absorbs only a small portion of catastrophic losses in spite of the fact that a relatively large share of households is insured. This is explained by small limits available for flood losses. Flood insurance is bundled with property insurance as it is in France and the UK, and residential insurance take-up rate is estimated at 60 percent. Like in France and the UK, flood premiums are independent of the flood risks, and there is strong cross-subsidization from low-risk to high-risk areas.

After Hungary's transition, there emerged a remarkable number of environmental and citizen groups concerned with the flooding issue. Many of these groups are opposed to further construction of levies as well as private flood insurance that they claim will disproportionately disadvantage the poor and vulnerable residents of many flood areas. Important and influential voices are advocating a more sustainable approach to flood management, including the re-naturalization of some portions of the rivers and a public/private insurance system that subsidizes the poor.

The Hungarian case illustrates the importance of including the range of stakeholders and actors, including government, industry and civil society, for a financially and socially sustainable integrated disaster system. The unchecked dominance of the bureaucracy in Hungary resulted in an overly costly structural mitigation program, a complete lack of incentives for the proper development of flood-risk areas, and a moral hazard with regard to personal mitigation. On the other hand, the private insurance option is unpopular among many of the public who prefer the solidarity of national compensation and are concerned about the effects of privatization on the poor.

### 3.3 Fiji<sup>5</sup> and India

Fiji and India are developing countries with extensive natural catastrophe exposure from cyclones, floods, droughts, earthquakes and tsunamis. We have chosen these two countries, the small island state of Fiji and the large and densely populated India, because of their marked contrasts in the management of disaster exposure. In India, despite the recently announced formation of a national Disaster Management Authority, the government is active mainly in aiding states in their response to catastrophes. Fiji, alternatively, has moved remarkably towards an integrated system for disaster risk management that includes a strong national program and plan, involvement by private insurers, and a keen awareness that NGOs and local efforts are an integral part of the system. In contrast to this integrated approach, India appears to be developing a more loosely networked system characteristic of individualistic and egalitarian cultures.

Fiji's national disaster management program began as an ad hoc governmental committee for emergency response, but by 1990, the national program was restructured to make it more comprehensive, covering prevention, mitigation, preparedness, and rehabilitation activities in addition to emergency response. In 1995 the government published the National Disaster Management Plan (Government of Fiji 1995) that laid out a comprehensive policy and detailed the supporting roles of NGOs in all the functions of disaster management. However, the equally important roles of tourism, industry and commerce did not receive recognition; for example, these sectors are not represented on the Mitigation and Prevention Committee, on which the members include mainly high-ranking bureaucrats. This Committee has been criticized for its irregular meetings, lack of focus on mitigation and prevention, and excluding local groups from the decision process. At the same time, the Plan does seem to be making a difference in disaster preparedness and awareness through an annual National Disaster Awareness Week and by greatly improving early warning measures.

For a poor country, private insurance plays an important role in Fiji's national strategy. Since Fiji has a thriving tourism industry, it is not surprising that private insurance has a very high uptake in the business sector, whereas there is less but still significant insurance cover for private urban dwellings.

Insurers take a proactive role in mitigation and prevention. After particularly severe cyclones in 1984, the Commissioner of Insurance established the Fiji Building Standards Committee made up mainly of private insurers. This committee had the responsibility to oversee the preparation of a National Building Code that would set minimum standards to reduce disaster-related losses and help achieve a stable or reduced hurricane insurance premium (Government of Fiji 1985). Of particular interest is that upgraded homes are inspected by a structural engineer and issued a certificate, which is required to obtain cyclone insurance cover and mortgages. Most urban areas have adopted the building code (Rokovada and Vrolijk 1993).

In contrast market actors are not very involved in India. Private disaster insurance exists, but there is very little reliance on the private market for financing relief

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<sup>5</sup> The Fiji case is based on Benson (1997) and Carter, Chung and Gupta (1991).

(Hoogeveen 2000). The authorities at the state level take the main responsibility for disaster relief with financial assistance from the central government. A small Calamity Relief Fund (CRF) has been constituted with contributions from both the state and central governments. If a disaster overwhelms the capacity of the state government to respond, the central government will provide financial and other assistance. If such a major disaster occurs, the central government commits itself to pre-fixed reimbursement sums for loss of life, limb, and partial and total loss to housing and productive assets.

Interestingly, India is developing a more loosely networked system. To date, the system gives little attention to mitigation at the governmental level. NGOs play an active role in risk reduction programs in the region. A new innovation in India is the so-called “knowledge network” that is involving civil society, the scientific community, and to a minor extent the market. The National Natural Disaster Knowledge Network has been designed to facilitate an interactive, simultaneous dialogue with all the players dealing with natural disasters. This network is conceived as a “powerful instrument to store, retrieve, disseminate and manage information” (Bhandari 2000). When fully operational, the information network will connect all government departments, research institutions, universities, community-based organizations and even individuals. It will facilitate information exchange about hazard risk, best practices within different organizations, and early warning systems, and it will provide a digital library of relevant, up-to-date information and databases.

Indian NGOs, such as the Disaster Mitigation Institute, are working with the government and the Grameen bank in designing tools to address disaster loss and poverty. For example, after the calamitous Orissa cyclone this NGO suggested that a small contribution from the state fund support the livelihoods of artisans in Dastakar. Timeliness and direct access of livelihood support was vital to the poor. Another innovative project pioneered by NGOs is a “relief-rating matrix” to gauge the degree to which government programs have actually helped the poor in reducing vulnerability. These ratings help articulate the demand for disaster risk management among the poor, and they provide an important feedback tool for public and private sector efforts in disaster relief. As cultural anthropologists have stressed, egalitarian organizations play an essential role in limiting the power of hierarchical bodies, and the relief-rating matrix may serve as a watchdog tool to monitor the dissemination of government relief funds.

India also appears to have a great deal of innovation from the private sector. Based on the relief-rating matrix, micro-insurance mechanisms are being designed to reach the poorest groups, build institutional capacity, and form capital necessary for disaster management targeted towards the poor. Finally, in Gujarat, India, work-fare programs and community reconstruction projects have provided needed work and income protection for poor families as well as necessary reconstruction activities (Bhatt 2000).

In sum, both countries have moved towards a balance of social cultures in the management of their disaster risks, but there may be destabilizing deficits in the national strategies. While Fiji has made important strides in establishing the institutions necessary for a burgeoning private insurance market, the high premiums render insurance available only for the higher-income businesses and households. Fiji might look to the French or British systems for their deliberate premium-spreading policies that have subsidized poorer policyholders. Because of the inefficiencies of these subsidies, the balancing act would then require more governmental involvement in setting requirements for private

mitigation measures. The deficit in India is the apparent dominance of the informal sector, and an important step has been taken to strengthen the government's hand by creating a national program. This program should also look to other countries for an equitable and efficient involvement of the private sector.

### **3.4 Insights from Country Experiences**

This brief overview of geographically and culturally diverse national systems for managing disaster risks has highlighted similarities and differences arising from the historical, economic and cultural contexts of the countries examined. The reviewed systems are evolving from a prevalence of local, informal coping mechanisms to more involvement by governmental and market actors. This section emphasizes the importance of developing collective programs that include (but do not capture) the individualistic values of marketplace actors and many diverse NGOs active in the risk management system. In balancing different commitments and values, Michael Shapiro (1988) has suggested that society needs "clumsy" or responsive institutions that nod in different directions to maintain a set of values over time.

How can a disaster management program be sufficiently comprehensive and at the same time responsive? Our case studies suggest some tentative insights on this question. One important lesson emerges from the Hungarian historical experience, which shows that governmental programs, while essential for coordinating the functions of disaster management, must not be so powerful as to exclude other actors holding conflicting values and views. Beyond this warning, Hungary's transition away from its prevailing hierarchical structures offers positive lessons to developing countries, especially its rapid transformation to private property so important for the functioning of private insurance and its establishment of public-private partnerships for disaster response.

Fiji has gone further than Hungary in engaging private insurers and NGOs in the management of disaster risks, but whether Fiji's evolving system is sufficiently clumsy will in part depend on the social acceptance of a risk-transfer system that excludes the poor. India, alternatively, makes less use of risk transfer via the market, nor does it have a governmental program for comprehensively coordinating the collective activities of disaster management. Rather, it is developing loose networks that will engage and coordinate informal activities in the country. This type of networking and information sharing activity may be an essential ingredient, but not the only ingredient, in governmental programs.

Turning to the insights from the developed world, they again raise warnings especially with regard to the laudable goal held by many Latin American authorities to shift resources from post-disaster functions to the prevention of disaster losses. This goal motivated governments of many developed countries to invest heavily in structural mitigation measures, especially to reduce losses from the flood hazard. With hindsight, many of these measures inadvertently increased flood losses, damaged ecological systems, and led to the loss of credibility of the responsible government authorities. This has exposed the dangers of a policy process with insufficient contestation, that is, a process that excludes conflicting values and critical views. Today, countries like the US,

Japan and Hungary are taking active steps to incorporate public dialogue and participation in mitigation policies and, more generally, in their disaster management programs.

There are also many positive lessons from the developed world. The most innovative is the public-private partnerships for transferring risks that one finds in France, Japan and the US. Our cases have shown that there are many routes for integrating risk transfer into a comprehensive system.

Policy makers intent upon instituting a comprehensive disaster management program can gain insights on their design by viewing the experiences of other countries. This section has presented an overview of the varied institutional arrangements making up different risk-management systems. Building on this overview of institutional contexts, we turn in the next section to examining some principles for the design of national risk management programs.

## **4. Designing Effective National Disaster Systems**

Drawing from the experience of different countries and recommendations of the policy makers involved in national disaster systems, some key guidelines for effective disaster management systems emerge:

- First of all, successful national systems have an explicit and appropriate national disaster strategy. Appropriate national disaster strategies integrate with national policy on development and environmental protection and are based on vulnerability assessments.
- Second, successful national systems integrate key players into the disaster management process. Such players include, inter alia, the finance ministry, local community leaders, NGOs and private-market actors.
- Third, successful national systems have provisions to ensure sufficient resources for key players to carry out their responsibilities.

### **4.1 Explicit and Appropriate National Disaster Strategy**

National disaster strategies are the cornerstone of a national disaster system. They outline the goals and objectives of the national system and provide a mandate for risk management programs to be designed and implemented. Appropriate national disaster strategies integrate with national policy on development and environmental protection and are based on vulnerability assessments.

#### *Integrating Strategy with National Development Policy*

Appropriate national disaster strategies integrate with national policy on development and environmental protection. Raising standards of living means not only guaranteeing access to basic needs but also reducing risk in peoples' lives. As eloquently stated by Amartya Sen in his most recent book:

*The challenge of development includes both the elimination of persistent, endemic deprivation and the prevention of sudden, severe destitution. However, the respective demands on institutions and policies of the two can be distinct and even dissimilar. Success in one field may not guarantee success in the other. (Development as Freedom, 2001, p.186).*

Economic development, environmental protection, and disaster management are intrinsically linked. A large part of the damage caused by Hurricane Mitch in Honduras and Nicaragua can be traced to poor land use practices and uncontrolled human settlement (Bate 1999, Olson et al 2000). The deforestation and rural-urban migration that created such high vulnerability to Mitch were largely due to the extensive poverty in the area. The aftermath of the hurricane was to further set back the poor. Successful national disaster strategies recognize the linkages between the poor, the environment, and natural disasters.

### *Vulnerability Assessment*

Appropriate national disaster strategies are based on vulnerability assessments. A vulnerability assessment explains the rationale for allocating resources to cope directly with natural events as opposed to other programs focused directly at reducing poverty. In some countries disasters are a major problem in eradicating poverty, but until a risk assessment is made, there will be no clear justification for allocating funds for specific programs or regions within a national system.

Vulnerability assessments are also an essential part of the process of integrating natural disaster strategy with overall development objectives. These assessments identify sources of risk, vulnerable groups, and potential interventions. In the first stages of establishing the new national system in Nicaragua, the Nicaraguan government and World Bank commissioned a study from the Spanish consulting company PYCSA to integrate existing hazard maps with poverty maps to identify communities most in need of disaster-related mitigation and preparedness projects. This identification process served as a cornerstone for all of the initial risk management activities. Vulnerability assessment allows policy makers to specifically define the objectives of the risk management programs and establish vulnerability reduction targets.

## **4.2 Integrating Key Players**

Successful national systems integrate key players into the disaster management process. Integrating disaster risk management with overall development policy requires senior government officials as key players.

The most successful systems take advantage of existing government structure. They involve national, provincial, local, and community government and ministries and other institutions. Essential institutional players are ministries such as the ministry of finance, ministry of health, ministry of education, organizations such as military units and civil defense, regional and local government entities, NGOs such as the Red Cross, international aid and finance organizations, private sector actors, and local communities.



Key to the success of these systems is the interaction between the coordinating bodies and institutional players. One framework for integrating the players is along the organizational structure shown in Section 3. This structure uses a National Disaster Council (NDC) and Central Control Group (CCG) to coordinate between institutional players.

### *Finance ministries*

Finance ministries are important players in disaster management systems. In its final report after funding projects for six years, the Caribbean Disaster Mitigation Project concluded that the institutionalization of disaster policy “needs to include economic planners and others who shape public and private financial decisions” (OAS 1999). The Asian Development Bank handbook for natural disaster planning reaches the same conclusion.

The participation of finance ministries helps to ensure funding for the institutional framework, facilitates the incorporation of disaster management into development policy, and provides incentives for financing mitigation projects.

Incorporating natural catastrophes into development policies means incorporating estimated costs of disasters into macroeconomic projections, future budgets, and the project investment process. Finance ministries are responsible for preparing projections, allocating budgets, and approving investments; they can and should incorporate the costs of natural hazards into each of these stages. Methodologies for do this will be a major focus of the Phase 2 report. One process for integrating probabilistic exposure to natural hazards with macroeconomic models is detailed in Freeman et. al. 2001.

In many developed countries, the finance ministry is engaged in the disaster management process by its responsibility to provide post disaster reconstruction financing. The need to fund repair to and reconstruction of buildings, housing, and infrastructure focuses attention on pre-disaster risk management practices. Finance ministers are interested in supporting *ex ante* activity, including mitigation and prevention measures, that reduce their defined obligation to generate more funds for reconstruction. By linking risk prevention to reduced need for post disaster funding, the finance ministries have an economic stake in maintaining the integrated risk management process.

Developing countries should make similar arrangements. Not until the finance ministry has the responsibility to manage the government’s post disaster reconstruction funding obligation, will it have strong interest in participating in the risk management process. When it takes on that responsibility, it has several options for providing post-disaster reconstruction funds: these include relying on post-disaster taxation or loans; setting aside reserve fund; insurance; or other risk hedging strategies discussed in section 2.3 on risk transfer.

### *Communities*

Local communities also play a key role in successful disaster management systems. When political impetus behind the national disaster system in Colombia flagged, local community efforts continued. Section 2 of this report described best practices in

community involvement in disaster management in World Bank lending for nonstructural mitigation, preparedness in Honduras, emergency response in Venezuela, and reconstruction in Mexico. To allow for feedback from communities into the national-level disaster management decision process, there should be an avenue for active participation of NGOs and representatives of civil society in the organizational structure of the national system.

### **4.3 Providing Sufficient Resources**

The problem of obtaining sufficient resources for disaster management has three components: providing financial resources for the on-going operation of a national system; providing incentives for funding risk mitigation projects; and financing post disaster reconstruction.

#### *Funding on-going operations*

In a sense, this issue is addressed in the following discussion on political sustainability. The technical requirement for funding on-going operations is discussed in Section 3. The creation of a budget for on-going operations is a component of a national system. Of course, the level of funding and its year-to-year sustainability is directly related to the involvement of the economic planners in the process of creating and implementing the system in the first place. A well conceived strategy will identify the necessary functions and the resources required to perform those functions. If the finance ministers are not actively involved, the national system will become minimized. Over time, funding for the system will be reduced.

#### *Financial Incentives for Mitigation*

Mitigation occurs when the interests of the ultimate risk bearer are aligned with the party incurring the cost of mitigation. For example, a homeowner is likely to take mitigation measures to reduce the exposure of his home to hurricanes if he must pay the cost of reconstructing after the hurricane hits. If the homeowner believes that someone else will pay the cost of reconstruction, he has no incentive to bear the cost of mitigation. As discussed earlier, unless the finance ministers have an economic stake in the cost of disasters in the form of bearing responsibility for providing economic resources for post disaster reconstruction, it is unlikely they will fund from their resources money for mitigation. Stated differently, if inexpensive funds can be found after a disaster to fund reconstruction, there is little economic incentive for governments to fund mitigation from scarce financial resources. Of course, this is true for all levels of government. As shown in the United States, local governments are unwilling to mitigate their risk from natural events because they believe that their costs after a disaster will be borne by the federal and state government. They are willing to support public investment for mitigation that is funded by the state and federal government. This reemphasizes the need to make the finance ministries articulate and bear responsibility for the post disaster financing needs of a country.

## *Financing Losses and Risk Transfer*

Today, there is very limited activity associated with financing losses and risk transfer in Latin America and the Caribbean. Several policy alternatives are available to encourage the use of risk transfer. The most obvious first step is institution building and development of necessary information to support an insurance program. As discussed in the risk identification section, this entails catastrophe modeling. Mexico has completed a catastrophe model evaluating the risk to government-owned buildings. The World Bank recently completed a modified catastrophe model for Honduras as the basis for its recent insurance proposal. The second step is creating demand for catastrophe insurance.

Section 2.3 of this report discusses possible policy alternatives to address both the supply and demand for risk transfer. The adoption of these alternatives in specific countries should be a major policy interest. Phase II of this research is intended to focus specifically on this issue.

An alternative to developing an insurance program is the creation of a disaster fund available to meet short-term needs in the post disaster period. This is also an additional approach used by Mexico and is proposed for Nicaragua. The catastrophe fund avoids the problem of seeking a new budget allocation in the middle of a fiscal year to meet anticipated annual needs. For Mexico, the amount budgeted for FONDEN has proven to be inadequate in each year but one since it was founded in 1996. FONDEN has no authority to carry over unused funds from one fiscal year to another. In fact, it is not a tool to transfer risk. Rather, it is a means to guaranty funding to meet short-term needs without requesting new appropriations in the middle of a budget cycle. It is an effective tool to focus policy makers at the national level on the need for consistent funding for disasters. As is now being explored for Mexico, it may provide a tool to explore risk transfer as a policy option.

Finally, governments should actively explore risk management strategies to cope with the post disaster needs of the poor. Having a clear strategy on the obligations of the government to meet the needs of the poor after a disaster, as well as a program to address those obligations is essential. While it is unlikely that risk transfer can play a role in meeting this need, the interest of the government in looking at risk transfer to meet their other post disaster obligations may free resources to help the poor.

## **5. Sustainability of National Systems**

It is important for national systems not only to function well but to survive periods in which relatively few catastrophic events occur and remain viable during and after major hazard events. To be sustainable, national systems must function effectively and have the continuous provision of political and financial resources. As policy makers know, programs that are sustained have well-defined objectives, resources to accomplish the objectives and meet stated goals. Systems that do not meet their objectives will not be sustained.

## 5.1 Political sustainability

Political sustainability of a national disaster system depends on many factors, most importantly, the recognized success of the system in reducing vulnerability to and speeding recovery from disasters. Other issues that impact political sustainability are:

- The more a national disaster system integrates with overall development goals, the easier it will be to maintain political interest in the system.
- Supporting a national disaster strategy with legislation increases the likelihood it will be sustainable.
- At some fundamental level, individuals and governments underestimate natural hazard risk. Sustainable national systems have active programs to maintain an adequate perception of risk, particularly in periods when few disasters happen.
- Sustainable programs have constituencies that support the political agenda needed to implement and carry out a program. There is a built in prejudice against changing existing programs, particularly if the changes impact existing power structures. One way to develop the needed support is to frame the natural disaster system as a poverty issue.
- Finally, a key part of political sustainability is providing the structures to make different organizations and individuals accountable for their disaster management responsibilities when events strike.

### *Integrating with Overall Development Goals*

The more closely a national disaster system integrates with overall development goals, the easier it will be to maintain political interest in the system. Programs survive changes in the political leadership when they are tied to long-term economic development. Programs not essential to economic development have difficulty maintaining their status in hard economic times. Natural disaster policy must find its place as a problem of economic development demanding the year-in and year-out attention of those concerned with a country's economic well being. The long-term survival of a national system therefore requires that those responsible for development planning be key participants in both the creation and on-going operation of the system.

### *Legislation*

Supporting a national disaster strategy with legislation increases the likelihood it will be sustainable. Legislation provides a formal basis for counter-disaster action, allocates major responsibilities in legal form, and provides a measure of protection for governments, organizations, and individuals by outlining the limited responsibilities of each in the disaster management process.

To the extent that legislation supporting the national disaster strategy is designed as a consensus-building process, it will also increase the likelihood of long-term support from the different participants.

The Disaster Manager's Handbook includes examples of legislation for the Cook Islands, Papua New Guinea, and Queensland, Australia. The Nicaraguan government also

publishes online the legislation it recently passed to establish its national system (see [www.sosnicaragua.gob.ni/Download/](http://www.sosnicaragua.gob.ni/Download/)).

### *Continued Perception of Risk*

At some fundamental level, individuals and governments underestimate natural hazard risk. As described in the country report on the United States, several theories exist to describe why the *risk* from natural hazards is consistently underappreciated. The failure to recognize the concept of risk means that action tends to be fueled by events, rather than by the probability of the event occurring. As detailed by Prof. Kunreuther, every major change in United States' natural disaster policy followed a disaster. Even then, the impetus for policy change tends to be of short duration, with a focus on solving a short-term issue rather than tackling long-term institutional failures.

As Section 2 discussed, many strategies exist to promote continued public awareness of disaster risk. Successful initiatives include the involvement of radio and television broadcasting agencies in designing informative programs and the inclusion of disaster awareness in school programs. Public awareness of disaster risk is essential to sustain programs, particularly through periods of few disaster events.

### *Creation of a Constituency*

The sustainability of a national system requires a constituency to maintain disaster management on the political agenda and counteract the reluctance of existing power structures, including civil defense organizations, to change policy. Constituencies also act as a force to prevent the national system from being captured by political groups in times of crisis. The advocacy group must frame its concerns in a way that captures the political attention of a country's leaders to force change in existing policy and offsets the temptation to commandeer the process when disasters strike.

One way to develop a natural constituency for disaster management is to frame the process as a poverty issue. Natural disasters impact the poor more than any other group: the research on this issue is compelling. Those concerned about the reduction of poverty need to become advocates for changing national policy towards disasters. This includes the bilateral, multilateral, and NGO community. The advocacy group for a natural disaster system needs to be more than the disaster management professionals; protection of the poor from the risk of natural disasters should be a mainstream poverty issue.

### *Accountability*

Finally, a key part of political sustainability is providing the structures to make different organizations and individuals accountable for their disaster management responsibilities when events strike. As discussed earlier in the case of the ministry of finance, the best way to ensure that the ministry invests sufficient present resources in mitigation projects and prepares a plan for obtaining reconstruction financing, is to hold it accountable for the reconstruction process. Legislation is the obvious choice for officially establishing accountability.

## 5.2 Financial sustainability

The best way to ensure financial sustainability of national systems is to ensure the continued political impetus behind the system. Other methods include committing to long-term financing contracts with external parties and responding to pressure from the international finance community.

### *Long-term Contracts*

Long-term contracts with reinsurance companies, investors, or international financial institutions are one way to ensure continued financial support for the system. In addition, long-term obligations encourage these parties to invest more fully in measures such as risk identification which will lead in the long-run to lower transaction costs.

### *International Aid and Financial Institutions*

The actions of the international donor community can play a decisive role in the sustainability of national programs. For the poorest of countries, the assistance of the international community is critical in their ability to deal with risk. Just as the way disaster relief and response aid is provided has enormous repercussions relative to the short term impacts of catastrophes, the way the international donor community addresses disaster policy can be critical.

The willingness of the international community to fund post disaster reconstruction projects without regard to proper concern for the exposure of reconstructed structures to hazards (including issues of citing and proper building standards); the willingness to ignore hazard risk as a component of developing country assistance strategies; permitting the bypassing of existing institutional structures for the provision of post disaster assistance; the provision of post disaster reconstruction funding without holding national governments responsible for some portion of future risk are all policies that will make or break the establishment of national programs. Much of the problematic policy related to natural disaster planning is a result of the types of programs the international donor community was willing to fund in the past.

There is considerable policy justification for the international finance community to place this issue on the table. The multilateral financial institutions have long recognized that they are the insurers for poorer countries losses from natural disasters. As the costs of disasters continue to escalate, the demands on the multilateral community for post disaster assistance has dramatically increased. During the past four years, the average annual lending from the IDB has increased by a factor of 10 from the previous 15 years. This experience parallels the experience of the World Bank. As noted by the IDB, while the global risk from disasters is increasing, the overall level of assistance available for emergencies has been shrinking since 1992 (IDB 2000). Increasing attention in the region on reducing the risk of natural disasters instead of responding to them once they occur should be a policy initiative of the IDB and its member countries.

## 6. Conclusion

This report analyzes the key elements of a comprehensive risk management system. Increasingly, risk management professionals recognize that the reduction of societal vulnerability to disasters includes a wide range of policy initiatives that engage broad segments of society. The focus of this report has been on the experiences of the international community to forge links at a national level to develop comprehensive national systems.

Two broad approaches emerge from the existing literature: a centralized, government directed risk management system and a more decentralized, locally-directed approach. The centralized strategy relies on national legislation that creates an organizational structure to integrate existing governmental and non-governmental institutions into the policy process. The most successful programs include reconstruction financing strategies, many of which use insurance to protect against large losses and encourage the adoption of mitigation measures. In practice, the more centrally-directed programs rely heavily on structural engineering solutions to risk management and have difficulty implementing nonstructural mitigation measures and finding and maintaining an appropriate role for local institutions in the risk management process.

Decentralized models on the other hand rely on national governments and NGOs to provide guidance and support for local initiatives. These locally-directed programs have proven effective in implementing nonstructural mitigation measures but lack the comprehensive approach possible with centrally-directed programs.

The best policy outcome is a national system that embodies a measured mix between the two approaches. A comprehensive approach requires the commitment of the national government. That commitment needs the attention of those directing development policies. As well, the role of risk transfer as a de-centralized, market initiative is important and, in the case of high exposure, will rely on a supporting role by the national government. The task is to create an effective national system with comprehensive vision that engages senior government policy makers, accommodates and supports local decision making and initiatives, and promotes the institutional conditions necessary for the constructive involvement of private-market initiatives.

## **Appendix A: National Risk Management Systems in Latin America and the Caribbean**

In Latin America and the Caribbean, the primary focus of disaster management—seen in legislation, the structure of programs and policy—has been on emergency response (Maskrey 1993). The focus on response has a history of more than 40 years, and was complemented in an important way by a greater attention on disasters and particularly on early warning systems during the last two decades. The problem of reducing risk, or of prevention and mitigation has recently become more important in Caribbean and Latin American disaster policy. Ironically, in recent years mitigation has attracted attention, yet has been a noticeably missing element in the legislation, planning, and institutions that deal with territorial and sectoral issues related to disasters (Lavell 2001). Many recent disaster management schemes in the region tend to concentrate on risk reduction while institutional capacity and mandate continue to focus on emergency response (Blaikie et al. 1996). Many institutions are undergoing internal transformations to accommodate risk mitigation and other aspects of disaster management. Some of these transformations are substantive, others cosmetic. The great challenge in the region is to find ways to promote and concentrate on risk mitigation in an environment dominated by institutions created specifically to respond to emergencies (not to reduce risk). Likewise, a major challenge is to create a harmonious transition from a partial or fragmented disaster management paradigm to an integrated one. To ensure the success of the transition, new integrated approaches face the challenge of involving rather than antagonizing traditional emergency response actors. At the same time, new approaches should involve social actors that are interested in risk reduction, as well as in the promotion of sectoral and territorial development (Mansilla 1996).

Many new initiatives have emerged in the region, particularly since Hurricane Mitch and the earthquakes in El Salvador in 2001. Some of the new efforts were initiated by governments, others by international organizations, NGOs, and financial institutes. For example, the CEPREDENAC supports regional programs for Central America ([www.cepredenac.org](http://www.cepredenac.org)). Current programs aim at strengthening mitigation, institutional development, and risk analysis.

Two central issues for many of the national systems revolve around the implementation and sustainability of national disaster management programs. First, countries face the task of expanding or recasting current disaster management programs from a traditional focus on emergency response to one that encompasses mitigation and preparedness, as well as coordinated reconstruction and financial strategies. Countries have taken three broad approaches to implementing national disaster management systems with a scope that reaches to mitigation, preparedness, and in some cases financial alternatives and risk transfer. Some countries such as



Honduras have attempted to expand the existing mandate of the national system by expanding the responsibilities of the existing institution. Others, such as El Salvador have created parallel institutions responsible for mitigation and preparedness. In a few cases, such as in Mexico, countries have taken a networked approach to implement a national disaster management strategy. The second major issue for many of the national systems was finding ways to sustain national programs once implemented. Garnering ongoing political and popular support, the cooperation of key stakeholders such as civil society and the military, and creating effective mechanisms and incentives for mitigation activities all pose challenges to the sustainability of national disaster management systems.

Country	Description of disaster management programs and ongoing or new initiatives
<b>Bolivia, Colombia, Ecuador, Peru and Venezuela</b>	<p>The Corporación Andina de Fomento (CAF), in response to a request from its five Andean members, is developing a Regional Andean Program for the Prevention and Mitigation of Risk (PREANDINO). PREANDINO seeks to broaden disaster management strategies to include risk mitigation and preparedness. Ministries of Planning and Development or Environment lead the program in each country, with participation from other ministries and departments. The CAF promotes institutional development. The European Commission and GTZ, with the technical support of LA RED, were some of the early promoters of PREANDINO.</p>
<b>CARICOM states</b>	<p>Small English-speaking islands of the Caribbean established the Pan-Caribbean Disaster Preparedness Project (PCDPP) in 1981 to improve national and regional disaster management in the Caribbean. Although it was conceived as an 18-month project, focused solely on disaster preparedness, the PCDPP operated for almost 10 years (Poncelet 1997). In 1989, when the project extended its work to the prevention of disasters, its acronym was lengthened to the Pan Caribbean Disaster Preparedness and Prevention Project (PCDPPP) to accommodate the term "prevention". PCDPPP has also led to the creation of disaster preparedness offices in several locations, such as the Central Emergency Relief Organisation in Barbados, the National Emergency Management Agency in Trinidad and Tobago and the Office of Disaster Relief Organisation in Barbados, the Management in Jamaica. In 1991 CARICOM approved the creation of the Caribbean Disaster Response and Emergency Agency (CDERA) to replace the PCDPPP, providing a new agency funded by the member states and donor agencies and responsible for mobilising resources among CARICOM countries (<a href="http://www.cdera.org">www.cdera.org</a>). CDERA commands a stronger institutional position than the PCDPPP, including the right to mobilise the military (such as the CARICOM Disaster Response Unit). CDERA was created to improve disaster response and national and regional disaster management. CDERA's main focus is disaster preparedness but it also promotes risk mitigation activities (ibid.).</p> <p>PCDPP was launched jointly by the United Nations Disaster Relief Organisation (UNDRO) now (DHA), CARICOM, Pan American Health Organisation/World Health Organisation (PAHO/WHO), and the League of Red Cross Societies (Red Cross). PCDPPP was supported by bilateral donors from Canada, the United States, the United Kingdom, and the European Economic Community. Its main achievements included increasing disaster awareness and low-cost mitigation measures. By the time that CDERA replaced the PCDPPP, all Caribbean countries had begun to lay the institutional groundwork disaster preparedness. (Poncelet 1997).</p>

<p><b>Non-English speaking Caribbean states</b></p>	<p>In contrast to the PCDDPP and CDERA, non English-speaking Caribbean states have engaged much less in formal regional disaster management arrangements. Response mechanisms have improved at the international and regional level. Efforts to improve inter-island mutual assistance—supported by PAHO and other organizations—now exist between St. Lucia and Martinique, and between Dominica and Guadeloupe (Poncelet 1997).</p>
<p><b>Central America and the Dominican Republic</b></p>	<p>Formal arrangements for regional disaster management and cooperation can be stalled because of diplomatic, political, and economic differences. Additionally, while various national, regional, and international organizations are intended to complement each other's activities, by the late 1990s no forum or procedural arrangements in the Caribbean existed to determine who should do what. Activities tended to reflect the institutional interests of different groups (Poncelet 1997).</p> <p>The Centro de Coordinación para la Prevención de los Desastres Naturales en América Central (CEPREDENAC) was established in 1988 as a coordination center for strengthening the capacity of the region as a whole to reduce the vulnerability of the population to the effects of these phenomena. Member governments include Belize (since 2000), Costa Rica, Dominican Republic (since 2000), El Salvador, Guatemala, Honduras, Nicaragua and Panama. CEPREDENAC supports the development of scientific capability and directly support efforts to reduce the vulnerability of the population. (<a href="http://www.cepredenac.org">www.cepredenac.org</a>)</p>
<p><b>Cuba, Puerto Rico, Barbados, and Jamaica</b></p>	<p>Until the 1960s there were also no specific national organizations to deal with natural disaster in the Caribbean (PAHO et al. 1994). When a state of emergency was declared, special powers were allocated to heads of state, defense or police forces. Cuba, Puerto Rico, Barbados, and Jamaica were some of the first countries to create specific national disaster management bodies. For more information on the system in Jamaica see <a href="http://www.odpem.org.jm">www.odpem.org.jm</a>. Cuba assigned its disaster relief responsibilities to civil defense, under the direction of the highest military command and the president. Puerto Rico, Barbados, and Jamaica created national disaster management committees within the prime minister's office or the Ministry of the Interior.</p> <p>Disaster coordinators have since the 1990s held responsibility for implementing mitigation activities, but experience showed that these officials often focused more on disaster response and tended to devote less attention to mitigation. To address this, planners were given a more active role in responsibility for mitigation. In Jamaica town planners are now required to take hazards into account in land use. In the Dominican Republic in 1995, high level discussions were held to create an entity within the presidency that would have overall responsibility for coordinating response, preparedness, and mitigation activities based on the Colombian experience (Poncelet 1997).</p>
<p><b>Bolivia, Brazil, Paraguay, Uruguay:</b></p>	<p>These four countries have fewer initiatives for risk mitigation, although each has civil defense mechanisms for emergency response. Bolivia promoted a "master plan" for La Paz considering urban risk mitigation several years ago with French cooperation. Brazil has mitigation programs related to industrial and technological events. Many universities work in topics as drought and landslides but only from technical point of view.</p> <p>Organizations as OAS, PAHO, UNDP have promoted preparedness and minor activities for risk mitigation, but lower disaster exposure in these countries reduces the priority of such programs.</p>

<b>Argentina</b>	Argentina has undertaken many initiatives to reorganize disaster management, particularly in the early 1990s. Argentina's civil defense mechanism undertakes emergency response, and some preparedness measures for technological risks and floods ( <a href="http://www.proteccioncivil.gov.ar">www.proteccioncivil.gov.ar</a> ). In Mendoza and San Juan, Argentina has promoted mitigation activities related to earthquakes.
<b>Chile</b>	Chile has a national office for emergencies and mitigation, ONEMI, which provides strong leadership for emergency response activities ( <a href="http://www.onemi.cl">www.onemi.cl</a> ). Preparedness is also one aspect ONEMI incorporates, but with an emergency response focus. For example, ONEMI has worked on public education, but always from the disaster awareness point of view. The military is not directly involved in ONEMI's emergency response activities. Disaster-related work other than emergency response falls to individual entities. For example, universities play an important role in regulations and building codes, which are currently not standardized.
<b>Colombia</b>	In 1989 the Colombian government established the <i>Direccion Nacional de Prevencion y Atencion a los Desastres</i> and located it just below the executive ( <a href="http://www.dgpad.gov.co/lacerca/snpad.htm">http://www.dgpad.gov.co/lacerca/snpad.htm</a> ). The military, civil defense, rescue teams and emergency physicians supported the operational capabilities of this new entity. The body was also given responsibility for planning through the ministry and control of a disaster fund ( <i>fondo de calamidades</i> ) (Poncelet 1997). Following the disaster of Nevado del Ruiz and destruction by the volcanic eruption of Armero and Chinchina, Colombia developed many disaster management programs, with support from the national government; the UNDR0 (after DHA, OCHA in Geneva) UNDP, CIDA, PAHO, among others. After the creation of the National System (prevención y atención de desastres) many activities in cities such as Manizales, Bogotá, Medellín, Cali have successfully mitigated urban risk where international organizations have supported the local work.
<b>Costa Rica</b>	After the Paetz earthquake in 1999, the government created the fund for reconstruction FOREC ( <a href="http://www.forec.gov.co">www.forec.gov.co</a> ); which was separate from the national system. The government now has a project of law and decree to strengthen and reinforce the National System taking into account the benefits of the model of FOREC and to promote risk reduction and preparedness.
<b>Dominican Republic</b>	Costa Rica has a National Commission for Emergencies ( <a href="http://www.cne.co.cr">www.cne.co.cr</a> ). In the early 1990s it was a good example for the other central American countries, however, bureaucratic changes have affected the original conception. The UNDP is promoting its analysis and strengthening the national commission to include risk mitigation (Rodríguez 1999).
	The Dominican Republic established a national disaster management system that originally involved both civil defense and a National Disaster Commission in charge of writing and updating the national disaster plan. The chief disaster coordinator is a senior medical officer who reports directly to the minister of Health in the case of a disaster. The country has an important project for risk mitigation and disaster preparedness of the region with support of IDB. There is a draft risk management law passing through the Congress of the Dominican Republic, which establishes the legal framework for an integrated national system for prevention, mitigation, and response.
	At the national level in many Caribbean countries, disaster coordinators now occupy full-time posts positioned very close to the highest executive level of government (Poncelet 1997).

<b>Ecuador</b>	<p>Ecuador's national system separates different disaster management activities across institutions. The military leads the National Institute of Civil Defense, while universities and other entities organize most prevention activities. Separately, the capital city, Quito, has had many initiatives to reorganize and promote municipal risk mitigation, with the resistance of the Civil Defense and the army. At present the UNDP is promoting a shift towards risk mitigation at the national level under the leadership of the national planning office. In Quito the administration is pushing to have a disaster management system at metropolitan level.</p> <p>Diverse programs have been promoted in Ecuador in the last ten years but by universities, NGOs, and other institutions distinctly separate from civil defense. In Quito, international organizations as Geohazards, the cooperation agency from France, OYO Pacific, US AID and OFDA have promoted projects to reinforce the capabilities to prevent, mitigate risk, and to response in case of disaster.</p>
<b>El Salvador</b>	<p>El Salvador's Committee of National Emergencies (COEN) has been the principal organization for disaster management (<a href="http://www.coen.gob.sv">www.coen.gob.sv</a>). COEN coordinates overall emergency response, working closely with the Salvadoran Armed Forces and other rescue organizations. To date its activities have focused almost solely on emergency response. Following the 2001 earthquakes, El Salvador created a new technical entity for risk management within the ministry of environment and natural resources (<a href="http://www.marn.gob.sv">www.marn.gob.sv</a>). This entity will complement COEN and expand on disaster management activities, particularly mitigation. The new entity will coordinate all monitoring and geophysical expertise for the country and will take a comprehensive disaster management approach, including social aspects and institutional capacity building. The new entity will serve as a nexus with the national environmental system and the creation of the country's development plans. In addition, because of its ministerial location, the new entity will be able to impart a broad vision of risk analysis and disaster management to important economic sectors. The creation of the new entity was accompanied by massive interest in risk reduction on the part of the government, NGOs, the United Nations, and municipal associations. Already in the past decade, the ministry of the environment has augmented its interest in risk and the search for more integrated solutions. This interest is embodied in projects funded by the IDB and the elaboration of new strategies for risk reduction within the context of regional development. A pilot study is underway in the Bajo Lempa area.</p>
<b>Guatemala</b>	<p>The National Coordinator for the Reduction of Disasters (CONRED) recently established an office of disaster management in addition to the office of emergencies and the COE. Parallel to this initiative and in concert with SEGEPLAN (the federal planning secretariat), CONRED has elaborated a proposal for the creation of a multisectoral system for risk management. This initiative, links SEGEPLAN's plan for poverty reduction with considerations of risk reduction.</p> <p>Guatemala has expanded the scope of disaster management by creating a new office (under the auspices of CONRED), in addition to the existing office for emergency response. Guatemala has also included a proposal for financial management of disasters that is coordinated with the national planning mechanism (SEGEPLAN).</p>



<b>Honduras</b>	<p>Honduras, with the support of the World Bank, is exploring new disaster management strategies. The national system, COPECO, was modeled after Colombia's national system. (<a href="http://www.copeco.hn">http://www.copeco.hn</a>) COPECO has recently promoted changes in disaster-related legislation. Currently a new law is being drafted to create a Sistema Nacional para la Prevención, Mitigación y Atención a Emergencias y Desastres similar to the one in Nicaragua.</p>
<b>Mexico</b>	<p>The Mexican government established the National Civil Protection System (SINAPROC) in 1986 as the main mechanism for interagency coordination of disaster efforts. SINAPROC is responsible for mitigating the loss of lives and material and the interruption of essential society functions caused by disasters. Responsibility for the system lies with the General Coordinating Body for Civil Protection in the Ministry of the Interior. The system synchronizes the technical work of various ministries, namely the Ministry of Social Development for geologic hazards and the Ministry of Environmental, Natural Resources, and Fisheries for hydro-meteorological hazards.</p> <p>In 1990 the National Council for Civil Protection (Consejo Nacional de Protección Civil) was added to SINAPROC. The council is an advisory, planning, and coordinating committee for civil protection. It is headed by the President of Mexico and made up of 12 ministers and the mayor of the federal district of Mexico City.</p> <p>The National Center for Disaster Prevention (CENAPRED) is a unique institution located on the National Autonomous University of Mexico (UNAM) campus that reports directly to the Directorate of Civil Protection of the Ministry of the Interior. (<a href="http://www.cenapred.unam.mx">www.cenapred.unam.mx</a>) It serves as a link between research work on natural disasters and policy makers and is involved in both research and information dissemination.</p> <p>The Mexican government allocates budgetary funds for disaster relief and reconstruction efforts by placing them in a Fund for Natural Disasters (FONDEN). FONDEN provides for the repair of uninsured infrastructure, immediate assistance to restore the productivity of subsistence farmers, and relief to low-income victims of disasters. (Kreimer et al. 1999)</p>
<b>Nicaragua</b>	<p>Nicaragua recently changed its disaster management policy and legislation to follow Colombia's model. Nicaragua has a civil defense program focused on emergency response. A new law in 2000 created the National System of Prevention, Mitigation, and Disaster Awareness (<a href="http://www.sosnicaragua.gob.ni">www.sosnicaragua.gob.ni</a>). This national system seeks different alternatives for risk reduction.</p> <p>The Nicaraguan program relies heavily on the experience of civil defense and INETER, the Institute for Territorial Studies (<a href="http://www.ineter.gob.ni">www.ineter.gob.ni</a>).</p>

<b>Peru</b>	Peru has one of the oldest national systems of civil defense, INDECI, with a traditional focus on emergency response ( <a href="http://www.indeci.gob.pe">www.indeci.gob.pe</a> ). Emergency response activities (civil defense) are comprehensive across disasters, and involve local communities. However, risk mitigation and reconstruction is neither part of the national system, nor does it always involve local communities. In the last El Niño event the government requested credits from multilateral institutions for intervention. These credits were allocated to institutions other than the National System for disaster-related work.
<b>St. Lucia</b>	The UNDP is promoting a project to review the present organization to cope with disasters and to mitigate risks. The CISMID and the universities have played a key role in disaster management, particularly with support from JICA and the Japanese government.
<b>Venezuela</b>	By the late 1990s St. Lucia restructured its national disaster committee with a focus on small decision-making bodies at the national emergency operating centre, as well as in key private institutions and ministries (Poncelet 1997). Since the mid-1990s, Venezuela began exploring the Colombia disaster management model, but eventually created the National System of Civil Defense—a system similar to the previous approach that focused on municipal emergency response. Municipal fire departments have played a central role in Venezuela's history of disaster management, particularly in Caracas. A principal difference between the old and new system was a heightened role for civilians vis-à-vis military participation. Since 1999, however, the government began to shift involvement back towards the military (particularly during the mudflows in the Vargas State). After the disaster in 1999, and the constitutional change, the government has explored a new model with greater emphasis on risk mitigation. The science and technology ministries have participated in disaster management, and their target is to work more in territorial zoning and land use policy, and vulnerability reduction. The UNDP has supported the activities, as has the Andean Corporation for Development (Corporación Andina de Fomento CAF).

Other resources include the Red de Estudios Sociales en Prevención de Desastres en Latin America ([www.dessenredando.org](http://www.dessenredando.org)) and Disaster Info ([www.disaster.info.desastres.net](http://www.disaster.info.desastres.net)). The OAS maintains a list of all of the natural hazard management initiatives that it sponsors in the region. The most recent full report can be obtained at [www.oas.org/nhp/nhpcateng01.PDF](http://www.oas.org/nhp/nhpcateng01.PDF)

## APPENDIX B: DISASTER MANAGEMENT SYSTEMS IN THE UNITED STATES

### Introduction:

This paper addresses the risk management strategies employed by the United States in dealing with natural catastrophes. It is one of three case studies done in connection with the National Systems and Institutional Mechanisms for the Comprehensive Management of Disaster Risk prepared for the Regional Policy Dialogue Initiative of the Inter-American Development Bank. This analysis was prepared by Howard Kunreuther, the Co-Director of the Wharton Risk Management and Decision Processes Center at the University of Pennsylvania. Professor Kunreuther recently co edited a book on the natural disaster policy of the United States, Paying the Price: The Status and Role of Insurance Against Natural Disasters in the United States. In this piece, Professor Kunreuther was asked to distill the experiences of the United States as relate to the political and financial sustainability of the comprehensive program in the United States. The emphasis of the paper is less on describing all the components of disaster policy, but to highlight the strengths and weaknesses of the existing system. Particular attention is focused on the lessons from the United States that may be applicable to other countries in Latin America and the Caribbean.

### 1. General Principles

This section discusses how the United States copes with natural hazards both prior to a disaster as well as after the event occurs. It focuses on the role of different interested parties and the types of public-partnerships that have evolved in coping with different hazards, notably earthquake, flood, hurricanes and windstorm.

There are several general principles that guide this discussion of disaster management systems:

- Before designing different program and strategies, it is useful to understand who are the different stakeholders concerned with the problems of natural hazards, what are their objectives and the nature of their decision processes. These **descriptive features** are discussed in Section 2.
- When designing different programs and strategies, one needs to take into account the impact that different disaster policies have on the allocation of resources across its different uses and their impact on how it affects specific stakeholders. We will discuss the **political sustainability** of a disaster management program in the U.S. in Section 3.
  - There is a need to determine the characteristics of a **financially sustainable** disaster management program and how well the United States fares in this regard. These issues are addressed in Section 4.

## **2. Descriptive Features of the US Disaster Management System**

This section focuses on the institutional arrangements associated with disaster management in the US and the decision processes of the concerned parties. Two groups of stakeholders need to be considered: those who assess the risk and those who manage the risk

### ***Assessing the Risk***

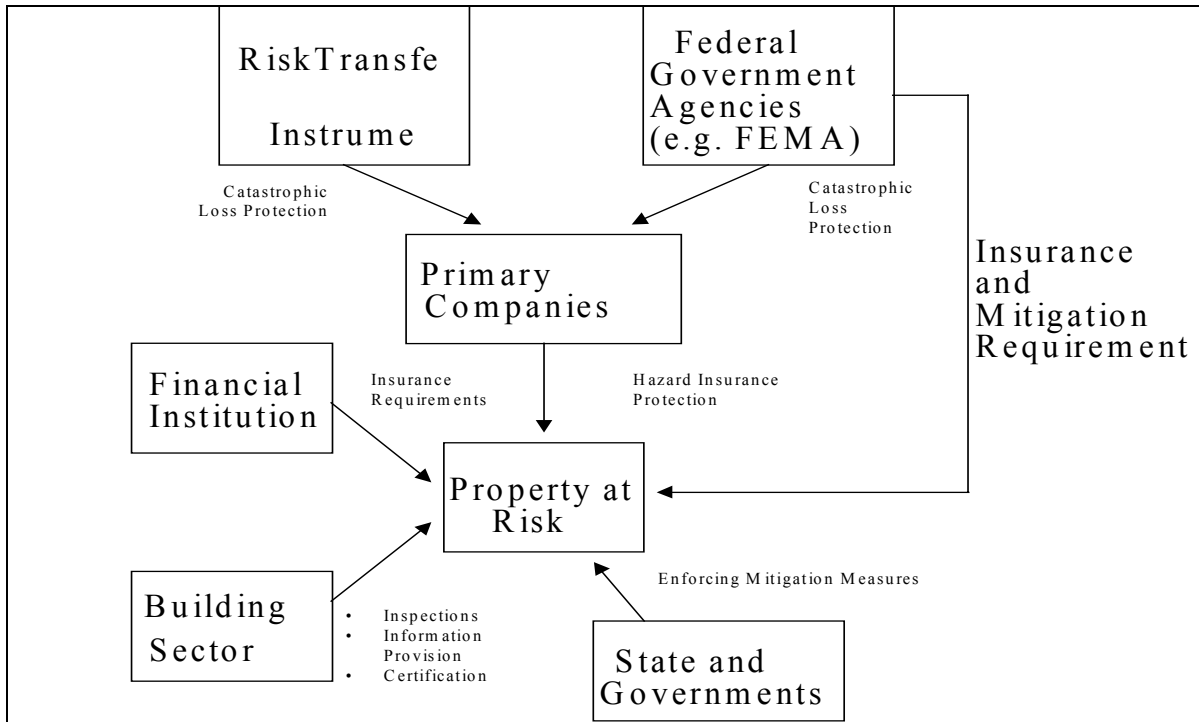
There are a group of stakeholders whose principal function is to provide estimates of the risk associated with hazards. More specifically, scientists estimate the likelihood that disasters of certain magnitudes will occur and engineers provide figures on the damage or losses if specific disasters occur in certain areas. In the past fifteen years relatively sophisticated computer-based models of catastrophic losses have been developed to incorporate these risk assessments and systematically evaluate the impact of alternative disaster management strategies on damage and the resulting losses to different stakeholders.

Scientists have been working to reduce the ambiguity and uncertainty in predicting the location, severity, frequency of occurrence, and physical effects of disasters. Engineers have focused on the nature, distribution, and level of damage from these events. Based on this information one can construct an exceedance probability (EP) curve, which depicts the annual probability that the losses to a given area or region of the country from a series of different disasters will exceed a certain magnitude. The EP curve is a key element for depicting the nature of the losses that can occur to a community, region or nation under a wide variety of different scenarios and disaster management programs. The accuracy of the EP curve depends upon the ability of scientific experts and engineers to estimate the short and long run impacts of disasters of different magnitudes.

### ***Managing the Risk***

There is another group of stakeholders or interested parties who utilize risk assessment data for developing disaster management strategies. Their principal roles and their linkages with each other are depicted in Figure 1. Although the United States is used as an illustrative example here, the basic structure is likely to be the same in most developed countries.





**Figure 1: Roles of Interested Parties**

The left box at the top of the figure labeled Risk Transfer Instruments refers to reinsurance and capital market instruments that can provide financial protection against catastrophic losses from major disasters. Reinsurance provides protection to primary insurers by covering a portion of their claims in exchange for a premium. The capital markets have recently provided private insurers access to funds in the form of catastrophe bonds or *cat bonds*.

As shown on the top box on the right hand side, government agencies at the national level, notably the Federal Emergency Management Agency (FEMA), play an important role in encouraging the use of mitigation measures to reduce losses and providing financial assistance following a major disaster. Under the Stafford Disaster Relief and Emergency Assistance Act of 1988, the federal government provides funds to cover at least 75 percent of the costs of rehabilitating public facilities.

With respect to the private sector, the federal government offers low-interest loans to uninsured and underinsured disaster victims through a Small Business Administration (SBA) disaster loan program. States have recently played a role with respect to providing financial protection to residents in hazard-prone areas. Following Hurricane Andrew in 1992, Florida created the Hurricane Catastrophe Fund to enable them to remain solvent while renewing most of their policies scheduled for non-renewal.

Insurance companies, as shown in Figure 1, provide direct insurance coverage to residential and commercial sectors for losses such as those caused by fires and wind damage from tornadoes and hurricanes. Insurers offer this coverage through the standard homeowners' policies normally required as a condition for a mortgage, and through commercial multi peril policies.

Earthquake insurance in all states (except California) is offered as a separate endorsement to one's insurance policy. In California a new state agency, the California Earthquake Authority, has been established to provide coverage to residents in the state, but private companies are also permitted to offer this insurance. For commercial structures, earthquake protection for property damage coverage is often included as part of a multiperil policy.

Since private insurers consider flood hazards uninsurable, FEMA provides direct insurance protection against such losses through the National Flood Insurance Program (NFIP). The NFIP requires flood insurance and imposes hazard mitigation requirements on all properties with federally insured mortgages in flood-prone areas.

As shown in Figure 1 other interested parties play key roles in the design and enforcement of loss reduction and financial protection measures. They include financial institutions, through specific insurance requirements as a condition for a mortgage; the building industry by the design of safer structures by developers and real estate agents through the provision of information on hazards to potential buyers and owners.

States and local communities are responsible for the development and enforcement of building codes and land use regulations to reduce potential disaster losses. Often local governments ignore the potential for losses from natural hazards since they view the risks of floods, hurricanes or earthquakes as a minor problem compared to crime, housing affordability and education. Local officials only become interested in this issue after a disaster occurs when it is too late to take preventive action.

### ***Decision Processes of Stakeholders***

An understanding of the decision processes of the key stakeholders provides guidance for developing a set of strategies for reducing losses from future natural hazards. To illustrate, suppose that there was general agreement by scientists, engineers and a federal agency such as FEMA that a particular mitigation measure was desirable for homeowners to adopt because the expected benefits exceeded its cost.

In order to develop a plan for encouraging the adoption of these measures one needs to know how the homeowner is likely to view the mitigation measure. There are at least five reasons why homeowners do not appear to want to invest in cost-effective loss reduction measures: short time horizons over which they want to recoup their investment in a mitigation measure; *high discount rates* regarding future payoffs; underestimation of the probability of a disaster occurring; *budget constraints* which restricts individuals from investing in protective measures; *limited assets* in relation to the potential loss so that people feel they can walk away from their destroyed home without being financially responsible.

### **3. Political Sustainability of Disaster Management Programs in the United States**

In determining the political sustainability of a disaster management program there are two criteria normally utilized in addressing these two questions: *efficiency* and *equity*. By *efficiency* we mean the allocation of economic resources to maximize social welfare. Social welfare is defined by the citizenry and thus may vary from one political entity to

another. *Equity* refers to concerns with fairness and the distribution of resources. An equitable distribution of resources may require special treatment of certain individuals or groups at the expense of others.

This section focuses on the importance of taking into account both efficiency and equity concerns in designing and implementing disaster management programs. We illustrate this point with a brief historical perspective on the problem by looking at the changing roles of the public and private sectors in providing insurance against floods in the United States and protection against earthquakes in California. We then turn to the broader challenges associated with implementing loss prevention and protection strategies when there is pressure to provide liberal relief following a major disaster.

### ***Historical Perspective on Flood Insurance***

The history of flood insurance in the United States provides a graphic illustration of the impact of specific disasters on the decision on whether or not to offer coverage. In 1897 an insurance company in Illinois offered protection to houses, contents and livestock along the Mississippi and Missouri River. Two major floods on these rivers in 1899 caused losses greater than the total net worth of the company and even washed away the home office.

Flood insurance was not marketed again until the mid 1920s when 30 companies offered coverage. Severe floods in 1927 and 1928 caused such catastrophic losses to these insurers that they all discontinued coverage. After these disasters few private companies offered flood coverage again on residential properties. After a series of floods and hurricanes in the mid 1950s there was pressure placed on the U.S., Congress by victims to provide federal flood insurance. President Truman proposed a federally backed flood insurance program twice but Congress did not appropriate the necessary funds.

Hurricane Betsy in 1965 that affected states in the Southeastern portion of the US provided the impetus for the establishment of the National Flood Insurance Program (NFIP). In 1968 flood coverage was marketed on a national basis but relatively few individuals voluntarily purchased policies even though the rates were highly subsidized by the federal government. As a result in 1973 Congress passed the Flood Disaster Protection Act that gave flood-prone communities the choice of participating in the NFIP or forfeiting the subsidized insurance and all but emergency forms of disaster relief. Once a community agrees to participate in the program, homes and businesses located in the 100 year flood plain are required to purchase flood insurance as a condition for a federally insured mortgage on their property. This increased the demand for flood coverage considerably.

The NFIP has a combination of requirements (e.g. land use regulations and building codes) for communities participating in the program. By restricting the location of buildings and design of buildings in relation to the 100-year flood to meet NFIP standards, the local communities are taking positive steps to reduce future flood losses. The NFIP requires the cooperation of the federal, state and local governments with the private property insurance industry. It is the clearest example in the United States of a public-private partnership for dealing with natural disasters.

## ***Historical Perspective on Earthquake Protection in California***

Earthquake insurance was first offered by private insurers ten years after the 1906 San Francisco earthquake. Few people purchased coverage so the insurance industry was spared significant losses following quakes in 1918 and 1925. After the San Fernando earthquake in 1971 a number of business establishments decided to purchase coverage but few homeowners followed suit.

With respect to loss prevention, none of the state's building codes incorporated earthquake-resistant features until after the Long Beach earthquake of 1933, and then only for schools and public buildings. After the San Fernando earthquake there was increased concern in revising the building codes to require earthquake-resistive design and construction. In response to this disaster the Alquist-Priolo Act was passed in March 1972. It required detailed geologic analysis in seismically active zones as part of the building permit process for large-scale developments or construction of public facilities such as schools or hospitals. The state prohibits construction within 50 feet of an active fault.

In October 1977, Congress passed the Earthquake Hazards Reduction Act (Public Law 95-124) to "reduce the risks life and property from future earthquakes in the United States through the establishment and maintenance of an effective earthquake hazards reduction program." To accomplish this, the Act established the National Earthquake Hazards Reduction Program (NEHRP). In November 1990 this program was significantly amended by the passage of the National Earthquake Hazards Reduction Program Act (Public Law 101-614). FEMA, the coordinating agency, designated improved model building codes and land use practices as critical goals.

Although there were a series of damaging earthquakes that occurred in California since the San Fernando earthquake, none of them compare to the January 17, 1994, Northridge earthquake. After Hurricane Andrew, it caused the largest insured damage any disaster in the United States with total insured losses of over \$12.5 billion. The insured damage from Northridge led them to question with earthquakes were an insurable event. This concern was heightened by the large increase in demand for earthquake coverage following this disaster. As a result the state-run California Earthquake Authority was established in 1996 whereby private insurers and reinsurers have a maximum loss of \$8 billion with the CEA setting rates, marketing policies and settling claims.

## ***Challenges in Designing and Implementing Loss Prevention and Protection Strategies***

There are several observations that can be gleaned from the above two historical sketches that are relevant for designing and implementing disaster management strategies:

- Individuals generally are **not** concerned with the consequences of disasters until after a severe event occurs. Note the lack of interest in flood insurance even though rates were highly subsidized and the limited

demand for earthquake coverage through the mid 1970s and the surge in interest after the Northridge disaster.

- Major disasters provide a window of opportunity to pass new legislation for dealing with future losses. State building codes and land use regulations were enacted in California after the Long Beach and San Fernando earthquakes; the NFIP was passed after Hurricane Betsy.
- The insurance industry now believes that both earthquakes and floods are uninsurable by the private sector. Hence the passage of the CEA as a state program for offering earthquake coverage in California and the NFIP as a national program for flood protection.

These three observations suggest a key problem facing stakeholders concerned with developing a sustainable disaster management program. Prior to a disaster there is little interest on the part of potential victims to protect themselves against the consequences of these events because they feel “it cannot happen to me”. Political units sense this lack of concern and hence place natural hazards very low on their agenda. Following a major disaster, there will be sympathy and concern for victims by the general citizenry and a desire by elected officials to offer those in need with disaster assistance. This reaction makes it less likely for those at risk to protect themselves in the future.

### ***Why Disaster Relief Discourages Loss Protection***

Two illustrative examples, one related to the private sector and the other from the public sector, highlight how liberal disaster relief has reduced the interest in investing in mitigation measures or purchasing insurance. Turning first to the private sector, following a series of disasters beginning with the Alaska earthquake in 1964 and culminating with Tropical Storm Agnes in 1972, the federal government provided liberal disaster relief to homeowners and businesses in the form of low interest loans and forgiveness grants. After Agnes, disaster victims were able to receive a forgiveness grant for the first \$5,000 of their loss and 1 percent loans for up to 30 years to cover their remaining damage.

Since 1972, more restrictive legislation has eliminated the forgiveness grants and raised the interest rates on loans. However, there is no guarantee that following another major disaster a new liberal relief measure will be passed. Furthermore many individuals today mistakenly perceive that if a disaster occurs they will be bailed out with grants and very low interest rate loans. This may be one reason why there is little interest in investing in mitigation or purchasing insurance voluntarily.

As pointed out in Section 2, the federal government through the Stafford Act provides funds to cover at least 75 percent of the costs of rehabilitating public facilities. For catastrophic events, such as Hurricane Andrew in 1992 and the Mississippi Floods of 1993, the federal government covered the entire cost of the public facility repairs; 90 percent of these costs were covered after the Northridge earthquake, with the remainder financed by the State of California. Thus, it is not surprising that there has been little interest by most municipalities in investing in loss reduction measures or purchasing insurance for their facilities; city officials probably assume federal or state funding will cover damage.

Speaking more broadly, there is a tendency on the part of the private and public sectors **not** to enforce regulations or standards on the books. In Florida insured property losses from Hurricane Andrew would have been reduced by 25 percent through building code compliance. Studies have found that personnel have insufficient knowledge of the hazard mitigation aspects of codes to enforce them effectively. The problem is compounded because of limited staffing so that even competent individuals cannot keep with the demand for building inspections.

### ***Recognizing the Importance of Distributional Issues***

One needs to address the equity issues explicitly in designing any disaster management program while trying to design a program that incorporates efficiency features. The National Flood Insurance Program (NFIP) best illustrates this combination. More specifically, there was a concern that if rates were determined on actuarial grounds then property values in flood-prone areas would decrease radically because of the high insurance costs associated with these homes and businesses. By charging subsidized rates on existing homes and actuarially fair rates on new structures, Congress felt it would maintain the property values for current residents (an equity issue) while forcing those building new structures in the flood plain to fully assume the risk (an efficiency issue).

The income distribution issue is particularly important when determining how to deal with low-income residents residing in hazard-prone areas. Many of these individuals do not adopt mitigation measures or protect themselves against financial losses from disasters principally because they “live from pay day to pay day”. Hence after a disaster they require special assistance from either private groups (e.g. the Red Cross) or the public sector.

Equity considerations argue for providing these residents with low-interest loans and grants for the purposes of adopting cost-effective mitigation measures or for enabling them to relocate their property in a safer area. Subsidizing these mitigation measures may alleviate their need for disaster assistance so this policy can also be justified on efficiency grounds.

## **4. Financial Sustainability of Disaster Management Programs**

We now turn to the question as to the features of a disaster management program that can reduce future damage from disasters, provide financial protection to victims suffering losses while at the same time being financial sustainable. The United States has tried to satisfy these three objectives by relying on a combination of different policy tools ranging from market mechanisms such as information provision and private insurance to public sector interventions such as building codes and land use regulations. There is also recognition in this country of the need to rely on public-private partnerships to achieve these objectives.

### ***Importance of Disaster Mitigation***

Following the large losses of Hurricane Andrew and the discovery that a sizable portion of the damage could have been eliminated through better designed buildings, there has been a concerted effort by both the public and private sectors to encourage risk mitigation measures (RMMs). FEMA has taken the lead in calling for a National Mitigation Strategy and encouraging public-private partnerships for reducing future disaster losses. Local and state governments are now more aware of the role they can play in promoting RMMs in their communities. For example, Florida has provided over \$8 million to cities and counties in the state for developing a local mitigation strategy. These strategies include strengthening existing structures and public facilities, elevating structures, implementing stronger building codes and educational awareness programs.

The insurance industry has formed the Institute for Business Home and Safety to evaluate alternative ways for making structures more disaster-resistant than they currently are and for developing economic incentives for encouraging property owners to adopt loss reduction measures. Banks and financial institutions have become cognizant of the importance of RMMs in protecting their financial investments with respect to property in hazard-prone areas.

One of the challenges in determining what RMMs to promote is defining the relevant costs and benefits. There is now a recognition that there are many indirect benefits associated with mitigation that need to be considered when defining what is a cost-effective measure. Some of the factors that need to be considered are the reduction in long-term impacts by reducing or eliminating damage through better-designed structures. These benefits include a reduction in business interruption, less need to relocate residents to temporary shelters and provide them with food, and a reduction in social stress following a disaster. From a financial perspective, the wide-scale adoption of RMMs by homes and businesses in a hazard-prone area reduces the catastrophic loss potential from a disaster and hence the need for reinsurance and/or capital market instruments by insurers. This can be viewed as an additional benefit of mitigation.

### ***Economic Incentives for Encouraging Mitigation***

Insurance and other financial mechanisms, such as reinsurance and catastrophe bonds, play a dual role in a disaster management strategy. Firms marketing these risk transfer instruments reward policyholders prior to a disaster for undertaking mitigation measures by charging them less for a given amount of coverage or offering them more protection at the same price. They can afford to do this due to the reduction in future disaster losses from the adoption of these RMMs. A second role that risk transfer instruments play is paying these same policyholders for losses after a disaster.

Insurers have tried to provide economic incentives for encouraging residents and businesses to purchase coverage and adopt cost-effective RMMs but with only limited success. One way to make a premium reduction financially attractive to the property owner is for the bank to provide funds for mitigation through a home improvement loan with a payback period identical to the life of the mortgage. If the annual premium reduction from insurance was greater than the annual loan cost, then the insured homeowner would have lower total payments by investing in cost-effective mitigation than not doing so.

### ***Importance of Land Use Planning and Building Codes***

To complement economic incentives, one may need to institute regulations and well-enforced standards. With the exception of the specific requirements of the NFIP, states have taken the initiative in developing policies governing land use and development in disaster-prone areas. Some states have intervened directly in private land use decisions by imposing requirements on development of hazardous areas such as coastal zones. Some states have enacted mandates that require local governments to develop comprehensive land use plans. Other states have required local governments to enforce provisions of state building codes addressing earthquakes and hurricanes.

If residents in hazard-prone areas are reluctant to voluntarily adopt mitigation measures that are cost-effective, then this provides a rationale for developing and enforcing building codes. There is an additional rationale for codes than just the direct benefits it provides to property owners. When a building collapses it may create externalities in the form of economic dislocations and other social costs that are beyond the economic loss suffered by the owners. For example, if a building topples off its foundation after an earthquake, it could break a pipeline and cause a major fire that would damage other homes not affected by the earthquake in the first place. In other words, there may be an additional annual expected benefit from mitigation over and above the reduction in losses to the specific structure adopting this loss prevention measure. All financial institutions and insurers who are responsible for these other properties at risk would favor building codes to protect their investments.

If a family is forced to vacate its property because of damage that would have been obviated if a building code had been in place, then this is an additional cost that needs to be taken into account. In addition to these temporary food and housing costs, the destruction of commercial property could cause business interruption losses and the eventual bankruptcy of many firms. The impact on the fabric of the community and its economic base from this destruction could be enormous. One study estimating the physical and human consequences of a major earthquake in the Shelby County/Memphis, Tennessee area, located near the New Madrid fault found that the temporary losses in economic output stemming from damage to workplaces could be as much as \$7.6 billion based on the magnitude of unemployment and the accompanying losses in wages, profits and indirect “multiplier” effects.

### ***Broadening Protection Against Catastrophic Losses***

New sources of capital from the private and public sectors are providing financial protection against losses from catastrophic events, which are alleviating insurers’ concerns that the next major disaster might leave them insolvent. They range from capital market instruments to insurance pools to federal solutions.

With respect to capital market solutions, in June 1997 the insurance company, USAA, floated a cat bond that provided them with protection should a major hurricane hit Florida. A 2 year cat bond was put together by Swiss Re Capital Markets and Credit Suisse First Boston in July 1997. The loss triggers were tied to California insurance industry earthquake losses based on the Property Claims Insurance index for the state. Many of the



cat bonds being issued today are tied to a disaster-severity index (e.g., covering damage from a certain earthquake magnitude event within a specified region).

Turning to the role of the public sector, the government may want to provide catastrophic reinsurance to insurers if the private sector does not offer sufficient coverage. As pointed out in Section 2, the reluctance of the insurance industry to cover losses from earthquakes in California led to the formation of the California Earthquake Authority. Similarly wind pools were established in Florida after Hurricane Andrew so that insurance for wind damage from hurricanes could be provided to all homeowners who wanted or needed coverage.

There has also been a proposal that the federal government offer *catastrophe reinsurance contracts*, which would be auctioned annually. The Treasury would auction a limited number of excess-of-loss (XOL) contracts covering industry losses between \$25 billion and \$50 billion from a single natural disaster. Insurers, reinsurers, and state and national reinsurance pools would be eligible purchasers.

Another proposed option is for the government to provide reinsurance protection against catastrophic losses. Private insurers would build up the fund by being assessed premium charges in the same manner that a private reinsurance company would levy a fee for excess-loss coverage or other protection. The advantage of this approach is that resources at the federal government's disposal enable it to cover catastrophic losses without charging insurers the higher-risk premium that either reinsurers or capital market instruments would require. If one views the private sector as the first line of attack on the problem, then one would only want to resort to federal reinsurance as last resort.

## **5. Future Challenges**

Based on the above analyses of the Disaster Management System in the United States the following set of conclusions emerge that are relevant in developing strategies for managing natural hazards in other countries, notably emerging economies:

One needs to involve a wide variety of stakeholders and policy tools in developing any disaster management program. The ways one brings interested parties together and combines policy tools depend on the nature of the institutional arrangements in the country as well as the type of disasters that the country faces. For example, in Turkey it would be difficult to institute a partnership between insurers and financial institutions in promoting mitigation measures because mortgages on property do not exist.

There is a need to understand the decision processes of key stakeholders when developing a disaster management system. For example, if many individuals treat a specific hazard as having a sufficiently low probability that they believe "it will not happen to me", then there will be little interest in voluntarily investing in protective measures or insurance even if they are highly subsidized. It may then be necessary to develop more formal requirements with appropriate economic incentives as well as well-enforced regulations, as illustrated by the National Flood Insurance Program. (NFIP)

In designing a disaster management system one needs to understand the values, goals and objectives of the relevant stakeholders and recognize that they may be conflicting with each other. The challenge is to construct a program that is viewed as

more desirable than the status quo by these key interested parties. There needs to be recognition that programs in place prior to a disaster may be greatly modified after a catastrophe occurs. The special disaster relief measures to the private sector following the Alaska earthquake and Tropical Storm Agnes as well as 100 percent financing of public structures after Hurricane Andrew and the Mississippi Floods illustrate this point.

Finally we need to find a balance between programs that have long-term benefits in improving the allocation of the nation's resources (i.e. efficiency concerns) and distributional considerations (i.e. equity concerns). The need to give low-income residents in high hazard areas special treatment and subsidies for protecting themselves highlights this point.

## References

- Albala-Betrand, J.M. (1993). Political Economy of Large Natural Disasters with Special Reference to Developing Countries. Oxford, Clarendon Press.
- Andersen, T. (2001) “Managing Economic Exposures of Natural Disasters: Exploring Alternative Financial Risk Management Opportunities and Instruments.” Special report prepared for the IDB, Washington DC.
- Anderson, M. and P. Woodrow (1989). Rising from the Ashes: Development Strategies in Times of Disaster. Boulder, CO, Westview Press.
- APELL—Awareness and Preparedness for Emergencies on a Local Level (1995). APELL Worldwide, UNEP, New York.
- ATC—Applied Technology Council (1985). Earthquake Damage Evaluation Data for California. ATC-13 Report. Redwood City, CA and Washington DC.
- Bate, P. (1999). “Insurance against the next Mitch.” August 1999 Issue, IDB America, Magazine of the Inter-American Development Bank.
- Bender, S. (1991) Primer on Natural Hazard Management in Integrated Regional Development Planning. Department of Regional Development and Environment Executive Secretariat for Economic and Social Affairs Organization of American States.
- Benson, C. (1997). “The Economic Impact of Natural Disasters in Fiji.” Overseas Development Institute, London, UK.
- Benson, C. (1997a). “The Economic Impact of Natural Disasters in Fiji.” Overseas Development Institute, London, UK.
- Benson, C. (1997b). “The Economic Impact of Natural Disasters in Viet Nam.” Overseas Development Institute, London, UK.
- Bhandari, R. K. (2000). “National Natural Disaster Knowledge Network for India.” *Asian Disaster Management News*, 6(3-4 July-December 2000).
- Bhatt, M. (2000) “Vulnerability, innovations, and the poor: The Demand Side.” *Innovations In Managing Catastrophic Risks: How Can They Help The Poor?* Washington, D.C.
- Blaike, P., Cannon, T., Davis, I. and B. Wisner (1994). *At Risk, Natural Hazards, People's Vulnerability and Disasters*. Routledge Publishers, London.

- Caballeros, R. and R. Zapata Marti (2000) “A Matter of Development: How to Reduce Vulnerability in the Face of Natural Disasters.” Joint ECLA-IDB paper presented at the seminar *Confronting Natural Disasters: A Matter of Development*, New Orleans, March 25-26, 2000.
- Carter, W.N. (1992). Disaster Management: A Disaster Manager’s Handbook. Asian Development Bank.
- Carter, W. N., Chung, J. M., and Gupta, S. P. (1991). “South Pacific Country Study.” Disaster mitigation in Asia and the Pacific, ADB, ed., Asian Development Bank, Manila.
- Coburn, A.W., Spence, R.J.S. and A. Pomonis (1991). Vulnerability and Risk Assessment. United Nations Development Program (UNDP) and Disaster Relief Organization (UNDRO).
- Cuny, F. C. (1983). Disasters and Development, Oxford University Press, New York.
- Davis, I. and S.P. Gupta (1990). Disaster Mitigation in Asia and the Pacific prepared by the Asian Disaster Preparedness Center of the Asian Institute of Technology.
- ECLAC—Economic Commission for Latin America and the Caribbean (1998). “Honduras: Evaluación de los daños ocasionados por el Huracán Mitch: Sus implicaciones para el desarrollo económico y social y el medio ambiente.” ECLAC publication.
- Elahi, Shirin (2001). “The Great Hanshin Earthquake, Kobe, Japan,” Paper prepared for the TSUNAMI project on The Uninsured Elements of Natural Catastrophe Losses, IIASA, Laxenburg, Austria.
- EQE (1995) The January 17, 1995 Kobe Earthquake. An EQE Summary Report. <http://www.eqe.com/publications/kobe/kobe.htm>
- FEMA. (2000). “Project Impact: Building Disaster Resistant Communities.” Federal Emergency Management Agency, Washington, DC.
- Foster, H. D. (1980). Disaster planning: The preservation of life and property, Springer-Verlag, New York.
- Freeman, PK, and Kunreuther, H. (1997). Managing Environmental Risk through Insurance. AEI Press (softback), Kluwer Academic Publishers (hardback).
- Freeman, P.K., Martin, L., Mechler, R., and K. Warner (2001). Catastrophes and Development: Integrating Natural Catastrophes into Development Planning, World Bank, Washington, DC (available on-line at [www.proventionconsortium.org](http://www.proventionconsortium.org)).

- Froot, K. (1999) The Financing of Catastrophe Risk. Chicago, University of Chicago Press.
- Garb, S., and Eng, E. (1969). Disaster Handbook, Springer, New York.
- Gilber, C. and C. Gouy (1998). "Flood Management in France," In *Flood Response and Crisis Management in Western Europe: A Comparative Analysis*, Uriel Rosenthal and Paul Hart (eds), Springer: Berlin, 15-54.
- Government of Fiji (1985). "Budget 1986."
- Government of Fiji (1995). "Fiji National Disaster Management Plan," Government of Fiji National Disaster Management Council, Suva.
- Gulkan, P. (2001). "Rebuilding the Sea of Marmara Region: Recent Structural Revisions in Turkey to Mitigate Disasters," A Wharton-World Bank Conference on Challenges in Managing Catastrophic Risks: Lessons for the US and Emerging Economies, Washington, D.C.
- Hays, W.W. (ed.) Facing Geologic and Hydrologic Hazards. Earth-Science Considerations. Geological Survey Professional Paper 1240-B (Washington, D.C.: U.S. Government Printing Office, 1981).
- Hoogeveen, J. G. M. H. (2000). "Risk and insurance by the poor in developing nations." Managing Disaster Risk in Emerging Economies, A. Kreimer and M. Arnold, eds., The World Bank, Washington, D.C.
- Horváth, G., S. Kisgyörgy, J. Sendzimir and A. Vári (2001). "The 1998 Upper Tisza Flood, Hungary: Case Study Report," IIASA study on *Flood Risk Management Policy in the Upper Tisza Basin: An Integrated Approach*, IIASA, Laxenburg, Austria.
- IDB. (2000). "Facing the challenge of natural disasters in Latin American and the Caribbean: An IDB Action Plan." Inter-American Development Bank, Washington, DC.
- Kreimer, A., and Echeverria, E. (1998). "Case Study: Housing Reconstruction in Mexico City." Disaster Management Facility, World Bank, Washington, DC.
- Kreimer, A., Arnold, M., Barham, C., Freeman, P., Gilbert, R., Krimgold, F., Lester, R., Pollner, J. D., and Vogt, T. (1999). "Managing Disaster Risk in Mexico: Market Incentives for Mitigation Investment." World Bank, Washington DC.
- Kunreuther, H., and Roth, R. J. (1998). Paying the Price: The Status and Role of Insurance Against Natural Disasters in the United States, Joseph Henry Press, Washington DC.

- Kuroiwa, J. "Microzonation: The key tool for formulation and implementing the national programme for disaster prevention and mitigation." Regional disaster management in the Latin American Region, Piura, Peru.
- Lavell, A. (1989). "Desastres naturales y zonas de riesgo en Centroamerica: Condicionantes y opciones de prevencion y mitigacion." Estudios sociales centroamericanos(49), 79-85.
- Lavell, A. (2001). "Algunos Programas Innovadoras en torno al Problema de Riesgo y Desastre en Centroamérica." .
- Linnerooth-Bayer, J., S. Quiano, R. Loefstedt and S. Elahi (2000), "The Uninsured Losses of Natural Catastrophic Events, Seven Case Studies of Earthquake and Flood Disasters," Summary Report, IIASA, Laxenburg, Austria.
- Mansilla, E. (1996). "Desastres modelo para armar: Coleccion de piezas de un rompecabezas social." La Red, Panama City.
- Maskrey, A. (1993). "Los desastres no son naturales." La RED, Panama City.
- Michel-Kerjan, Erwann (2001). „Insurance Against Natural Disaster: Do the French Have the Answer?," Paper presented at the First Annual IIASA-DPRI Meeting on Integrated Disaster Risk Management, IIASA, Laxenburg, Austria.
- Mileti, D. S. (1999). Disasters by Design: A reassessment of Natural Hazards in the United States, Joseph Henry Press, Washington, D.C.
- Mileti, D. S., Darlington, J. D., Passerini, E., Forrest, B., and Myers, M. F. (1995). "Toward an integration of natural hazards and sustainability." The Environmental Professional, 17, 117-126.
- Munich Reinsurance Company (2001). Topics: Natural Disasters. Annual Review of Natural Disasters 2000. Munich, Munich Reinsurance Group.
- OAS Organization of American States (1999). "Final Evaluation of the Caribbean Disaster Mitigation Project (CDMP)." <http://www.oas.org/en/cdmp/document/ofdaeval.htm>
- Olson, R., J.P. Sarmiento Prieto, R. Olson, A. Estrada, and V. Gawronski (2000). The Marginalization of Disaster Response Institutions: "The 1997-1998 El Niño Experience in Peru, Bolivia, and Ecuador," Natural Hazards Center Special Publication #36, University of Colorado at Boulder.
- Olson, R., R. Alvarez, B. Baird, A. Estrada, V. Gawronski, and J.P. Sarmiento Prieto (2001). "The Storms of '98: Hurricanes Georges and Mitch -- Impacts, Institutional Response, and Disaster Politics in Three Countries," Natural Hazards Center Special Publication #38, University of Colorado at Boulder.

- Petak, W.J. and A.A. Atkisson. *Natural Hazard Risk Assessment and Public Policy: Anticipating the Unexpected* (New York: Springer-Verlag, 1982). Hays 1981
- Platt, R. H. (1999). *Disasters and democracy: the politics of extreme natural events*, Island Press, Washington.
- Pollner, J. (2000) "Catastrophe Risk Management Using Alternative Risk Financing & Insurance Pooling Mechanisms: The Insurance Market and the Case of the Caribbean Region." Washington DC: World Bank.
- Poncelet, J. L. (1997). "Disaster Management in the Caribbean." *Disasters*, 21(3), 267-279.
- Red Cross and Red Crescent Society (2001). *World Disasters Report: Focus on Recovery*, International Federation of Red Crescent Societies, Washington, DC.
- Red Cross, WMO, and ESCAP (1977). *Guidelines for Disaster Prevention and Preparedness in Tropical Cyclone Areas*, published jointly by the Economic and Social Commission for Asia and the Pacific, the World Meteorological Organization, and the League of Red Cross and Red Crescent Societies, Geneva/Bangkok.
- Rokovada, J., and Vrolijk, L. "Case Study Fiji: Disaster and development linkages." *South Pacific Workshop*, Apia, Western Samoa.
- Sanderson, D. (2000). "Cities, disasters, and livelihoods." *Environment & Urbanization*, 12(2), 93-102.
- Schilderman, T. (1993). "Disasters and Development: A Case Study from Peru." *Journal of International Development*, Vol. 5, No. 4.
- Sen, A. (1999). *Development as Freedom*. New York, Alfred A. Knopf.
- Siri, G. (2000). "Targeting assistance and social investment funds." *Innovations in managing catastrophic risks: How can they help the poor?*, Washington, DC.
- Smith, K. (1996). *Environmental Hazards: Assessing Risk and Reducing Disaster*, Routledge Physical Environment Series, University of Cambridge.
- United Nations (1984). *Disaster prevention and mitigation: A compendium of current knowledge*, United Nations, New York.
- UNDHA, UNDP, and MWR, V. N.—United Nations Department of Humanitarian Affairs, United Nations Development Program, and Ministry of Water Resources of the Socialist Republic of Viet Nam (1994). "Strategy and action plan for mitigating water disasters in Viet Nam." DHA/94/1, New York and Geneva.
- Vári, A., Z. Ferencz and J. Linnerooth-Bayer (2001). "Flood Risk Management in the Upper Tisza Region: Results of a Public Questionnaire," In *Flood Risk*

*Management Policy in the Upper Tisza Basin: An Integrated Approach*, IIASA, Laxenburg, Austria.

Vermeiren, J. and J. Pollner. (1994) "A Probable Maximum Loss Study of Critical Infrastructure in Three Caribbean Island States." World Bank-OAS Report. <http://www.oas.org/en/cdmp/document/pml/pml.htm>

World Bank. (2000). "Chapter 9: Managing -Economic Crises and Natural Disasters." World Development Report 2000/2001: Attacking Poverty, Oxford University Press, World Bank, Washington, D.C., 161-176.