DISASTER RISK MANAGEMENT
WORKING PAPER SERIES NO. 13

36462

Mainstreaming Hazard Risk Management into Rural Projects

Jolanta Kryspin-Watson

with Jean Arkedis and Wael Zakout

The World Bank

WORKING
PAPER
SERIES
NO.13

Mainstreaming Hazard Risk Management in Rural Projects

Jolanta
Kryspin-Watson

with Jean Arkedis and Wael Zakout

The World Bank

Washington, D.C.
April 2006

Table of Contents

Acknowledgements

Preparation of this paper was possible due to the generosity of the Agriculture and Rural Development Unit (ARD), which funded the study through a Competitive Grant. The study team would like to express its gratitude for ARD's support of this initiative. The publication of the study was facilitated by the Hazard Management Team of the Urban Unit (TUDUR), which also supports dissemination efforts.

The work of the team profited greatly from the invaluable insights, guidance, and provided comments to the study, particularly, by Saroj Kumar Jha, Margaret Arnold, Joseph Goldberg, Miroslav Ruzica, Zoe Trohanis, and Frank Sperling. Special thanks go to Sushma Ganguly for her support and the final outcome of the study.

The team leader for this initiative was Jolanta Kryspin-Watson, a staff member of the Environmentally and Socially Sustainable Development Department in the Europe and Central Asia region (ECSSD). The team also included Jean Arkedis (Consultant), who carried out the research, desk reviews and provided written inputs to the document, and Wael Zakout (ECSSD), whose oversight and guidance throughout the process of development of the paper shaped its overall contents.

Executive summary

One of the major roles of the international institutions related to natural disasters has been funding relief and reconstruction efforts. Between 1980 and 2006, the World Bank has financed more than 150 post catastrophe reconstruction projects worth over US$14 billion.[1] In recent years, however, the World Bank and the other regional development banks have recognized the need to finance projects whose aim is to reduce risk.

This shift in focus from relief and reconstruction to risk reduction reflects, first and foremost, the growing recognition that disasters are inevitable and they undermine these institutions core mission to eradicate poverty. But it has also grown out of an understanding that development processes themselves can play a role in driving disaster risk.

Over the past several decades, natural disasters have posed an increasing threat to developing countries. More than 95 percent of all deaths caused by disasters occur in developing nations. Additionally, direct and indirect losses experienced by developing countries are estimated to be 20 times greater (as a percentage of GDP) than those of the developed countries.[2]

The rising costs of disasters and their disproportional affects on the developing world have resulted in an increasing awareness of the connection between disasters and development. On the level of the international policy agenda as a whole, hazard mitigation has been incorporated in the United Nation's Millennium Development Goals where it is listed as one of the necessary steps to realize poverty reduction. Individual institutions including the World Bank and other regional banks, such as the Inter-American Development Bank and the Asian Development Bank, have begun working towards the goal of hazard mitigation in several ways. On the one hand, they have begun to fund stand-alone projects to enhance the hazard risk management capabilities of their borrower countries. On the other hand, these institutions are looking for ways of streamlining of risk management practices in to other projects.

This paper addresses the issue of streamlining hazard risk management into individual projects in the rural sector. The purpose of this paper is to raise awareness and understanding of risk and disaster management and to provide concrete examples of past projects demonstrating ways to mainstream hazard risk management components. It does not provide a comprehensive checklist for incorporating risk management into project design. This effort may lead to follow-up work addressing technical aspects in a more comprehensive way.

The underlying premise of this paper is that taking disaster risks into account when designing and implementing rural projects can be done in a manner which does not greatly change the project's scope. Mainstreaming risk management can be done in a cost-effective manner whose benefits in terms of both lives protected and the sustainability of projects outweigh the cost.

A number of case studies present projects undertaken in the past which were developed through the ingenuity of donor staff and the local project stakeholders. In many cases, they combined a basic understanding of hazard risk management with a clear understanding of local conditions and the project goals. It is hoped that the risk management framework and the specific examples presented will motivate others to seek out effective ways of incorporating risk management in to future rural operations.

Chapter 1.

The Importance of Hazard Risk Management for Developing Countries

1.1 The Cost of Disasters to Developing Countries

The increasing severity of disasters and their mounting human and economic costs explain why disaster mitigation and risk reduction are important aspects of sustainable development strategy. Not only have the number of disaster events increased, but there is an overall trend in the increasing cost of disasters over the past two and a half decades. Estimates show that between 1983 and 2003, the direct economic losses from natural disasters have increased five-fold, to a staggering US$629 billion.[3] These impressive totals do not even include the 2004 Tsunami and the Pakistan Earthquake of 2005, whose economic impacts are estimated at over US$100 billion.[4] In 2005 alone, disasters cost US$159 billion in large part due to Hurricane Katrina, which cost US$125 billion.

Even more compelling for encouraging mitigation in developing countries is the evidence showing that low and middle income countries are more vulnerable to disasters and their destructive impacts than their industrialized counterparts. Not only do these countries experience a higher number of total disasters (in several years more than 6 times as many events), but these disasters also have a more profound impact on their economic development. Overall, the direct and indirect losses from disasters in developing countries are estimated to be 20 times greater (as a percentage of GDP) than those of industrialized countries.[5]

While better mitigation measures, land use patterns, and other preparedness efforts have in part contributed to the fact that the number of lives lost has declined in the past 20 years—natural disasters claimed the lives of 800,000 people in the 1990s compared to 2 million in the 1970s—the total number of people affected by disasters has increased. By 2004, the number of people affected by natural disasters tripled to 2 billion.[6] Statistics from 2004 and 2005 will no doubt confirm this sharp upward trend.

Box 1.1 - Definitions

Natural hazard refers to a geophysical, atmospheric or hydrological event that has the potential to cause harm or loss.

Vulnerability is the potential to suffer harm or loss (related to capacity to anticipate a hazard, cope with it, resist it and recover from its impact).

Risk is the likelihood of a specific hazard of specific magnitude occurring in a specific location and its probable consequences for people and property.

A ***disaster*** is the occurrence of an abnormal or infrequent hazard that impacts on vulnerable communities or geographical areas, causing substantial damage, disruption and possible casualties, and leaving the affected communities unable to function normally, instead requiring outside assistance.

Sources: Definitions adapted from the United Nations International Strategy on Disaster Reduction and the ProVention Consortium's *Measuring Mitigation*, December 2004.

1.2 The Impact of Disasters on Rural Regions and Economic Growth

From earthquakes and wildfires to hurricanes, mudslides, droughts, floods, and other hydrometeorlogical events, disasters of all types affect developing countries throughout the world. There is much attention paid to the impacts of disasters on urban regions because of their high population densities and

concentration of expensive infrastructure. Nonetheless, mitigating disaster impacts in rural regions is of critical importance for social and economic development of many developing countries.

Overcoming the precarious nature of rural livelihoods is one of the key challenges to rural development. Risk and disaster management are pertinent to rural development because of this precariousness. As the World Bank's Rural Development Strategy[7] underscores, rural development is fundamental to the overall goal of poverty eradication. Rural regions are home to over 70% of the world's poor who are particularly vulnerable because of their exposure to risk and income shocks. When disasters strike, they can have devastating affects on individuals and communities.

The major types of disasters that impact agricultural areas are drought and floods. The most vulnerable agricultural areas comprise 18.5% and 27.5% of the world's surface and are home to large percentage of the world's population.[8] In addition to their localized impacts, damage and destruction in rural regions can have a national ramification since agricultural production and other rural sectors are often the key drivers of the economies of developing countries. For example, in Central Asia and the Caucasus, agriculture accounts for a large portion of GDP in most countries. In Armenia it represents 30% of GDP, in Azerbaijan 20%, and in Georgia 26%.[9] A major drought which affected the region in 2000-2001 caused losses of US$800 million in agriculture alone, representing a loss of nearly 6% of GDP in Georgia and 5% in Tajikistan.

Likewise, Hurricane Mitch's devastating impact on the countries of Central America was acutely felt in the rural areas of the country where mudslides, flooding, and continuous severe rainfall and winds had debilitating impact on the rural economy and society (Box 1.3). Moreover, the rural impacts were felt throughout the country's economy which experienced a total of US$6.0 billion in direct and indirect material losses. Two-thirds of these losses were attributed to losses in the affected countries' primary sectors of production (agriculture, livestock, forestry and fisheries).

Box 1.2 - Agricultural Impacts of the 2004 Indian Ocean Tsunami and 2005 Pakistan Earthquake

The World Bank estimates that damage to the agriculture sector (consisting of livestock, agriculture and agriculture-related infrastructure, crops and fisheries) in Asia due to the 2004 tsunami and the 2005 Pakistan earthquake reached a whopping US$1.81 billion. The amount of financing needed to address these losses climbed to US$1.4 billion. Damage and needs assessment figures for several countries are listed below.

Pakistan (earthquake)
Agriculture, livestock, & irrigation damage - US$337.2 million
Needs - US$218 million

India (post-tsunami)
Agriculture & livestock damage - US$37.51 million
Needs - US$21.66 million
Fisheries damage - US$567.8 million
Needs - US$284.1 million

Maldives (post-tsunami)
Agriculture damage - US$11.07 million
Needs - US$11.14 million
Fisheries damage - US$25.1 million
Needs - US$14.09 million

Sri Lanka (post-tsunami)
Agricultural and livestock damage - US$3 million
Needs - US$4 million
Fisheries damage - US$97 million
Needs - US$118 million

Indonesia (post-tsunami)*
Agriculture and livestock damage - US$224.8 million
Fisheries damage - $510.9 million

Source: Individual country damage assessment reports. The World Bank, 2004-2005.

* No needs were costed.

In addition to their immediate impacts—death, injury, hunger, and starvation—there are other long-term consequences which link disasters closely to development. Direct losses in the rural regions including destroyed crops, killed animals, and damage to social infrastructure were compounded by the indirect losses resulting from other infrastructure and road damage which cut off rural regions from their markets. Similar losses were experience in 2004-2005 in the tsunami-affected countries and in Pakistan due to the earthquake (Box 1.2).

Box 1.3 - Rural Impacts of Hurricane Mitch

For 10 days in October 1998, Hurricane Mitch pummeled Central America causing more than 9,000 deaths, at least 9,000 disappearances, and 13,000 injuries, according to the Economic Commission on Latin America and the Caribbean (ECLAC). More than 460,000 people were left homeless and millions were displaced. Of the US$6.0 billion in direct and indirect material losses, two-thirds were attributed to losses in the affected countries' primary sectors of production (agriculture, livestock, forestry and fishery). The flooding and other storm damage to productive land, as well as the damage or complete destruction of infrastructure such as rural roads or highways critical to bringing agricultural products to market, resulted in loss of livelihoods for individual poor farmers and rural laborers. This compounded the human suffering already evident from the loss of life and destruction of other housing, clinics, and other social infrastructure. A report from the Inter-American Development Bank, underscores the magnitude of its specific impacts on the rural sectors of individual countries and the overall affect that destruction of rural livelihood and factors of production can have on their overall economies. A number of statistics are highlighted below:

Nicaragua:

- Direct and indirect damages to the agricultural, livestock and fishery sectors totaled about US$185 million (including the negative health effects such as the spread of disease due to excess humidity and other unsanitary conditions).
- Flooding and storm damage affected 13% of the area used for internal consumption production and 10% of the area for export and industrial production.
- 50,000 animals, mostly bovines, died.

El Salvador:

- Several days of torrential rain resulted in major flooding and mudslides in the rural inland and coastal regions of the country, affecting 147 communities and 1/4 of the country's rural population (37,000 people).
- A total of 65,200 hectacres of land were badly flooded resulting in a loss of 18% of the 1998-1999 basic grain harvest and 9% of the estimated sugarcane production.
- 2,653 kilometers of rural roads needed major rehabilitation.
- Of 10,000 damaged homes, many were in the rural areas of Ahuachapán and the Bajo Lempa.

Honduras:

- Initially affected 1.5 million people and killed a total of 5,657.
- Highways and roads suffered the full impact of the rising river levels which left enormous deposits of debris and detritus on the slopes of the North Coast Mountains.
- Riverbeds overflowed and destroyed the roads and buildings in their paths. In other hilly and mountainous areas of the country, the debris left by the rivers--rocks, sand and the remains of trees--blocked passage and drainage and caused heavy erosion of the slopes and vegetation.
- In many sections of the national highway network up to 70% of certain highways must be rebuilt.
- 1,600 water and waste systems in rural regions had serious problems (either they were flooded or excavated wells for drinking water were blocked or obstructed).

Sources: Inter-American Development Bank. *Central America After Hurricane Mitch: The Challenge of Turning a Disaster into an Opportunity.* Consultative Group for the Reconstruction and Transformation of Central America.
USAID. "Hurricane Mitch Program Overview." Downloaded January 2006. http://www.usaid.gov/sv/mitch/

Disasters also have financial implications for developing country governments. Often they destroy infrastructure that the government had already taken on debt to build. They can also wipe out a portion of the government's tax revenue and force funds to be diverted from development programs which are critical to the rural poor to instead pay for relief and reconstruction efforts. In Honduras alone, Hurricane Mitch resulted in losses of 41% of GDP and a staggering 292% of the government's annual tax revenue.[10]

1.3 Disaster Management Needs and Realities of the Rural Poor

Whether in the developing world or the developed, individuals have specific disaster management needs immediately before, during, and after a disaster.

These include:

- Effective, timely and safe **control** of existing or potential hazards (for example, ensuring dam safety for flooding, seismic standards for earthquakes, or adequate control of wildfires);
- Timely, accurate, and meaningful public **warning** to persons at risk;
- Assistance in **protection** from hazard effects;
- Swift fulfillment of the **immediate needs** of displaced or impacted people;
- **Restoration** of the community to pre-disaster state or new post-disaster state; and
- Timely and accurate responses to **requests for information** or response to rumors while all other services are being performed.[11]

Fulfilling these needs adequately is a challenge even for countries which should have the most highly development disaster management capability, as the recent example of Hurricane Katrina demonstrated. Disasters pose difficult challenges of coordination, communication, logistics, public warning, response, and relief for developing and developed countries alike. But, these difficulties are compounded in developing countries because of the high vulnerability of the poor.

Rural communities and the rural economy have specific characteristics in developing countries which make the rural poor particularly vulnerable to natural hazards. They include:

- Lack of assets, poor access to credit, and few savings mean that they have limited options and coping mechanisms available to them when assets are destroyed or the economy is disrupted;
- Lack of diversified sources of income makes those reliant on agricultural and commodity production or extraction vulnerable to price fluctuations which can often be triggered by a large scale disaster; and
- Frequent settlement in hazardous locations prone to flooding, erosion, landslides results in disproportionate destruction of housing and other assets of the poor.

These characteristics mean that disasters have the potential to deepen the poverty trap in which the rural poor often already find themselves.

1.4 Characteristics of a Post-Disaster Environment in Developing Countries

The following characteristics typify the immediate post-disaster environment among rural populations in developing countries:

Food insecurity and asset depletion

Disasters directly increase the food insecurity of populations by destroying crops and causing the death or injury of livestock and other animals. In addition to immediate food insecurity, when disasters result in the

death of income generating members of the household or destroy productive assets, they can have long term impacts on food and income security. Often, lacking access to credit, savings, or other means of smoothing income, households have to make immediate decisions about whether to sell an animal, fishing boat, or another asset in order to pay for food and other necessities.

Lack of housing and shelter facilities for people and animals
Disasters destroy poorly constructed rural housing infrastructure, and few rural communities have alternative shelter facilities. People are often left to rely on tents and other interim solutions that do not always provide adequate protection while they wait for reconstruction to be completed. Shelter for animals is also a large problem in rural areas, especially pastoral communities where there is rarely much forethought or contingency planning for animals and livestock.

Public health concerns
Disasters magnify sanitation problems and other public health challenges which already affect rural communities. Because of poor infrastructure, poor drainage, and unprotected waters supplies, disasters involving heavy rainfall, flooding, or tidal waves can lead to stagnant or contaminated water ripe for breeding contagious diseases. Likewise, contamination and other public health issues are always a concern with disasters with high casualty rates until the dead can be properly laid to rest.

Changes to the social fabric
Catastrophic events can have a variety of impacts on the social fabric at the local level. Some disasters can wipe out a key demographic group, such as laborers or fishermen who were in the storm's path, leaving women and children behind. In other cases, damage effects key sectors of the economy and jobs are eliminated in one traditional sector, to be replaced in the immediate aftermath by jobs related to the reconstruction itself. Adjusting to the new realities may have long term societal and economic impacts that are not immediately apparent.

Psychological impacts
On a psychological level, disasters can be traumas for survivors, especially those who were seriously injured, lost a loved one, experienced the disaster alone, fear a reoccurrence of the event, lost their home, or had their livelihood threatened. In developing countries, there is usually little access to social services to help cope with these psychological impacts.

Physical changes in the environment
Different hazard types have different environmental impacts. Hurricanes, tidal waves, and other coastal hazards can affect sea levels and cause salt water to flow areas where marine life is adapted to fresh water. Earthquakes and flooding can cause changes to arable land and erosion patterns. All disasters have the potential to destroy flora and fauna and thus disrupt ecosystems, impacting the people who are a part of them. Communities may or may not be well adapted to deal with these impacts. In areas where communities have a historical connection to the land they live on, populations often have developed coping mechanisms which anticipate the environmental impacts of recurring natural hazards. In areas where communities are new to the land, perhaps because they have been displaced by conflict, population growth, or land reform program, communities may not be well adapted these changes.

Chapter 2.

Breaking the Cycle: Mainstreaming Disaster Risk Reduction

Like challenges such as gender inequality and environmental degradation, natural disaster vulnerability is a cross-cutting problem which can undermine sustainable development efforts and projects in other areas. Because of this, disaster management, mitigation, and risk reduction, are all activities which are appropriate for mainstreaming in to development policies and programs.

From the perspective of the donor community, mainstreaming risk management can be incorporated into many levels within an organization. It can take place at the macro-level, where donors mainstream risk management in to the overall development priorities in their work with client countries. This has resulted in the realization that enhancing individual countries' disaster management capability in one of the areas of preparedness, response, recovery, and rehabilitation (Box 2.0) is closely linked to the sustainability of other development investments. The World Bank and other development banks have thus supported a range of stand-alone projects. These projects have included the establishment of independent disaster management agencies responsible for coordinating a government's disaster response, efforts to update and enforce building codes or national land use planning, the development of new early warning systems, establishing emergency communications management systems, as well as investments in flood protection and seismic retrofitting, among others.

The focus of this paper, however, is to compliment these stand-alone efforts. Its purpose is to encourage mainstreaming on the level of individual projects in rural areas.

Mainstreaming risk reduction has three goals:

- To reduce existing risks where possible to mitigate the impacts of future disasters;
- To ensure that development does not drive risk, (that is, that projects do not inadvertently increase risk of the beneficiary population); and
- To ensure the sustainability of the individual project, thus protecting the project's investment.

In general, hazard risk reduction mainstreaming involves

Box 2.0 - Definitions

Disaster Management (also known as Emergency Management) is the organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation.

Disaster Management involves plans, structures, and arrangements established to engage the normal endeavors of government, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs.

Mitigation is any action taken before, during or after a disaster to minimize its impact, including structural (physical) and non-structural measures.

Preparedness is any specific measure taken before disaster strikes, usually to forecast or warn against it, take precautions when one threatens and arrange for the appropriate response.

Relief, *rehabilitation* and *reconstruction* are, respectively, any measure undertaken in the aftermath of a disaster to save lives and address immediate humanitarian needs, to restore normal activities and to restore physical infrastructure and services.

Source: Definitions adapted from the United Nations International Strategy on Disaster Reduction and the Provention Consortium's *Measuring Mitigation*, December 2004.

understanding local risks and hazards and weighing the trade-offs, costs, and benefits of incorporating a risk reduction strategy or component in to the project scope. In practical terms, mainstreaming risk reduction will vary from project to project. The purpose of this document is not to delve in to the specific technical aspects of incorporating risk reduction in to various sectoral projects. Rather, it is designed to: a.) present some background information and resources related to natural hazard risk in rural communities and economies; b.) outline some cross-cutting interventions and mainstreaming components; and, c.) discuss next steps and follow-on efforts for mainstreaming from a sectoral perspective.

It is important to note that mainstreaming may not be appropriate for all projects. In some cases, there is no obvious way to incorporate a risk reduction measure while realizing the project's original development objective. In other cases, the hazard risk management challenges would be more adequately addressed through a stand-alone project.

2.1 Background Information and Resources

Understanding Hazards and Risks

The first essential step when undertaking any kind of risk reduction mainstreaming is to have an accurate picture of the hazards and risks relevant to the project and its geographical location. It is important to note that generalized assumptions about the most prevalent risks can be faulty, leading to miscalculations which are costly in terms of lives and the integrity and sustainability of the project itself (see Box 2.1).

Accurate data on local risks and hazards may or may not be easily accessible. In some cases, the process of undergoing a country-wide risk assessment may have been undertaken as part of another project. Some countries may have some kind of hazard risk assessments either at the central or local levels.

Other countries may have little or no reliable hazard data available. In those cases, it may be worthwhile to consult a brief hazard profile of the country's most likely hazards. For example, the World Bank's report, *Natural Disaster Hotspots: A Global Risk Analysis,*[12] paints a picture of the most vulnerable areas, especially those vulnerable to multiple hazards. Another Bank publication, *Preventable Losses: Saving Lives and Property through Hazard Risk Management – A Comprehensive Risk Management Framework for Europe and Central Asia,*[13] contains profiles for the countries in that region. The United Nations Development Program released a report in 2001 called *Disaster Profiles of the Least Developed Countries*[14] which contains one page profiles of 25 countries and the major disasters affecting them. Other major global risk assessment initiatives include the Disaster Risk Index (DRI), a project of the United Nations Development Program.[15]

These reports do not address hazards and risks specific to a particular region or locality, however. Moreover, these resources normally emphasize the catastrophic disasters, but everyday hazards might pose an equally important threat as the example of snow collapsing school roofs in Afghanistan demonstrated (Box 2.1). While conducting some kind of local risk and vulnerability assessment would ideally be a precursor to most projects, this is often not feasible or necessary.[16] Most local communities which face regularly recurring hazards are aware of these risks and have developed coping mechanisms to deal with them. At the very least, anecdotal evidence is a basic way to consider local risks and the viability of traditional coping mechanisms in project design and implementation phases.

Box 2.1 - Building for the Wrong Risks

Although development project do not set out to increase the vulnerability of the built environment or the projects beneficiaries, in many cases, they actually do. When project design does not consider all relevant hazards and risks, the project itself can build in unnecessary vulnerabilities which undermine its sustainability.

For example, a road that was recently constructed across the interior of Dominica, a Caribbean island, was designed based on the projected traffic volume without considering relevant and likely weather conditions, such as intermittent hurricanes and heavy rainfall. As a result, the road has already deteriorated significantly.

Another example in Moqr, part of Afghanistan's vast rural region, shows the importance of considering all possible hazards, not just catastrophic events. School buildings and clinics which were constructed as part of a US$73 million project were built to seismic standards with light, flexible building materials used on their roofs. But these materials proved to be inappropriate for winter weather. Several of them collapsed under the weight of the winter storms, perpetuating the challenge of providing primary education in a country where half of all school-age children have no access to education.

Sources: Benson, Charlotte and Edward Clay. *Understanding the Financial and Economic Impacts of Disasters.* Disaster Risk Management Series No. 4. The World Bank. 2001.

Stephens, Joe and David B. Ottaway. "A Rebuilding Plan Full of Cracks." *The Washington Post.* November 20, 2005.

Understanding National, Sub-national, and Local Disaster Management Stakeholders and Institutions

Disaster management systems vary among countries in their level of capability in the areas of mitigation, preparedness, response, and recovery. The organizational structures of these systems on the national, sub-national, and municipal or local levels also vary. In some countries, disaster management is the responsibility of a dedicated central government agency whose sole function is to implement programs in coordination with sub-national and local stakeholders. In other countries, these responsibilities are scattered throughout the government and fall under a myriad of agencies ranging from civil defense or the military, to agricultural and rural development agencies. In many cases, the weakness of disaster management institutions and lack of human resources and technical capability limit overall capability to a few preparedness and response activities, while mitigation programs and long-term recovery ability are lacking.

Consensus in the evolving debate on the best way to organize the components of national systems for hazard risk management has begun to converge around several key points. First, whether they are centralized or more de-centralized systems, implementing comprehensive risk management involves many stakeholders. These stakeholders may represent institutions related to the following areas, among others: land use planning, environmental protection, public health and safety, agriculture and rural development, urban planning, water resource management, infrastructure, communications, utilities, etc. In highly developed systems, disaster management agencies often serve as a focal point for developing comprehensive and country-wide risk management strategies in coordination with other relevant stakeholders both in and out of government. For the purposes of this paper, it is useful to be aware that the same stakeholders relevant to a specific project component related to hazard risk reduction may or may not have an existing institutional arrangement with the national hazard management systems.

Second, local level participation is increasingly recognized as a key component of comprehensive risk

management systems (see Box 2.2) and as such, communities themselves (including community groups and other relevant institutions) are also key stakeholders which are relevant to rural projects incorporating risk management. Local capability has often been weak throughout the developing world especially where the only local risk management institutions are emergency committees which are activated only in disaster response. There is a growing number of cases, however, where local risk management capacity building has been undertaken as a specific development project by either central or sub-national governments. International and local NGOs have in some cases supported these efforts, and in other cases have worked on the community level to support disaster management project even where there is no broader country-wide risk management effort. The international community also has a direct role in providing humanitarian assistance and disaster relief.

Understanding local disaster management capability and local stakeholders is critical for ensuring that projects incorporating a risk management mainstreaming component are in-line with and build upon past efforts where possible.

Box 2.2 - Local Level Participation in Hazard Risk Management

The reasons why local level participation is increasingly recognized as a key component of comprehensive risk management systems were highlighted in the World Bank's *Comprehensive Risk Management Framework For Europe and Central Asia.** They include the following:

- "The effects of a disaster are first felt at the level of the community, and the community is the first to respond to a disaster […].
- Failure to understand the behavior and culture of the community can lead to badly designed early warning systems.
- Involvement of local people promotes self-reliance and ensures that emergency management plans meet local needs and circumstances.
- As World Bank experience shows, reconstruction efforts are more effective if the community is actively involved. Many communities are in remote areas that are not well connected by roads or other modes of transportation. Such communities may not receive any emergency aid and have to rely on their own resources to cope with the disaster. For this reason, they need to receive disaster-preparedness training.
- Local communities are important channels for public awareness campaigns, valuable resources for vulnerability assessment and monitoring enforcement, and essential sources of indigenous knowledge regarding hazards and mitigation.
- Preparation at the community level improves a nation's capabilities in responding to and coping with disasters, as local communities form the building blocks of a country.
- Involving communities creates a pressure group to ensure that authorities at both the local and central levels remain responsive to community concerns.
- A community-level focus facilitates identification of vulnerable groups, such as women, the elderly and ethnic groups. The concerns of these groups should be voiced in any participatory effort."

*Source: Pusch, Christoph. *Preventable Losses: Saving Lives and Property through Hazard Risk Management. A Comprehensive Risk Management Framework for Europe and Central Asia.* The World Bank. 2004.

2.2 Cross-Cutting Interventions and Mainstreaming Components

The first step to mainstreaming hazard risk reduction is to understand the hazards that may affect the project in the short, medium, and long term and the likelihood of their occurrence, as discussed in detail above. Following hazard identification, there are a number of possible hazard risk reduction components or interventions that could be incorporated in to a project. The sections below discuss some of the cross-cutting interventions that may apply to more than one project area. The included case studies are not meant to represent a comprehensive catalog of mainstreaming options, but rather exemplify ways that these interventions have been included as components in past projects.

Building Smart: Small-Scale Rural Infrastructure, Mitigation, and Shelter

Building small-scale rural infrastructure such as health clinics, schools, rural roads, and facilities or store houses for agricultural cooperatives, is a component that cuts across project types such as community development, health, education, transportation. There are two major considerations for incorporating hazard risk reduction in to construction: a.) mitigation, or ensuring that the buildings are constructed to withstand relevant hazards (Box 2.3); and, b.) shelter, or considering whether new facilities can be built to also serve as disaster shelters for people and animals.

In most developed countries, there are building codes with which large-scale infrastructure must comply in order to be disaster-resistant. In many developing countries, either building codes do not exist, or if they do, are not enforced. Especially in rural areas, housing is often poorly constructed and public shelter facilities for both people and animals are lacking, compounding the vulnerability of the population.

Some basic risk reduction considerations for rural infrastructure (housing, clinics, schools, rural roads, utility systems, and irrigation systems) include, but are not limited to the following:

Box 2.3 - Prevention Pays: The Costs and Benefits of Mitigation

Although there is not one single exhaustive source showing the benefits of mitigation, there is nonetheless mounting individual evidence that not only does mitigation pay off, but it is also cost effective. For example:

- The World Bank and the US Geological Survey estimate that if US$40 billion had been invested in mitigation and other preventative measures, the worldwide economic losses worldwide from natural disasters in the 1990s could have been reduced by US$280 billion.
- The US$3.15 billion spent on flood control in China since 1960 is estimated to have helped avoid losses of about US$12 billion.
- A project study undertaken by the Organization of American State's Caribbean Disaster Management initiative looked at infrastructure projects that failed due to natural disasters. It found that mitigation efforts to make them survive the disasters would have increased costs only 1-12%.
- A 1998 study commissioned by the United States Federal Emergency Management Agency (FEMA) estimated that mitigation only increases construction costs in the US by 1-5%.

Measuring the benefits of mitigation is a difficult task. As shown earlier, the costs of disasters are not only financial, but also humanitarian, social, and environmental and thus, developing one methodology for quantifying these costs is difficult. Furthermore, the fact that the benefits of mitigation may be realized only in the long term (when a disaster strikes in the next generation) disincentivizes investment because politicians and other government officials have to show results in the short term.

Sources: The World Bank Hazard Management Unit, and Benson, Charlotte and John Twig, *Measuring Mitigation*, ProVention Consortium, 2004.

- Ensure that materials used in construction are appropriate for year-round weather conditions and other hazards of the area. For example, materials used in masonry construction which are water-soluble may

be inappropriate for flood-prone areas and certain metals and woods are more appropriate for earthquake risk than others.

- Select building sites with the lowest hazard risk; for example, avoid flood-prone areas, areas unsuitable for laying solid foundations (such as sandy areas or weak soil composition), and areas prone to erosion.
- If there is earthquake risk, include both structural and non-structural mitigation measures in project design. Structural mitigation includes requiring that buildings are constructed or retrofitted to earthquake resistant standards. Non-structural measures involve ensuring that that lighting, shelving, and other equipment contained within buildings are securely fitted and attached so that they will not injure people during an earthquake.
- Avoid building rural roads in low-lying areas prone to flooding; building roads in flood plains can impede water flow and prolong flooding whereas elevating road slightly and allowing for proper drainage helps to keep access roads functional preventing communities from being cut off from urban areas and thus, markets.
- Consider elevating buildings in flood-prone areas and ensure deep, solid foundations.
- Ensure that utilities and water supply systems are protected from hazards as well; for example, water supply systems should be placed above the flood plain.
- Consider using newly constructed schools, clinics, and other facilities as shelters for people in a post-disaster setting. In flood-prone areas, multi-story buildings allow for people to shelter in upper floors.
- Consider the location of new housing settlements and include flood retention pits in planning if they are needed to offset increased rainfall runoff.

Box 2.4 - Case Study: Advancing Education while Mainstreaming Disaster-Resistant Standards into School Construction

Experience has shown that building disaster resistant schools is a worthwhile investment. When Hurricane Ivan devastated the Island of Grenada in 2004, it leveled critical infrastructure including 11 public health institutions, and 70% of the tourism infrastructure (which accounts for 60% of the countries export earnings), among other damage. Tellingly, the storm rendered all of the primary and secondary schools unusable except for two—those that had been built and retrofitted by the Bank to disaster resistant standards.*

This lesson is being applied to construction of primary and secondary schools in rural India as a part of the ongoing Bank-funded "Elementary Education Project." Overall the project will "assist the Government of India in its efforts to attain its goals of universal elementary education, and, support educational development that contributes to participative economic growth and poverty alleviation"**

Community construction manuals have been developed in conjunction with the second component of the project. They include advice to guide the community through the selection process for establishing a committee to oversee the construction, as well as practical considerations on where and how to build to ensure the sustainability of the buildings and their appropriateness for local weather conditions. For example, the manual cautions against building in low-lying areas or on a slope and suggests appropriate soil types for foundations.

Sources: *****The World Bank. *Grenada: A Nation Rebuilding, An assessment of reconstruction and economic recovery one year after Hurricane Ivan.* 2005.

******The World Bank. *Elementary Education Project.* Project Appraisal Document and Appendices.

Box 2.5 - Case Study: Financing Mitigation in Viet Nam through Micro-Credit

Growth in Viet Nam over the past decade has resulted in higher living standards and better living conditions. This has coincided with an increase in private expenditure in housing and rural infrastructure. In fact, about 80% of rural housing has turned over in recent years with new structures being built to replace their thatch and bamboo predecessors. Unfortunately, much of the housing is not being built to withstand the storms, typhoons, and flooding which affect Viet Nam annually.

Development Workshop France (DWF), an international NGO, has implemented projects* in Thua Thien Hue Province in central Viet Nam since 1999, involving public awareness and prevention campaigns demonstrating techniques for small public facilities reinforcement. Through this work, however, DWF recognized that there was a complementary need to provide families with affordable credit to pay for the housing improvements.

In 2002-2003, DWF initiated a new program in 10 communes which combined cash grant subsidies with micro-credit for housing improvement. At the commune level, the Commune Damage Prevention Committees manages the credit scheme. "Family Prevention Groups" made up of 5-10 families determines the lending priorities, decides upon the subsidy/credit proportions, and manages the dispersal of funds at the hamlet or village level.

There has been debate about the viability of lending for housing improvement rather than for income generating activities. While repayment rates near 80%, may not ensure the project's sustainability in the long-run, the project has demonstrated that even poor families are willing to invest in their own protection.

**Projects funded by CIDA (Canadian International Development Agency), Alternatives(Canada) and FACV (Fondation d'Aide Canada -Viet Nam) 2000-2002; by ECHO-DIPECHO (European Commission) 2003-2005*

Source: Adapted from International Strategy for Disaster Reduction, World Disaster Reduction Campaign 2005, "Microfinance and disaster preparedness: an innovative approach for housing preventive reinforcement against cyclone and flood damages, Viet Nam."

Box 2.6 - Case Study: Reducing Agricultural Vulnerability in the Kyrgyz Republic through Flood Protection and Mitigation

The Flood Protection Project of 1998 was implemented as part of the emergency response to major flooding which had taken place the earlier that year in the Kyrgyz Republic. T he project rehabilitated or replaced lost irrigation infrastructure, especially headworks, which are essential to agriculture but had been washed away or destroyed by large floods. Similarly, flood control infrastructure such as eroded river embankments, protective spurs, and a number of dikes were also replaced or repaired.

Although the project's impetus was the repair and rehabilitation of irrigation and flood control infrastructure that had been damaged by the 1998 flood, the new infrastructure investment and other works were re-built or constructed anew to standards which would ensure their longevity. In each case, new and better techniques were sought to ensure that all infrastructure improvements undertaken in the country's mountainous regions could meet mitigation standards normally applied in flatlands. This project serves as an example of both defensive mitigation by building to better infrastructure standards and proactive mitigation by improving flood control techniques. It recognized that reducing flood vulnerability would limit potential future devastation to the agriculture sector and individual livelihoods.

The World Bank. Flood Emergency Project. The Kyrgyz Republic. 1998. Report No: 18701-KG

Public Awareness and Disaster Education

Public education is a key method for channeling community participation in hazard risk reduction management. In many rural communities, there are low levels of awareness about local risks and ways individuals can reduce their vulnerabilities, and a lack of knowledge about how to prepare and what actions to take in the event of a disaster. Programs which address these topics can be instrumental in encouraging mitigation and preparedness at the household level, an essential aspect of comprehensive risk management since it can often take several days or more after a disaster strikes for outside aid to arrive.

There are many possibilities for the type of projects that could mainstream a public education component. For example, since children are often conduits for raising family preparedness levels, primary education projects can target children by introducing courses in school curricula that cover general disaster information. Following the 2004 floods in Bangladesh, damage assessments produced by the World Bank and the Asian Development Bank noted that the public health problems had been averted because people had been taught how to boil water to prevent dehydration as a part of a larger public health project.

Public outreach efforts have been tailored to complement another project objective such as forestry management as Box 2.6 illustrates. Other programs have covered topics including how to build homes or other buildings to disaster-resistant standards as Box 2.5 mentions, planning for sheltering livestock and other animals, and general information about hazard types and their impacts.

Box 2.7 - Case Study: Using Public Education to Promote Fire Prevention in the Amazon

Constituting one-third of the world's remaining tropical rainforests, the Brazilian Amazon provides important global environmental services. Its rainforests are a "repository of biodiversity, a carbon sink and protection of the watershed of the World's largest river"* and possibly affect regional weather patterns. However, burning practices by farmers and ranchers to clear land for crops or grazing pastures have not only accelerated a process of deforestation, but they also often result in unintended escaped fires which destroy timber, pasture land, and other infrastructure.

The Fire Prevention and Mobilization Project in the Amazon (PROTEGER II) was approved in 2001 as a follow-on project to a similar effort. Its objective is to not only prevent and control the unnecessary spread of fires, but also to promote alternatives to fire for agricultural purposes. The project has sought to provide guidance to local communities and other stakeholders in high risk areas on the risks and consequence of uncontrolled burning. It has funded preparedness training and public awareness campaigns that promote and teach technique for safe burning. It has also provided equipment and training to community fire prevention units on how to monitor and suppress fires when they do occur.

* Source: The World Bank. *Brazil: Fire Prevention and Mobilization Project in the Amazon (PROTEGER II).* Project Information Document Report No. PID10184. 2001.

Early Warning Systems

Improved technology often used by agencies responsible for providing hydrometeorlogical and other weather services now allows for the prediction of imminent hazards such as storms, hurricanes, and tornadoes before they occur. Droughts, on the other hand, are not sudden onset disasters, but rather show up in insufficient harvests resulting from low levels of precipitation over a long period of time. Early warning systems which can analyze data such as amounts of rainfall and basic household welfare data can predict an ensuing disaster and allow local communities, governments, and aid organizations to implement coping mechanisms before conditions turn in to a full-blown disaster. If these warnings are communicated well to the potentially affected population, they allow people to take preventive action, or to activate drought

response measures without losing time, provided that the population has been properly educated (see discussion above) on what action to take.

Early warning systems combine diagnostic tools to evaluate weather-related or other data with communication networks to disperse warnings about imminent disasters, every day storms, and even potential failure of flood control mechanisms such as dams. They can be lifesaving interventions for fishermen and coastal communities as well as farmers and the lack of adequate warning has proved to cause preventable deaths. For example, in 2004, 350 fishermen drowned in the Arabian Sea near the coast of Gujarat because although there were warnings about an imminent storm, the fishermen did not have radios to hear them.

Early warning systems are important for development work in many rural sectors and have been implemented as both stand-alone projects and as components and subcomponents of larger projects. For example, the experience of the 2004 Tsunami underscored the need for developing a regional warning system to communicate warnings to coastal communities, fishermen, and other boaters. The necessary level of effort will require multi-donor coordination in developing individual projects which address many of the aspects of capacity building, public education, institutional strengthening of detection capability and communication as well as funding to improve and implement warning systems.

Other country (as opposed to regional) projects have approached the issue of early warning systems by incorporating it in a stand-alone disaster management project. For example, the World Bank's Natural Disaster Mitigation Project for Honduras[17] (2000) had a community level flood warning system component. Another approach has been to mainstream early warning into sectoral projects in areas such as fisheries, agriculture (see Box 2.7), and dam safety or water resource management. For example, the *Dam Safety Project* in Armenia (1999) incorporated a component to provide for updating emergency procedures and warning systems in the case of dam failure.[18]

Box 2.8 - Case Study: Improving Pastoral Livelihoods while Mitigating the Impacts of Drought in Ethiopia*

The primary purpose of the Pastoral Community Development Project, initiated in 2003, is to improve the livelihoods of the pastoral groups of the arid, and semi-arid Ethiopian lowlands, by fostering income growth, access to public services, and by facilitating better institutional, social, and environmental conditions.

In addition to approaching livelihood improvement through traditional community level development assistance, however, this project recognizes that mitigating the impact of drought is inextricably linked to achieving livelihood improvement. Periodic droughts have always impacted the livelihoods of people living in Ethiopia's lowland pastoral production systems. The drought risk and impact has increased, however, as a result of increasing human and livestock population pressure and the increasing frequency of drought possibly linked to climate change and other environmental factors.

The second project component provides funding for building a community-based early warning system to establish a communal collection, and analysis of basic household welfare data, focusing on sub-groups to design pastoral production systems. A disaster contingency planning subcomponent will build capacity at regional levels for disaster preparedness - mitigation and rapid response - for drought management and recovery activities, providing grants to finance activities identified in contingency plans.

* Adapted from The World Bank. *Ethiopia Pastoral Community Development Project.* Project Appraisal Document. Report No. 25227. 2003.

Contingency and Continuity Planning

Disasters not only affect individuals, but also affect all kinds of organizations, businesses, and government entities in rural areas including municipal governments and their entities, village organizations and committees, farms, and microfinance organizations, etc. In addition to physical damage, disasters interrupt daily operations, destroy records, and impede the ability of organizations to service their clients.

Box 2.9 - Case Study: Contingency Planning, Back-Up and Mitigation for Land Administration in Aceh, Indonesia

Secure property rights and good land administration have been increasingly viewed as important for making the assets of the poor fungible and thus, help them create their own wealth. As World Bank project teams found out, the devastation caused by the Tsunami had direct negative impacts on land administration and property rights.

The damage to property rights and land administration system was severe. The nature of the destruction, combined with the large death toll, wiped out any marks on the ground that define property rights, land boundaries and people's memory of the location of these boundaries. Furthermore, the destruction of land books and cadastral maps in several land offices has made the reconstruction of property rights even more difficult. In addition, several land offices were either completely destroyed or structurally damaged. In Banda Aceh alone, the land office lost 41 staff, approximately, one third of its staff.

The damage of the tsunami in Aceh underscores the need for preparing land offices by backing up and digitizing records, and for formally recording and titling property lines defined by mere land markings. While structural mitigation measures to office building may not have prevented all of the destruction, some buildings withstood the Tsunami and subsequent earthquakes better than others.

As part of the reconstruction effort, the World Bank's Reconstruction of Aceh Land Administration System Project seeks to recover and protect the ownership and land rights of the affected population to prevent against land grabbing and to rebuild the land administration system. In doing so, the Project Appraisal Document (PAD) laid out specific provisions to ensure that land offices will be built back better. It requires that all buildings should be constructed to meet international standards for earthquakes and to ensure that vital equipment and records are stored above the tsunami flood levels. Buildings to be renovated are to be structurally assessed by professional engineers, and structurally enhanced to meet international earthquake structural standards.

The project also budgets for a subcomponent dedicated to backing-up and digitizing reconstructed records. A major impediment to the recovery of property rights and the reconstruction of the land administration system had been the destruction of the one and only land records system by the tsunami. Paper-based records systems are susceptible to all forms of disasters, including tsunami. They require significant storage space. The key outputs of the recovery of land records under the project will be digital land records and a computerized land records management system. The back-up system will be computerized, and include safe off-site storage to ensure that the loss of information can never recur.

Source: The World Bank. *Reconstruction of Aceh Land Administration Project.* Project Appraisal Document. Report No. 32716-ID. 2005.

Contingency and continuity planning is another entry point for improving the disaster resilience of development investments. Contingency and continuity planning is a process which usually involves preparing an institution or other business operation for disasters in order to minimize interruption and mitigate a disaster's physical and economic impact. The contingency and continuity planning process will obviously result in different specific outcomes and preparedness activities for a land management office

than it would for a group of rural farmers or pastoral herders (see Box 2.7) or for a microfinance institution. Nonetheless, there are a number of common features or steps involved in the process. They include:

- Understanding which hazards (considering both daily hazards and major disasters) could interrupt operations and how;
- Planning for the physical security and possible evacuation of employees, staff, etc. in the case of a business or other institution, or for the shelter and care of animals and livestock in the case of farmers or herders, or for the safe storage of boats and personal shelter in the case of fishermen;
- Considering alternative transportation methods and routes for bringing goods to market, accessing clients, etc.;
- Ensuring that documents, records, and other data (both electronic and hard copies) are backed up either physically or electronically in an off-site location (where possible, converting paper records in to electronic copies facilitates storage and back-up);
- Implementing back-up communication systems for receiving disaster warnings and updates and for communicating with employees, staff, and their families if necessary; and
- Stock-piling food, basic medicines, and other supplies necessary to maintain operations during an interruption.

Addressing Hazard Risk Reduction through Environmental Protection

Climate change and environmental degradation are increasingly recognized as contributing to the increasing frequency of natural hazards (in particular, hydrometeorological events) and the higher vulnerability of already vulnerable populations.[19] However development itself often accelerates these very processes. Burgeoning populations have higher demands for water, land, and other natural resources such as lumber. In search of higher incomes, rural communities put stress on the environment by, for example, extracting natural resources or by clearing forests or other lands for agriculture or human settlement.

Projects in areas such as natural resource management, forestry, water resource management, etc., often have to balance income growth and environmental protection. Many projects in these areas already operate with an underlying premise that development can be made optimal and sustainable by mitigating, where possible, any negative environmental impacts which might exacerbate disaster vulnerability.

For the purpose of this discussion on mainstreaming risk reduction, it is important to note that there is a whole group of projects which already have ancillary benefits in terms of natural hazard risk reduction. For example, forestry management projects which seek to improve local capacity, land use planning, and public education help to prevent deforestation which may contribute to erosion, climate change, and other processes that increase natural disaster vulnerability. Similarly, projects which promote wetland and watershed protection and restoration or improving land use planning, or those that apply other techniques or methodologies for assessing and limiting the potentially adverse effects of climate change may help to simultaneously mitigate drought and floods in many vulnerable countries without modifying their approach. On the other hand, depending on the project's objectives, there may be additional ways to enhance the hazard risk reduction aim of these types of activities by adding public education, community planning or another intervention described above.

Box 2.10 - Case Study: Community Based Ecosystem Management in Chad

The objective of the Community Based Ecosystem Management Project is to restore some of the most fragile ecosystems, by enabling local communities to better fight desertification, rehabilitate degraded lands, and protect biodiversity.

The first component - financial support for community-based ecosystem management subprojects - co-finances subprojects to support community-based ecosystem preservation, and natural resources management activities. Some of the activities likely to be eligible include, inter alia, the reforestation and rehabilitation of gallery forests, the development of grazing corridors, community co-management of protected areas, the introduction of agro-forestry techniques, *the development of local drought management plans, bushfire awareness and control programs*, and, pilots to demonstrate or disseminate more sustainable, alternative energy technologies and practices.

Source: The World Bank. *Community-based Ecosystem Management Project*. Project Appraisal Document. Report No. 32512. 2005.

Box 2.11 - Case Study : Improving Agricultural Production in Serbia Through Better Water Resource Management and Flood Control

Of the 10 million people in Serbia, some 50% live in rural areas, and 17% derive their living from agriculture and associated industries. However, agricultural production is not as efficient as it could be for a number of reasons. Water systems and infrastructure are not well-maintained and are rapidly deteriorating. Although small producers cultivate around 85% of arable land, their needs were not attended to during the Communist era. Furthermore, about 30% of the arable land, 512 larger settlements, 515 industrial installations, 4,000 km of roads, and 680 km of railways are vulnerable to flooding. Although, government flood amelioration levees and flood control reservoirs would help to alleviate some damage, major events would likely still lead to significant crop losses.

The Serbia Irrigation and Drainage Rehabilitation Project recognizes the interrelatedness of poor systems and infrastructure, land use problems, and flood vulnerability and their combined negative impact on agricultural production levels. The first component will seek to rehabilitate and improve drainage and flood control infrastructure. For example, project funds were used for repair and replacement of pumps, repairs to pumping stations and drainage structures and procurement and repair of specialist maintenance equipment. The rehabilitation work is complemented by improving or repairing flood control systems to protect agricultural land in the flood plain. This has involved repairing and restoring river embankments, for example, in sections where stone embankment toes have eroded and need to be replace. In other areas, localized dredging is needed or control structures require repair and/or remodeling.

The second component supports the development and/or rehabilitation and improvement of minor irrigation schemes for small scale producers mainly in the hilly regions of Central and Southern Serbia. The third component aims to strengthen the institutional capacity of water sector institutions and the fourth component involves monitoring and evaluation.

Source: The World Bank. *Serbia Irrigation and Drainage Rehabilitation Project.* Project Appraisal Document. 2005.

Risk Transfer through Index-Based Insurance

As the World Bank's recent paper *Managing Agricultural Production Risk*[20] points out, disasters constitute low probability, but high consequence risks for individual farmers and for the agricultural sectors of developing economies. The purpose of hazard-related insurance is to directly address the livelihood insecurity associated with natural hazards and to take advantage of global markets to transfer that risk.

Providing rural producers with an ex ante insurance product helps them avoid paying the typically high interest rates that they are often charged ex post.

Not only are markets for insurance and risk transfer mechanisms in developing countries typically weak, but neither do many ex ante insurance products exist. This places part of the burden of risk on the donor community which often helps to bail out countries, forgive debt or pay for emergency response in the wake of disasters. While the help of the international community is needed, these responses also create unsustainable dependencies.

Traditional agriculture insurance has not proved to be helpful in hazard risk transfer either. It often incurs high transaction costs in order to monitor individual yields and it also has an implicit moral hazard by encouraging farmers to destroy crops or livestock to collect payment.

Index-based agricultural insurance, though it is a relatively new area of focus, has proved to be more promising. Rather than basing indemnity payment on individual farm yields, index-based policies pay out policy holders on the basis of an index such as area or regional yields or weather data such as temperature or rainfall. This approach helps to eliminate some of the transaction costs of monitoring involved in traditional insurance products. Because they pay out to farmers regardless of their individual yields, they also incentivize affected farmers to continue producing if they can and to salvage affected crops and livestock.

Box 2.12 - Case Study: Contingent Credit for Livestock Mortality Index Insurance in Mongolia

"The economy of the Mongolian countryside is herder-based. Agriculture contributes nearly one-third of the national GDP and herding accounts for over 80 percent of agriculture. Animals provide sustenance, income, and wealth, protecting nearly half the residents of Mongolia. Shocks to the well-being of animals have devastating implications for the rural poor and for the overall Mongolian economy. Major shocks are common as Mongolia is a harsh climate and animals are herded with limited shelter. From 2000-2002, 11 million animals perished due to harsh winters (*dzuds).* The government of Mongolia has struggled with the obvious question of how to address this problem.

The Mongolian government requested specific assistance in coping with extreme livestock losses. Given the nature of highly correlated death rates for animals in Mongolia, an index-based livestock insurance (IBLI) product was proposed and in May 2005, the World Bank approved a loan to Mongolia to finance the Index-Based Livestock Insurance Project. This project will support a three-season pilot program in three states in Mongolia and includes a contingent debt facility to serve as a mechanism for protecting against extreme losses during the pilot. The major objective of the pilot program is to determine the viability of IBLI in Mongolia, including testing herders' willingness to pay for an IBLI product. The index would pay indemnities based on adult mortality rates by species and by soum (province). By law, Mongolia performs a census of animals each year. Elaborate systems are in place to assure the quality of the data. The proposed pilot involves three distinct layers of risk: 1) self-retention by the herder; 2) a base insurance product (BIP) for mortality rates in a certain range; and 3) a disaster response product (DRP) for livestock losses beyond the layer covered by the insurer.

An index-based insurance program was recommended because of significant concerns about moral hazard, adverse selection, and extreme monitoring costs associated with any individual livestock insurance program in the vast open spaces of Mongolia. Weather index insurance was considered; however, it was determined that the weather events contributing to livestock deaths were too complex to develop this alternative…."

Source: Excerpt taken from The World Bank. *Managing Agricultural Production Risk: Innovations in Developing Countries.* 2005.

The experience of the World Bank in providing index-based agricultural insurance products is well documented in the study *Managing Agricultural Production Risk*. It provides detailed case studies discussing the Bank assistance in Nicaragua, Morocco, India, Ukraine, Ethiopia, Malawi, and Peru in supporting provision of crop insurance through various activities including undertaking feasibility studies, implementing pilot projects, and supporting government-led programs, among others. In addition to crop insurance, the Bank was also involved in efforts to provide livestock mortality index insurance as the case study above illustrates.

Box 2.13 - Case Study: Weather-Indexed Crop Insurance in the Ukraine

Country context and risk profile

Rural financial institutions in Ukraine increasingly use future harvests as collateral since farm equipment is generally antiquated and of limited value. These lenders also tend to require harvest insurance to hedge against crop losses. The major banks active in agricultural lending… do not lend on the basis of uninsured collateral, so to obtain credit, a farmer must have a proper insurance policy written by a pre-approved insurer. To provide for the lending insurance needs of farmers, most banks set up their own insurance companies. Most farmers do not yet understand the particular nature of weather index insurance, but are familiar with weather risk and would like to have protection against natural, multiple perils.

Policy objectives

The government has experimented with compulsory crop insurance and is now establishing a crop insurance subsidization scheme. The regulator has approved weather index insurance as an insurance product and a few weather insurance policies were sold to farmers in the first pilot sales season of 2005.

A feasibility study by Commodity Risk Management Group presents a risk management framework and considers several options for government intervention in the sector. An investment phase would consist of the acquisition and installation of automated weather stations, including the analysis of the density of the network required for the weather exposure of Ukraine and the design of an adequate maintenance program to ensure the quality of observations across time.

In addition, the government could consider a Backstop Facility for Weather Risk Insurance Retention. Ukrainian insurance companies would need international reinsurance for insuring against systemic risks. A risk pool "facility" in Ukraine would allow for the underwriting of agricultural reinsurance based on pre-established guidelines. This pool would then reinsure itself through a government fund. Extreme or catastrophic risk would be reinsured on the international reinsurance market based on transparent and competitive premium ratemaking principles; that is, once the pool and the government fund are depleted, international reinsurers would pay the remaining claims. Through the aggregation and layering of risk, reinsurers would be interested in reinsuring risk in Ukraine and forced to price the risk competitively.

Source: Excerpts adapted from *Managing Agricultural Production Risk: Innovations in Developing Countries*. The World Bank. Agriculture and Rural Development Department. 2005.

Disaster Preparedness for Microfinance Institutions

Microfinance programs help to provide low income groups with key financial services that they are otherwise lacking. Whether providing loans to invest in income generating assets, risk insurance, or additional saving mechanisms, microfinance programs strive to be risk reducing as they can help low income groups diversify the sources of their livelihoods or, by targeting women, help families have additional wage earners. In addition to their inherent role in helping to offset disaster risk through asset accumulation and income diversification, microfinance networks have been used in post-disaster settings for disbursing disaster aid in both the form of loans and grants.

There is ongoing debate about their appropriate role. On the one hand, the existence of microfinance networks can serve as a conduit for rapidly dispersing aid to help vulnerable populations avoid declining further in to poverty. On the other hand, opponents argue that lending at concessionary rates or even

disbursing grants undermines the principle behind micro-credit that money be paid back and changes borrowers expectations about their relationship with creditors.[21] Microfinance institutions can best serve their clients in a post-disaster by weighing the pros and cons of various post-disaster assistance schemes ahead of time through a contingency planning process. Adopting a contingency plan and educating relevant staff on their roles for carrying it out helps to minimize the time for the organization to react and assist its established and new clients (if appropriate).

Box 2.14 - Case Study: Microfinance in a Post-Disaster Environment

The role of microfinance services in responding to disaster risks was first demonstrated in Bangladesh during the 1998 floods. Approximately 100,000 square kilometers was inundated for two- and one-half months, affecting 30 million people. Damages to standing crops, livestock and houses virtually suspended the rural economy. During the floods, in addition to relief work coordinated by the government and military, microfinance workers were able to help recovery by maintaining contacts with local scheme members. Workers carried money with them and provided immediate interest-free consumption loans so that the members would not go hungry. Different programs, as discussed below, provided a number of specific financial services.

The Grameen Bank set up a Disaster Mitigation Task Force at the central level. It prepared and implemented a rehabilitation program, which included new loan products and loan assistance for housing rehabilitation and agricultural production. The Bank gave fresh loans to members who had five to 10 installments remaining in the repayment schedule. The borrowers who had already paid half or more of their loans were eligible to take new loans for the amount that they repaid.

Two large NGOs with microfinance programs were also involved: The Bangladeshi Rural Advancement Committee extended loans to 240,000 families to support the repairing and rebuilding of homes. It also purchased 364 tons of rice in the open market and sold it at subsidized rates to group members.

The Proshika took up an emergency rehabilitation program worth Tk50 million, through which 100,000 affected families were provided an interest-free loan of Tk500 each. It also supported a credit program worth Tk30 million for aman, vegetables, and winter crop cultivation. In addition to these credit operations, all the programs took up a number of relief and recovery activities, independent of their credit operations. For example, they set up medical centers and distributed food, drinking water, milk and medicine. They also agreed to support a number of activities in the non-farm sector, which would help the people affected by floods to resume their economic activities.

A number of factors contributed to the effective intervention of microfinance programs in the 1998 floods. Programs with good leadership responded quickly to the situation, availed of existing disaster mitigation funds or developed alternative fundraising strategies to meet the demand for resources. The involvement of committed field staff was also very important. Close monitoring allowed for the collection of information on the damage to assets and income of clients and loss of program income as a result of potential drops in savings and repayment. On the basis of this information, programs projected capital requirements for loans during the rehabilitation period.

Source: As quoted in United Nations Development Programme. *Reducing Risk a Challenge for Development.* 2004.

At the very least, microfinance institutions themselves are often hit by disasters and should be prepared. For example, building or retrofitting offices to disaster-resistant standards and ensuring that all records are

adequately backed up at off-site locations helps to ensure continuity of operations (see Contingency Planning Section). The World Bank's *Surviving Disasters and Supporting Recovery: A Guidebook for Microfinance Institutions* includes detailed advice about preparing the institution, clients, and providing disaster response and recovery services.[22]

Chapter 3.

Moving the Mainstreaming Agenda Forward

Donor operations in rural development involve projects in many sectors including agriculture, fisheries, forestry, natural resource management, land management, land administration, rural transport, water resource management (including irrigation and drainage or rural sanitation and water supply), commodity risk management, etc. Other projects, such as livelihood support or community-based rural development projects can involve components of several sectors. The case studies throughout this paper have shown the myriad of ways how hazard risk reduction can be mainstreamed into individual projects in a number of these sectors depending on an individual project's objectives and local conditions. While the success of future mainstreaming efforts will continue to depend on local conditions, and relevant hazards and vulnerabilities, there is a need for consolidating the lessons learned and best practices for the various sectors.

In some sectors, this process is already taking place. For example, as discussed in the sections above, a number of experiences in assisting countries in implementing index-based insurance schemes to reduce agricultural and livestock hazard risk has helped in identifying salient issues for moving forward in this area. Similarly, the field of micro-credit has been impacted by a number of different disasters which has raised debate about the appropriate role of micro-credit in disaster relief as well as the appropriate approaches for preparing micro-credit institutions themselves, as discussed earlier.

These areas are by no means the only ones where improved sectoral techniques may eventually lead to good practice guidelines. In fact, good practice work is already going on in many sectors as demonstrated by many case studies. Where no sectoral guidelines currently exist, it is hoped that this paper may serve platform from which to begin more formalized discussion and analysis of distilling best practice solutions in the various sectors.

For example, enhancing the disaster resistance of agriculture at both the country level and the community level will likely involve a multi-sectoral approach. It will require addressing the vulnerabilities associated with the two major disasters that affect it—flood and drought. And it may involve additional research in to resilient seed strains, looking for ways to enhance capacity in country-wide as well as local level crop and animal contingency planning, etc.

Likewise, enhancing the disaster resistance of the fisheries will likely involve a myriad of interventions to mitigate the impacts of storms, storm surges, hurricanes, and other hydrometeorological events. Interventions might seek to mitigate the impacts of disasters to related infrastructure and equipment, improve early warning systems, research techniques for protecting marine life from environmental changes brought on by disasters (saline inundation in to fresh water habitats, etc.), develop approaches for improving contingency planning at an industry or local level, etc.

Developing more technical guidelines is an important step for furthering the mainstreaming agenda to improve the disaster resistance and capacity of rural communities and economies. It is a process that must engage the technical experts in looking for the practical steps to link the development process with risk management. Advancing this agenda will hopefully ensure that, in the best case, Bank operations take advantage of new opportunities for reducing risk and at the very least, do not help to drive risk.

Resources

World Bank Hazard Risk Management Website
www.worldbank.org/hazards

United Nations International Strategy for Disaster Reduction
http://www.unisdr.org/

InterAmerican Development Bank Disaster Risk Management
http://www.iadb.org/SDS/ENV/site_2493_e.htm

Asian Disaster Preparedness Center
http://www.adpc.net/

Relief Web (United Nations)
http://www.reliefweb.int/rw/dbc.nsf/doc100?OpenForm

Food and Agricultural Organization of the United Nations (FAO) Emergency Operations and Rehabilitation Division
http://www.fao.org/reliefoperations/index_en.asp

ProVention Consortium
www.proventionconsortium.org/

United Nations Development Programme, Bureau for Crisis Prevention and Recovery, Disaster Reduction Unit
http://www.undp.org/bcpr/disred/index.htm

Rural Finance Learning Center: Risk Management
http://www.ruralfinance.org/servlet/CDSServlet?status=ND0xODU3JjY9ZW4mMzM9KiYzNz1rb3M~

Regional Center for Disaster Information (Latin America and the Caribbean)
http://www.crid.or.cr/crid/esp/index.html

Endnotes

[1] The World Bank. "Natural Disasters: Counting the Cost." Press release March 2, 2004.
--. "Pakistan: World Bank Supports Earthquake Recovery with US$470 million." Press release Oct 25, 2005.
--. "Tsunami Provides Opportunity to Rethink Disaster Management." Jan 17, 2005.
[2] The World Bank. Hazard Risk Management Unit.
http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTURBANDEVELOPMENT/EXTDISMGMT/0,,menuPK:341021~pagePK:149018~piPK:149093~theSitePK:341015,00.html
[3] The World Bank. Natural Disasters: Counting the Cost. Press release March 2, 2004.
[4] "Floods and drought boost global disasters in 2005." Reuters. Jan 30, 2006.
[5] The World Bank. "Natural Disasters: Counting the Cost." Press release March 2, 2004.
[6] Ibid.
[7] The World Bank. *Reaching the Rural Poor: A Renewed Strategy for Rural Development.* 2003.
[8] Dilley, Max, et al. *Natural Disaster Hotspots: A Global Risk Analysis.* The World Bank. Apr 2005.
[9] The World Bank. *Drought: Management and Mitigation Assessment For Central Asia and the Caucasus.* Report No: 31998-ECA. March 11, 2005
[10] United Nations Office of the Coordination for Humanitarian Affairs. *Disaster Reduction and the Human Cost of Disaster.* IRIN Web Special. June 2005.
[11] Adapted from James Lee Witt Associates. *Review of Emergency Preparedness of Areas Adjacent to Indian Point and Millstone.* Prepared for the Power Authority of the State of New York. 2003.
[12] Dilley, Max, et al. *Natural Disaster Hotspots: A Global Risk Analysis.* The World Bank. Apr 2005.
[13] Pusch, Christoph. *Preventable Losses: Saving Lives and Property through Hazard Risk Management – A Comprehensive Risk Management Framework for Europe and Central Asia.* The World Bank. 2003.
[14] United Nations Development Program. *Disaster Profiles of the Least Developed Countries.* Third United Nations Conference on Least Developed Countries. Brussels, 10-14 May 2001.
[15] United Nations Development Programme. *Reducing Risk: A Challenge for Development.* 2004.
[16] For discussion of various approaches to community-level risk assessment, see pp. 65-83, "Indicators and Other Instruments for Disaster Risk Management At the Local Level," in Bollin, Cristina et al. *Disaster Risk Management By Communities and Local Government.* Inter-American Development Bank. Dec 2003.
[17] The World Bank. *Project Appraisal Document The Natural Hazard Mitigation Project for Honduras.* Report No: 20386-HO.
[18] The World Bank. Project Appraisal Document Dam Safety Project. 1999. Report No: 19362 AM.
[19] See F. Sperling and F. Szekely. *Disaster Risk Management in a Changing Climate. Discussion Paper prepared for the World Conference on Disaster Reduction on behalf of the Vulnerability and Adaptation Resource Group (VARG)*. Reprint with Addendum on Conference outcomes. Washington, D.C. 2005.
[20] *Managing Agricultural Production Risk: Innovations in Developing Countries.* The World Bank. Agriculture and Rural Development Department. 2005.
[21] See *The Economist*, "Starting Over; Microcredit and Disasters," 17 Dec 2005 for further discussion on the pros and cons of using micro-credit as disaster relief.
[22] For more information see Miamidian, Arnold, et al. *Surviving Disasters and Supporting Recovery: A Guidebook for Microfinance Institutions.* Disaster Risk Management Working Paper Series No. 10. The World Bank. Feb 2005.

THE WORLD BANK

Hazard Risk Management Team

1818 H Street, N.W.
Washington, D.C. 20433 USA

World Wide Web: http://www.worldbank.org/hazards