

Issues and Question for Decision Making for Extreme Events Workshop Managing Catastrophic Risk

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This paper raises a set of issues and questions associated with catastrophic risk management which reflect the interests of a group of us working in this area. A more detailed discussion of some of these issues appears in the paper “Mitigation and Financial Management for Natural Hazards” posted earlier on the Extreme Events Decision Making Conference website:
<http://www.albany.edu/cpr/xedm/>

MITIGATION STRATEGIES FOR REDUCING DISASTER RISK

In developing innovative mitigation strategies one needs to consider ways for encouraging and/or requiring individual households, businesses and governments to adopt cost-effective loss reduction measures. If individuals do not invest in these mitigation measures voluntarily, it may be necessary to institute requirements through either the private sector and/or governmental regulations/standards. There is considerable research that has been undertaken in recent years that suggest that the following issues should be considered in designing mitigation strategies for reducing disaster risk:

- **Understanding Individual Decision Processes:** Residents and businesses located in hazard-prone areas frequently misperceive the risks that they face by underestimating the chances of the disaster and not thinking about the resulting consequences. They are often reluctant to adopt mitigation measures voluntarily for several reasons. Individuals may have relatively short time horizons over which they want to recoup their investment in a loss reduction measure. Even if the expected life of the house is 25 or 30 years, the person may only look at the potential benefits from the mitigation measure over the next 3 to 5 years. The need for a quick return is also consistent with having a high discount rate regarding future payoffs. In addition, some individuals and business owners may perceive the probability of a disaster causing damage to their property as being sufficiently low that the investment in the protective measure will not be justified.

If people have budget constraints, then they will be reluctant to incur the upfront costs associated with protective measures. They feel they cannot afford these measures. Individuals may also have little interest in investing in protective measures if they believe that they will only be financially responsible for a small portion of their losses should a disaster occur either because of limited assets (e.g. declaring bankruptcy) or anticipation of liberal disaster relief.

The above problems are particularly acute in emerging economies where a large segment of the population in hazard-prone areas are poor and hence do not have the resources to invest in protective measures. Moreover, many are marginalized from society and forced to live on the most vulnerable land.

- **Combining Private Sector Initiatives with Public Sector Programs:** By understanding individual decision processes we are in a better position to develop innovative strategies for implementing successful mitigation programs. One possible strategy is to provide market-based incentives, such as premium reductions on insurance for well-designed homes, and combine this with well-enforced building codes. There also needs to be a recognition that anticipation of liberal disaster assistance acts as a disincentive for adoption of mitigation activity. The reality often is that homes and businesses suffering damage and losses from a disaster do not get the type disaster assistance that they may have anticipated before the event. Given their current institutional arrangements and existing rules and regulations, what types of private-public sector programs can be developed for specific countries? How will these programs differ across countries? What similarities and differences exist between developed countries and emerging economies in this regard? What specific mitigation programs should be considered for dealing with the poor?
- **Undertaking Benefit-Cost Analysis:** In order to prioritize loss reduction measures it is necessary to understand the relevant expected costs and benefits associated with a specific proposal (e.g. retrofitting a set of structures to be more resistant to earthquakes) There is the upfront costs associated with investing in a specific measure that has to be balanced against the expected discounted benefits over the life of the structures affected by the loss reduction measure. There are both direct benefits from a mitigation measure (e.g. reduction in property damage) as well as indirect benefits (e.g. reduction in business interruption losses). One of the key issues is how easy it is to quantify these benefits and costs in the context of a specific country? What are the uncertainties surrounding these estimates? Can one undertake sensitivity analyses when one is uncertain with respect to specific costs and benefits to determine how robust the mitigation measure is with respect to these estimates? What role does the engineering infrastructure play in assessing and carrying out loss reduction measures?

ROLE OF INSURANCE/REINSURANCE AND THE CAPITAL MARKETS IN MANAGING CATASTROPHIC RISKS

In recent years new risk transfer instruments have emerged involving the capital markets to complement traditional insurance and reinsurance. They provide hedges to corporations concerned with potential insolvency or shortages of surplus should a major natural disaster occur. They also offer local as well as national governments financial protection after catastrophic events if they have difficulty raising funds through taxation or external borrowing. The potential for utilizing some of these new risk transfer instruments in conjunction with traditional forms of insurance and reinsurance raise the following set of issues:

- **Risk Assessment Process:** The capital market can provide financial protection against large-scale natural disasters only if the risks involved can be properly quantified. Catastrophe modeling is therefore a critical element of any solution involving the capital markets. These models integrate risk assessments from leading scientific and engineering experts to project the potential damage to a community or region from

disasters of different magnitudes. One of the challenges is accurately modeling the risks and vulnerabilities of communities or regions subject to natural disasters. What are the uncertainties associated with these risk assessments? How will various mitigation and retrofitting programs affect these risks? What future work needs to be undertaken to more accurately estimate these risks? What are the special challenges in undertaking risk assessments in emerging economies using these catastrophe models? What is the role of the World Bank and other multilateral and bilateral organizations in promoting sound risk assessment in emerging economies?

- **Relationship Between Insurers and Reinsurers:** Both the insurer and reinsurer traditionally have viewed reinsurance as a long-term relationship with elements of trust between the two parties. Can one view this relationship today in the same manner? For example, if reinsurers suffer large losses following a major disaster are they still willing to provide insurers with protection in the future? What is likely to happen to the price of future reinsurance after a catastrophic event?
- **Attractiveness of New Financial Instruments:** Today there is not a large investor appetite for new financial instruments and a significant risk premium appears to be needed to attract investors. Is this high-risk premium likely to last as investors become more familiar with these new financial instruments? What aspects of the bonds themselves and the risk quantification process underlying them are more attractive or less attractive to institutional investors? Can one establish long-term guarantees with new financial instruments after the contractual period is reached? For example, if a party requiring risk-bearing capital (e.g., a national or local government, a national pool, an insurer) issues an indexed cat bond for 15 months, how certain is the party as to what returns they will have to guarantee in issuing a similar cat bond covering risks beyond the initial period?
- **Providing Financial Protection in Emerging Economies:** In many emerging economies there are relatively undeveloped insurance markets so that few homes and businesses have financial protection against natural disasters. What are some of the challenges emerging economies face in providing risk transfer instruments (e.g. insurance, catastrophe bonds) so that potential victims can reduce their losses should a major disaster occur? What are the prices of these new financial instruments likely to be? How will they compare with other protective measures such as reinsurance? Are there some creative ways one can combine reinsurance with capital market instruments to provide protection to governments in emerging economies against large-scale losses? What distribution channels should be used to get financial assistance from these instruments to individuals and communities affected by natural disasters? What are the challenges for the international financing institutions (IFIs) in developing programs and new products to allow the introduction of capital market instruments in emerging economies?
- **Impact of Mitigation Measures on Risk Transfer Instruments:** What role are mitigation measures likely to play in the pricing and available coverage of risk transfer instruments? Mitigation is likely to reduce the variance in future losses, but we need to

know what the impacts of mitigation are likely to be for disasters of different intensities and magnitudes so that we can better understand their impact on pricing and available coverage.

MARKETS, REGULATION AND PUBLIC-PRIVATE PARTNERSHIPS

In the past few years there has been a call for combining market mechanisms from the private sector (e.g. financial incentives, risk transfer instruments) with governmental regulations and standards (e.g. well enforced building codes, land use regulation) to reduce future losses from natural disasters and provide financial protection. These so-called public-private partnerships raise the following sets of issues for discussion at this workshop:

- **Linking Market-Based Incentives with Financial Requirements:** One way to encourage residents and businesses to invest in loss reduction measures is to provide monetary incentives such as premium reductions on risk-transfer mechanisms or low interest loans. Since individuals are unlikely to adopt loss-reduction measures voluntarily, can private sector institutions such as banks play a role by requiring cost-effective mitigation measures and insurance as a condition for a mortgages or business loans?
- **Challenges for Using Private and Public Sector Mechanisms in Emerging Economies:** In many emerging economies there is not a well developed banking and insurance system. Financial institutions may not issue mortgages so that it will be difficult to encourage the adoption of loss-reduction measures through requirements such as those listed above. Are there ways that one can develop special incentive systems through the public sector (e.g. subsidized loans for mitigation, possibly coupled with compulsory catastrophe insurance as a precondition for government assistance) for encouraging residents and businesses to adopt these measures? What is the role of the IFIs in initiating and supporting appropriate mechanisms for effective private/public partnerships?
- **Role of Well-Enforced Building Codes:** Building codes exist in most countries, but are not always enforced. Well-enforced building codes are particularly desirable when property owners would otherwise **not** adopt cost-effective loss reduction measures because they underestimate either the benefits from the measure and/or the probability of a disaster occurring. An additional rationale for building codes is the negative externalities in the form of economic dislocations and other social costs when a building collapses. What are the challenges in developing and enforcing building codes in both developed countries and emerging economies? In what ways can building codes be part of a public-private partnership for reducing future disaster losses?
- **Regulations Related to Infrastructure:** The disruption of lifelines, such as water, electricity and transportation, can have an enormous impact on the recovery process following a disaster, particularly in poor countries. When homes are without water and electricity it may be necessary to relocate victims far from their residences for long periods of time. Business interruption due to the lack of these services can be very costly

to the economy of the country. The social fabric of the affected area can be adversely affected if there is a lengthy delay in the restoration of the infrastructure. For these and other reasons it may be necessary to impose specific regulations and codes in the design of lifelines such as water and electricity supply as well as the construction of roads and bridges. The challenge facing the emerging economies is how to finance these mitigation measures.

REDUCING THE VULNERABILITY OF THE POOR

Low-income families are often forced to live in hazard-prone areas and hence are more vulnerable to natural disasters than other residents. Some of the factors contributing to their vulnerability are lack of access to resources, limited knowledge and awareness of the hazard as well as ways to reduce their future losses. The following issues might be considered when designing innovations for reducing the vulnerability of the poor:

- **Ways the Poor Cope with their Future:** There are three broad ways that individuals and families can be prepared for coping with their future. They can accumulate assets through **investments** in human capital (e.g. household members available for work), productive assets (e.g. land, farming equipment) and collective assets (e.g. irrigation systems). They also can have **claims** (e.g. food, labor, financial assistance) on other households, landlords, community based organizations and the national government. Finally they can have **stocks** in the form of food, stores of value (e.g. jewelry) and money. The challenge is to develop ways that these three sources of assistance can be utilized for coping with the consequences of disasters so that the poor do not suffer irreversible negative effects.
- **Dealing with the High Correlation Problem:** Catastrophic events, such as a major flood or earthquake, create severe damage in a specific region. Highly correlated losses limit ways that the affected region can deal with the problem. For example, after a flood or drought many households seek credit at the same time. Hence, it will be difficult to supply everyone's needs if risk pooling is confined to the affected region. A natural question to ask is whether one can expand risk-sharing arrangements so that they cut across regions?
- **Providing Better Information:** In order to develop strategies for coping with disasters it is necessary to provide those residing in hazard-prone areas with information on the risks they face and indicate ways that they can reduce future losses. There are challenges that emerging economies face in how this information can be given to individuals in ways that they can use. In a world with 1.2 billion people living on less than \$1 a day, the first question to ask is whether the poor can be expected to take steps voluntarily to reduce the risk of natural disaster when they are facing more imminent risks such as lack of employment and basic consumption needs? Are there ways to provide the poor with information on the hazard and mitigation strategies so they are empowered to take some steps to make their homes and businesses safer? What role can the public sector play in making individuals more aware of the hazards they face?

- **Risk-Reducing and Risk-Coping Strategies:** There are a number of ways that the private and public sectors can assist the poor in dealing with potential damage from natural disasters. Government institutions can provide funds for helping low income families move to safer locations and/or build hazard-resistant houses. Do microcredit institutions, such as the Grameen Bank in Bangladesh, have the potential to provide insurance protection and funds for mitigation and recovery after a disaster at the individual and community level? What role can informal mechanisms, such group-based insurance systems, play in spreading the risk over a large enough area to avoid the high correlation problem? How can social protection mechanisms, such as social investment funds and safety nets help in managing disaster risk?.

SELECTED REFERENCES

Freeman, Paul (2000) "Public Sector Management for Natural Disaster Losses" A Paper Presented to the World Bank/Government of Mexico Workshop on Insurance Instruments for Natural Disasters, Mexico City, Mexico

Gilbert, Roy and Kreimer, Alcira (1999) "Learning from the World Bank's Experience of Natural Disaster Related Assistance" Washington, DC: World Bank Disaster Management Facility.

Inter-American Development Bank (2000). Facing the Challenge of Natural Disasters in Latin America and the Caribbean: an IDB Action Plan. Washington, DC.

Kreimer, Alcira et al. (1999) "Managing Disaster Risk in Mexico: Market Incentives for Mitigation Investment", Washington, DC: World Bank Disaster Management Facility.

Kleindorfer, Paul and Kunreuther, Howard. (1999). "Challenges Facing the Insurance Industry in Managing Catastrophic Risks." in Kenneth Froot (ed.) *The Financing of Property/Casualty Risks*, Chicago, University of Chicago Press.

Kunreuther, Howard and Roth, Richard, Sr. eds. (1998). *Paying the Price: The Status and Role of Insurance Against Natural Disasters in the United States*, Washington, D.C., Joseph Henry Press.

Morduch, J. (1999). "Between the Market and the State: Can Informal Insurance Patch the Safety Net?" *The World Bank Observer*. 14: 187-207.

Pitt, Mark (2000). "Relevance of Microfinance for Disaster Mitigation" Paper presented at the UNDP-World Bank sponsored colloquium on Microfinance: Disaster Risk Reduction for the Poor, February 2, 2000. The World Bank, Washington, DC.

Siegel, Paul B. (2000). "Protecting the Poor: Disaster Risk and Microfinance." Presentation at the World Bank Urban Forum, April 5, 2000. Westfields, Chantilly, VA.