INNOVATIONS IN MANAGING CATASTROPHIC RISKS: HOW CAN THEY HELP THE POOR?

A Conference

Sponsored by the ProVention Consortium

Co-organized by the Wharton School (University of Pennsylvania),

The Financial Sector Development Department (World Bank),
&
The Disaster Management Facility (World Bank)

World Bank, "F" Building
2121 Pennsylvania Ave., NW
Washington, DC
January 8-10, 2001

CONTENTS

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INNOVATIONS IN MANAGING CATASTROPHIC RISKS: HOW CAN THEY HELP THE POOR?

Introduction

The timeliness of these discussions could not have been have been more tragically underlined than by the events that immediately followed. In the space of two weeks, major earthquakes struck El Salvador and the state of Gujarat in India, devastating communities, most of them poor, that were living on marginal lands or in poorly constructed buildings unable to withstand the effects of these disasters.

In one of the most provocative sessions of this conference, *"Reducing the Vulnerability of the Poor"* Gabriel Meli, a Salvadorean and Mihir Bhatt, from Ahmedabad in Gujarat, forcefully addressed the theme of this event. Both speakers called for all those present to concentrate their efforts on solutions that specifically addressed the poor -- those disproportionately affected by natural disasters.

Background

Reducing disaster vulnerability in developing countries may very well be the most critical challenge facing development in the new millennium. Rapid population growth, urbanization, environmental degradation, and global climate change are all contributing to an increase in the frequency and magnitude of disasters. And their most deadly impact is on the lives and living environment of the poor. Natural catastrophes and man-made disasters claimed more than 105,000 lives across the globe in 1999, and resulted in total losses of around US$100 billion. It is widely recognized that developing countries bear the majority of these costs, accounting for more than 95 per cent of the deaths and two-thirds of the economic losses.

Over recent years, the international community has come to realize that relief and development are not separate topics; disaster vulnerability has everything to do with poverty and development, and vice versa. Measures taken to reduce the impact of disasters provide an effective vehicle to make substantial advances in the fight against poverty. The ProVention Consortium, a global coalition of governments, international organizations, academic institutions, private sector and civil society organizations, was formed to reduce disaster risk in developing countries, and make disaster prevention and mitigation an integral part of development efforts. ProVention partners that include the World Bank and the Wharton School, are actively exploring ways to empower developing countries to more effectively manage disaster risk.

There are three key areas involved in developing an effective disaster risk management strategy: (i) *identifying* the hazards and risks one is facing; (ii) *reducing* those risks that can be reduced by, for example, either avoiding the hazard or building structures that can withstand hazard impacts; and finally (iii) *transferring* the risks that cannot be eliminated or reduced through risk sharing mechanisms or risk financing mechanisms such as insurance. These three components are inter-related and mutually reinforcing. For

example, the use of formal insurance mechanisms can provide incentives for investments in risk reducing measures and the enforcement of building codes.

Through technical assistance and lending, development institutions such as the World Bank are assisting developing countries to strengthen their capacity to manage disaster risk with tools that cover the three key areas mentioned. These tools include hazard mapping, better land use planning, redressing environmental degradation, protection of watersheds and roads, enforcement of building codes, preparation of emergency response plans and more effective management of disaster risk and potential losses. In the area of risk transfer, the World Bank is promoting the use of natural disaster insurance in its member countries, and in addition is beginning to explore innovative mechanisms for managing risk such as capital market instruments, guarantees, weather indexing, commodity risk insurance, and microfinance instruments for disaster risk.

The private sector has a lot to contribute to efforts aimed at reducing disaster risk, and recent developments provide the ingredients for rethinking the way both developed countries and emerging economies should deal with natural hazard risks. These developments include:

?? An emergence of new capital market instruments, such as catastrophe bonds, for providing protection against catastrophic losses from these risks. Although the volume of business to date in these instruments is relatively small, they offer promise for protection in the future, both in the developed countries as well as emerging economies.

?? New advances in information technology (IT) and risk assessment offer an opportunity to estimate more accurately the chances and potential losses of future disasters. The development of faster and more powerful computers and improved data on hazards, properties and people at risk enable one to examine extremely complex phenomena in ways that were impossible even five years ago. Catastrophe models with accompanying user-friendly software have been developed and marketed by private sector firms. These developments have important implications for managing risks. For example, insurers and reinsurers can more accurately estimate the premiums for providing protection against these risks and develop strategies for managing their portfolios so as to avoid sufficiently large losses that cause an unacceptable loss of surplus. Similarly it is now feasible to set the terms of new capital market instruments based on the estimates from the catastrophe models.

?? Mitigation measures promise to reduce losses from natural disasters and catastrophic accidents. In particular, there are many benefits that have traditionally not been considered as part of the standard benefit-cost analysis in evaluating the cost effectiveness of various mitigation measures. These benefits may make mitigation extremely attractive to all of the concerned parties.

Audience

The conference brought together leading academics, development practitioners, private sector leaders, and public policy experts to examine issues surrounding the management of catastrophic risk in emerging economies.

Conference Objectives

The overall goal of this conference was to explore instruments for disaster risk transfer and their relevance for protecting the poor from disaster impacts. Presentations examined the role that risk transfer mechanisms can play in promoting awareness and investment in disaster mitigation measures, and their potential effectiveness in protecting the poor from disaster impacts. Presenters discussed both traditional and non-traditional mechanisms for transferring or financing risk, as they explored the questions: How can these instruments help developing country governments to reduce disaster risk? How can they directly help the poor to manage risk?

Participants discussed how new developments in the field of disaster risk management have changed the way we think about natural disasters in both developed and developing countries. Specific sessions examined the role that technology and modeling are playing in quantifying the risks associated with natural hazards and the role of new financial instruments in providing protection against catastrophic losses from a future hurricane, earthquake or other natural hazard. Finally the event considered the role that mitigation and loss prevention can play as part of a hazard management strategy and how these approaches could reduce the magnitude of future disaster losses.

The events in El Salvador and Gujarat serve to remind us that the objectives of this event also represent an imperative to the international community. Those that were in the audience, those helping to deepen and advance understanding of these issues, now face the enormous challenge of transforming this collective knowledge and the innovations discussed, into practical and effective programs capable of reducing the impact of natural disasters on the poor.

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Innovations In Managing Catastrophic Risks: How Can They Help The Poor?

Proceedings of the conference jointly organized by the Wharton School at the University of Pennsylvania & The World Bank

Tuesday January 9, 2001

Session 1: Mitigation Strategies for Reducing Disaster Risk: Illustrative Case Studies

Moderator: Frannie Léautier *Director, Infrastructure Group, The World Bank*

Panelists:

- **Howard Kunreuther,** *Cecilia Yen Koo Professor of Decision Sciences and Public Policy, University of Pennsylvania*
- **Polat Gulkan,** *Professor, Middle Eastern Technical University, Turkey*
- **Charlotte Benson,** *Researcher, Overseas Development Institute, London*.
- **Norio Okada,** *Professor of Integrated Management for Disaster Risk & Disaster Prevention, Kyoto University*

Rapporteur:

- **Leslie Martin**, *IIASA*

Frannie Léautier briefly introduced the speakers to the audience. She then framed some of the key issues addressed by presenters:

- With regard to private sector companies, why are they reluctant to adopt mitigation strategies?
- What are the incentives necessary to develop cost effective mitigation strategies?
- What similarities and differences exist between developed countries and emerging economies in this regard?
- What specific natural disaster mitigation programs should be considered for assisting the poor with losses?
- How easy is it to quantify these benefits and costs in the context of a specific country?
- What uncertainties surround these estimates?
- Can sensitivity analyses be undertaken when uncertainty remains as to the specific costs and benefits that are implied?
- What role does the engineering industry play in assessing and carrying out loss reduction measures?

<u>Presentation 1</u> "Mitigation and Financial Risk Management for Natural Hazards" -- **Howard Kunreuther,** *Cecilia Yen Koo Professor of Decision Sciences and Public Policy, University of Pennsylvania***.**

In the presenter's view a successful risk management strategy to reduce losses and provide financial protection, needed to include specific policy tools including well-enforced building codes, indemnity contracts (e.g. excess loss reinsurance), and indexed catastrophe bonds.

Implementation of an effective disaster risk management strategy requires significant understanding of three key variables:

1. The extent of vulnerability of the city or region
2. The motivation behind the decision processes of interested parties
3. The robustness of existing disaster management provisions -- and specifically the roles played by public and private organizations in that strategy.

Analysis of these dimensions provided a means to estimate a prudent insurer's (termed a "Down to Earth" insurer by the presenter) estimated profits or losses whilst operating with and without indemnity contracts/catastrophe bonds and with or without well-enforced building codes enforced on residential properties.

Taking the notional example of the City of Oakland, California, and an imaginary "Down to Earth" (DTE) Reinsurance Company, Dr. Kunreuther explained the structure of a typical indexed cat. bond making the following assumptions:

- A bond with one year term and a single coupon payment;
- The coupon is guaranteed regardless of when the disaster happens;
- Time value of money is negligible;
- The Catastrophe Bond is designed to protect insurer from losses that occur less than 3% of the time. The Catastrophe Bond is indexed to the magnitude of the disaster with earthquake magnitude measured by moment magnitude, and by the Saffir-Simpson Scale in case of a hurricane.

Applying the structure of the bond to Oakland, Dr. Kunreuther presented "Exceedance Probability" (EP) curves. For a given loss event, an EP curve defines an associated probability of exceeding that loss on an annual basis. In the Oakland example that means (a) EP curves with mitigation and reinsurance: one with and one without a cat. bond; (b) EP curves without mitigation and reinsurance: one with and one without a cat. bond.

The analysis illustrated several findings:

- Well-enforced building codes reduce the probability of insolvency of the DTE Company to below 2% whether or not reinsurance or cat. bonds are in place.
- Building codes reduce worst case losses and hence reduce the price and required coverage from cat. bonds.
- The insurer's profitability is decreased when building codes are well enforced because the DTE Company is assumed to have a full book of business.

- If the DTE Company is constrained by insolvency probability, then mitigation is likely to lead to expanded coverage and higher profits.

Dr. Kunreuther emphasized that cat. bonds can significantly reduce worst case losses. However, cat. bonds reduce only marginally the probability of insolvency but can significantly reduce the profitability of the DTE company. As a result Catastrophe Bonds may not be attractive to the DTE company at current prices.

Future research should explore the ability of Catastrophe Bonds to cover multiple risks, their suitability for weather risk transfer and mitigation, and as risk transfer instruments for hazards in emerging economies.

Presentation 2 "Rebuilding The Sea Of Marmara Region - Recent Structural Revisions In Turkey To Mitigate Disasters" -- Polat Gulkan, *Professor, Disaster Management Research Center, Middle Eastern Technical University, Istanbul*.

In 1999, Turkey was hit by two major earthquakes in the Sea of Marmara region in the northwest part of the country. For the first time in its history, the Republic of Turkey was compelled to take concrete steps to institutionalize disaster mitigation policies. The Government of Turkey took radical measures to break the "vicious circle" of rushing to international lenders in the wake of disasters, but doing little to prevent their recurrence. Examples of measures taken included:

- Creation of a compulsory earthquake insurance
- Building construction supervision to ensure that nominal quality standards are abided by in the building construction continuum in Turkey
- Regulation for implementing construction supervision
- Revision of laws regulating engineering and architecture practice
- Establishment of general conditions for mandatory financial liability insurance for supervising construction firms etc.

Dr. Gulkan questioned whether these important measures alone, would be sufficient to help reduce the impact of natural disasters in Turkey. One important omission in this newly crafted system appears to be that no incentives have yet been established to encourage mitigation measures. A good example of this lack is that there are presently no incentives in place to encourage homeowners to upgrade their buildings. Although this kind of mitigation would enhance the resilience of their homes, insurers neither reinforce this behavior by reducing premiums nor extend the coverage that these individuals receive.

In Dr. Gulkan's view the most challenging issue for the recently created "Natural Disasters Insurance Council" (DASK) is to successfully transfer of its risk to international capital markets and re-insurers. DASK manages the Turkish Catastrophe Insurance Pool - a fund created through contributions made by homeowners under the mandatory insurance scheme. The ability of this scheme to indemnify policyholders following a disaster would depend on the Council's ability to spread its portfolio of risk throughout international markets.

Presentation 3 **"Dominica - Challenges And Opportunities For Hazard Risk Reduction" -- Charlotte Benson,** *Researcher, Overseas Development Institute, London*.

Dominica, located in the Eastern Caribbean, is a small lower-middle income island state with a population of 76,000 inhabitants -- a third of who live in poverty. The country is vulnerable to a wide range of natural hazards, particularly tropical storms and volcanic eruptions.

Ms. Benson briefly outlined the numerous conditions that present obstacles to disaster risk reduction:

- Serious limitations in scientific knowledge. Resources for research are scarce and therefore knowledge is incomplete and information not objective.
- The dynamic nature of hazard vulnerability is another challenging condition for the country. It depends on shifts in the structure and composition of economic activity, different levels and nature of capital formation, as well as on longer-term direction of development. This implies the need for a constant re-quantification of risk.
- Limited public resources and a weak ability of banking/credit and insurance sectors to spread or transfer risk.

This notwithstanding Ms. Benson noted significant opportunities to reduce risk in Dominica.

- Existing financial risk transfer mechanisms could be strengthened and insurance could be used to promote mitigation.
- Disaster management should be identified as a priority in government planning whereby hazard risk reduction would emerge as a central consideration in economic and financial planning.

Presentation 4 **"Innovating Loss Estimation Methods For Disaster Mitigative Urban Diagnosis"** -- **Norio Okada**, *Professor of Integrated Management for Disaster Risk & Disaster Prevention, Kyoto University*.

The presentation focused on the lessons learned from the 1995 Hanshin-Awaji earthquake. Dr. Okada introduced a conceptual model to manage disaster risk. In his view there are five modes of management tasks to be conducted over time in order to manage disaster risk:

1. **"If now what"** diagnosis identifies the status quo of the city in terms of vulnerability against disaster risk. ("***if*** a disaster were to occur now, what effects would it have?")
2. **"By when, how plan"** is a management plan for mitigating disaster risks ("by ***when*** should we have a plan in place to mitigate disaster risk?")
3. **"If then how operation"** -- Preparing a manual of real-time operations to be conducted to minimize damage in the event of a disaster. ("***if*** a disaster takes place, then ***how*** are we expected to exercise operations?")
4. Contingent operations to prepare a package of distinct operations on possible disasters (On what factors are our operations contingent")

5. Operational priorities ("***now*** that a disaster has actually occurred what are our priorities").

Dr. Okada highlighted the importance of being aware of some of the obstacles to the effectiveness and accuracy of current disaster loss estimation methods:

- Excessive simplicity and lack of precision in estimation;
- Lack of available earthquake disaster scenarios on which to base loss estimations -- both in terms of number and variety.

To cope with these bottlenecks Dr. Okada proposed to open the estimation methods to the public and to make use of multiple scenarios.

Regarding these problems Dr. Okada mentioned that current loss estimation methods in use in Japan are not always mutually comparable or compatible. Each of them has been developed independently and the definition of what is meant by "damage" or "loss" is not always clear.

With this in mind, Kyoto University is currently undertaking an empirical study to tailor major representative estimation methods in common usage in Japan and to make these methods compatible. Furthermore, the methods will be re-examined, refined and improved to make them used more commonly. In an attempt to make the results widely available, Dr. Okada was considering publishing them on the web as an "open source" program.

Session 2: The Role of Insurance, Reinsurance and the Capital Markets in Managing Catastrophic Risks

Moderator: Rodney Lester, World Bank

Speakers:
- **Neil Doherty**, *Wharton School, University of Pennsylvania*
- **David Durbin**, *Swiss Re*
- **Yuichi Takeda**, *Tokio Marine*
- **Paul Freeman**, *IIASA*

Rapporteur: Steve Levy, *Project Manager Catastrophic Risk Project, Wharton School University of Pennsylvania*

This panel consisted of two academics and two practitioners. The academics presenting somewhat differing views of the nature of the problem facing the Bank and it's clients when managing catastrophic risks and the practitioners focusing on the practicalities involved.

Presentation 1: Neil Doherty, *Professor of Risk Management and Insurance at the Wharton School, University of Pennsylvania*

The first speaker presented a conceptual framework and typology of the differing nature of risk facing a development bank and it's client countries. This framework, and its implications, was devised in collaboration with Caroline L. Clarke of the Inter-American Development Bank. Dr. Doherty then described the characteristics of the World Bank's risk exposure, the Bank's current risk management practice, and what he sees as risk management opportunities for the Bank.

While any bank may face risk exposure to default or re-negotiation following a catastrophe, a development bank, due to it's role as an intermediary between development countries and the credit market, also faces more subtle and peculiar risks. Dr. Doherty and Ms. Clarke have formulated a new concept to describe these peculiar risks, the first being "Mission Risk". Mission Risk is generally defined as " the impact of prospective and actual catastrophes on the ability of the Bank to carry out its normal function."

Two general categories of Mission Risk were also described. "Intermediation Risk" was defined as "exposure to or realization of a catastrophic risk that causes the Bank's cost of capital to be raised or its lending capacity to be reduced". "Diversion Risk" was said to occur when "the occurrence of a catastrophe causes a diversion of the Bank-supported activities in the client nation from development to reconstruction". Diversion risk is both mission risk to the Bank and an uninsured loss to the borrowing nation.

Very large events, or accumulations of simultaneous events, can cause significant deterioration in the Bank's financial condition and its delivery of services. This risk profile lends itself to a conventional multi-tier risk management program, with lower levels being self insured and higher levels being ceded to some external counter-party with hedge, contingent debt, contingent equity, or similar transaction.

However, not all losses can easily hedged. For example, while the cost of replacing a physical asset funded through bank debt can be easily measured, and thereby lends itself to hedging, the cost of something like the deferral of a financial sector reform following a catastrophe is not at all easy to measure. In addition, the size of such a cost depends in part directly on strategic and operational choices made by the Bank. Consequently, should an attempt be made to hedge such losses, there would be a definite moral hazard problem.

This lack of objectivity in loss measurement has important implications for designing a risk management strategy. Types of information not usually gathered must be assembled to assess mission disruption, and this may be problematic. For example, while it should be straightforward to document the transaction, re-programming, and opportunity costs to the Bank using records from previous catastrophes, measuring welfare costs to the Bank and its clients from the diversion of mission, or the redirection from development to reconstruction, will not be so easy.

Thus, due to measurement issues alone, mission risk will be hard to hedge. As a result, it is not surprising to find that the current "risk management strategy" of the Bank is to act implicitly as a "self insurer" of both default and mission risk.

To compound this unfavorable situation, the Bank's lack of formal structure to monitor and measure this risk exposure makes the pricing of such risks very difficult. This in turn restricts its access to both traditional, and new, loss financing instruments.

There are some bright spots in the Bank's situation and current practices however that may point the way to opportunities. For example, recently the Bank has shown an interest in funding disaster loss mitigation projects. In addition, the Bank has begun to play a limited role in facilitating the supply of private risk management services.

One recent example of this is the Bank initiative to evaluate and design a disaster insurance pool for Caribbean countries. Another is the brokering of access to private financial expertise to support the Mexican Earthquake Fund. Thus there may be opportunities for the Bank and its affiliated agencies to invest in, or provide guarantees for, private insurance operations.

After taking stock of the situation, Dr. Doherty outlined what he sees to be three risk management opportunities for the Bank.

1) The Bank might become explicitly a "captive insurer" of it's own risk. This formalization of the Bank's self-insurance role will of necessity create a demand for the measurement and pricing of this risk. Such accurate measurement would also help the Bank to achieve a more efficient allocation of its resources. The risk characteristics identified above suggest that the Bank should aim to secure continuity in its basic mission. This would mean that the Bank's lending capacity, cost of capital, and ability to deliver consulting would all need to be hedged from catastrophic risk. To do this Ms. Clarke and Dr. Doherty recommend the use of parameterized hedge products and strongly argued against the use of contingent debt instruments.

2) The Bank might become much more active as a facilitator in the provision of private risk management services. Natural extensions of the Bank's existing operations could help promote local insurance institutions through consulting in risk evaluation and mitigation, or the development of local capital and credit markets by providing guarantees and helping to design local insurance regulations. In addition, since the success of local insurance markets depends largely on access to reinsurance and other sources of risk capital, the Bank is in a unique position to facilitate this access. It can do so by designing vertically integrated catastrophe risk facilities like the Caribbean Insurance Pool, facilitating broker access to the reinsurance and capital markets, providing risk capital directly, or finally, broker indexed cat. reinsurance or cat. bonds on behalf of client nations.

3) Finally, the Bank might act directly as an insurer of client risk. The role of the Bank in underwriting client risk is not new. Implicitly, it already underwrites some risk associated with default and/or re-negotiation of debt. By explicitly underwriting risk, exposures could be monitored, priced, and if necessary reinsured in secondary

markets. The Bank naturally generates much of the information for properly insuring risks in its feasibility evaluations for project lending, and the moral hazard problem is lessened by the Bank's close monitoring of project operations and its role in designing and financing loss reduction activities.

There are some problems to be faced however. Because the Bank cannot use risk-adjusted lending rates, there are perverse incentives for client nations to exercise loss control and mitigation. This moral hazard from cross-subsidized pricing could be held in check by the Bank's role in project design, monitoring and supervision. In addition, because a Bank-underwritten insurance fund could be a vehicle for aggressive rent seeking by client stakeholders, any potential insurance initiative by the Bank should not seek monopoly access but should be supplemented by the encouragement of private markets. This is because rent seeking becomes transparent with competition.

The Bank will also need to guard against "crowding out" risk capital for the private insurance suppliers. Finally, exposure of the Bank's capital to catastrophic risk will raise the cost that capital. Just how much will depend on the risk characteristics of the insurance portfolio, the equity funding of the insurance operation, and on the Bank's ability to hedge excessive risk in the reinsurance and capital markets.

Presentation 2: Dr. David Durbin, *Head of Economic Research and Consulting at Swiss Re*

Dr. Durbin spoke about catastrophe event magnitude and effects from a reinsurer's perspective. His talk comprised three sections, a description of the magnitudes of catastrophic events and their economic impacts, a description of the reinsurance marketplace, and a discussion of recent innovations in risk placement.

In the first section, a series of detailed and well-presented tables clearly made the point that for events with a 200-500 year return period, there was great disparity between the economic loss and the insured loss. This pattern held true even in such economically developed places as California. For example, the Northridge earthquake damage was only about one third insured. Ratios of insured loss to economic loss developing nations are of course much, much lower.

The second section outlined trends in the reinsurance industry over the past ten years. Since 1994 the Lloyd's share of the market has fallen dramatically, and the Bermuda share has grown substantially. In addition the market itself has become very concentrated. The top ten firms now have 47% of the worldwide market, and the top four 30%.

Finally, the third section showed how fears of inadequate reinsurance capacity, and occasional wild fluctuations in catastrophe reinsurance prices, have spawned a new market in insurance securitization.

There are two major advantages in securitization. First, the capital markets have an amount of capital that simply overwhelms that of the insurance industry. Second, the

participation of capital market investors can more efficiently spread catastrophe exposure over a wider capital base. Investors like the low covariance of these instruments with other asset classes and thus are willing to participate despite their comparative novelty. The result of these innovations was made clear in another series of tables that showed that reinsurance prices have come down 45% since 1994 (although they are now increasing again). Dr. Durbin explained that the cyclical nature of reinsurance prices has been forcing continuous product innovation over this period.

Presentation 3: Yuichi Takeda, *Head of the integrated solutions group of Tokio Marine Insurance Company*

Mr. Takeda began his talk by outlining how Tokio Marine's very heavy risk concentration in Japan required it to actively seek out non-Japanese risks to diversify it's portfolio. This diversification strategy relies, in part, on parametrically triggered catastrophe bonds.

Mr. Takeda outlined how employing such instruments successfully presents many challenges. First and foremost, it requires accurate and detailed risk analysis. Second, mitigation measures must be vigorously pursued. Finally, continuous monitoring of the performance of individual instruments is essential. However, catastrophe bonds offer several advantages over traditional reinsurance. These advantages are pricing stability, longer-term contracts, better transparency of risk analysis, and lower price.

Finally, Tokio Marine also employs, where appropriate, a completely different approach to diversifying its very heavy Japanese risk exposure. This method couples the traditional insurance concept of risk pooling with rigorous and transparent risk definition and analysis. The results are "zero-cost" swap transactions with holders of risk outside Japan. Not surprisingly this method presents its own challenges.

First and foremost, both parties must not only be comfortable in the quantification of the risks to be swapped, but they must be willing to trade their risks in the place. This approach to risk management does however point to a possible future role for the Bank in helping their clients manage their risk. The Bank might act as a financial catalyst promoting the intermediate pooling of natural catastrophe risk between countries.

Presentation 4: Paul Freeman, *Senior Researcher at the International Institute for Applied Systems Analysis*

Mr. Freeman's presentation was directed toward examining the basic question "why would a government be interested in hedging its risk in the first place?"
In Mr. Freeman's view, a government has three different kinds of risk exposures. They are:

- Risk derived from its own investment decisions, i.e. infrastructure risk.
- Risk it assumes from others due to market failure.
- Risk to the poor who have a claim on government assets in time of tragedy.

Each of these different "risk origins" critically determines which risk management tools and resources are appropriate to employ. Governments in this regard have essentially three options:

?? They can utilize "internal resources" such as tax revenue, budget reallocation, and domestic borrowing.
?? They can utilize "external resources" such as foreign borrowing, aid or grants.
?? They can utilize "hedge instruments" which by definition will cost more than the expected risk.

Since hedges "cost more", why would a government be interested? Freeman asserts that the feasibility and/or cost of the other alternatives may make hedges the more attractive option in some cases. The suitability of the other options depends on the economic characteristics of the specific country.

For example, if the size of the loss is large compared to tax revenue, this type of "internal resource" becomes just too costly to consider. By contrast, a government assuming risk in solving a market failure can quickly become a very tricky situation because of equity problems between recipients. Such equity problems may lead to complications that the government would prefer to avoid.

Thus, in conclusion, the decision whether to hedge of not to hedge is often driven by much more than a simple cost-benefit analysis of the different strategies. The role the government wishes to take in assuming risk and its decision-making processes are equally important.

Rodney Lester moderated the question and answer session that followed these presentations.

The questions posed, addressed:
?? The measurement of mission risk.
?? The ways that laws and regulations in developing nations may interfere with the efficient handling of risk.
?? How might governments be prodded to act to manage risk before a disaster?
?? How cheap reinsurance and low consumption might be explained.
?? As the scientific characterization of risk becomes more and more reliable might we not expect reinsurance firms simply flee from all the risky places? What might be done to prevent this from occurring?
?? How will disaster reduction become a more powerful driver of risk management? The extrapolation of current trends in disaster loss yields the result that by 2065 the economic losses to disasters could equal gross global product. Obviously, disaster reduction must become much more prevalent than it now is.

All members of the panel and the moderator offered the following responses.

?? Mission risk might be measured via a "post-mortem" after disasters such as Hurricane Mitch. Such a study would be aimed at gathering information on the cost of re-programming post disaster.

?? Laws and regulations are often problematic to the efficient handling of risk. Foremost among these problems is the widespread problem of clear title. In many developing nations clear title to property is often entirely lacking for a substantial portion of the population. Obviously, lack of clear title is a very serious problem for any insurance scheme. The Bank is very interested in finding solutions to this problem.

?? The voluntary decision of governments to take steps to manage risk *before* disasters is very unlikely in the absence of compelling economic research.

?? The picture that cheap reinsurance and low consumption is a real situation is spurious, and an artifact of how both are measured. Driving these measurement biases is the fact that the product mix has changed dramatically over the period in question.

?? The notion that with better risk characterization the reinsurance industry might flee all risky places is potentially a real problem. Unfortunately, the International Association of Insurance Supervisors has chosen to not address this issue when devising their core principles. This potential problem will only become more real over time and bears close watching.

?? There is currently a very apparent inefficiency of incentives for disaster mitigation. However, as the activities of modeling companies assume a greater role in driving insurance pricing, there is reason to be optimistic that the efficiency of incentives will increase.

Parallel Session 3A: Markets for Catastrophic Protection and the Role of Government Intervention

Moderator: **Jean Michel Attlan**, *Sr. Insurance Officer, International Finance Corporation*

Speakers:

- **Paul Kleindorfer,** *Universal Furniture Professor of Decision Sciences and Economics, Wharton School, University of Pennsylvania*
- **Mike Mwemba,** *Deputy Registrar of Insurance, Pension and Insurance Authority of Zambia*
- **Sean Mooney,** *Chief Economist, Guy Carpenter and Co., Inc.*

Rapporteur: Leslie Martin, *IIASA*

Presentation 1: Paul Kleindorfer, *Universal Furniture Professor of Decision Sciences and Economics, Wharton School, University of Pennsylvania.*

Dr. Kleindorfer's presentation identified the opportunities and barriers in establishing new insurance markets in emerging economies. Dr. Kleindorfer attributed low insurance penetration in emerging economies to:

- Low credibility, in part due to little history of insurance or social acceptance or value of insurance, poor claims payment record, and no effective legal recourse
- "Uninsurability" at affordable prices, due to agency costs, high reinsurer/broker/capital market rents, and difficulty in reducing moral hazard
- Distorting government subsidies.

In order to establish trust in the insurance system, insurers should develop first those markets that are easiest to insure and then reach the others. It should start, for example, with business structures and then proceed to business operations, new infrastructure, completed infrastructure, and finally homeowner infrastructure.

According to Dr. Kleindorfer, the critical determinant for successfully establishing new insurance markets is science and engineering in risk quantification. It is in the area of risk quantification that Dr. Kleindorfer sees a possible role for the World Bank.

Presentation 2: Mike Mwemba, *Deputy Registrar of Insurance, Pension and Insurance Authority of Zambia.*

Mr. Mwemba's presentation discussed the impact of catastrophes in Africa. Mwemba emphasized the importance of identifying and evaluating risk not just of natural disasters but of societal and man-made disasters as well. Examples of these other disasters include plagues, war, "brain-drain", and debt crises.

Mr. Mwemba proposed three goals in risk management:
- Eradicating the cause of the risk
- Controlling its occurrence
- Alleviating the resulting suffering.

His strategy to accomplish these goals includes promoting good governance, civil education, and regional cooperation.

Presentation 3: Sean Mooney, *Chief Economist, Guy Carpenter and Co., Inc.*

Mr. Mooney's presentation focused on catastrophe protection plans. First of all, he pointed out that these plans could usually only be developed in the momentum that develops in the immediate aftermath of a crisis.

Whereas insurance markets are appropriate for hedging against certain types of risk, Mr. Mooney identified that government programs are necessary for "non-insurable" risk. This risk could represent, for example, loss due to floods or expenses related to the provision

of temporary shelter. The boundary of what constitutes non-insurable risk is not fixed but has been moving over time.

Mr. Mooney underlined the importance of catastrophe protection plans with examples in which pre-funding led to economic booms -- due to the stimulus of reconstruction. Reliance on post-funding could lead to recessions from which economies might take years to recover.

In the second part of his presentation, Mr. Mooney contrasted different catastrophe protection plans. He described the structure of those plans: primary insurance or reinsurance, government or private and the features of plans: retention/deductibles, co-insurance, second event issues, triggers, and caps/pro-rata.

He discussed the issues of single-peril versus multi-peril coverage, and the role of mitigation incentives. Mr. Mooney identified the principal challenges of low insurance penetration and the need for enforceable building codes. He concluded by emphasizing that the structure and features of any plan must be customized to the region and market it covers.

Discussion

1. **Question**: Aren't building codes a "micro-management" solution? A "quick fix?" What about land use and urban planning?

   Response: Land use planning works best during times of significant rural to urban migration. Indeed, the best time for decisions is before action occurs.

2. **Question**: Shouldn't the government make insurance compulsory because of the low perception of risk on the part of individuals?

   Response: One role of the government is to increase the perception of risk.

3. **Question**: Should one include catastrophe risk in newly emerging insurance markets?

   Response: With weak actuarial tradition and highly correlated risk, catastrophes could kill the existing trust in private insurance. Government pools therefore seem most appropriate for hedging catastrophe risk in the first stages of insurance penetration.

   Follow-up question: Then why do government pools exist in places like the US that have sophisticated market systems?

   Response: In the case of Florida, high losses surprised the insurance industry and led to a call on resources provided for political reasons.

   Response: Note that the insurance companies would have otherwise dropped their cat. coverage: the government was forcing insurers to provide subsidies from non-cat. coverage to cat. coverage.

Parallel Session 3B: Public-Private Partnerships

Moderator: **Kristalina Georgieva**, *Director, Environment Department, The World Bank*

Speakers:
- **Hiroyuki Kameda**, *Disaster Prevention Research Institute (DPRI), Kyoto University*
- **Steve Bender**, *Principal Specialist, Organization of American States*
- **Fred Krimgold**, *Co-Director, World Institute for Disaster Risk*
- **Jelena Pantelic**, *Sr. Management Planning Specialist, World Bank*

Rapporteur:
- **Koko Warner**, *Natural Catastrophes and Developing Countries Project, IIASA*

Poverty and Catastrophes

Session 3B focused on ways in which public and private actors can coordinate efforts to reduce the impacts of disasters on the poor. Examples of coordination efforts among research institutes, between insurance and public organizations, among a global network of research institutions, and with NGOs, exemplify ways in which public and private entities can work together to reduce the vulnerability of the poor to natural catastrophes.

Presentation 1: "Multi-Disciplinary Integration In Disaster Mitigation Studies", Hiroyuki Kameda, *Disaster Prevention Research Institute, Kyoto University.*

Dr. Kameda's remarks on interdisciplinary disaster mitigation research identified the critical elements of effective disaster management. First, he noted that disasters are not only a physical but also a social phenomenon, so that understanding the disaster within its societal context becomes key to disaster management.

Second, both pre- and post-event disaster management efforts are required, and information management is also crucial. Third, social management is an important component of disaster management. This complex set of elements requires a multi-disciplinary approach.

The Disaster Preparedness Research Institute (DPRI) of Kyoto University provides an example of this disaster management approach. Stemming from the DPRI, the Earthquake Disaster Mitigation research institute (EDM) also takes a multidisciplinary approach to reduce earthquake loss vulnerability in Japan.

EDM's researchers are divided into societal, physical, and information teams, made up of international participants. The risk management approach focuses on identifying and addressing risks, with constant consultation and review by parties involved in risk management. The result is a continuous cycle of vulnerability reduction. The cycles of

risk management involve establishing the context of vulnerability, identifying and evaluating risks, treating the risk, and monitoring the results by consulting with stakeholders. The next approach focused on stakeholders as well, bridging the gap between insurance providers and low-income groups.

Presentation 2: "Risk transfer and finance experience in the Caribbean", Steve Bender, *Principal Specialist, Organization of American States*

Against the background of heavy losses from hurricanes in the late 1980s, Mr. Bender explained the risk transfer and finance experience in the Caribbean. Following the catastrophes, rates for property insurance rose above levels affordable to property owners.

International research efforts started exploring ways which governments and the private sector could maintain adequate catastrophe insurance coverage in the region while meeting the needs of low-income groups. Mr. Bender identified three types of public-private partnerships that encourage disaster mitigation: well-enforced building codes, provision by banks of long-term loans for mitigation, and lower deductibles and premiums offered by insurance for those who invest in mitigation.

Insurance practices require transformation to meet needs of the poor

Insurance underwriting, pricing, and marketing, need to be transformed to meet lower income family needs. Insurance can be a tool to manage risk, but it often addresses risks of lesser importance to the poor. Instead of financial or economic risk, the poor are disproportionately affected by physical risk when buildings sustain damage from catastrophes.

Poor-quality buildings may result when underwriters do not know much about hazards or structure vulnerability (front-loaded incentives). Building codes and code enforcement should be linked to underwriting. Stricter enforcement of building codes is one way to bridge the gap between the vulnerability of the poor and the ability of insurance to manage risk.

Lending institutions should require insurance on infrastructure built with loan proceeds. Mechanisms must be introduced to systematically link underwriting to quality control of construction. An example of this type of program is a pilot experience in Barbados, Antigua, and Barbuda that worked with private sector to manage risk. Insurance companies offered premium discounts if they saw signs of mitigation/risk-reduction activities underway. Training was also undertaken, with an emphasis on mitigation activities as prerequisites for insurance premium discounts.

Reducing risk in the informal housing sector was based on increasing appropriate and long-term housing policy. A “hurricane resistant home improvement program” offered technical booklets to homeowners to teach them how to improve the disaster-resistance of their homes. In addition, property insurance was introduced in non-traditional markets, and property insurance was more closely linked with construction quality control. The

Caribbean experience highlights the ability of public-private partnerships to achieve more effective disaster management for the poor.

Presentation 3: "Public-Private Partnerships For Global Risk Management Projects: Activities Of The World Institute For Disaster Risk Management", Fred Krimgold, *Co-Director, World Institute for Disaster Risk Management.*

Mr. Krimgold presented two examples of programs from the recently created World Institute for Disaster Risk Management (DRM). DRM is a global network of research institutions that create capacity to assume large-scale global projects of risk management. Two examples illustrate public-private partnerships that help reduce the vulnerability of the poor to disasters.

The Micro-zonation in the Marmara Region (Turkey) is a 2-year, $1.3m project undertaken with many collaborating institutions. The major components of the project include the development of a GIS-based micro-zonation methodology and a study of the feasibility of implementation, in light of the regulatory, economic, and social framework. The bulk of construction under this project is private, and a need exists to find a venue for increased public and private interaction in private building activities.

A second example of a public-private partnership is an incremental seismic rehabilitation project. This project identifies minimum performance standards in developing regions and helps identify where mitigation begins, and whether it is possible to lower the threshold for initiating mitigation activities.

Presentation 4: "Multi-Lateral Partnerships In Hazard Reduction", Jelena Pantelic, *Senior Management Planning Specialist, DMF, World Bank*

Using a case study of Bangladesh, Ms. Pantelic illustrated ways in which new private-public partnerships work to reduce risk to natural disasters for the poor. Like many developing countries, a close link exists between poverty and disaster vulnerability.

Recurring disasters claim thousands of lives, damage social infrastructure and negatively affect the national economy by diverting economic resources from development efforts to disaster rehabilitation efforts. Recognizing these links, Ms. Pantelic led a team to investigate the how public-private partnerships could address catastrophe impacts in Bangladesh.

Public-private partnerships

Public private partnerships have achieved disaster loss reduction in many developed countries. Effective, strong institutions create an enabling environment for the private sector to appropriately and efficiently meet both business objectives and disaster reduction measures. Economic incentives allow private involvement to provide services that fill a gap in disaster risk management.

Developing countries have begun to experiment with public private partnerships but still face underdeveloped institutions with low capacity and insufficient resources. This is

especially true in a case where priorities such as public health or education, infrastructure, and long-term disaster mitigation compete for priority attention. The private sector is also constrained by weak formal sectors, inadequate access to formal insurance and capital markets. These factors limit risk transfer among the poor. To function properly in emerging economies incomplete financial markets need support from NGOs, international institutions, and the financial sector.

In Bangladesh, efforts are underway to strengthen public-private partnerships. The insurance sector provides services through microfinance institutions. Insurance is not directly targeted to disaster losses but is indirectly related to family and community loss in recurring events (for examples coverage for tools/machinery on which small business owners depend). In spite of these weaknesses, private initiatives such as microfinance have thrived in Bangladesh and successfully targeted poor groups. Micro-insurance services are also offered.

Through NGOs, which provided the impetus for these types of programs, micro-finance and microinsurance reach up to 8 million poor, an estimated 80% of whom are rural women. Organizations such as the Grameen Bank focus on credit. NGOs offer financial and non-credit services and programs such as the Bangladesh Rural Advancement Committee emphasize community and human resource development.

Many weaknesses in these approaches remain and hinder effective disaster relief to the poorest. Some of these include: legal and regulatory weakness, the long-term nature of catastrophe impacts on the poor, and concerns about the international donor community about sustainability and wise use of available funds.

Incentives for loss reduction through PPP

Public-private partnerships can provide incentives for loss reduction. The Bank's Disaster Management Facility (DMF) has promoted several initiatives to facilitate loss reduction among the poor. These include a forthcoming study promoting market-based incentives for disaster vulnerability reduction, and a series of workshops investigating mechanisms that lead communities to become more resilient, particularly in infrastructure.

The next steps for public-private partnerships in Bangladesh include strengthening the regulatory framework to include the poor in decision-making about disaster risk management, linking insurance to microfinance activities, and establishing permanent disaster reduction efforts. According to Ms. Pantelic, disasters serve as "entry points" for development. Public-private partnerships are tools that can help build comprehensive development frameworks that fully integrate measures to address the disaster vulnerability of the poor.

Discussion

Following the speakers, a discussion opened with a series of questions that revolved around how these partnerships reached the poorest of the poor. Ms. Pantelic responded that reaching the poorest of the poor remains a problem for several reasons. It remains difficult for insurance mechanisms to deal with problem of the poor. Similarly, new pressure on NGOs sponsored by international resources to become self-sufficient leads

NGOs to seek constituents who are easier to reach, who recover better, who are more robust. This approach excludes the poor in remote areas, those who work in informal sectors, and those without sufficient assets to participate in formal credit schemes.

Mr. Krimgold noted that Swiss Re is interested in developing insurance links to microfinance institutions, attaching elements of risk management and information through microfinance. Although indirect, helping the poor also helps the poorest of the poor, increasing an economy's capacity to pull them up and offer employment. Mr. Bender added that, in addition to insurance and other mechanisms of disaster risk management, public-private partnerships need to assess the structure of vulnerability and the underlying objectives of development.

Within the context of reaching the poorest of the poor, a question arose about efforts to reduce disaster vulnerability in Africa. Ms. Pantelic responded that in spite of high vulnerability and exposure, Africa received less attention, perhaps due to lower population densities. Bill Anderson acknowledged that Bank is aware of this deficit in Africa and the DMF is extending the work to this region. Mr. Bender added that vulnerability reducing measures can be tied to broader development policy for the region.

Finally, the discussion turned to the members of public-private partnerships and the roles they play in reducing the vulnerability of the poor to catastrophes. In response to a question about the role of academia in these partnerships, Messrs. Bender and Krimgold stressed the importance of such participation. ProVention involves academic research in efforts to reduce vulnerability.

Academia plays an integral role in programs discussed by Dr. Kameda and Mr. Krimgold. Walter Hays noted that to create "champions for the cause," partnerships needed sustained support over a long period of time if they were to achieve reductions in vulnerability. To develop these champions, it is necessary for donors and host institutions in developing countries to commit to providing intellectual and financial support to the initiatives. Dr. Kameda added that for true efficacy, partnerships must leave their comfort zones and commit to long-term success of the partnerships.

Conclusions

Disasters affect almost all aspects of the lives of their victims, often the poorest of the poor. Sustainable public-private partnerships can help to reduce vulnerability but must overcome some challenges. First, the multisectoral nature of disaster response requires interdisciplinary research, and cooperation between insurance and the public sector, formal and informal economies, NGOs and international organizations. Second, ways must be found to link formal risk management such as insurance to the types of vulnerabilities that most affect the poor, such as disaster-resistant infrastructure.

Third, international organizations can help create projects to foster public-private partnerships by drawing on the expertise of disaster risk management institutes. Fourth, public-private partnerships in developing countries require stronger institutions and links between formal insurance and microfinance activities, as well as long-term disaster reduction efforts. Public-private partnerships show much promise in bringing the disaster

research community together to effectively address the risk management needs of the poorest of the poor.

Wednesday, January 10, 2001

Session 4: Reducing The Vulnerability Of The Poor

Moderator: Margaret Grosh, *Lead Economist***,** *Poverty and Social Protection, The World Bank*

Speakers:
- **Gabriel Siri**, *International development expert, El Salvador*
- **Mihir Bhatt**, *Honorary Director, Disaster Mitigation Institute, India*

Rapporteur:
- **Dr. Koko Warner**, *Natural Catastrophes and Developing Countries Project, IIASA*

Poverty and Catastrophes

In the two weeks following session four, Central America and India were both rocked by severe earthquakes that claimed the lives of thousands and devastated already poor areas. The events added urgency to the Bank's concerns over the interrelation of poverty, vulnerability, and disasters.

Session four highlighted, then resolved, a subtle tension in the workshop discussions. The first day of the gathering focused on the ability of market mechanisms (such as insurance and bonds) to address catastrophe loss in developing countries -- yet the poor were mentioned infrequently. Broad themes of catastrophe finance seemed to overlook the acute post-disaster needs and longer-term recovery implications for the poor.

Session four revealed a divergence in focus between traditional risk management tools and the specific needs of the poor following catastrophes. In contrast to the preceding day, the session outlined non-traditional mechanisms designed to address the specific needs of the poor and set the tone for the remainder of the conference: to find an appropriate balance between market and non-market mechanisms in addressing catastrophe loss and vulnerability of the poor.

Presentation 1: "Targeting Assistance And Social Investment Funds", Gabriel Siri, International Development Consultant, El Salvador.

Following catastrophes, a need arises for rapid disbursement of resources to provide assistance and reconstruction. Social investment funds can contribute to these objectives at a local level, with the needs of the most vulnerable—the poor—in mind. Mr. Gabriel Siri began by outlining the poverty-specific impacts of natural catastrophes in developing countries and some of the difficulties in addressing vulnerability among the poor to disasters. He then introduced the potential role of Social Investment Funds for disaster management and targeted poverty relief. Social Investment Funds (SIFs) have the

potential to deliver disaster assistance to the poor and play a part in at least two important areas: pre-disaster mitigation efforts, and post-disaster rehabilitation and reconstruction.

Post-disaster response

Social funds have a number of core characteristics that make them well suited for responding to disasters. They specialize in small construction works, are able to mobilize and disburse resources and expand operations rapidly, maintain direct contact with poor communities, operate in a decentralized manner, and work closely with civil society organizations and local governments. SIFs also face limitations, and to date function best at providing post-disaster assistance.

A few examples of SIFs and post-disaster risk management illustrate their ability to address the needs of the poor. In the aftermath of Hurricane Mitch in Honduras and Nicaragua, social investment funds responded rapidly to the emergency and adjusted their project portfolios to meet the needs of the rural and urban poor facing disaster losses. The projects focused on rehabilitation and reconstruction of social infrastructure, as well as livelihood protection.

Pre-disaster mitigation

SIFs facilitate pre-disaster efforts to help poor mitigate risk of catastrophe loss. The funds can contribute to damage prevention activities and financial schemes aimed at risk mitigation. To the extent that SIFs create permanent employment, generate social services for the poor, or widen community-based civic action, vulnerability of the poor is reduced. Microfinance operations allow the poor to diversify income and reduce loss risk.

Effective intervention

Effective intervention requires that SIFs be able to target the poor most affected by the catastrophe and to coordinate response efforts. Social investment funds can facilitate targeted assistance to the poor when disasters occur and allow the international donor community and local governments to use limited disaster relief resources in ways that will help the most vulnerable victims of the catastrophe: the poor.

Presentation 2: "Vulnerability, Innovations, and The Poor: The Demand Side." -- Mihir Bhatt, *Disaster Mitigation Institute, India*

The supply side of disaster management (such as insurance) is well investigated. Supply exists where risk management markets function well. Yet such traditional schemes can be difficult for the poor to access. This does not imply that the poor do not demand risk-spreading tools, but that the poor require innovations to be made to available risk management tools.

The DMI in India is undertaking efforts to better understand the vulnerability and demand issues of the poor, and is designing tools to address disaster loss and poverty. Research shows that the poor face multiple vulnerabilities and have multiple demands for risk transfer mechanisms.

Vulnerabilities

Mr. Bhatt described the types of vulnerability faced by the poor when disasters strike. Catastrophes exacerbate already difficult situations where livelihood, access to food, safe water, and shelter are tenuous. In emergency situations, the poor may be cut off from vital infrastructure-related services as well as facing unemployment.

Of the vulnerabilities mentioned by Mr. Bhatt, livelihood was the greatest concern of the poor. Cyclone victims preferred the opportunity to work rather than receiving food donations. Mr. Bhatt noted that protected livelihoods reduce a number of vulnerabilities for the poor when catastrophes occur. However, most governments and NGOs have not sufficiently addressed the vulnerabilities of the poor, particularly livelihood protection.

Demands

Mr. Bhatt identified three demands of the poor: relief that protects livelihood, safety that covers vulnerability and poverty, and effective relief that articulates the voice and demands of the poor. These demands revolved around local, micro-oriented risk management options that could offer: practical usability, reliability, accessibility, sustainability, timeliness, etc. These criteria are used in a relief-rating matrix, discussed below.

Examples of innovations: Livelihood relief

A review of the Disaster Mitigation Institute's Relief Fund (1998) illustrates the types of innovations underway to address the vulnerabilities and demands of the poor for disaster risk management.

Following a cyclone in Orissa, a small contribution from the fund supported the livelihoods of artisans in Dastakar. Timeliness and direct access of livelihood support was vital to the poor. Other innovative projects used a "relief rating matrix" to gauge the degree to which programs helped the poor in reducing vulnerability.

These ratings help articulate the demand for disaster risk management among the poor, and provide an important feedback tool for public and private sector efforts in disaster relief. In addition, efforts to better understand the demands and vulnerabilities of the poor, foster innovations in market mechanisms such as insurance to better meet the risk management needs of this group. Local communities and governments are employing these innovations to provide micro-insurance mechanisms to reach the poorest groups, build institutional capacity, and form capital necessary for disaster management targeted towards the poor.

Mr. Bhatt concluded by stating that the supply of risk management tools is relatively limited in scope and "visibly located," with innovations in insurance and other mechanisms well recorded. Although concern about the impacts of natural catastrophes on the poor is rising, understanding of demand of risk management tools by the poor remains "scattered and erratic." Mr. Bhatt cited a central role for the ProVention Consortium in serving as a center of information for innovations in risk management for the poor, starting with a consolidation of knowledge about the vulnerability and demands of the poor for practical, reliable, sustainable, and timely risk management tools.

Discussion

The questions and discussion focused on technical aspects of the programs discussed by Messrs. Siri and Bhatt, and then moved to the central theme of the session. First, questions centered on the source of technical expertise used in distributing SIF resources following a disaster and how that expertise integrates with local needs. Both Mr. Siri and Mr. Bhatt responded, emphasizing the use of new tools (SIFs and other innovations such as livelihood protection) to reach the local needs of the poor following catastrophes. Mr. Bhatt also made several suggestions for the special role of the ProVention Consortium as a source of expertise and a clearing-house of risk management information. His ideas included:

1. Ongoing, decentralized but connected collection of innovations related to vulnerability reduction and risk management for the poor (web site for risk reduction innovations, joint annual ProVention Publication on top 50 innovations in risk reduction, biennial regional conferences)
2. Grant cycle to research and publish data and details about local innovations in risk management for the poor
3. Venture funds to support innovations in disaster risk management for the poor (would support programs such as social security scheme, livelihood relief fund, relief rating service)

After discussing these technical aspects, both speakers underscored the need to promote livelihood support opportunities for the poor, and ensure the sustainable provision of infrastructure and services after catastrophes to the most vulnerable groups.

Conclusions

Attention then turned to some of the underlying questions about the use of market and non-market or semi-market risk management tools to help the poor following catastrophes. Rodney Lester summarized the key issue well. He stated that markets should be used where possible, and where non-market mechanisms are employed, effort should be directed to promote effective targeting of the most needy groups.

Session four successfully dispersed any perceived dichotomy between the focus of traditional and newer mechanisms of risk management; the central message of the session became finding the appropriate balance between the two. Paul Freeman pointed out that traditional approaches could indirectly help the poor manage disaster risk by promoting development, and insuring business, which provides employment stability.

Tools such as social investment funds and livelihood relief programs can directly help the poor deal with disaster risk. The mechanisms can complement each other, especially as the vulnerabilities and demands of the poor for risk management are better understood.

Recommendations

Many current disaster preparedness and response efforts are not targeted toward the most vulnerable groups, and formal insurance arrangements are beyond the reach of the very poor. The budgets of the poor have demands that are more pressing than insurance -- where costs are up-front and payoffs are far off. When the media coverage subsides, the

poor in Central America and India will begin to piece their lives together again. Post-disaster assistance is insufficiently targeted toward the recovery of those most affected by the catastrophe; assistance to the poor is often limited to emergency relief and not to offsetting their losses and rebuilding their livelihoods through employment- and income-generating projects.

Three recommendations emerged from session four. First, policy and research efforts should focus on understanding and addressing vulnerability and disaster risk for the poor. Second, policy should focus on effectively targeting the poor in catastrophe relief efforts. Finally, policy should employ market and non-market mechanisms to address different parts of disaster risk management to reduce the vulnerability of developing countries, and especially the poor to disaster risk.

Session 5: New Instruments for Managing Catastrophic Risk

Moderator: Howard Kunreuther, *Cecilia Yen Koo Professor of Decision Sciences and Public Policy, University of Pennsylvania*

Speakers:
- **Panayotis Varangis,** *Senior Economist, The World Bank*
- **Ross McIntyre,** *Portfolio Manager, ENRON*
- **Ashoka Mody,** *Lead Financial Specialist, The World Bank*
- **John Pollner*, Senior Financial Specialist, the World Bank***

Rapporteur:
- **Vijay Kalavakonda**, *Financial Analyst, The World Bank*

Introduction

Over the last decade, 1991-2001, the losses due to natural disaster, human, physical and economic have been more profound than any time in the recent history. Natural disasters have had a disproportionate impact on developing countries and/or emerging markets than developed nations.

Some of the primary reasons attributed to such huge losses are: lack of mitigation strategies reflected in the form of poor town planning, poor building construction, the incidence of larger populations living in or near disaster-prone areas such as river banks, and lack of risk management and/or risk transfer alternatives.

Presentation 1: Panayotis Varangis, *Senior Economist, The World Bank*

In this session the focus was on evolving new instruments and/or strategies for funding losses due to natural disasters. In almost all developing countries the primary funding source of disaster losses is the government, who in turn resort to:

- Seeking emergency funding from multilateral institutions
- Requesting aid funding

- Generating resources internally by way of raising taxes and/or levying a surcharge on the already existing tax items[1].

The session primarily focused on two alternatives for management of risk and/or indemnity payouts-

- Use of parametric instruments and
- Cat. (or catastrophe) risk pooling approach.

It is important to note that financial instruments may represent a vehicle capable of achieving better risk mitigation and/or management. Risk pricing, in the form of insurance premium, acts as a signaling mechanism for the quality of property being insured, where buildings of high quality pay a lower premium and poorly constructed properties and/or those lying closer to risk prone areas tend to pay a higher premium. This incentive mechanism, in the form of premium being charged, is also an effective tool to promote mitigation and better building standards.

Independent vs. Covariate Risk

Risks lie in a continuum, from zero correlation at one end to in between risks and risks that are 100% correlated at the other extreme.

For risks which are 0% and 100% correlated there are well-established markets where risk exposure can be hedged using contracts such as insurance and futures. However where risks lie between these extremes, there is a dearth of financial hedge instruments.

The primary market for hedging against catastrophic risks has been reinsurance, which is limited by capacity. The global (re)insurance industry's estimated risk capacity is about $250 billion, a significant part of which is committed to huge shares of compulsory motor insurance, liability insurance and workman's compensation.

As a result an event like hurricane Andrew or a Northridge earthquake can have huge impact on the available capital within the reinsurance sector leading to spiraling of reinsurance price. Such cyclical phenomenon in terms of reinsurance pricing has led to collaboration and/or partnership between the public and private sector to evolve new approach to finance losses due to natural disasters.

Weather Based Index Insurance

An example of these new approaches to hedge risk is "weather-based index insurance", an insurance technique based on the occurrence of a weather event, rather than on actual losses or indemnity payout.

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[1] Turkey subsequent to the Marmara Earthquake (1999) and India subsequent to the recent earthquake in Gujarat (2001) have levied surcharges on existing taxes to generate revenue for reconstruction purpose. In both these countries the insurance payout subsequent to the earthquake has been in the region of US$200 – 250 million. A majority of the cost for reconstruction US$2-3 billion in the case of Turkey and an expected cost of US$3-4 billion in the case of India, is borne by the Government.

Taking as an example the case of drought, insurance contracts would be written against severe rainfall shortfalls (say 30 percent or more below the norm) as measured at a regional weather station. The insurance would be sold in standard units (for example US$10 or $100), all buyers paying the same premium and all receiving the same indemnity payment per unit of insurance if the pre-defined rain shortfall were to occur.

The insurable interest for the weather-based index insurance lies in the correlation between risk (for example crop losses or other financial losses) and the occurrence of a weather event, such as drought, flood, high/low temperature or wind speed. But unlike traditional indemnity based insurance, weather-based index insurance can reach out to previously uninsured people, many of who are poor.

The principal advantage of this kind of insurance is that the weather, or "trigger" event (e.g. a rainfall shortage) can be independently verified, and therefore is not subject to the possibilities of manipulation which are present when insurance pay-outs are linked to actual losses.

Since the contracts and indemnity payments are the same for all buyers per unit of insurance, the usual problems of "moral hazard", (i.e. the lack of incentives for the insured to prevent losses when the event happens) and "adverse selection" (i.e. only those with the highest risk exposure wish to be insured), associated with traditional indemnity based insurance are lessened.

In addition, the insurance would be easy to administer since there are no individual contracts to write, no individual property inspections and no individual loss assessments. This can help make the insurance affordable to a broad range of people, namely all those people affected by weather related risks such as hurricanes, floods, drought etc whose incomes are affected by the insured events.

This type of insurance would be also relatively easy to market. For example, it could be sold through banks (mortgage, retail and commercial), farm cooperatives, input suppliers and micro-finance organizations, as well as being sold directly to individual property owners including farmers to hedge their crop risks. Weather insurance is not only for property owners and/or farmers but banks and rural finance institutions could purchase such insurance to protect their portfolios against defaults caused by severe weather events.

Presentation 2: "Weather Based Index Insurance - The Demand Side" -- Ross McIntyre, *Portfolio Manager, ENRON*

Demand for weather index products began in 1996 with the deregulation of power industry in the U.S. Deregulation led to greater volatility in revenues, which was due to the volatility in demand for energy where demand in turn was dependent upon the weather conditions. Extreme low and high temperature creates peak load problems for electricity generators and also distributors.

Unable to generate sufficient electricity to meet demand, local companies would be forced to go to the open market to purchase additional power. Purchasing on the open

market exposes the companies to price fluctuations that increases volatility in their revenues. Using index contracts, companies can hedge against these additional costs and/or volatility to their revenue stream.

The second source of potential demand is the agriculture sector. This sector often contributes 15-20% of the national GDP and provides employment to as much as 35-40% of the workforce in many low- to lower-middle income countries. Agricultural production is inherently a risky business, and farmers face a variety of weather, pest, disease, input supply and market related risks. Given an uncertain income each year, farmers must worry about their ability to repay debt, to meet overhead costs (e.g. land rents and taxes) and, in many cases, their ability to meet essential living costs for their families.

These same risks are also of concern to agricultural lending institutions. Confronted with risky borrowers, lenders must seek to reduce the possibility of poor loan recovery rates in unfavorable years, even if this means only modest levels of lending to agriculture.

Given the varied impact of weather events demand can come from two potential sources:

- The government to provide relief and/or support subsequent to catastrophic weather events
- Commercial sector, namely banks, commercial farmers, input suppliers etc who are also exposed fluctuations in earnings (refer below to the Nicaragua example).

Industry Weather Exposure	
SECTOR	**EXPOSURE**
Energy	+ + +
Agriculture	+ + +
Food/ Beverages	+ + +
Tourism/ Entertainment	+ +
Construction	+ +
Transportation	+ +
Hotels	+
Communication	+

Presentation 3: "Conceptual Design of the Nicaraguan Rainfall Based Index Insurance" -- Ashoka Mody, *Lead Specialist, World Bank*

The proposed rainfall based-index insurance project has two components that are focused towards providing insurance: a) to the Government of Nicaragua to insulate against fiscal risks; b) to provide market-based insurance for commercial farmers to hedge their yield-related risks.

The primary objective of the risk cover to government is to:

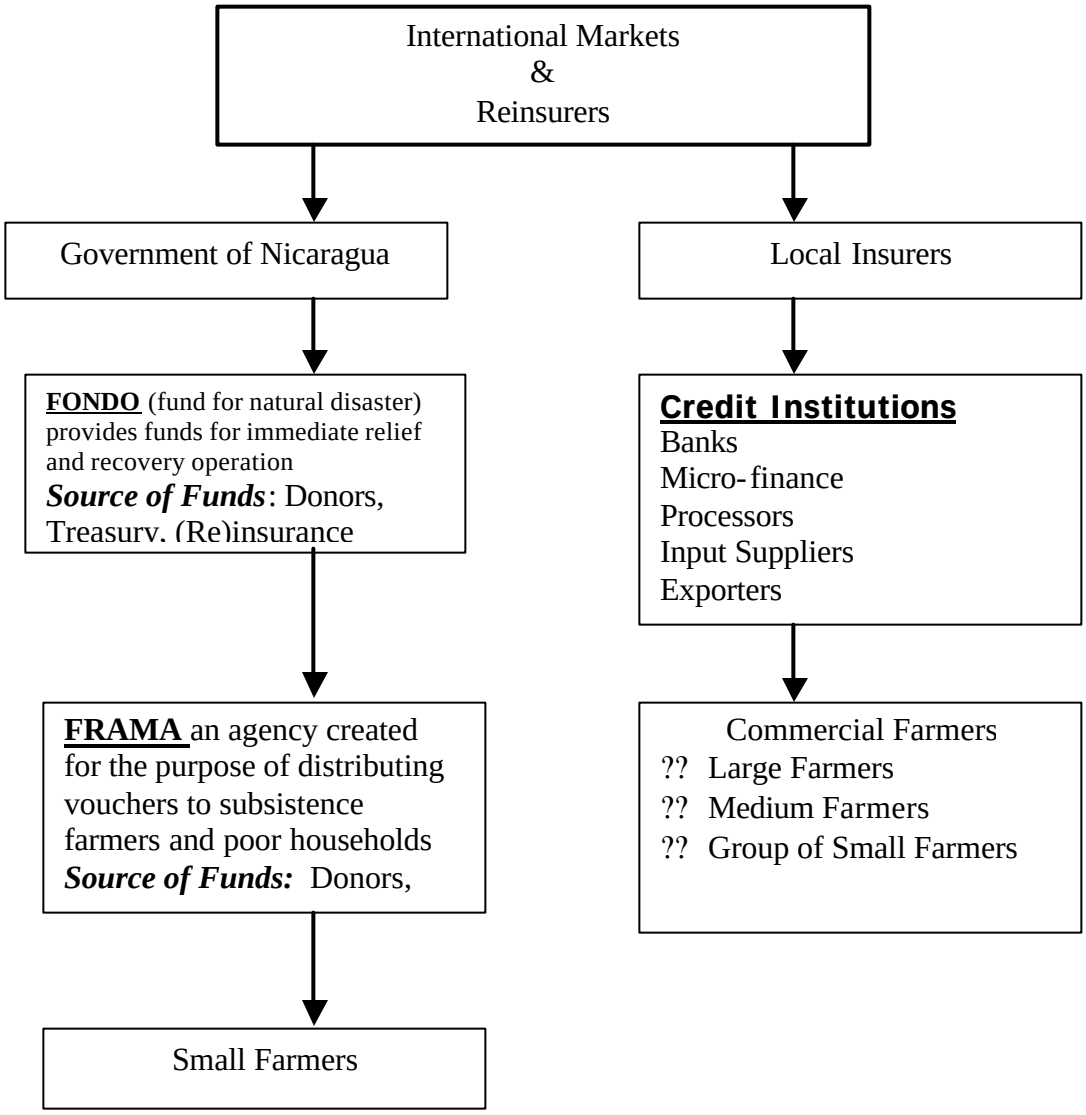
- provide insurance to the GON against possible fiscal risks subsequent to huge catastrophic events (e.g. Hurricane Mitch or earthquake in Managua)
- provide a source of funds for FRAMA to provide assistance to small farmers, subsequent to a catastrophe event

The objective of private insurers is to develop market-based mechanisms and/or instruments for:

- Commercial farmers to hedge their yield risks using rainfall insurance.
- Banks to hedge their portfolio from shocks due to catastrophic events which affects the loan recovery from the farmers (Note: on average banks lend 30% of loans to the agriculture sector)

- Input producers to insulate them and in the process help in reaching more farmers with inputs.

- Insulate the exporters and processors from loss of income (mainly due to lower capacity utilization of their installations) following weather catastrophic event affecting producer yields.



Weather Based Index Insurance -- Challenges

The primary challenge in designing such parametric contracts is the need for having a time-series, atleast 15-20 years, of reliable data sets. Once when the contract is written the payout is triggered by the measurements at the pre-identified set(s) weather stations, for this reason the weather stations must be protected against possible tampering.

This can present a challenge, given the low level of computerization and poor infrastructure that currently exists in many developing countries. There is also the dual challenge of :

- Designing the contract in such a way that basis risk[2] is minimized
- Educating the farmers about how the instrument works, given that loss payouts will be based on output from the weather stations rather than individual farms.

Presentation 3: "Catastrophe Financing- The Risk Pooling Concept[3]" -- John Pollner*, Sr. Financial Sector Specialist, The World Bank*

Global catastrophes such as past hurricanes or earthquakes around the world generated significant reinsurance shortages in the early to mid-1990s resulting in dramatic rate increases in the Caribbean.

During the mid 1990s, Caribbean countries experienced insurance rate increases between 200%-300% as a result of a shortage of insurance cover, due to indemnity payments made for large hurricane and earthquake losses worldwide. From a developmental perspective, this experience of market shocks discouraged prudent 'risk hedging' policies in the form of promoting wider-spread insurance practices both in the public and private sectors of the Caribbean. To illustrate, the average variation on typical catastrophe insurance rates in the Caribbean and internationally, within the past decade, fluctuated between 30% and 50%.

Emerging economies suffer not only from the devastating effects of disasters, but also from market imperfections and constraints which generate disincentives to better risk management. In the Caribbean region, the problem of catastrophe risk insurance and constraints to expanding risk management strategies are linked to both the limited domestic risk bearing capacity and international market forces.

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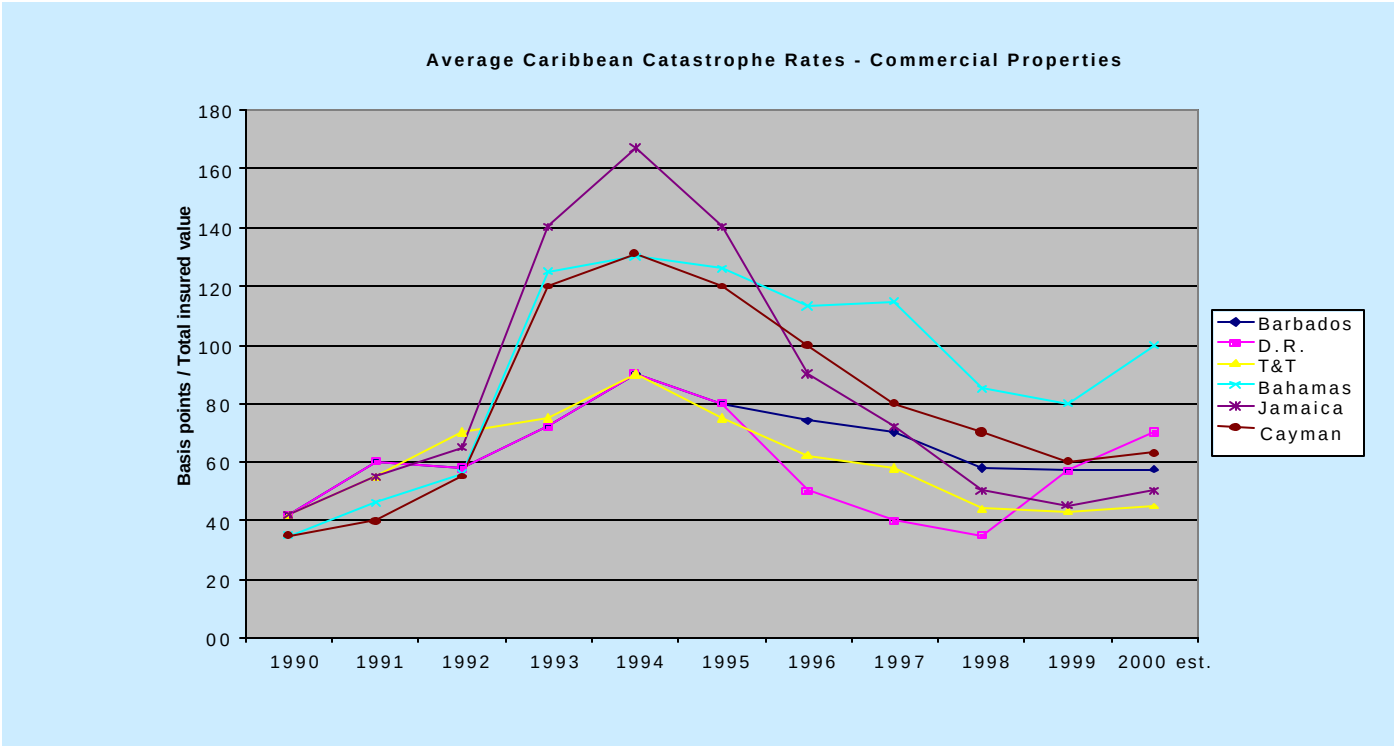
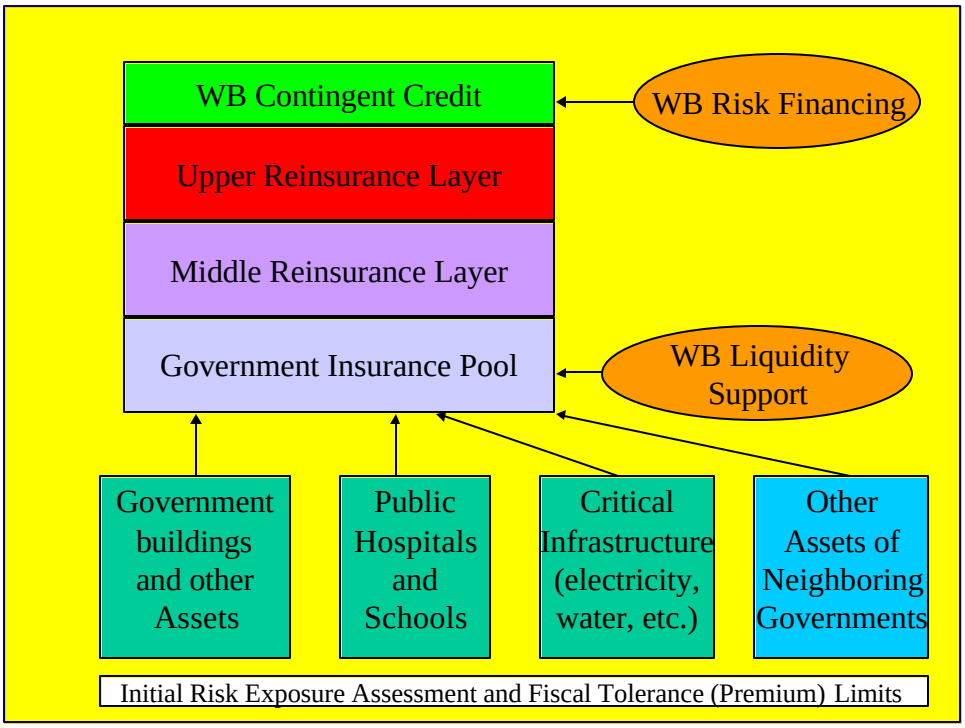
[2] Basis risk- the gap between of the actual losses and the event triggered losses as measured at the weather station.

[3] The management of catastrophic risks using pooled insurance structures and Alternative financing & risk transfer mechanisms- the insurance market and the case of the Caribbean region (05/2000) by John Pollner





Design

The concept of creating regional pools for the purposes of reinsuring local primary insurers, has often been debated in the Caribbean. There are several options to be considered in the design of regional pools, although key aspects to take into account are whether the creation of a pool gives incentives to primary carriers to reduce dependence on commercial international reinsurers solely for the associated

commission income, and to what extent a pool itself will subsequently cede part of its coverage to international reinsurers (i.e., to optimize risk management).

Both these issues will determine to some extent, the success and functionality of an insurance pool. The critical criteria should be the extent to which any pool arrangement is able to generate genuine additional capacity (see below) rather than the reshuffling of existing capacity levels.

A key aspect to consider would be how the pool itself would retrocede some of the risk to international commercial reinsurers and whether the pool would seek to become a reinsurer at all or whether it should restrict itself to the role of a primary insurer for catastrophe risk.

A sufficient initial capitalization and a minimum ongoing level of working capital would be required of the pool to assure that it retains sufficient coverage to meet its objectives. The result of retroceding too much of its portfolio would likely invalidate many of the benefits of establishing a pool, unless of course, the excess of loss limits for such retrocession were at the higher levels of coverage, thus avoiding excessively high premiums and associated volatility.

Reinsurers will also need to be convinced to take on any of the risks from a pooled portfolio at any level of coverage. However, this issue can be addressed by developing a priori, and providing, transparent information showing the derivation of the probable loss values of the pooled risks backed by methodologically robust techniques covering country-by-country and sector-by-sector risk assessments including damage and disaster event probability measures.

From the private sector perspective, there are very valid arguments for some of the larger and more secure carriers not to participate in the pool, thus depriving the pool from substantial premium income to maintain its operations. This concern is in many ways a reflection of the segmented quality of the regional market.

It may therefore be preferable to establish a pool for a smaller group of countries (e.g.: the OECS countries or a sub-region excluding the larger countries) in which the insurance industry has fewer large players, regulatory norms are standardized. In this way the benefits of risk sharing would be far greater given the small sizes and vulnerability of their national economies.

Establishing a regional pool or disaster reserve fund that has financial resources in line with actuarial requirements is extremely difficult -- not least the prompt payment of claims. As a result, in the initial years of any such fund, there may be a role for a multilateral institution to provide a guarantee of financing or a contingent line of credit for quick disbursement. This would cover any shortfall in pooled fund assets and provide the requisite upper-level loss coverage for eligible indemnity payments.

Alternatively, a pre-funded arrangement can be made by issuing long term bonds in the capital markets and making the proceeds available to the ESC fund (similar to that of the Florida Windstorm Underwriting Association).

A long-term credit facility would be favorable in that it would be:

1. Committed or funded a priori,
2. Longer term maturity thus lessening the repayment load,
3. Lower financing cost than comparable commercial lines of credit due to a lower borrowing cost, and
4. Less costly from an actuarial viewpoint, than reinsurance, at the highest potential loss layers.

The basic rationale for this approach is to better protect the Caribbean economies with improved risk management tools. The objectives are to diminish economic volatility in countries subject to shocks that are unrelated to international market movements, or where countries affected by single natural events are disproportionately affected.
Key in this respect, is the need to reduce the level and volatility of catastrophe insurance premiums, and to increase overall coverage, given the inherent cyclical nature of risks in the region. The objective would be to develop domestic financial industries and insurance-linked mechanisms that can help to increase the private sector capacity to better absorb and spread these risks.

In this context, the long-term strategy is to ensure more sustainable development in the region by supporting development and implementation of risk sharing and risk transfer instruments that could adapt the latest risk financing and risk transfer technologies to the needs of the small Caribbean states.

The objectives in this context would also include:

- Implementing more optimal risk transfer and institutional mechanisms to improve the efficiency and operation of insurance markets,
- Providing liquidity for more rapid reconstruction in those cases where damage was incurred, including for the uninsured housing sector which is typically disproportionately affected, and
- Reducing the vulnerability of structures through the improvement and enforcement of building code standards and land use/ construction planning.

The proposed strategy to address these problems, takes into account the latest developments in catastrophic risk transfer schemes, including those piloted by the natural disaster funds in Florida, Hawaii, California, Tokyo, and New Zealand.

In addition, the advent of the catastrophe options market developed under the Chicago Board of Trade, and the development of several weather indexed catastrophe bond instruments in the Reinsurance and Investment Banking industries, there are a number of innovative tools which could be adapted to the Caribbean context. These instruments could result in more optimal risk financing and risk transfer methods better able to cope with the severity and financial impact of natural catastrophes.

The role of a multilateral development bank in this context would be to support the credit quality of such schemes as well as organizing and/or financing the appropriate technical assistance required.

Policy and Institutional Options

Solutions to the catastrophe risk problem, due to its potentially devastating effects, cannot be accomplished without leveraging sufficient capital and assuring stable long-term capacity, two important financial pre-conditions.

At the individual country level, governments can instill risk management practices by better controlling 'exposure' through regulatory actions aimed at vulnerability reduction programs particularly for the low income sectors, and by assuring that the local insurance sector has sufficient capital (net of reinsurance cover) to withstand large losses. Simultaneously, enforcement of insurance coverage, both in the private and public sectors is needed, along with market incentives to monitor property risks and adjust premiums by rewarding owners and property holders who reduce physical risk exposures.

While such actions can provide the framework for establishing the requisite institutional support, the magnitude of catastrophe risks requires more radical solutions to ensure that governments can minimize contingent fiscal liabilities and the private sector and local communities can recover quickly from natural disasters.

To address the catastrophe-risk insurance constraints listed above stable insurance funding mechanisms are required with the ability to accumulate reserves that can be more optimally leveraged via risk transfer to the international markets. In the context of small economies with limited risk absorption capacity, the pooling of risk exposures enables broader coverage protection using more efficient deployment of pooled capital for risk transfer, permitting a faster accumulation of catastrophe reserves to help buffer the disruptive supply effects of worldwide disasters on domestic markets.

Discussion

The questions and discussion focused primarily on the role of World Bank funding subsequent to natural disasters and to what extent such funding is creating a disincentive for countries to adopt modern risk management techniques.

Focusing on the example of a proposed reconstruction loan of U.S.$1.0 billion provided to Honduras and Nicaragua at a concessionary rate.

Question: Given the concessionary rate, what incentives are there for the Nicaraguan Government to purchase risk cover against catastrophic event from the international market?

Answer: The World Bank's decision in this case reflects the policies of donors since the loan is provided from IDA (International Development Agency) monies that are grant funds provided by the major shareholders of The Bank.

Conclusions

The session concluded with the following observations:

1. Dialogue needs to be initiated with various donor agencies to highlight the moral hazard environment being created by the discriminate funding of natural disaster losses by donor agencies.

2. Funding by the donors should be rather based on clearly defined set of rules which do not establish negative incentives in those countries practicing better risk management techniques.

3. Parametric triggers could help in promoting transparency and providing legitimacy to external funding and also internal funding, subsequent to catastrophic losses.

Pooling of risks does provide risk diversification and such approach should be explore of countries with minimal economic diversification and/or is too small to manage the risk independently.

Parallel Session 6A: Potential Applications and Cases Studies -- Mitigation Strategies

Moderator: William Anderson, World Bank

Speakers:
- **Roberto Meli**, *Professor, National Autonomous University of Mexico*
- **Mustafa Erdik,** *Professor and Chair, Department of Earthquake Engineering, Bogazici University, Turkey*
- **Richard Klein**, *Sr. Researcher, Potsdam Institute for Climate Impact Research*

Rapporteur:
- **Reinhard Mechler**, IIASA

This session on mitigation strategies also dealt with the identification of recommendations for research, policy as well as operational measures for natural disaster mitigation programs and disaster management.

Presentation 1: "Experiences on Implementation of Disaster Mitigation Programs." Professor Roberto Meli, *The Autonomous University of Mexico (UNAM)*

The presentation was concerned with experiences and problems with disaster mitigation activities in developing countries. The overarching issue was to examine why mitigation programs often have had little impact. Dr. Meli offered the following reasons:

- Planning is normally done on a short-term basis,
- Typically mitigation planning involves only one agency although natural disasters constitute a complex technical, social and cultural problem requiring the collaboration of several agencies.

- Populations vulnerable to natural hazards are rarely consulted in the planning process. For plans to be effective they must include an appreciation of local conditions as well as physical issues.
- The dynamic aspect of risk needs to be accounted for and risk integrated into the overall development program.

Dr. Meli demonstrated his general findings by means of experiences with earthquakes and floods. Starting with earthquakes, he identified the principal problems as: the rapid evolution of building codes, an ever widening gap between specialists and practitioners, complicated designs required by building codes, and problems with building code enforcement.

Although modern building codes have been widely introduced as important elements of a disaster mitigation strategy, evidence of their effectiveness in mitigating the effects of disasters, have been variable. When improved codes were introduced in Kobe they had positive effects when the city suffered an earthquake in 1995. However the benefits of codes introduced prior to Mexico's earthquake in 1985 were more difficult to determine, and, perhaps most significant of all, it was the most recently constructed buildings that fared worst during Turkey's earthquakes of 1999.

Dr. Meli advocated a shift to the introduction of more robust systems with an emphasis on those that could be easily put into practice. Dr. Meli also noted that codes could only be applied where construction projects had been officially sanctioned. In Mexico informal non-engineered construction accounted for well over a third of buildings constructed (of 700,000 new structures, 300,000 had been built without official permits). Dr. Meli suggested that educational programs could be useful in demonstrating the benefits of seismic design to those involved in construction.

There is some evidence to suggest that public facilities, whilst in many cases subject to particularly strict codes, regularly exhibit damages higher than for other buildings. Dr. Meli indicated that this might be the result of the application of varied structural schemes. To ensure these facilities were as resilient as possible, Dr. Meli advocated simpler retrofitting procedures.

According to Dr. Meli, Flood Mitigation measures are often far more complicated to undertake since they must take account of the complex social, economic and environmental interactions that exist. In many cases the best solution would be to relocate a vulnerable population but often this is not possible. As an intermediary solution, Dr. Meli proposed the installation of early warning systems.

In conclusion, Dr. Meli summarized that a first step in a successful mitigation program should be a correct assessment of risks that takes account of all stakeholders. Mitigation programs should be of a type that are easy to implement and aimed specifically at protecting the people at risk.

Presentation 2: "Rehabilitation, Recovery and Preparedness after 1999 Kocaeli and Düzce Earthquakes." Mustafa Erdik, *Professor, Bogazici University, Turkey*.

Turkey suffered two earthquakes in 1999 that caused a high number of casualties and extensive damage: 18,000 people died and total damage was estimated at between $16-20 billion (U.S.)

Dr. Erdik identified widespread building code violation as a major factor in the particularly high levels of devastation that resulted from these events. Non-compliance is partially explained by high inflation rates that limited demand for mortgages and served as an impediment to wider development. This demand was exacerbated by ineffective building construction supervision and often insufficiently qualified engineers.

Rehabilitation in Turkey is progressing steadily: repair and strengthening is being done for urban infrastructure and residential buildings. Permanent housing is being facilitated by low-interest loans but micro-enterprises are taking a much longer time to recover. Along side general reconstruction, specialized emergency management agencies are being created, compulsory disaster insurance is being introduced and the building code is being revised.

Notwithstanding this evident progress, there is widespread concern that steps to enhance disaster preparedness are proceeding too slowly. Dr. Erdik illustrated this using the example of Istanbul, where there is still no program for retrofitting residential buildings as yet unaffected by earthquakes. In an area with an extremely high probability of an earthquake in the near future, it is estimated that as much as one fifth of 700,000 houses are at risk and this imposes a significant cost.

Dr. Erdik estimated that for an outlay of $200million, 5,000 of the most vulnerable structures could be made more resilient and that this measure alone could save as many 20,000 lives in the event of an earthquake of similar severity to those that occurred in 1999.

Presentation 3: "Integrating Natural Disaster Reduction and Adaptation to Climate Change: Rationale and Constraints." Richard Klein, *Senior Researcher, Potsdam Institute for Climate Impact Research (PIK)*

Mr. Klein talked about the potential for integrating the fields of disaster management and climate change adaptation. These fields share many similarities as extreme natural events also represent a significant area of study in the field of climate change. In addition, the focus of disaster management activity is placing less emphasis on a reliance on disaster relief and an increased consideration of disaster preparedness. This longer-term perspective is also central to research in climate adaptation.

Defining adaptation as "an adjustment in ecological, social or economic systems in response to actual or expected climatic stimuli and effects", Mr. Klein noted that this process can take many forms. Institutions and physical structures can adapt to different impacts at different times with the adaptation process being variously purposeful, ad hoc, autonomous, anticipatory or reactive.

Anticipatory adaptation is particularly relevant for policy and involves increasing the robustness of infrastructure, the flexibility of systems and improving awareness and preparedness.

Mr. Klein noted that the current difficulty in securing funding for research on climate change and adaptation is based in part on the fact that the global costs and benefits have yet to be fully assessed and demonstrated. As a result Mr. Klein believed that "no-regret" adaptation measures were more likely to secure funding.

He concluded by calling on the two research communities to collaborate more closely sharing as they do as many similar areas of interest and common concerns. Collaboration would help introduce a needed long-term perspective to the natural disaster field.

The need for communication between the hazard and the climate change adaptation community was an issue taken up in the floor discussion where it was mentioned that there are obviously numerous shared issues that may sometimes be obscured by differing terminologies.

It was also conceded, for example, that at the World Bank these communities are separate, but increasingly starting to exchange ideas. Further, it was said that funding agencies and the ProVention Consortium bear the responsibility of fostering interdisciplinary research and developing a long-term strategy.

It was noted that short-term strategies such as minimum retrofit for earthquakes could actually lead to even larger impacts in case of a major disaster. Another point of common agreement was the centrality of including the perspectives and needs of stakeholders when developing mitigation measures and particularly so when the focus was on poor countries. Overall, it was concluded that mitigation should and can be an important complement to insurance strategies in any comprehensive disaster risk management strategy.

Parallel Session 6B: Insurance and Reinsurance

Moderator: Richard Herring, *Jacob Safra Professor of International Banking, Wharton School, University of Pennsylvania*

Speakers:
✍ **Morton Lane,** *President, Lane Financial LLC*
✍ **Eugene Gurenko,** *Senior Financial Economist, The World Bank*

Rapporteur:
✍ **Leslie Martin,** *IIASA*

This session discussed the role of development banks in the hedging of catastrophe exposures in developing countries with, as an example, a recent project in Turkey. It emphasized the blurred boundaries between capital markets and insurance.

Presentation 1: Morton Lane, *President, Lane Financial LLC*

Mr. Lane divided the insurance market into three sets of actors: those who originate risk, those who receive risk, and those who structure and transfer it between the two other parties.

This third actor, the broker, is the role that Mr. Ashoka Mody described when relating his involvement on behalf of the Bank in helping to design a crop insurance program for Nicaragua. A broker in these cases has several responsibilities. First of all, he must be aware of the prices that investors will be willing to accept for given types of risk. Secondly, he needs to find a metric for evaluating that risk (i.e. parameterization).

Finally, he should provide security, that is, the confidence that when an event occurs there will be a payout. With cat. bonds, security is automatically provided because the indemnity is provided up-front. In Mr. Lane's view, when dealing with reinsurance and developing countries, providing security is a perfect role for the World Bank.

Mr. Lane's presentation emphasizes that *securitizing* and *derivatizing* insurance is a new field. As a new field, it must first gain widespread investor acceptance. As it starts out it should restrict itself to providing simple instruments that investors could understand, like single risks. Once we prove things to the market we can move on to, for example, multi-peril risks.

Secondly, the securitization and derivatization of insurance is an experimental market. Last year represented the first year that the transfer of insurance to capital markets has not increased (because prices dropped and corporate bonds have gone up).

Finally, the World Bank is in a unique position to determine how markets develop. It could look into loss-of-life contracts that would provide families with compensation for income support. Or maybe, Mr. Lane suggested, the Bank should develop contracts for itself to insure its own risk and enhance its credit rating.

Presentation 2: Eugene Gurenko, *Sr. Financial Economist, World Bank*

Mr. Gurenko's presentation highlighted the role the Bank recently played in supporting the development of the Turkish Catastrophe Insurance Pool (TCIP).

Mr. Gurenko sees a role of the Bank in helping countries pool risk and make people more conscious of their risk behavior. However, the Bank's mandate deals with sovereign risk, which is distinct from catastrophic risk. The Bank is traditionally the lender of last resort, but it is ill equipped to provide the instant liquidity needed after a catastrophic event. Furthermore, its reconstruction loans crowd out other development lending.

As an example of the Bank's recent involvement as an advisor and facilitator in the hedging of catastrophe risk, Mr. Gurenko presented the TCIP.

Establishing the background to the project, he noted that: Over the last century Turkey has suffered 66 earthquakes of a magnitude 8 or greater. Istanbul is particularly at risk. Turkey has very low earthquake insurance penetration—almost zero in middle- and low-

income classes. The existing insurance industry has a small capital base and few reserves. Before the earthquake, Turkey had few prospects of expanding this coverage because of a law guaranteeing government reconstruction funds for private structures. In general, households had a poor understanding of their catastrophe exposure.

The objectives of the TCIP are to ensure that domestic dwellings have earthquake insurance and build up a national capital base. It does so via compulsory insurance, in which the TCIP is the sole provider of earthquake coverage. The TCIP does not cover infrastructure because that risk is assumed directly by the government. In addition, the TCIP transfers catastrophe risk to international reinsurers and capital markets and encourages mitigation and good construction practices. Finally, it reduces government fiscal exposure by amending existing disaster law.

Some features of the TCIP include:

- Coverage of up to $30,000 per dwelling, with no coverage for contents.
- 15 rating categories based on hazard zone and building type, with a 2% deductible for claims and the option on on-line registration.
- Private insurers assume no loss.
- Loss adjusters are independent and operations are extensively outsourced.

The current financing of the TCIP has $540 million in reinsurance with Milli Re and $100 million in a liquidity pool (uncommitted loan facility) at the World Bank. The Bank covers reinsurance retention up to $17 million: above that the losses are split 40/60 between the Bank and reinsurance. Thanks to the liquidity pool the coverage is offered at a low long-term average price, despite high coverage credit quality (A+ and up). The coverage includes multiple events, is scalable, and is provided with options to renew.

In setting up the TCIP the Bank acted as advisor and facilitator. It helped design the insurance policy, policy distribution and accounting systems, and underwriting guidelines. In addition it contributed to modeling the exposure, conducting a public relations campaign, and training local staff. Finally, its most important role lay in carrying on a dialog with the government on how to improve the regulatory framework and enforce building codes.

Discussion

4. **Question**: Will the cat. market collapse after the first big hit?

Response: Two companies have already received small recoveries, but the big one has not hit yet. Mr. Lane suspects that the market will not disappear but just adjust its prices and go forward.

5. **Question**: What would happen if a disaster were to hit Turkey tomorrow? How do you stop a politician who, following a disaster, wants to help people who did not purchase insurance? What are the incentives for people who buy policies today?

Response: You can't stop that politician. But having to wait for slow government payouts can be a powerful incentive to invest in insurance.

Further response: The only option is to be altruistic, to hope that there will be no event and, if there is, to showcase those who did purchase insurance.

6. **Question**: What is the role of the Bank in hedging catastrophe risk?

Response: The Bank is currently going beyond its charter to foot the bill for catastrophe risk. It should not be the free reinsurer of last resort.

Further response: Somebody has got to pay the premium in order to hedge risk. The only one who has the premium is the World Bank. The Bank can be a catalyst, not only as a broker but by also by the demonstration effect of taking out hedges for its own risk, with the end goal of getting these countries to ultimately pay these premiums on their own.

Alternative view: From his experience in environmental insurance, Mr. Freeman argued that when commercial banks do not want to take on environmental risk they do not take out insurance themselves but instead force their clients to take it out as a precondition of lending. Similarly, the Bank could play not only the role of facilitator but could also insist that its clients hedge catastrophe risk as a prerequisite for new loans.

Response to the alternative view: The Bank can hedge the risk at the cheapest cost because of its comparative advantage in assembling a diversified risk portfolio. It should therefore provide this hedge as a service to its lenders.

Parallel Session 6C: Potential Applications and Case Studies -- New Financial Instruments

Moderator
✍ **Paul Kleindorfer,** *The Wharton School, University of Pennsylvania*

Speakers:
✍ **Tomoko Matsukawa,** *Sr. Financial Office, World Bank*
✍ **Doris Herrera-Pol,** *Manager, Marketing and Client Outreach, World Bank*
✍ **Ricardo Zapata**, *Focal Point on Disaster Evaluation, Economic Commission for Latin America and the Caribbean (ECLAC)*

Rapporteur:
✍ **Patricia Grossi,** *The Wharton School, University of Pennsylvania*

Dr. Paul Kleindorfer set the stage for the discussion, putting forth the following three questions on new financial instruments:

1. What is an appropriate, feasible role of the World Bank or the International Financial Corporation to promote new financial instruments?
2. How can new instruments be linked to: (a) mitigation prevention; and (b) appropriate signals to general risk bearing and risk transfer markets?
3. What are the implementation barriers to the use of new instruments? How can the barriers be overcome?

Presentation 1: Tomoko Matsukawa, *Sr. Financial Office, World Bank*

Ms. Matsukawa stated at the outset that she would try to answer questions (1) and (3), as put forth by Dr. Kleindorfer. She began by describing the role of her department at the World Bank. Her department supplies technical assistance in the form of risk assessment and risk management, regulatory understanding, and risk transfer instruments to its clients (*e.g.* nations). She described the financial role of the World Bank as a lender to government in the form of post disaster funds (traditionally) and a promoter of risk transfer mechanisms (more recently).

Ms. Matsukawa described three major policy guidelines of the World Bank. First, the World Bank covers risks that a government can take but not beyond. In other words, they cover credit risk only. The government, to which they are supplying a loan, has to counter guarantee. Second, private financiers must share the risk where the World Bank can assume this only partially. Finally, the World Bank covers certain types of debt, such as commercial debt (but not insurance contracts).

Ms. Matsukawa then described four examples of countries in need of assistance in managing their catastrophic risk. For each example, there are certain questions to be posed. Why isn't insurance or private financing in place? What are the perceived risks? What are the actual risks? What are the corporate risks?

- The first example is a nation without private insurance or financing and the government must assume the catastrophic risk. The World Bank's role in this instance is to assist the government in its financing of their risk through a line of credit or contingent loan.
- The second example is a developing nation who faces significant catastrophic risk. In this instance, the World Bank can offer a partial risk guarantee in the form a catastrophe bond.

- The third example is 'local risk' not tied to the federal government of a nation. In other words, there is commercial risk beyond the public catastrophic risk. In this instance, the World Bank cannot do anything, but the IFC (International Finance Corporation) can be used for covering some of the risk.

- The final example involves a nation where private financing (through insurance) is covering the catastrophic risk but the premiums are too high. The World Bank can guarantee part of the risk (*i.e.* partial risk guarantee) in order to reduce premiums.

Presentation 2: Doris Herrera-Pol, *Manager, Marketing and Client Outreach, World Bank*

Ms. Herrera-Pol, as part of the Financial Products and Services Department at the World Bank, focused on three main items in her presentation. First, Ms. Hererra-Pol described the challenges the World Bank faces in intermediating cat risk products. Second, she described the challenges facing the clients of the World Bank in using these products. Finally, she described the role of the World Bank and the IFC in advancing risk management strategies, specifically public-private partnerships.

Ms. Hererra-Pol began by describing the World Bank as a borrower and lender to clients and an intermediary between financial markets and developing countries. The World Bank does not take market risks. She emphasized that cost-effective products are the "No. 1" priority of the World Bank. This is a priority because emerging economies are hardest hit by catastrophes and cannot handle the risk themselves.

The World Bank offers borrowers three types of products: loans, guarantees, and hedging products, (which were introduced last year). Additionally, currency swaps have been proposed to the World Bank's board, and commodity swaps are being offered on an experimental basis.

Ms. Herrera-Pol believes that the World Bank cannot offer cat. risk hedges yet. She stated that there needs to be a liquid market and the clients of the World Bank must be educated on these types of products (*i.e.* due diligence). Currently, financial products offered by the World Bank are linked to governmental loans (not the private sector). So, "we aren't there yet." In summation, she noted that the market is in its infancy (*e.g.* last five years) and the number of investors must grow before the World Bank can offer cat. risk products in its intermediary role to its clients.

Ms. Hererra-Pol then described the challenges facing the clients (borrowers) of the World Bank. While most clients' cat. losses are huge, the products are expensive (high

premiums), and the risk management and prevention process has high upfront costs with no guaranteed return. A risk management culture must be developed within the nation and the clients must be able to understand and manage the newer financial products.

Finally, Ms. Herrera-Pol described the role of the World Bank and other International Financial Institutions as institutions that should "push the back the frontiers" on risk management alternatives. The World Bank must discuss risk management with their business partners (in order to get creative solutions) and they must discuss risk management with their clients (to prioritize their long-term view). Finally, the World Bank should support and promote client capacity building.

Presentation 3: Ricardo Zapata, *Focal Point on Disaster Evaluation, Economic Commission for Latin America and the Caribbean (ECLAC)*

The final speaker in the panel was Ricardo Zapata, who discussed new financial instruments for reducing vulnerability. As part of ECLAC, Mr. Zapata began with a description of the methodology his group has used to evaluate the impact of natural disasters in their region of the world.

ECLAC has data from the past thirty years on the effects of natural disasters to Latin America. Specifically, losses have averaged $12 Million a year, and from 1972 to 1999, there has been a loss of $50 Billion to the region. Additionally, over 150 million people have been affected by natural disasters with over 108,000 dead. Mr. Zapata stated that clearly, disasters have a greater effect on developing countries. He then went on to describe different sectors within each nation that are affected by natural disasters (*e.g.* social sector, infrastructure, etc.) and how they could be mitigated to some degree.

He described direct damages from a natural disaster to a country as damage to assets or infrastructure. Indirect damages include those that affect the flow of income and production in the nation (*i.e.* unrealized income due to emergency). He focused on the indirect damages, noting that they were hard to quantify, and he emphasized the importance of trying to quantify the effects of "recurrent small disasters," such as flooding every year. This can have a cumulative negative effect on a country's indirect damages (*e.g.* Belize).

Mr. Zapata went on to describe the global effects of natural disasters, including human suffering, loss of capital, the postponement of investment projects, the deterioration of the economy, etc. With a disaster, the effects on a nation can be enormous over time. Following this discussion, he described the ideal characteristics for new financial instruments.

- New financial instruments should be similar to other tools to reduce risk (*e.g.* insurance, bonds, derivatives, etc.)
- Instruments should be sensitive to different impacts of different regions or nations; they should promote equity and development in the countries they help;
- Instruments should aim to mitigate the asset and flow losses
- Instruments should be developed and implemented ('owned') by the main stakeholders;

✍ Instruments should be mutually reinforced by government interventions.

He concluded by emphasizing that the role of ECLAC is to expand the capability of nations to manage their catastrophic risk.

Discussion

Discussion in this breakout session focused on the role of the World Bank in new financial instruments of catastrophic risk. Given their operational constraints (*i.e.* the three major policy guidelines described by Tomoko Matsukawa), the World Bank can only do so much in the usage of new financial instruments.

In summary, everyone agreed that the World Bank should have a strong commitment to do what it can to promote these new instruments within their limited charter. Also, they (and other International Financial Institutions) should help nations in their risk assessment process and continue their leading role in risk bearing to developing countries around the world.

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