

# Natural Catastrophe Risk Insurance Mechanisms for Asia and the Pacific

Main Report

Asian Development Bank





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# Executive Summary

## Introduction

This summary reviews the key issues and discussions that occurred during the Asian Development Bank (ADB) Conference on Natural Catastrophe Risk Insurance Mechanisms for Asia and the Pacific held in Tokyo on 4–5 November 2008. The conference featured a general plenary session followed by a day of focused workshops. The summary concludes with a series of recommendations based on the conference results.

The key finding of this report is that many opportunities exist for transferring natural disaster risk in Asia and the Pacific if addressed within a regional public–private partnership (PPP). That partnership must necessarily include national governments, all regional development partners and institutions, and key private sector players, both global and local. The opportunities discussed in this report will largely remain opportunities unless obstacles and gaps in knowledge, research, and experience are bridged. A regional approach to bridging these gaps, involving all critical parties, represents the best chance to unlock the resources necessary to move the region forward to better disaster risk management (DRM).

## Background and Objectives

Developing member countries (DMCs) are vulnerable to natural hazards given their location, fragile economies, and relatively modest investment in disaster management planning. Natural catastrophes are a major threat to sustainable development.

New developments in catastrophe risk financing markets have expanded the opportunities to transfer natural catastrophe risks originating within Asia and the Pacific. Designing such catastrophe risk transfer programs in conjunction with comprehensive DRM strategies further enhances their attractiveness to global risk finance markets.

Following the Hyogo Framework for Action in 2005, ADB initiated a technical assistance project, Development of Catastrophe Risk Insurance, which explored catastrophe risk insurance opportunities for the region. A key recommendation of that report urged ADB to host a small workshop to consider natural catastrophe insurance mechanisms for Asia and the Pacific.

The objectives of the conference were to (i) alert DMCs to new opportunities to transfer natural catastrophe risk using both traditional insurance and recent capital market mechanisms; (ii) assess the opportunities for catastrophe risk transfer in the Pacific island countries, based on an initiative led by the World Bank; and (iii) consider the feasibility of developing risk transfer programs for Asian megacities.

## **The Fundamental Issues of Catastrophe Risk Finance in Asia and the Pacific**

### **Leveraging insurance and capital markets**

The key finding from the conference was that market interest in developing risk transfer mechanisms for Asia and the Pacific is substantial. This interest derives not only from traditional insurance and reinsurance sources, which have and continue to be active in developing risk transfer mechanisms for the region, but also from global capital markets, which have a more recent interest in becoming engaged with the region. That interest derives principally from a desire to develop a portfolio asset class uncorrelated to traditional capital market asset risk parameters, such as interest rates and economic cycles.

This interest in developing risk transfer solutions also stems in part from the gradual merging of the traditional insurance market and the deeper and more liquid capital markets. The assimilation of these formerly distinct markets has produced hybrid risk transfer products such as catastrophe bonds and other risk transfer mechanisms that have brought capital market strengths to bear on behalf of sovereign interests as well as traditional insurers and reinsurers.

International financial institutions are exploring different regional approaches to catastrophe risk transfer. For example, the Inter-American Development Bank has advanced an integrated DRM model that combines elements of fiscal planning, risk mitigation, and risk transfer. Such efforts deserve careful study and could serve as models for regional partnership efforts in the region.

### **Deficiencies in the commercial market**

The key question is whether there is a gap between what DMCs currently look for and require from catastrophe risk markets, and what those markets are prepared to offer. Further, if such a gap exists, what can international financial institutions do to fill the gap and what kind of PPP makes sense?

Such a gap does appear to exist. The paradox is that despite low premium rates, usage and acceptance of such insurance is relatively low, notwithstanding increased frequency and severity of disaster losses in DMCs in recent years. Explanations for this gap ranged from lack of insurance affordability, low levels of awareness of the full economic impact of natural disasters and the general availability of insurance solutions, and the possibility that traditional insurance solutions might be incompletely addressing the appropriate hazards and people's real needs and concerns.

### **The building blocks of catastrophe insurance**

High quality catastrophe risk models are an essential ingredient to an active and competitive catastrophe risk-financing marketplace in Asia and the Pacific. Currently, such models are not adequately developed in DMCs because of issues of scale and the expense of model development and maintenance. Development of high quality models involves significant effort in collecting data relating to hazard assessment, exposures, vulnerability, and loss histories.

The function of catastrophe risk models is two-fold: to establish proper risk pricing and to assure proper risk diversification (noncorrelation). The latter function helps

assure that a given portfolio of risk will not be substantially impacted by a single or compound hazard event. Current catastrophe models are not well adapted to the most relevant hazards impacting Asia and the Pacific. In particular, flood is likely the most critical hazard in need of modeling in the region, yet it remains the most technically challenging.

The development of quality loss models in the region is an essential precursor to more active commercial market interest. As such, the donor community can help to secure greater private sector interest by funding the development and maintenance of these models. Such models can also be used as effective risk mitigation tools by informing governments of the consequences of enacting particular policies and infrastructure decisions.

### **Catastrophe insurance triggers**

Parametric insurance pays an insured based on the occurrence of an event, not the magnitude of the resulting loss. As such, trigger mechanisms must be devised to determine whether such an event has occurred and if payment under a parametric insurance contract is required. Such triggers may be of a pure parametric nature (e.g., based purely on wind speed readings) or based on a parametric index or model (e.g., payment is based on a formula, index, or model as a proxy for the actual event).

Basis risk is the risk to the insured or insurer that the resulting payment is not commensurate with the loss. While the main attribute of parametric insurance is the speed with which payment is made, the accompanying basis risk may mean that the insured is under-compensated for the loss. Basis risk is an issue especially for parametric insurance where, depending on the trigger mechanism, payments may significantly vary from the actual loss incurred. As a general rule, the more sophisticated the model or index that triggers the payment, the lower the basis risk. Basis risk also seems to relate to premium affordability, with pure parametric insurance producing higher basis risk, but somewhat lower premium than index or modeled parametric insurance.

## **Applications of Catastrophe Risk Transfer Mechanisms in Asia and the Pacific**

### **Creating a viable risk pool for the Pacific**

This workshop, jointly sponsored by ADB, the World Bank, and the Japan Ministry of Finance, explored how catastrophe insurance might be used in the Pacific, a region prone to natural disasters, and what actions have occurred and remain to be taken to launch such a facility. While catastrophe insurance is not by itself a solution to enhancing resilience to natural disasters, the success of the Caribbean Catastrophe Risk Insurance Facility (CCRIF) has fueled interest in pursuing such a course in the Pacific.

The CCRIF was designed to fill the financing gap between the immediate disaster response and rebuilding, a period during which government income can be reduced. Meeting government's need for prompt funding in the aftermath of a natural disaster was the primary goal of the facility and thus a parametric insurance solution was chosen. While substantial differences exist between the Pacific islands and the Caribbean, the need for quick release of disaster funding is a common requirement. Like the CCRIF, the Pacific initiative under consideration would also be a sovereign risk facility, funding government liquidity requirements.

The World Bank, in close consultation with partners including ADB, has facilitated the development of three possible approaches to creating such a facility and has organized the collection of hazard and exposure data sets for eight Pacific island countries, leading to the creation of a catastrophe risk model. The three options are: a risk pool, supported by reinsurance; a combination of risk retention, backed by a donor-based reserve fund and complemented by reinsurance; and finally, complete reliance on a donor-funded reserve pool.

The key milestones to success in the Pacific are building enhanced data and collection methods, and concerted action to communicate with and educate government and



elected officials to build a foundation of understanding and support. Ongoing dialogue with the commercial insurance industry is also essential. ADB can be instrumental in both tasks, and has already approved a \$1 million technical assistance to build partnerships and databases.

### **Catastrophe insurance for megacities**

The critical issues include identifying key risk characteristics and challenges of transferring catastrophe risks in Asian megacities, and charting a course of action to launch such an initiative.

Growth of Asian megacity population and economic importance has been dramatic in the past decade is projected to continue. With this growth is a corresponding challenge to deal with the rising exposure to natural catastrophe risk. Threats of earthquake, windstorm, and flood are now joined by the possibility of rising sea levels and climate change patterns that can be accentuated in urban locations.

While Asian megacities share many risk characteristics, the differences among them in terms of culture, institutions, and disaster preparedness may be too great to contemplate a traditional risk pooling mechanism. Rather, it may be preferable to formulate individual risk transfer programs, tailored to provide coverage that is feasible with current data quality and market preferences. Such an approach would not preclude sharing information and technical resources or even joint participation in a reinsurance structure.

The main priorities for megacity catastrophe protection were identified as households (protecting economic gains at a family level); infrastructure (e.g., power, telecommunications, water); and relief and response (expedited aid to minimize loss of life and economic impact). Overall, a more proactive megacity disaster risk management will help ensure that development is sustainable.

It will be important to integrate meaningful and measurable risk mitigation programs to any megacity

risk transfer program, as will the close coordination of any plan with private insurers within the region and globally. ADB can facilitate the development of megacity catastrophe solutions by using a combination of its convening power and guarantee authority.

### **ADB Framework Statement for a Disaster Management Public–Private Partnership**

ADB now has an opportunity to assume a significant facilitating role in the field of catastrophe risk finance. By sponsoring the Tokyo Conference on financing catastrophe risks, it has made a statement regarding the importance of DRM in achieving sustainable development in its member countries, and it has led by convening wide-ranging interests in catastrophe risk finance to assess opportunities for PPP.

All regional development partners must consider their actions in the context of a larger regional framework for action that reflects the needs of member countries and the interests of the private sector. That framework should serve as both a platform upon which action plans can be launched, and as a broad statement of purpose under which all initiatives can reflect the shared objectives of all the framework partners. The framework could include a detailed statement of commitment to press forward with coordinated efforts to leverage its resources to bridge gaps in knowledge, research, and experience in catastrophe risk finance in Asia and the Pacific.

The framework could also include an advisory committee that would meet to review individual initiatives and make recommendations to ADB on a continuing basis. This advisory committee would be made up of regional partners, including national governments and private sector interests. Such a PPP could serve as a focal point to attract incremental capacity and risk management to the region and encourage private sector involvement. The objective would be to create a vibrant marketplace

for catastrophe risk in Asia and the Pacific, using ADB's convening power and resources.

All the recommendations below fit within such a framework by seeking to bridge knowledge or experience gaps identified as creating an impediment to building a full array of catastrophe risk transfer opportunities for DMCs.

## Recommendations

The conference discussions identified many initiatives that could promote catastrophe risk financing in Asia and the Pacific. The following seven recommendations were the most prominent among many sound proposals. The first four appear in order of priority, based on the opinions expressed.

### 1. Establish a regional PPP for catastrophe risk finance. The partnership should link national governments and ADB programs and resources to commercial interests in the region.

This tripartite partnership should first, in a preliminary study, assess the resources, needs, and requirements of all its constituent elements, most critically the requirements of member countries. The PPP should also assure that the private sector has a sound understanding of ADB programs and capabilities. Currently, this is not the case. Also, for development partners to leverage their resources in catastrophe risk finance, they should understand better the capability and interests of the commercial market. ADB must also be able to identify the proper entry and exit points for its own resources. The study should seek to understand what the commercial market perceives as impediments to market entry, for ADB to serve as an effective catalyst.

### 2. Conduct an internal assessment of ADB programs and resources to identify actions that it could take to advance a regional catastrophe risk financing program.

ADB could demonstrate its commitment to DRM “best practices” by more aggressively managing its own catastrophe risk exposure, including assessing its catastrophe risk exposure for each project loan or guarantee, and insuring its own portfolio as a way to draw in private sector capacity to the region. It could also explore ways to spread protection benefits to DMCs by directly providing catastrophe risk protection to project loans at a small surcharge or by sponsoring a “cat bond” issue that could provide indirect benefits to DMCs by providing a debt service holiday in case of a natural disaster. ADB could also consider using its guarantee authority to backstop cat bonds issued within Asia.

### 3. Establish funding for catastrophe model development in Asia and the Pacific as part of a regional catastrophe risk–financing PPP.

The dearth of catastrophe risk models in DMCs has impeded both the development of catastrophe risk financing opportunities and the entry of key market participants. As part of a PPP framework, ADB should initiate funding of a catastrophe model pilot project in a select area or group of countries that can demonstrate the incentive value of such models by drawing in private sector participation. It should also initiate and maintain an open-source regional data bank on catastrophe hazards and vulnerability.

### 4. Sponsor a small workshop focused on development of a megacity catastrophe risk–financing pilot program in one or two Asian DMC cities.

The four objectives of this targeted workshop are: (i) determine what benefits these megacities need to derive from a catastrophe risk scheme and how such a scheme would fit into existing DRM plans and institutions; (ii) analyze the specific natural catastrophe risk factors and parameters in one or two DMC megacities; (iii) discuss the relative merits of different risk–financing alternatives; and (iv) agree to launch a pilot project in one or more cities to establish feasibility,

demonstrate the application of PPPs, and attract global risk capital. The megacity workshop would dovetail with ADB's urban sector strategy and be consistent with its urban development objectives.

**5. Organize an educational curriculum and supporting programs to train DMC “chief risk officers” and others with related responsibilities.**

Training could be conducted primarily through web tutorials with matching printed materials. Upon completion, participants could become eligible to join an organization of risk officers, and such training could be linked to funding for conferences, workshops, and further training programs. ADB could convene a group of experts to work out the details of curriculum, certificates, publications, organizations, and ongoing management. The training module could be integrated with other activities in risk management, such as a megacity pilot workshop, risk modeling support, and implementation of a general catastrophe risk management framework.

**6. Launch a small microinsurance catastrophe risk insurance pilot project in several DMCs to study issues of insurance acceptance, awareness, and relevance to the needs and concerns of ordinary people.**

Low insurance penetration in DMCs is attributable in part to the absence of a relevant connection to people's daily concerns. A pilot study such as this could reveal

what natural catastrophes mean to the people most affected. The importance of socioeconomic factors in the acceptance of insurance has perhaps been underestimated. A microinsurance project could illuminate cultural and socioeconomic factors of insurance acceptance by building an insurance program from the ground up.

**7. Champion the adoption of uniform building standards throughout all DMCs.**

ADB has an opportunity to lead in the area of uniform and technically up-to-date building standards appropriate to catastrophe risk. As part of its Disaster Management PPP, it could work with national disaster authorities to establish a set of standards and to offer incentives to DMCs to adopt them. It should also require compliance with internationally respected building codes before a project may receive funding or other assistance.

# Background and Credits

Economic growth, urbanization, and the effects of global warming in Asia and the Pacific have made the region more vulnerable to natural catastrophes. When natural disasters strike, countries often face difficult choices between funding immediate basic needs and adhering to longer-term development plans. The advent of new catastrophe risk transfer mechanisms that can access global capital and reinsurance markets poses new questions and opportunities for developing countries to anticipate and manage natural catastrophe risk. Specifically, what can multilateral development banks like the Asian Development Bank (ADB) do to foster public–private partnerships to introduce new risk transfer solutions such as regional risk pooling?

To understand the complexity of disaster risk management in Asia and the Pacific and to identify ways to assist member countries, in 2006, ADB undertook a regional technical assistance Development of Catastrophe Risk Insurance Mechanisms (RETA 6284). The final report recommended holding a workshop to exchange ideas and explore prospects for an Asian insurance pool. This idea was explored further with the assistance of a Japan Special Fund technical assistance for Natural Catastrophe Risk Insurance Mechanisms for the Asia and Pacific Region (RETA 6474). In November 2008, ADB and the Japan Ministry of Finance cosponsored a conference in Tokyo to look at options for financing natural disaster losses, evaluating current risk pooling mechanisms, and reviewing lessons learned; identifying what Asia and the Pacific governments want from catastrophe insurance, and the insurers' needs to enter such markets. Subsequent workshops explored the special needs of Asia's megacities and the Pacific islands.

Pre-conference papers prepared by specialists charted the main issues, new developments, and considerations for moving forward. Moderated panel sessions with audience participation elaborated on the topics. The by-invitation-only meeting brought together government risk managers, insurers and reinsurers, insurance brokers, financial institutions, rating agencies, development partners, multilateral development banks, and



specialist research institutes. Resource persons included representatives from ADB; AIR Worldwide Corp; Aon Benfield; Bloomberg; Caribbean Catastrophe Risk Insurance Facility; Jardine Lloyd Thompson; General Insurance Association of Japan; International Finance Corporation; governments of Cayman Islands, India, Indonesia, Japan, and the Philippines; Guy Carpenter; International Institute for Applied Systems Analysis; Mitsui Sumitomo Insurance; Munich Re; Risk Management Solutions; Pacific Islands Applied Geoscience Commission; Swiss Re; and World Bank Group.

Overall conference development and coordination as well as conference proceedings were prepared by Peter Clark (lead consultant), Russell Blong, and Jonathan Hill under the direction of Neil Britton, senior disaster risk management specialist (Regional and Sustainable Development Department [RSDD]); Christophe Bellingier, principal guarantees and syndication specialist (Office of Cofinancing Operations); Emma Ferguson, senior country specialist (Pacific Department); and Mariflor Aunario, sector officer (RSDD). Administrative assistance was provided by Gren Saldevar-Perez (RSDD).

## Photographs

Cover: Christopher A. Spohr; xvi, 6, 32, 42: AFP ImageForum; 22: Neil Britton; 48: ADB and World Bank. *Pakistan Cyclone and Floods 2007: Preliminary Damage and Needs Assessment, Balochistan and Sindh*.

# Glossary of Terms

**Adaptation**

Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

**Basis risk**

The risk that the measure of loss under an index or parametric form of insurance will not equate with the actual loss incurred.

**Captive insurer**

A subsidiary entity formed to provide insurance back to its parent.

**Disaster**

A serious disruption to the functioning of a community or a society causing widespread human, material, economic, or environmental losses that exceed the ability of the affected community or society to cope using its own resources.

**Disaster risk management**

The systematic process of using administrative decisions, organizations, operational skills, and capacities to implement policies, strategies, and coping capacities of a society to reduce the impacts of disasters.

**Disaster risk reduction**

A series of interconnected actions to minimize disaster vulnerability by avoiding (prevention) or limiting (mitigation and preparedness) the adverse effects of hazards within the broad context of sustainable development.

**Exposure**

The sum total of human life and physical infrastructure at risk of loss resulting from the occurrence of a particular hazard or peril. Or in the context of an insurance contract, the total of insured assets (or the sum insured) at risk of loss resulting from the occurrence of the peril insured against at any one time.

### **Hazard**

A potentially damaging physical event, phenomenon, or human activity that may cause the loss of life or injury, property damage, social and economic disruption, or environmental degradation.

### **Indemnity**

The contractual sum due an insured from an insurer based upon the insured's actual loss suffered.

### **Mitigation**

Structural and nonstructural measures, such as land use policies, undertaken to limit the adverse impact of natural hazards, environmental degradation, and technological hazards.

### **Moral hazard**

The prospect that a party insulated from risk may act in a manner adverse to the interests of a party bearing the risk, such as by acting carelessly or negligently.

### **Parametric insurance**

An insurance contract in which payment is based on the occurrence of a specified event, as opposed to the measure of loss suffered by the insured.

### **Parametric index insurance**

An insurance contract in which payment is based on an index as a proxy for the actual loss suffered. The index itself can be linked to objective factors such as storm intensity or location, or can be based on industry or modeled losses.

### **Reconstruction**

Activities to repair and restore a disaster-damaged built environment, and which offers opportunities to develop early disaster risk-reduction measures.

### **Recovery**

Decisions and actions taken after a disaster to restore to or improve upon the pre-disaster living conditions of the impacted community, while encouraging and facilitating necessary adjustments to reduce future disaster risk.

### **Rehabilitation**

The social processes that encompass decision making about restoration and reconstruction activities.

### **Relief or response**

The terms are used interchangeably in the literature to mean the provision of assistance or intervention during or immediately after a disaster to meet life preservation and basic subsistence needs of those affected. Duration can be immediate, short term, or extended.

### **Risk**

The probability of harmful consequences or expected loss of lives and people injured; and property, livelihoods, and economic activity disrupted (or environment damaged). This is the result of interactions between natural or human-induced hazards and vulnerable conditions.

### **Risk transfer**

A contractual process whereby the burden of financial loss is shifted to another party, via the use of insurance or other financing instruments, in return for a payment or premium.

### **Risk assessment**

A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods, and the environment on which they depend.

### **Vulnerability**

Conditions determined by physical, social, economic, and environmental factors that increase community susceptibility to hazard impact.

# Acronyms and Abbreviations

CCRIF	—	Caribbean Catastrophe Risk Insurance Facility
DMC	—	developing member country
DRM	—	disaster risk management
DRR	—	disaster risk reduction
GFDRR	—	Global Facility for Disaster Reduction and Recovery
GIIF	—	Global Index Insurance Facility
GDP	—	gross domestic product
HFA	—	Hyogo Framework for Action
IADB	—	Inter-American Development Bank
ILS	—	insurance-linked securities
IMF	—	International Monetary Fund
PPP	—	public–private partnership
PRC	—	People's Republic of China
SOPAC	—	Pacific Islands Applied Geoscience Commission
WB	—	The World Bank







## Overview

On 4–5 November 2008, the Asian Development Bank (ADB) hosted a conference in Tokyo on Natural Catastrophe Risk Insurance Mechanisms for Asia and the Pacific. This conference was supported by the Japan Special Fund and organized in association with the Japan Ministry of Finance and Mitsui-Sumitomo Insurance Company. Over 200 participants from 22 countries attended the conference and included ADB developing member country (DMC) representatives, government officials from Japan, representatives from the World Bank Group, international insurers, reinsurers, risk managers, and risk financing experts. The principal purpose of the conference was to build awareness among DMC representatives of developments in catastrophe risk–financing markets that open up new possibilities to transfer natural catastrophe risk, especially when done in conjunction with comprehensive disaster risk management (DRM) strategies. Additionally, the conference explored the development of catastrophe risk transfer facilities for the Pacific islands and for Asian megacities in two concurrent workshops held on the second day.

The conference was organized around a series of background papers written for the conference and used to initiate the panel discussion of each session. These papers provided an invaluable resource for planning the conference and for its future work. For attendees, the papers provided a foundation upon which the conference discussion and debate could build. Each author presented a brief oral report on key issues or findings contained in their paper prior to the panel discussion. These papers are not reviewed individually in the conference report, but are available on ADB's website<sup>1</sup> along with the conference and workshop programs and biographies of resource persons who presented.

A central theme underlying the conference was the question of how best ADB and other international financial institutions and regional donors can assist in facilitating the understanding of catastrophe insurance

<sup>1</sup> [www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp](http://www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp)

“The respective strengths and weaknesses of the public and private sectors in catastrophe risk management show areas in which ADB, governments, and the private sector could successfully team up and work together.”

mechanisms and the adoption of *ex ante* risk-financing and disaster risk-reduction (DRR) practices and mechanisms. ADB, in particular, has been considering ways in which it can play a catalyst role to jump-start *ex ante* initiatives without impeding or competing with possible private sector interests in the catastrophe risk-insurance area. One path toward sustainable catastrophe risk-transfer markets is to establish public-private partnerships (PPP) where possible, to launch these initiatives. These PPPs can serve as platforms for market-based risk transfer solutions that can benefit from ADB resources and expertise, but allow the program to spin off as a stand-alone program.

Another way to help advance catastrophe risk preparedness is to support programs to develop public resources such as hazard models that would be useful in

multiple facets of disaster response, mitigation, and risk management.

Clearly, a key element to developing PPPs in this area is establishing a fundamental understanding of private sector interest and capability in the catastrophe risk-insurance area. For the donor community to partner with private sector interests, it must know the extent and nature of those interests. The private sector requires a better understanding of ADB programs and capabilities as well. To achieve this, ADB could launch an information campaign targeted to potential private sector partners to educate them about its mission and strengths.

ADB needs to consider the nature and extent of its role if it is going to be an active partner in this field. For example, it may opt to assume the role of coordinator and

**Figure 1: Strengths and Weaknesses of the Public and Private Sector in Catastrophe Risk Management**

Contributions	ADB and/or Public Sector	Private Sector
Raise awareness for risks and solutions	✓	✓
Strengthen countries' resources for risk prevention measures and reduction in vulnerability to disasters	✓	✗
Build and/or improve “environment” for risk transfer solutions (e.g., regulatory and legal framework, and data series for new covers)	✓	(✓)
Enable efficient access to markets (e.g., changes in legislation, if necessary)	✓	✗
Develop risk transfer products and structures that address the needs most effectively	✗	✓
Manage and absorb risks; determine adequate risk premiums	(✓)	✓
Financial support, particularly in start-up phase and pilots	✓	(✓)
Transfer of global “best practices”	✓	✓

ADB = Asian Development Bank.

Source: Bollmann, A. 2008. Catastrophe Risk Financing in Asia and the Pacific: A Regional Approach. A Private Sector Perspective on ADB's Potential Roles in the Areas of Catastrophe Risk Financing. Paper presented at the Natural Catastrophe Risk Insurance Mechanisms for the Asia and Pacific Region Conference and Workshops, Tokyo, 4–5 November. [www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp](http://www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp)

facilitator using its deep knowledge of DMC governments, institutions, and development history. It could also choose to use its technical assistance authority more aggressively by funding the necessary building blocks to catastrophe risk transfer, such as market research, inventories of exposure, or catastrophe risk modeling. It could use its investment and guarantee powers by spurring the development of pilot programs with equity or guarantee support.

The conference and workshops uncovered a number of options for ADB and others to consider, for them to assist in the development of catastrophe risk transfer and risk mitigation programs. These are discussed in some detail in this report.

## Historical Background

The widely accepted framework for natural DRM has undergone a significant shift in the past decade. An awareness of developing country vulnerability to the effects of global warming, combined with a realization of the importance of instituting comprehensive DRM strategies across all developing countries has led to a fundamental change in thinking across the international donor community. This paradigm shift has manifested itself in two fundamental areas: (i) the need to institute widespread natural disaster planning, research, and institution building to anticipate and absorb the costs that natural disasters impose on developing countries; and (ii) the realization that the status quo ante relied too heavily on post-event funding of disaster losses and not strongly enough on pre-event planning, mitigation, and risk transfer strategies.

Taken together, these two changes in focus reflected a consensus among the international donor community that the prevailing paradigm in disaster assistance might not be up to the task of delivering a sufficiently robust, proactive disaster management strategy necessary to deal with the exigencies of natural hazards and global warming or to protect hard-won gains in economic development.

In particular, the international donor community felt that an overreliance on ex-post disaster funding was failing to integrate DRM strategies into economic development planning generally and into national and local government planning specifically. In part, this was occurring because of inadequate attention to basic risk management skills in key government offices and underdeveloped domestic insurance infrastructure in many DMCs. Also critically missing was any coordinated effort among IFIs to spearhead incentives and programs to jumpstart *ex ante* DRM programs.

Fundamental to the *ex ante* model of DRM is the growing appreciation of the opportunity costs and inefficiencies associated with post-event funding. It is now widely understood that post-event funding has the effect of deferring, and in some cases, replacing development spending already earmarked. The irony of this is that some DMCs have expressed reservations about *ex ante* risk mitigation and transfer programs on the basis that such spending will constitute a zero-sum transaction: what savings the country realizes from mitigation and risk transfer will be netted out of future donor flows. In effect, it appears that such post-event donor flows already tend to reduce or replace subsequent program funding. At this juncture, the full extent of the opportunity costs represented by post-event funding are not well understood or appreciated by DMCs or the international community and warrant further investigation.

It is also well established that post-event disaster funding tends to be ill-timed and inefficiently spent. Contrary to the notion that post-event funding gets disbursed quickly and into the right hands, the fact is that such funding often tends to lag the immediate liquidity requirements of central and local governments and tends to be spent in a manner inconsistent with a hierarchy of needs. The lag and uncertainty of donor flows also has a harmful effect on fiscal planning and the investment environment generally.

This realization is, in part, what led to the formulation of the International Strategy for Disaster Reduction system



**Box 1: Report Highlight: Disaster Risk Management Principles**

Disaster risk management (DRM) is a comprehensive, systematic approach to reducing the effects of disasters by recognizing the risks inherent within a locality, the factors that make populations vulnerable, and the means by which those risks can be minimized.

DRM is based on the premise that natural hazards do not necessarily lead to disasters, but may if they affect vulnerable populations. Consequently, DRM and poverty reduction strategies should go hand in hand—especially as insufficient consideration of both may increase vulnerability to natural hazards. To emphasize this connection, the concept of disaster risk reduction was introduced to reinforce the idea that vulnerability can be lessened by controlling disaster risk. Disaster risk reduction and hazard management are therefore integral to development activities.

The key elements of DRM are expressed below:

- (i) Development of a legal, institutional, and operational framework that legitimates, consolidates, and coordinates disaster risk reduction efforts, and in particular links them to development policies.
- (ii) Risk assessment to identify, analyze, and evaluate the types and magnitude of potential impacts faced by the Asian Development Bank's developing member countries and that affect development investments.
- (iii) Risk reduction actions designed to lessen, if not remove, causes of disaster.
- (iv) Financial protection that includes risk transfer and financial options to spread financial risks over time and among different actors.
- (v) Emergency preparedness and response to enhance a country's readiness to cope quickly and effectively with an emergency.
- (vi) Post-disaster rehabilitation and reconstruction to support effective recovery and to safeguard against future disasters.

by the United Nations (UN) in 1999, and the development of the Hyogo Framework for Action at the UN World Conference on Disaster Risk Reduction in Kobe, Japan, in 2005. This was followed by the formation of the Global Facility for Disaster Reduction and Recovery (GFDRR) in 2006. Spearheaded by the UN and the World Bank, the GFDRR is a partnership to initiate and fund comprehensive DRM strategies. As part of its Disaster and Emergency Assistance Policy, ADB has indicated its intent to explore ways to cooperate with the GFDRR in programs that operate in its DMCs.

**Opportunities to Use Catastrophe Risk Finance and How ADB Could Facilitate the Process**

As a first step toward studying how it could best implement the major objectives of the Hyogo Framework for Action, ADB initiated regional technical assistance (RETA) 6284, which reported on the “Development of Catastrophe Risk Insurance Mechanisms” in Asia (2007). The purpose of the study was to investigate catastrophe risk–insurance mechanisms and to consider ways in which ADB might play a role in increasing the availability and use of such mechanisms by DMCs in their DRM strategies.

After noting the relatively weak state of DRM programs in most DMCs, the study concluded that reinsurance capacity was generally available in DMC markets, but low insurance penetration and low demand for catastrophe insurance and weak or nonexistent regulation combine to create a gap between market capability and DMC use of catastrophe risk–insurance mechanisms.

The authors also surveyed the various types of risk transfer products and structures currently used. These included traditional reinsurance programs, as well as catastrophe-linked securities and derivative products. The various trigger mechanisms that can be used with catastrophe insurance were also discussed in detail.

## Box 2: Report Highlight: The Hyogo Framework for Action

Realizing the threat that natural disasters posed to development gains, the Hyogo Framework for Action (HFA) was developed to establish an action plan for 2005–2015. The HFA reflected the belief that natural disaster risk management needed to be an essential component and feature of all programs and policies to ensure sustainable development. It recognized the key fact that natural catastrophes have the capability to disrupt much good work and otherwise sound policy, and unless developing countries and development organizations integrate disaster management in every phase of their work, they risk losing hard-fought development gains.

More specifically, the HFA highlighted the importance of

- (i) promoting the development of financial and risk-sharing mechanisms, particularly insurance and reinsurance against disasters;
- (ii) encouraging the establishment of public–private partnerships to better engage the private sector in disaster risk reduction activities; encourage the private sector to foster a culture of disaster prevention, putting greater emphasis on, and allocating resources to pre-disaster activities such as risk assessments and early warning systems; and
- (iii) developing and promoting alternative and innovative financial instruments to address disaster risk.

The HFA established several priorities for action to

- (i) ensure that disaster risk reduction is a national and local priority with a strong institutional basis for implementation;
- (ii) identify, assess, and monitor disaster risks and enhance early warning;
- (iii) use knowledge, innovation, and education to build a culture of safety and resilience at all levels;
- (iv) reduce the underlying risk factors; and
- (v) strengthen disaster preparedness for effective response at all levels.

The HFA also noted that regional and international organizations should consider these priorities and attempt to implement them in the context of their programs and policies, where appropriate.

In particular, the paper focused on the attributes of risk pools and the benefits and problems associated with such programs. The report concluded that ADB should take the lead in advancing the understanding and deployment of catastrophe risk–financing mechanisms in Asia and the Pacific by acting as a catalyst to spur both the research and analysis of catastrophe risk in the region, and by establishing best practice standards in managing its own catastrophe risk portfolio more proactively.

The report went on to recommend, among other things, that ADB sponsor a parametric catastrophe risk–pilot project in the region that could attract the attention of global markets and demonstrate the utility and methodology of a parametric catastrophe risk–transfer program for DMCs to consider.

The report also recommended ADB to host a small workshop on the idea of a regional reinsurance pool and invite major market players and DMCs to assess market capability and gauge DMC interest. Given the growth in the catastrophe risk–finance market in the intervening year and the surge in interest among many parties, the scope of the workshop concept evolved into the Tokyo Conference on Natural Catastrophe Risk Insurance Mechanisms for Asia and the Pacific held in early November 2008.





# Fundamental Issues of Catastrophe Risk Finance in Asia and the Pacific

## Overview

The fundamental objective of the conference plenary session was to alert regional developing countries, nongovernment organizations, and other regional government representatives to new opportunities to access insurance and capital markets to transfer catastrophe risk. Recognizing the possibility that many country representatives would not have opportunities to keep up with developments in catastrophe insurance products and capital markets, the conference team concluded that the first day plenary session needed to establish baseline information on catastrophe insurance and capital markets before moving on to discuss particular applications of those tools to the Pacific and megacities on the second day.

To accomplish that, the first day's proceedings were divided into four sessions, each intended to build on the preceding session and lead to a working knowledge of the basic building blocks of catastrophe risk finance. These sessions focused on leveraging insurance and capital markets against natural catastrophes; deficiencies in the commercial market's coverage of the Asia and Pacific catastrophe risk; the foundations and purposes of catastrophe risk modeling in the region; and finally, the options available of so-called trigger mechanisms used in parametric insurance schemes.

The unfolding global financial crisis colored much of the discussion at the conference and participants were asked beforehand to reflect on the impact of the crisis on catastrophe risk pricing and the availability of capital. While the credit crisis had been ongoing for a year, the import of the worldwide deterioration in equity and credit markets was only fully being recognized in the 2 months before the conference. Thus, while very much an ongoing story, some participants thought the crisis could have a very real bearing



on the state of the insurance and capital markets' appetite for catastrophe risk while others considered the more likely outcome to be only a hardening of rates.

### **Leveraging Insurance and Capital Markets Against Natural Catastrophes**

How can developing member countries benefit from new risk transfer opportunities and how have global capital markets made it easier?

The objectives of this session, as outlined by the conference team, are the following:

- Conduct a brief survey of insurance and capital market product innovations and the state of those markets.
- Communicate the potential value created by the convergence of insurance and capital markets to participants and explain why this is an important development for disaster risk management (DRM) strategies.
- Have participants take away concrete examples of how these new hybrid products have been deployed in developing countries.
- Discuss the risk attributes of insurance-linked securities in light of the ongoing credit crisis and assess the relative performance of those securities.

#### **Insurance and capital markets have begun to merge**

An evolving, but nonetheless profound event in the global financial system has been the gradual convergence, or assimilation of insurance and capital markets. The panel saw the merging of what was once considered two technically and culturally distinct markets as a positive development that has had a substantial impact on the available methods of risk transfer and the pricing of that risk. The panel members also credited the merging markets for providing greater choice and price competition. This assimilation has been facilitated by

both a globalization of financial markets and a realization that the management of capital and the management of risk are fundamentally similar. That has permitted capital markets to underwrite and securitize traditional insurance risks and it has allowed insurance companies and those insured to access new risk bearing capacity of capital markets, which has in turn helped perfect pricing and perhaps even smoothed out insurance pricing cycles. In short, the gradual merging of markets has permitted leveraging vastly greater capital market resources against traditional catastrophe risks to enhance risk-taking capacity, improve pricing, stabilize markets, and perhaps most important, develop new risk transfer mechanisms for natural catastrophe risks traditionally dependent on more limited insurance market capability. This has been viewed as an attractive new investment opportunity for capital market investors largely because of the uncorrelated nature of the underlying risk, relative to other asset classes that tend to be directly linked to economic factors such as interest rates, economic cycles, and credit quality. To attract capital market funding, it was first necessary to develop new mechanisms with a high degree of transparency and minimal counterparty credit risk.

During the conference session, the potential for capital markets to attenuate the insurance cycle and smooth pricing was discussed. The panel considered this theoretically sound, but noted that the level of premium production produced by capital market products was still only 1%–2% of global insurance premium. The panel felt that, nonetheless, it had the potential to have a big impact on market pricing generally. However, it was also noted that capital flows in both directions and flows away from insurance products could have the opposite effect on pricing.

The panel was particularly interested in the applicability of capital market risk transfer solutions to governments. Capital market products offer special advantages to governments seeking to buy catastrophe protection because of their ability to self insure large exposures and bring a diverse portfolio of risks to the market. Panelists noted that the Asia and Pacific governments should be



### Box 3: Report Highlight: Insurance-Linked Financial Products

The convergence of insurance and capital markets is best epitomized by the development of a market for issuing and trading securities derived from insurance instruments. Insurance-linked securities (ILS) and related financial products allow the transfer of insurance risk to capital markets by contractual agreement. Examples of ILS and financial products include catastrophe bonds, sidecars, and industry loss warranties.

**Catastrophe bonds** are securities that transfer defined catastrophe risks to investors via bond instruments. A special purpose vehicle established on behalf of the sponsor most often issues catastrophe bonds. Typically, the bonds are floating rate instruments, the principal of which is used to pay off losses in the event of a specified catastrophic event.

**Side cars** are securities issued to investors that have opted to participate proportionately in an insurer's book of business. Much like a quota-share reinsurance contract, investors accept a share of losses for a like share of premium, less commissions for expenses.

**Industry loss warranties** are contracts that transfer risk based on a measure of loss to the entire insurance industry, not to the particular insured. Insurance loss warranties are commonly executed as reinsurance contracts, but they may also be structured as securities or derivatives.

The ILS market has often been used by insurers to buy protection for high severity, low probability risks to supplement or replace traditional reinsurance at very high levels in a reinsurance structure. Used in this manner, ILS contracts allow insurers access to incremental capacity at attractive pricing. Driving the development of the ILS market on the other side have been capital market investors, quick to fill a capacity gap and diversify their portfolios with risks not correlated to financial and credit-related risks already on their books.

A major factor in the growth of the ILS market has been the liquidity depth of capital markets. In the current environment, it is anticipated that capital market appetite for ILS products may be substantially reduced, albeit probably only temporarily. What is clear is that the secondary trading market for these securities has slowed to a crawl in the absence of broader credit market activity. However, it is expected that the ILS market will rebound in conjunction with a thaw in the credit environment generally, especially if reinsurance rates harden as expected over the course of 2009–2010.

in the market buying protection for the poor, repairing infrastructure damage, and aiding in building critical new capacity in developing country insurance markets.

**How is the catastrophe risk market responding to the global credit crisis?**

The panel agreed that while activity in insurance-linked securities (ILS) markets had slowed, there seemed to be no fundamental changes or long-term adverse consequences for the ILS market as a result of continued turmoil in global financial markets. The exception to that appeared, not surprisingly, to be in the higher cost of

capital. However, there did appear to be agreement on the fact that the predicted superior performance of ILS in a period of market turmoil was proving to be true. It had long been argued that the uncorrelated nature of natural catastrophe risk securities, relative to other asset classes underwritten by capital markets, coupled with the transparent nature of those risks, would lend stability to those securities in troubled times. The panel agreed that this was happening in practice, although new issuance of these securities was being constrained by the higher cost of capital. However, risk spreads and yields appeared to holding up well. Specifically, it was noted that since March of 2007, the Standard & Poors 500 Index was

#### Box 4: Report Highlight: Credit Crisis Update

As already noted, the conference occurred during a particularly turbulent period of the unfolding and deepening credit crisis. While many participants addressed the impact of the crisis on the state of catastrophe risk insurance markets, much has happened since that time to clarify its potential impact. To capture the most current thinking on the impact of the crisis, the conference organizers polled a number of participants and market experts to gauge their sentiment on the state of the markets and the outlook for 2009.

Not surprisingly, there was a range of views on the state of the markets and the prognosis for the coming year. While most participants agreed that catastrophe reinsurance rates were hardening as a result of 2008 losses, reduced portfolio asset values, and the rising cost of risk capital, they disagreed on the implications of rising catastrophe rates. Some noted that rising rates did not correlate well with underwriting results and hence were not fully justified.

Others noted that higher rates were part of the mending process that would restore reinsurance balance sheets and promote more discipline in allocating and pricing of capital. Others observed that 1/1 renewal rates for catastrophe risks were actually flat to 2008, even in the United States market, but that additional layers or new business was more difficult to place.

It was also noted that the credit crisis had helped shift the catastrophe bond market toward an investor-driven, as opposed to issuer-driven market. The significance of this shift has been seen in a diminished investor interest by those without insurance specialization (e.g., hedge funds) and a heightened interest by those investors with insurance expertise. The practical import of this may be a corresponding increase in indemnity trigger bonds and a decrease in parametric trigger bonds, since the transparency of the parametric trigger—so important to capital markets—is of less value to those investors with the ability to manage the indemnification process.

It was also noted that the failure of Lehman Brothers had created some turmoil in the catastrophe bond market, given their role as a guarantor of collateral investor funds. Hence, even though the underlying risk being transferred remained uncorrelated to financial asset classes, it had nonetheless been caught up in the credit crisis, thus tarnishing to some degree the claim that catastrophe bonds are both uncorrelated and free of credit risk.

In summary, the general conclusions of the group polled were the following:

- 1) Catastrophe pricing will increase as a result of 2008 losses and the need to strengthen balance sheets, but catastrophe risk capacity will not likely be substantially reduced, and renewal business may not be affected dramatically.
- 2) Despite setbacks in the catastrophe bond and insurance-linked securities market, participation by capital markets in catastrophe risk financing is here to stay, but the absence of capital market liquidity would be a meaningful constraint to new issues in 2009.
- 3) Reinsurers could face a serious challenge in replenishing capital in a locked-down credit market in the event of major catastrophic losses in 2009.
- 4) The credit market turmoil underscores the need to create a more robust and reliable catastrophe risk financing structure within Asia and the Pacific that is stable and prepared to respond to regional needs.

trading down 37%, the BB (investment grade) Corporate Bond Lehman Index was trading down 18%, and the Swiss Re BB Catastrophe Bond Index was trading up 9.7% in the same period.

As regards the impact of the financial crisis on catastrophe risk transfer more generally, the panel noted that reinsurers had been hit particularly hard by declining asset values and that the resulting increase in cost of

capital could translate into increased prices. They noted, however, that even with depressed portfolio values, most reinsurers' premium to surplus ratios were still more than adequate.

On the regulation of the global ILS market, the panel believed that additional regulation was essential. While minimal regulation of the derivatives market was seen as a positive attribute that had helped produce low transaction costs, the failure of adequate supervision and the scale of the market has since demonstrated the need for global international standards. And within Asia, where such regulation has a weaker footing, it is even more imperative that such efforts be made. It was noted that regional development partners could play a significant role in encouraging regulatory authorities in Asia and the Pacific to comply with global standards. However, while ILS often include a derivative component, they are normally collateralized to the maximum possible loss amount and hence are quite distinct from credit-linked derivatives.

### **Are There Deficiencies in the Commercial Insurance Market's Coverage of the Asia and Pacific Catastrophe Risk and Does Risk Pooling Bridge the Gap?**

The objectives and questions to be answered in this session, as outlined by the conference team, are the following:

- Establish a consensus on whether there is a gap to be filled and if so, is the gap a function of demand or supply side factors?
- From the developing country side, how is the gap viewed and where do these countries see limitations of the commercial market contributing to the shortfall?
- From the commercial market's side, what are the systemic obstacles within countries to creating demand or establishing the necessary prerequisites to writing catastrophe coverage in these countries?

- Which of these aspects of market gaps can the ADB effectively address?

Is there a gap between what developing member countries require to better manage catastrophe risk and what insurance markets are prepared to offer?

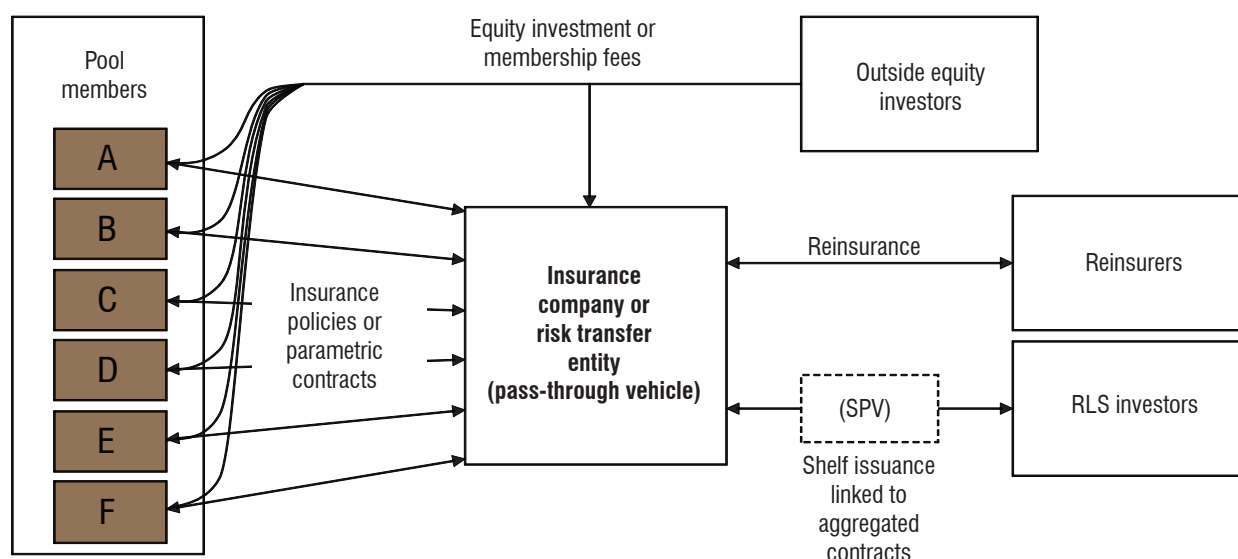
The panelists generally agreed that a reasonably priced catastrophe risk capacity was available for Asia and the Pacific. However, this fact highlights the paradox of having ample capacity at historically low prices during a period of very low catastrophe risk–insurance penetration. In other words, if capacity and cost is not the cause of a coverage gap, then where do we look for answers?

One observation was that from a government perspective, a key factor leading to low levels of acceptance is that catastrophe insurance often fails to address fatalities. It was noted that protection of livelihoods and human life itself might often be more relevant to developing country-disaster management needs than the protection of government assets or private infrastructure. By focusing exclusively on property damage, catastrophe insurance may reduce its relevance to national governments that are more concerned about the loss of human life. Expanding the focus to include fatalities could be one way to address the demand-side weakness and help bridge the gap.

A panelist also observed that there was a significant gap between the market and demand even in Japan. He noted that in the event of an extremely large earthquake in Japan resulting in roughly \$1 trillion of losses, only 10% of the loss would currently be covered by insurance. He also noted that even with widespread popular understanding of quake risk in Japan, it was difficult to sell such coverage, with only about a 22% penetration of households in Japan.

Several other explanations for the gap were suggested, including the possibility that the hazards typically addressed by catastrophe insurance sometimes failed

**Figure 2: Example of a Risk Pool**



RLS = restructured loans, SPV = special purpose vehicle.

Source: Hill, J. 2008. Leveraging Insurance and Capital Markets against Natural Catastrophes. Paper presented at the Natural Catastrophe Risk Insurance Mechanisms for the Asia and Pacific Region Conference and Workshops, Tokyo, 4–5 November. [www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp](http://www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp)

“A basic example of a pooling mechanism. The pooling entity or ‘pass-through vehicle’ is owned by members and/or policyholders and may be funded through outside equity investors or governments as well. In this example, the pool accesses the traditional reinsurance market and obtains additional capitalization through risk-linked securities issued a small amount at a time through a shelf program.”

to address the hazard ultimately causing the greatest loss. At least one panelist suggested that typhoon and earthquake risk were only part of the hazard mix that the commercial market needed to address. The secondary hazards spawned by typhoon and earthquake, such as landslides, floods, and tsunamis, were possibly the hazards of greater concern to developing countries but not always adequately addressed by the market.

#### Insurance affordability

Catastrophe risk insurance premium is often deemed to be too expensive by developing countries. It is true that catastrophe risk premiums sometimes reflect high

multiples of expected losses, since the underlying events tend to be high severity and low incidence, thus necessitating a high capital charge for the extremity of the event. Therefore, the cost of capital to reserve against catastrophes can be a major driver of catastrophe insurance costs and can render the insurance “unaffordable” without necessarily making the insurance mispriced. Also affecting affordability in developing countries, relative to rates in developed countries, are lower construction standards and higher levels of moral hazard as regards claims handling.

But it was by no means agreed, notwithstanding assertions of historically low-catastrophe risk pricing in

### Box 5: Report Highlight: Insured Catastrophe Losses in 2008

According to Swiss Re, 2008 was the second costliest year in terms of catastrophe losses for insurance firms worldwide. In all, the total volume of claims on natural and man-made disasters amounted to \$50 billion, almost double the amount from the previous year.

In total, catastrophes worldwide (insured and uninsured) caused \$225 billion of damage, with natural disasters generating \$43 billion of claims. Man-made disasters, such as fire and explosions, generated \$7 billion of claims. The vast majority of all catastrophe losses worldwide remain uninsured, especially in the developing world where insurance penetration is extremely low.

In 2008, catastrophes caused more than 238,000 fatalities, with over 90% of the total occurring as a result of cyclone Nargis in Myanmar and the Sichuan earthquake in the People's Republic of China.

Overall, it was noted that developing countries absorbed a larger proportion of natural disaster losses in 2008 than in the previous year, thus resulting in a relatively small percentage of losses covered by insurance worldwide (22%).

Asia and the Pacific, that such insurance was deemed sufficiently affordable by developing countries. This was seen as a gap in and of itself. Catastrophe risk–insurance pricing relative to historic insurance pricing benchmarks is a vital indicator to gauge the state of the market, but to assess affordability of catastrophe risk premium in developing countries may require a different metric. For example, a suggestion was made that the socioeconomic issues should be weighed first before discussing affordability of catastrophe insurance.

To do that, it would first be necessary to ask two fundamental questions: what do catastrophes do to people

and what benefits do poor people in particular want to see from catastrophe insurance? It was suggested that one way to achieve that ground-level view would be via a microinsurance pilot project. Such a pilot project would require a sharp focus on what people really want from catastrophe insurance and would reflect real socioeconomic issues that affect people's lives.

**Should international financial institutions and donors reduce the cost of insurance and what would be the effect of doing so?**

Some panelists thought some degree of financial incentives were important to jump-start the process, but that premium subsidies were inadvisable given their tendency to distort market pricing and make long-term program commitments more difficult. It was noted that the experience of the Caribbean Catastrophe Risk Insurance Facility (CCRIF) indicated that some degree of premium subsidy had proven helpful in forging regional catastrophe risk mechanisms, but that the trade-off is the need to wean the recipients off the subsidy later, which can prove difficult.

In this context, a participant observed that the idea of subsidizing premium suggests knowledge of the proper price for catastrophe risk in developing countries. He argued that since insurance is so underdeveloped in these countries and catastrophe risk data are so inadequate, the question of what constitutes a subsidy is inherently unanswerable at this point.

**What can ADB do to facilitate access to catastrophe risk transfer?**

It was broadly agreed that there was ample opportunity for ADB to play a critical role in the development of catastrophe risk insurance in Asia and the Pacific.

A panelist stated that ADB had enormous power to promote the adoption of catastrophe risk insurance. He noted that it has deep and longstanding relationships with its member countries and is in a unique position



to build understanding of the benefits of catastrophe risk insurance and also bridge the differences among countries when forming regional schemes. For example, ADB is in a prime position to use its convening power to build the political will to accept the cross-subsidization of losses in a regional scheme. This could be achieved once ADB had built a sound understanding within the region of the value of catastrophe risk insurance.

The panel noted how important the success of ADB's initial efforts would be. Finding a scheme that works will help build momentum to replicate the success in more challenging locations later. For example, it could

initiate a regional data bank on catastrophe hazards and vulnerability that would be open for all to access.

There was also consensus that ADB should lead by example and develop better catastrophe risk management of its own loan portfolio. There were two obvious benefits to this idea: (i) the institution would be exercising the prudent management of its own catastrophe risk; and (ii) it would be addressing the harmful follow-on effects of disasters on its own lending resources following a catastrophic event. Insuring such risk into the private sector would help eliminate the opportunity costs to its own mission resulting from

#### **Box 6: Report Highlight: The Inter-American Development Bank Approach to *Ex Ante* Disaster Risk Management**

The Inter-American Development Bank (IADB) is in the process of developing *ex ante* disaster risk management (DRM) programs for several countries in Central America. Its approach to the development of these mechanisms differs, in several important respects, to the work being done by other multilateral development banks in other regions.

The principal departure in the IADB approach is to bypass initially the regional catastrophe risk-pooling concept, at the first tier insurance level, in favor of developing a menu of financial instruments that can be shaped to an individual country's particular needs, instead of relying solely on risk-transfer instruments. IADB perceives significant value in developing DRM capabilities by country. First, such an approach assures that the resulting program is tailored precisely to the country's DRM requirements and capabilities. Second, it provides the country with a track record and market presence vis-à-vis capital markets and reinsurers. And third, IADB believes that reinsurance market pricing implicitly provides much of the economic advantages of risk pooling, particularly when the size of coverage is limited and/or the risks in the eventual pool are significantly correlated.

The IADB strategy calls for an integrated, multifaceted program to be devised for each country that may include (i) prevention and mitigation measures, (ii) contingent credit facilities providing immediate liquidity to absorb medium probability and/or medium-level losses, (iii) insurance of low probability and/or high losses, and (iv) ex post financing of extremely low probability and/or catastrophic losses. This structure includes a degree of credit enhancement by IADB, in particular through the contingent credit facility that may improve the ability of a country with low credit to access global markets on favorable terms.

Another significant feature of the IADB approach is to structure insurance coverage through captive insurance entities established by the country authorities and managed by independent administrators and auditors. The purpose of the captive structure is to provide governments with improved access to insurance and reinsurance markets. IADB is also in the process of forging public-private partnerships between governments in Central America and a private international insurer.

IADB sees risk mitigation and natural DRM planning as being integral parts of any national strategy and is prepared to provide nonreimbursable technical assistance funding to support the development of the domestic insurance market, regulatory strengthening, and risk management programs.

natural catastrophes. Finally, the panelists agreed that ADB can provide technical assistance to developing countries in terms of feasibility analysis of different insurance schemes, fund data collection to build up the regional infrastructure necessary to attract insurers, and ultimately facilitate the development of efficient insurance markets in the region.

## Building Blocks of Catastrophe Insurance: Catastrophe Risk Models—Their Purpose and Importance

The objectives of this session, as outlined by the conference team, were as follows:

- Establish a baseline understanding of catastrophe risk modeling for those unfamiliar with the field.
- Outline the challenges and impediments to catastrophe risk modeling and catastrophe risk data collection generally in Asia and the Pacific.
- Explore who is best prepared both to do the work and pay for it.

### What are the basics of catastrophe modeling?

This session began with a review of the fundamental purpose and methodologies behind catastrophe loss models. Catastrophe modeling is fundamental to how catastrophe risk management is undertaken and is used for pricing, structuring, and transferring risk to insurance and capital markets.

Panel participants explained that the two critical functions of catastrophe models are to establish risk pricing and to correlate the portfolio. The portfolio correlation yields information on the potential for multiple locations to be affected by a single or compound hazard event. This function ties directly into one of the most important concepts behind insurance: diversification. Assessing correlated risk helps promote the spread of risk so that a single event will not result in losses to a substantial proportion of a portfolio of risks.

The pricing information derives from taking the losses from the full range of possible events and from applying the expected rate of occurrence of that event to yield an expected loss figure.

Both functions are achieved by (i) generating a broad universe of hypothetical hazard events with appropriate magnitudes, frequencies, and locations; (ii) identifying a portfolio of assets that could be damaged, together with their values and locations; (iii) assessing the vulnerabilities of those assets as percentages of their values, summing the potential losses from each event; and (iv) ranking the potential losses in the form of an exceedence probability curve.

### Catastrophe modeling in Asia and the Pacific: What are the issues in building catastrophe models?

Of particular interest to the panel was the prospect of developing catastrophe risk models in areas within Asia and the Pacific where such models had not been attempted or were incomplete.

The panel agreed that it was critical to invest the proper talent and funds into developing and maintaining these models. In particular, the panel noted that catastrophe model outcomes are extraordinarily sensitive to the parameters used. For example, in windstorm models, a 1% increase in wind speed could produce a 7% increase in loss. The suggested implications of this sensitivity was that scaled-down modeling efforts are likely to yield significantly less valuable models that are less likely to produce accurate results and will fail to win the confidence of insurance and capital markets. The succinct message was: do not sacrifice the quality of the model when moving into new geographies.

The panel also reiterated the point expressed earlier that current catastrophe models were not well adapted to the most relevant hazards impacting Asia and the Pacific. In particular, flood is probably the most critical hazard in need of modeling for the region, yet it remains the most challenging. Recent advances in remote sensing

technology provide opportunities to develop index insurance programs by mapping and then monitoring known flood reaches, but more work needs to be done before a marketable model is available for developing countries.

In this context, it was noted that in Asia and the Pacific, many typhoon fatalities result from landslide and storm surge and in the Pacific, earthquake fatalities often result from tsunami—yet most models focus on wind speed and ground shaking. Thus, modeling efforts need to be refocused to include secondary impacts to capture relevant loss data that may better reflect concerns of countries in the region. It was noted that in the Pacific islands, choosing the correct hazard to model would depend on the purpose of the modeling exercise. For example, if the aim is to protect human life or to fund emergency loss expenses, the choice will decide what hazard to focus on. The former may be better linked to flood or landslide and the latter to windstorm.

The panelists generally agreed that asset values in the Pacific area were not big enough to warrant the commercial market to fund the cost of catastrophe modeling. A panelist declared that where there is a will, sufficiently large insured values, and a business case to be made, then catastrophe models would follow. It was noted that presently, those conditions prevail in very few countries in the region and virtually none in the Pacific.

The costs of developing catastrophe models are not only out of reach for many smaller countries, the cost of establishing and maintaining such models with timely and accurate data collection is also quite high. Clearly, such data collection and management is essential for developing risk-financing schemes, yet the historical record in the Pacific, for instance, is often incomplete and internal funding is scarce for such things as maintenance of weather stations and hazard databases. Development banks can play a critical role in enabling DRM strategies to move forward by funding such modeling and data collection efforts. Doing so could

pave the way for these risk-financing programs to win acceptance in global insurance and capital markets by providing the necessary DRM infrastructure funded on a continuing and sustainable basis.

#### Risk mitigation: The importance of reducing the impact of disasters and the benefits of mitigation

Several participants emphasized that no country can engineer a viable insurance scheme without risk mitigation. As noted by previous speakers, a risk transfer mechanism without a risk mitigation regime is simply not viable in any market, especially in a developing region where there is less reliable data and fewer participants. Often, an appreciation of this holistic approach to DRM is missing when proposals are made to transfer catastrophe risk in developing countries. A risk must first be deemed insurable before a catastrophe risk-transfer program is considered, and to do that most effectively, risk mitigation should be integrated into the country's DRM plan.

Catastrophe modeling can be used as an effective risk mitigation tool and can be used to encourage mitigation to reduce risk. For example, catastrophe risk modeling can be used to enhance building code or land use reforms. Models can help inform governments about the loss reduction attributable to specific improvements (e.g., storm shutters) or can instruct where not to build to avoid hazards.

#### What are the roles for multilateral development finance institutions?

An important question put to the panel was how the cost of catastrophe modeling is to be met when the immediate rewards to commercial insurers and modelers are low. It was agreed that catastrophe modeling in the developing regions of Asia and all the Pacific islands was too expensive to be justified by commercial modelers. One solution aired was the notion of an open-source model that could be devised and maintained (both the code and the product) for common use. The advantage of this

would be lower initial and ongoing costs. The downside, as noted by the panel, could be that the quality of the data and maintenance could be substandard.

There was broad agreement that development banks and/or agencies could be in the best position to “prime the pump” for catastrophe model development and maintenance. ADB could fund a development platform that could begin building data collection infrastructure (e.g., wind stations) in key locations and data maintenance capability. The collection of loss data is also vital to validate model results. ADB could also fund the building of a catastrophe model that is used as a community resource within the region that can then be sustained by the data collection network already in place. In this way, ADB could provide the missing link in the development of a catastrophe risk model for Asia and the Pacific and play a major role as a catalyst to break one of the key logjams in DRM in the region.

### Catastrophe Insurance Triggers: What is the Best Fit for Asia and the Pacific? Why Does It Matter? What Initiates a Payment under a Catastrophe Risk Insurance Policy?

The objectives of this session, as outlined by the conference organizers, are the following:

- Review the basics of catastrophe insurance triggers in the context of parametric insurance mechanisms, especially as they relate to pricing and affordability.
- Provide examples and case studies to demonstrate the applications of these triggers in actual parametric programs.
- Present the International Finance Corporation’s pending Global Index Insurance Facility (GIIF) and explain its relevance to Asia and the Pacific’s DRM efforts.

### Background information

The panel covered the essential foundations of catastrophe insurance triggers and the specific applications of certain trigger mechanisms in practice (CCRIF) and in theory (Asia and the Pacific). Prefacing that discussion was a brief survey of trigger types and their applications.

1. **Indemnity.** This is the traditional method of triggering payment under an insurance policy and involves presentation of proof of actual loss suffered. It is often called a perfect hedge, but it too has some degree of basis risk.
2. **Pure parametric.** Payment is made based on the occurrence of a pre-defined event, not the resulting loss. Basis risk is high, given the pure proxy role of the event itself.
3. **Parametric index.** Instead of paying strictly based on the occurrence of an event, this trigger pays based on an agreed index or formula (an objective, external measure) as a proxy for likely losses. The CCRIF operates with a parametric index trigger. Basis risk is lower than in a pure parametric trigger.
4. **Modeled loss.** Instead of using an index, this trigger uses a peril model that will ascribe losses and probabilities based on model inputs. With a quality model, basis risk is reduced further.
5. **Industry index.** Payment is triggered by total market losses exceeding a certain level. This is not applicable to developing country markets given the lack of data.

### Basis risk: What is it and why does it matter?

Basis risk is the risk that the recovery under an insurance contract does not equate to the loss incurred. Basis risk can cut in both directions with the insured being less than fully compensated for his loss and the insurer paying out less, or the insured being made more than whole and the insurer’s payment exceeding



the actual loss. Basis risk is present in all insurance transactions and is vital to understand since it tends to be accentuated in parametric mechanisms. That is so because parametric mechanisms seek to use the loss event as a proxy for the loss itself and utilize modeled losses or indexes as the basis for compensation, as opposed to loss calculations that are based on actual assessments. By definition, even highly sophisticated modeled losses can never precisely align with actual losses, thus creating some degree of basis risk. Indemnity policies create basis risk as well by dint of deductibles and other contract terms.

The key reasons that the insured and insurers accept basis risk in the context of parametric catastrophe insurance is because (i) it eliminates potentially long administrative delays in getting funds into the hands of those buying protection for emergency aid; (ii) when insuring sovereign assets, the determination of loss can be difficult since exposure data can be hard to obtain or unreliable, thus rendering indemnity policies difficult to underwrite; (iii) since governments have some element of control over losses they suffer, a certain degree of moral hazard exists when insuring sovereign assets, again often rendering indemnity policies impractical; and (iv) there is a trade-off between basis risk and price, with higher basis risk parametric products (pure parametric) tending to be less expensive than lower basis risk products (modeled parametric).

The panel was also concerned about who should bear basis risk. One view was that from a political standpoint, the consumer must be protected from basis risk. Under this view, it was considered unfair for a householder or farmer to bear this risk when they had relied on the insurance protection, only to see the insurance fail to cover the loss adequately or perhaps not respond at all.

Possible solutions suggested by the panel members included: having catastrophe insurance schemes or

scheme sponsors bear basis risk; seeking to have basis risk reinsured as part of the total risk transfer structure (where primary coverage is provided by capital markets and basis risk cover is written by reinsurance markets); and seeking to use indemnity covers where affordable.

### The choice of triggers affect the cost of insurance

The panel noted serious issues of affordability that tied back to discussion from an earlier panel on the wisdom and need for incentives, particularly premium subsidies. Sentiment was expressed from the audience that perhaps objections to premium subsidies were misplaced. The question posed was: “What is wrong with subsidizing premium on the front-end of the process since governments are usually forced to reallocate resources after a natural catastrophe to aid the poor in any event?”

The panel stated that it is difficult to generalize about the impact of different trigger mechanisms on affordability and their respective impacts on basis risk. At the most general level, it can be said that the “commoditization” effect of capital markets pricing of parametric triggers can produce savings over traditional indemnity insurance products especially when it involves a significant amount of co-insurance. Yet, parametric trigger mechanisms produce countervailing basis risk that can add to the net loss to an insured. Nonetheless, it can be said that basis risk diminishes the more sophisticated the parametric trigger, although as noted in the comments below on the CCRIF case study, even with a parametric index trigger, significant basis risk—and hence costs—can remain.

Within the catastrophe bond market specifically, the panel noted that from 2003 to 2007, virtually no indemnity triggers were used for non-United States bonds and as a rule, pure parametric triggers were about 15% less expensive than indexed or modeled bonds.

Some examples of how trigger mechanisms can help shape catastrophe risk transfer programs

### **The Caribbean Catastrophe Risk Insurance Facility**

The panel noted that the timing of receipt of disaster aid funds was the key driver behind the formation of the CCRIF. Some form of parametric trigger was therefore recommended. The parametric-index option was chosen for the CCRIF in part to reduce basis risk. Rather than key payments off the loss event itself, a formula index was created as a proxy to the loss event that would estimate the likely losses in an earthquake or hurricane. To do this, within each member country, reference points were established based on population and exposure values. At each such point, the formula incorporates measures of wind speed or ground shaking followed by the application of a formula to derive expected loss amounts. (A more complete description of CCRIF operations is found on p. 24.)

### **MAIPARK**

The panel discussed the relative merits of different trigger mechanisms as they pertain to MAIPARK (the commercial pool of earthquake risks written within Indonesia) and the National Disaster Management Program of Indonesia. It was noted that the primary task of these programs is to get cash into the hands of the people most affected by the disaster within 2 weeks. This is the critical task in the eyes of the Government of Indonesia, and as such, a parametric trigger is being studied as a means to speed funds to those in need. Currently, all MAIPARK insurance programs are indemnity based.

However, basis risk associated with parametric triggers can be difficult if not impossible in a country like Indonesia with insurance penetration of under 1% of gross domestic product and with a lack of general insurance awareness. Politically, it could be very

difficult for the government to explain to the public and elected officials why funds spent on insurance protection did not produce the protection when the disaster struck.

Indonesia recognizes that it cannot allow itself to be in such a situation, and therefore, a hypothetical compromise might be to combine parametric triggers with indemnity triggers. Parametric insurance could be deployed at a level that can be justified by pricing and affordability, but at the lower levels of the program, the government believes that the insurance must remain indemnity based.

### **The Global Index Insurance Facility**

The International Finance Corporation presented a brief summary of a new index reinsurance facility now in its formative stages. The Global Index Insurance Facility (GIIF) as proposed is to be comprised of a reinsurance vehicle intended to originate, intermediate, and underwrite weather that could be indexed, catastrophe, and commodity price risks in developing countries. In addition, the GIIF will have a funding vehicle dedicated to the development of local insurance markets, capacity building and technical assistance for the development of *ex ante* risk transfer mechanisms and catastrophe risk-modeling expertise among other endeavors. It was stated that one of the important functions of the GIIF would be to create intermediaries on the ground within developing countries. It was noted that while capacity for catastrophe risks globally is considered adequate at the moment, too little of this capacity is coming out of the developed world to be used in the developing world. Hence, the potential real value of the GIIF would be to create risk markets in the developing world by focusing on local capacity building to get insurance companies and other intermediaries in developing countries to become stakeholders and begin to write catastrophe coverage.

### Are there special considerations in Asia and the Pacific affecting the choice of triggers?

The applicability of these trigger mechanisms to catastrophe risk in Asia and the Pacific is impacted by the lack of adequate peril models in many territories as well as the difficulties in gathering market and historical loss data. The implication of the former is that the cost and lead time necessary to structure these programs may be substantial and that either traditional reinsurance or pure parametric or parametric index may be the preferred course.

Also, it was noted by the panel that the need for better and more sophisticated modeling is even greater when using parametric or parametric index triggers. This is because with these triggers, the uncertainty in the catastrophe risk–transfer transaction is retained by the buyer, as opposed to indemnity transactions where all the uncertainty is retained by the reinsurer. This raises the stakes within Asia and the Pacific of generating quality models to reduce basis risk.

### Key ideas for forming a framework approach to better disaster risk management in Asia and the Pacific and how ADB can best facilitate its development

- **Market research assessing the scope of private market interest.** For regional development partners to leverage their finite resources wisely and to act as a catalyst to attract private sector capital and expertise, it is essential to understand better the capability and interests of commercial market participants. Achieving a better understanding of what the private market is prepared to do and why, is critical to shaping this catalyst role.
- **Research opportunity costs of both post-event funding as well as *ex ante* funding.** More work is required to assess the follow-on effects of both *ex ante* and post-event catastrophe funding. The possible unintended consequences of each must be better understood for policy makers to make informed decisions regarding catastrophe risk–financing.
- **Lack of adequate catastrophe models.** The development and maintenance costs of catastrophe risk models have been impediments to more effective DRM in Asia and the Pacific. Coupled with the difficulty of obtaining consistent and reliable data, this has hindered catastrophe risk finance opportunities. International financial institutions need to consider ways to sustainably fund such activities.
- **Catastrophe risk and/or insurance awareness.** The low level of insurance penetration in developing countries was in part attributed to a lack of popular awareness of both the vulnerability to catastrophe risk as well as the existence of possible insurance solutions. Regional development partners could launch awareness campaigns and begin to incorporate catastrophe risk reviews as part of their normal project assessment process.
- **Develop a PPP for catastrophe risk pooling.** ADB is in a unique position to use its convening power and loan and guarantee functions to establish a PPP-based platform to support catastrophe risk financing in the region. Such a PPP could serve as a transitional mechanism to bridge the gap between country needs and commercial market capabilities. The platform could serve as the basis for numerous endeavors, including a pilot program for Asian megacity risk.

- **Microinsurance.** A microinsurance pilot project could begin to address issues of low acceptance of catastrophe insurance in regional developing countries. By building insurance awareness from the ground up, the needs and values of ordinary people would begin to be reflected in catastrophe insurance products and acceptance rates could rise significantly.
- **ADB to develop catastrophe risk best practices standard.** By more aggressively managing its own catastrophe risk exposure within its loan portfolio, ADB could set an example to its member countries of how to better manage risk. By doing so, ADB could foster insurance industry interest in the region. It could also consider ways to share the protection benefits with its borrowers in the event of a natural disaster that impacts loan repayments.
- **Fund feasibility of catastrophe risk–financing options for individual countries.** Existing DRM programs and institutions differ markedly from country to country within Asia and no single catastrophe risk financing solution fits all countries' cultures and approaches to DRM. ADB and other international financial institutions could support studies within individual member countries to ascertain the catastrophe risk–financing strategies that fit well with that country's existing DRM framework and culture.







# Applications of Catastrophe Risk Transfer Mechanisms in Asia and the Pacific

## Creating a Viable Risk Pool for the Pacific

### Overview

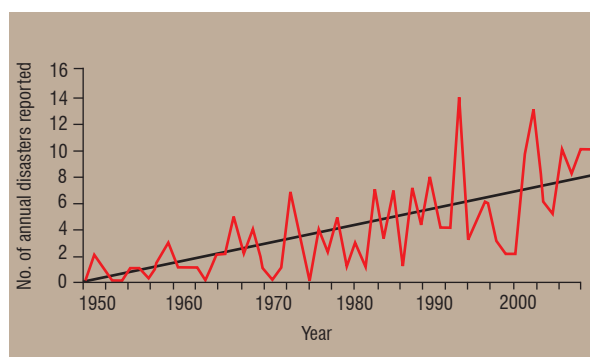
This workshop was jointly organized by ADB, Japan's Ministry of Finance, and the World Bank. It had three broad objectives: (i) to generate a better understanding of how catastrophe insurance is relevant to the Pacific; (ii) to create a better understanding of what initial actions have been taken to advance catastrophe insurance in the Pacific; and (iii) to facilitate discussion of possible future actions and options in support of catastrophe insurance in the Pacific.

### Opening Addresses

In its opening remarks, ADB made clear its commitment to understand better how gaps can be bridged to develop proactive disaster preparedness. Currently, ADB capitalizes on the comparative advantages of the respective institutions and synergies with the private sector to develop the most efficient support for governments. The central question is, how can the Pacific strengthen its resilience to natural disasters? While catastrophe insurance is not the complete answer, it may help governments with the immediate liquidity needed following a disaster.

For its part, the World Bank recognizes that the Pacific islands are exposed to a wide range of natural catastrophes and the significant impact these have on people's lives and economic performance in small economies. There is now a greater awareness of the need to adapt to natural disasters and to acknowledge climate change. But while adaptation is an important policy ingredient, it is neither a complete nor sufficient solution for major disasters.

**Figure 3: Trend in Annual Reports of Natural Disasters in the Pacific Islands**



Source: Blong, R. 2008. The Special Nature of Disaster Risk in the Pacific. Paper presented at the Natural Catastrophe Risk Insurance Mechanisms for the Asia and Pacific Region Conference and Workshops, Tokyo, 4–5 November. [www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp](http://www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp)

“While several studies purport to show an increase in natural disaster losses, the most careful analyses indicate increased losses result from societal changes and changes in values at risk.”

Collective risk pooling in the Pacific has been given fresh impetus by the success of the Caribbean Catastrophe Risk Insurance Facility (CCRIF). The CCRIF was designed to fill the financing gap between the immediate disaster response and rebuilding, a period during which government income may be reduced. The World Bank’s experience with catastrophe risk financing and significant in-house technical expertise led the Pacific islands to invite the World Bank to examine risk pooling. To date, the World Bank has identified three possible approaches: (i) regional pooling of country risks supported by reinsurance markets, (ii) establishment of donor catastrophe reserve funds, or (iii) a combination of a regional reserve with access to the reinsurance market in the case of infrequent events. With an expanded awareness of the value *ex ante* financing and stronger government support, the World Bank can now play an important role in establishing

a regional catastrophe insurance mechanism in the Pacific islands.

### The Caribbean Catastrophe Risk Insurance Facility

The CCRIF: How was it created and what problems was it designed to solve?

The primary objective of the CCRIF is to cover the post-disaster liquidity gap—that is, the gap between emergency funding and rehabilitation funding. The need for prompt release of funds was a major goal of the CCRIF, which substantially influenced the decision to use a parametric policy. To date, the facility has paid three claims (one for earthquake and two for hurricanes), all of which have been paid within 15 days.

During the workshop session, representatives of the World Bank and the CCRIF described how the creation of the CCRIF had been accomplished in two phases. Its implementation was initially funded by Japan and involved modeling by EQECAT (one of three global modeling companies), examining possible financial structures and governance arrangements, preparing operating manuals, and selling the concept to Caribbean governments. The CCRIF was then incorporated as a captive insurance organization in the Cayman Islands with a catastrophe insurance expert undertaking front office duties and a captive agent providing back office services. The CCRIF appointed Benfield as the broker to intermediate with reinsurance markets. An independent asset manager was also appointed.

An initial feasibility study for the CCRIF was conducted in November 2005, in part to gauge the level of country interest in establishing such a facility. The CCRIF management set the goal of having 10 countries committing to the scheme—from among 20 Caribbean Community (CARICOM) members—but recognized the facility could be sustained, if necessary, with only six participants inclusive of Jamaica. Individual discussions

were held with countries and also via regional workshops. A particular effort was made to include government officials with technical responsibility in these workshops. Doing so provided a group of officials that could reliably inform senior government officials on a continuing basis.

To establish a firm basis of support, the CCRIF requested a 2-year initial commitment from governments to provide stability within the scheme as it commenced. Premiums ranged from \$500,000 to \$2 million annually. In the first year, an equivalent participation fee was also charged, which allowed capital to be quickly built. During this critical formative period, CARICOM provided essential expressions of political support.

### The Cayman Islands experience

The Cayman Islands shares some critical risk characteristics with Pacific countries and is especially exposed to earthquake and hurricane risk. A turning point for the Cayman Islands occurred in 2004 when hurricane Ivan caused damage estimated at 184% of gross domestic product (GDP). Notwithstanding that the government had a proactive strategy at the time, including property insurance, a mitigation program, a disaster fund, and enforcement of building codes, hurricane Ivan forced the realization that more needed to be done to anticipate and manage catastrophe risk. After hurricane Ivan, 16 regional governments across the Caribbean expressed interest in a catastrophe insurance facility, with each expressing different risk concerns.

CCRIF policies were put in place in May 2007. In August 2007, the category 3 hurricane Dean passed near the Cayman Islands but was too far to the south to achieve wind speeds on the main island necessary to trigger the policy. Nonetheless, damage was incurred and government officials wanted a payout and had little interest in discussing the fine points of triggers and models. In the aftermath of hurricane Ivan, and recognizing that efforts are needed to enhance communications and understanding of CCRIF operations, CCRIF management worked closely with the Cayman Islands

finance ministry to model various hypothetical scenarios. This led to a better understanding among politicians of the loss model. Later, a lower return period threshold was implemented for all members to better meet country needs.

### What does the Caribbean Catastrophe Risk Insurance Facility experience tell us about forming a catastrophe risk pool in the Pacific?

The workshop panel highlighted some lessons from the CCRIF experience that may be applicable to the work taking place to develop the Pacific Catastrophe Risk Pool Initiative.

- It is important for countries to understand the risks they are exposed to, to think about the potential consequences of those risks, and the types of resources needed for recovery over what period of time.
- Communication has been invaluable to CCRIF's sustainability, particularly in the lead up to implementation of the scheme, and has helped maintain a strong level of commitment among its members. Clearer and more consistent early messages to governments—for example, regarding the CCRIF's aim, how modeling works, how the policy works, more information on premiums and deductibles—would have been beneficial. During its design and inception, considerable discussion was required to build a consensus for the CCRIF. It is clear now that such dialogue is important so that the final result is something countries own over the long term.
- Discussion centered on how important it was to get the scheme right versus getting the scheme running. It was felt that most things were right with the CCRIF, but there was also pressure from the region to make the scheme operational. The CCRIF continues to evolve, but is increasingly becoming part of the regional disaster risk management (DRM) architecture. The most important message was to be flexible, as it is not possible to get all aspects of the scheme right the first time.

- A midterm review recently undertaken by the World Bank made a number of sound recommendations. While modeling firm EQECAT had adapted its models for use in the Caribbean, the CCRIF is now considering changing to a model based in the Caribbean. This shift to a new model has been discussed with individual participant countries and at workshops. Issues such as premium and coverage arising from the transition between models, and possible differences in model results that may not fit with the current trigger guidelines are being considered. New products such as flood cover (potentially by mid-2009) or new members would also produce changes. Potential disruptions brought on by a model change will need to be mitigated, but the CCRIF has in-house expertise to assist in the transition process and a strong focus on communication and dialogue with its member countries.
- During its initial development, the CCRIF utilized public data from a number of sources, but the availability and quality of the data significantly varied by country. In retrospect, more time could have been spent looking for data and proxy data, using local expertise as much as possible. As data remain an issue, setting up a data repository with the CCRIF member countries is being considered. Some comments expressed at the workshop suggested gathering suitable data for the Pacific would be slow as data collection among many of these countries is similarly uneven and the data tend to be scattered across government agencies and external bodies.
- The CCRIF is a major milestone in catastrophe risk financing, but nonetheless has implications for donor response post-disaster, since a common approach among donors is to reallocate development funds. While the Cayman Islands was not so dependent on aid and was eager to be self-sufficient, elsewhere in the Caribbean, the situation was different. For example, Grenada has traditionally relied heavily on donors. It took a

major disaster for them to recognize the liquidity gap between emergency and/or humanitarian funding and rehabilitation funding in terms of lost government revenue. It is this revenue that the CCRIF has been designed to replace, though with only three payouts to date, neither the pattern of government use of funds nor their adequacy is clear.

- Financial risk transfer should not be seen as the sole disaster risk management solution. Countries should also look to use risk retention (for example, a disaster fund) and risk reduction tools (such as adequate building codes).

## Pacific Catastrophe Risk Financing Initiatives

Pacific island states are especially vulnerable to natural catastrophe risks because of their size, fragile economies, and proximity to geophysical hazards. Annual damage from natural catastrophes averages between 2% and 7% of GDP, and historically this situation has been exacerbated by limited access to world insurance markets to assist in managing this risk.

In 2007, the World Bank began work on the Pacific Catastrophe Risk Pool Initiative. The principal objective of this initiative was to develop market-based risk transfer solutions and create a regional catastrophe risk pool to finance governments' short-term liquidity needs caused by a national disaster. The World Bank viewed its principal role as supporting catastrophe risk assessment efforts in these countries and structuring these risks into a more diversified portfolio to better enable the transfer of these risks to private reinsurance markets.

The World Bank Pacific Initiative builds upon long-established relationships with governments, as was the case in the Caribbean. Global risk modeling company Applied Insurance Research (AIR) has produced country-specific risk models. The phase 1 feasibility study of the Pacific Catastrophe Risk Financing Initiative focused on



eight countries: Cook Islands, Fiji Islands, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. The study considered the costs posed by direct losses to residential, commercial, industrial, and public assets; and emergency losses sustained by government due to cyclones (including wind, rain, and storm surge) and earthquakes (and resultant tsunami generated by earthquakes greater than the magnitude of 8.5). Hazard intensity, exposure, vulnerability, and losses were considered. Asset replacement costs were calculated for each of the eight countries included. These country specific models permit the design and pricing of individual country insurance coverage, thereby avoiding cross-subsidization effects.

The World Bank indicated that the quality of the data available for these eight countries was quite variable. Several data sources were available for cyclones, but earthquake monitoring is less widespread. Using data, proxies, and experience from existing models in other countries, country risk profiles for earthquake and cyclones were prepared. AIR developed catastrophe risk analyses for all eight countries, the first ever performed for these countries. Country risk profiles are used as a technical basis for devising optimal risk mitigation strategies. These profiles show a significant likelihood of future substantial losses due to cyclones and earthquakes. Risk profiles for additional countries are likely to be developed in the second phase of this study.

The overall objectives of phase I are to provide, for the first time, catastrophe loss estimates for major hazards for each selected country, and identify catastrophe risk financing options. One such option is a facility that can provide immediate post-disaster liquidity in the event of major perils. Parametric insurance allows for rapid payment, while a regional scheme allows the benefits of diversification. The backing of international reinsurance and capital markets provide stability, while donor contributions help assure sustainability.

At present, there are three options for a Pacific initiative being considered. These are

- (i) a pooling of risks, supported by reinsurance markets (which can result in volatile premiums);
- (ii) a combination of risk being retained by the countries (backed by a reserve fund) and use of reinsurance; or
- (iii) complete reliance on a donor-funded reserve pool.

For the Pacific, the World Bank estimates the likely size of the required reserve to be about \$30 million for each hazard in each country based upon a hypothetical portfolio of typhoon and earthquake risks in eight countries for events exceeding losses with a 10-year return period. In the case of the CCRIF, initial capital came from countries and donors. For the Pacific Catastrophe Pool, initial capitalization of \$30 million–\$40 million would likely be sufficient to launch the initiative.

The next steps (phase II), as endorsed at the World Bank–International Monetary Fund Annual Meeting in October 2008, are to complete the Pacific catastrophe risk assessment through refining existing models and including other countries, and to provide support for implementation of appropriate regional catastrophe financing options. The World Bank believes that opportunity for risk diversification in the Pacific is significant, and that capital requirements needed to sustain major losses can be reduced possibly by as much as 50% if countries decide to act collectively and pool their individual risks rather than insure them individually.

#### The Pacific Islands Applied Geoscience Commission Perspective on managing catastrophe risk in the Pacific

In a paper prepared for the conference, the South Pacific Applied Geoscience Commission (SOPAC) noted that consideration of a catastrophe insurance scheme by Pacific countries goes back at least as far as the Forum Economic Ministers Meeting in 1999. SOPAC observed that an earlier pilot study had shown that for any insurance scheme to be effective, it first needed to be placed within a broader risk management plan.

Any catastrophe insurance scheme must take into account DRM, climate change programs, and sustainability issues. SOPAC has historically promoted elements of a disaster management framework and recognized that partnerships need to be strengthened—national partnerships between different areas of government, as well as regional and international partnerships. SOPAC stressed the importance of establishing systematic data collection and management systems and building databases at the national level. The appropriate legislative, institutional, and operational framework to support catastrophe risk insurance must also be identified.

Finally, SOPAC highlighted the notion of country ownership, particularly through understanding of options, benefits, and costs. Foremost among the needs of Pacific countries to venture into catastrophe risk insurance are quality damage databases and economic impact modeling. Also important to the long-term success of the initiative will be high-level lobbying and sensitization, guaranteeing pool funds, diversifying products to support existing approaches, and establishing a regulatory and management framework.

### Options for Catastrophe Risk Transfer in the Pacific Region

The main focus of this session was the exploration of appropriate roles that the insurance industry can play in partnerships with ADB and the World Bank in bringing a Pacific catastrophe risk-transfer facility to fruition. In this regard, the panel emphasized the importance of early involvement by the private sector insurers, risk managers, and intermediaries to assure the longevity and sustainability of the facility. It was noted that the prospect of long-term success of any such program is vital to private sector participation to allow sufficient time to recover significant upfront costs. In addition, it was noted that early involvement of the private sector is an effective

means to integrate risk mitigation programs in the broader scheme since it had particular expertise in this area.

For its part, the World Bank observed that while it is leading this overall effort in partnership with ADB, it viewed its role as a facilitator, not a driver of the process, and its objective was to draw in private sector participation as much as possible.

The panel recognized that obtaining quality data was a crucial issue for the Pacific. While governments have data located in various places, these need to be centrally managed and accessible. In October 2008, ADB approved a \$1 million technical assistance (TA 6496-REG: Regional Partnerships for Climate Change Adaptation and Disaster Preparedness) that will strengthen partnerships. The project will support the development of up to eight geographical information system (GIS)-based national databases, and a consolidated regional database encompassing risk, hazard, and geo-referenced exposure data that would enable projection of country vulnerability and calculate losses when disasters happen. The dataset will support informed decisionmaking aimed at minimizing the negative social and environmental impacts of catastrophic events, hazard risk management, and vulnerability assessment. The outputs of the project will also support the broader work led by the World Bank on catastrophe insurance for the Pacific. The project will be implemented for 2 years and will focus on those eight countries covered by the World Bank's phase 1 feasibility study—Cook Islands, Fiji Islands, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. ADB's technical assistance in strengthening in-country use of the data will be helpful.

It was noted that while the AIR focus so far has been largely on building losses, not infrastructure losses or healthcare costs, efforts are underway to expand the base data available and discussions have been held with ADB on this issue. Participants recognized that the

modeling process is challenging and that the AIR work presented was a first attempt, not a final assessment. The questions and issues raised would contribute to fine-tuning of the models.

Participants pointed out that AIR modeled emergency losses (presumed to be the rough equivalent of the liquidity gap faced by governments), as a function of direct losses, utilized the experience of a number of countries in the Caribbean, Central, and South America. The Caribbean is very different from the Pacific and the implications need to be explored further—for example, the reliance on subsistence livelihoods in the Pacific and what this might mean for an understanding of the economic damage created by disasters. This issue needs to be reflected in estimating emergency costs, as governments need funds to ensure food security. An improved understanding of emergency losses could be discussed with Pacific governments.

Education of politicians was seen as an important issue. Can politicians, who tend to have short-term horizons and come and go from office with some frequency, be educated on the value of catastrophe insurance? Could the civil service play an important role in educating politicians? In the Cayman Islands, quarterly updates on the CCRIF are provided to cabinet officials and education is ongoing. Different ministries have different interests, but once a dollar value had been placed on contingent liability through risk modeling, clear solutions can be discussed. The benefits of a catastrophe insurance scheme to the people, the voters, can be highlighted to politicians. Consultation with politicians was seen as important, as was country ownership of any scheme.

In particular, Pacific island–government representatives stressed the need to view this risk transfer initiative as only one part of a more comprehensive catastrophe risk strategy in the region. As part of that broader strategy, disaster management solutions for affected agricultural production and livelihoods must also be found.

The catastrophe insurance scheme devised for the Pacific needs to be a market-based solution to ensure its sustainability. The active involvement of national and international insurance companies is instrumental to the marketing, ultimate acceptance, and success of a scheme. Insurance companies' capital could be leveraged to support development of the insurance industry in the Pacific and industry data and business contacts could be vital building blocks in developing the local market.

#### Ideas for addressing gaps in knowledge, research, and experience for catastrophe risk transfer in the Pacific

- Communication is paramount as elected officials and governments need clear consistent explanations to building long-term relationships and strengthen national, regional, and international partnerships. The benefits of a catastrophe insurance scheme to the people—the voters—should be highlighted to politicians as part of a campaign to encourage regional “ownership” of any catastrophe risk insurance scheme.
- The CCRIF has in-house experts to provide technical advice daily. This support will be even more important as perils are added, additional countries incorporated into the scheme, and/or as the catastrophe risk insurance models and parametric triggers change. Any catastrophe insurance scheme needs to be flexible and should evolve with time, as experience is gained and views or priorities change.
- Coverage of perils and the parametric triggers used should be considerably thought out. For example, a single wind-related parametric trigger for tropical cyclone and/or hurricane may not be entirely suitable as it may be appropriate to consider storm surge and excess rainfall or flood in determining payouts that realistically reflect losses.
- Strengthening the understanding of emergency losses and liquidity gaps is needed. In the

Caribbean, no data are available on the percent of the liquidity gap filled by CCRIF payments. No comprehensive emergency loss data have been found in the Pacific. Modeling has been based on building losses without considering infrastructure losses or healthcare costs. In the Pacific, subsistence livelihoods and food security may need to be included in an understanding of the economic damage created by natural disasters.

- Data is an important issue. More time could have been spent looking for data and proxy data in the Caribbean. Local expertise is invaluable. Keeping data up-to-date requires national and regional input, as this is where much of the data originate. Emphasizing national use of the dataset helps build support for longer-term storage, maintenance, and ownership of the data.
- The interaction of any catastrophe insurance scheme with DRM and risk reduction initiatives, climate change programs, and sustainability issues emerged as a consistent regional

requirement. Similarly, the importance of combining risk management instruments to both protect the fiscal balance of the state and to improve its capacity to respond in the case of a natural disaster was emphasized. Catastrophe insurance is just one instrument for countries to consider and it is important to understand if it is right for the Pacific.

- As building standards and building codes appropriate for catastrophic events are absent or not enforced in some Pacific nations, ADB could work usefully with developing member countries and the Institute of Professional Engineers New Zealand or a similar body to establish suitable regulations and training.
- If the issue of catastrophe insurance in the Pacific is to move forward, insurance industry representatives should be included in the dialogue so that the industry can understand the scheme, work to ensure its continuity, and collaborate with ADB in endeavors to increase insurance penetration in Pacific nations.









# Applications of Catastrophe Risk Transfer Mechanisms in Asia and the Pacific

## Catastrophe Insurance for Megacities

### Objectives

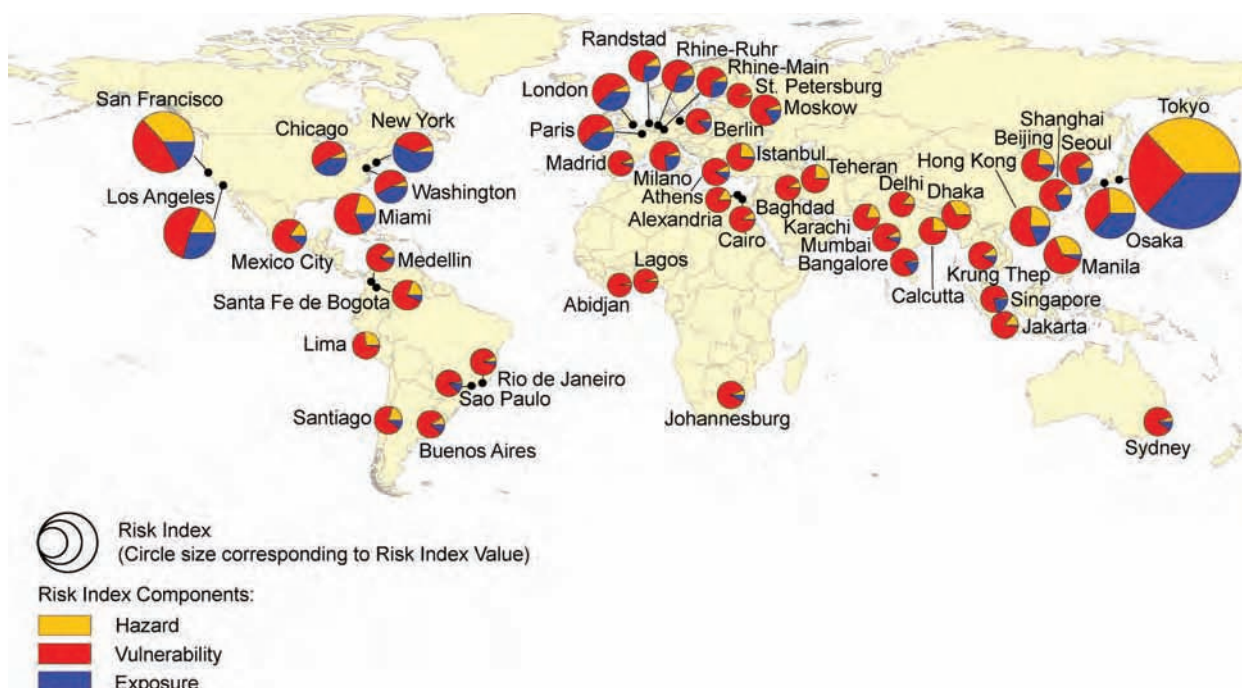
At the outset of the conference, the objectives of the megacity workshop were identified as follows:

- Identify unique risk characteristics and special challenges in organizing risk transfer mechanisms for Asian megacities.
- Set objectives for an Asian megacity risk transfer program.
- Chart specific courses of action that will help enable an Asian megacity risk transfer program to succeed.

### Background: Megacity Growth Introduces Disaster Risks that Merit Special Attention

Given the state of catastrophe risk management in developing Asian countries, it would be difficult to find any area that would not benefit from in-depth analysis and development of disaster recovery and risk transfer programs. The challenge lies in deciding where to focus attention and resources first. One approach is to identify a small number of areas and risks where solutions will have the most immediate and far-reaching impact.

**Figure 4: Munich Re's Megacity Risk Index**

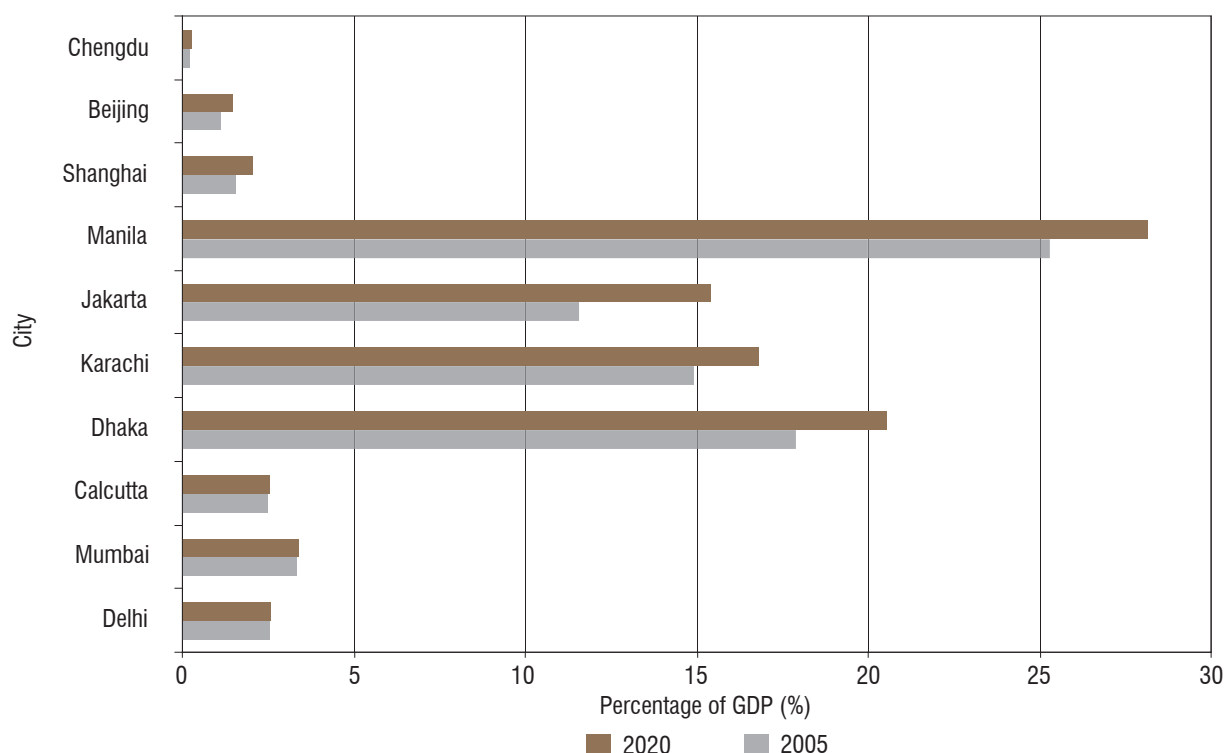


Source: Spranger, M. 2008. The Special Nature of Disaster Risk in Megacities. Paper presented at the Natural Catastrophe Risk Insurance Mechanisms for the Asia and Pacific Region Conference and Workshops, Tokyo, 4–5 November. [www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp](http://www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp)

“Munich Re has developed a natural hazard risk index for megacities . . . It enables the risk potential to be identified quickly and makes risks comparable and transparent. Assessments of vulnerability can be confirmed and objectified through specific surveys.”

In recent years, Asian megacities have grown more populous and economically significant. With this growth, risk has become more concentrated in terms of both economics and human life, and most Asian megacities have significant catastrophe exposures that remain largely uninsured. While rural and smaller city populations are no less vulnerable to natural catastrophes, the workshop was organized around Asian megacities with the intent that solutions for megacities may improve disaster preparedness and sustainability of development in other areas as well.

Risk pooling in various forms has been discussed widely as an approach to managing Asian catastrophe risk. If a catastrophe risk pool or other regional insurance mechanism is pursued, it is natural to consider risks in megacities that would be suitable for pooling. One of the key advantages of a risk pool is the information exchange and learning that takes place among pool participants. It will be important to establish means and strategies to encourage information exchange and learning with or without a risk pool (see Box 7).

**Figure 5: Megacity Contribution to National GDP in Asia in 2005 and Projected for 2020**

GDP = gross domestic product.

Source: Mechler, R., S. Hochrainer, and K. Williges. 2008. The Special Nature of Natural Disaster Risk in Asian Megacities and the Case for Megacity Risk Pooling. Paper presented at the Natural Catastrophe Risk Insurance Mechanisms for the Asia and Pacific Region Conference and Workshops, Tokyo, 4–5 November. [www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp](http://www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp)

“Economic activity and value added of megacities can be of the scale comparable to many national economies. Manila, Dhaka, Karachi, and Jakarta are the key economic powerhouses of their respective countries. India and [the People’s Republic of] China are more diversified, yet the five major Indian cities—Bangalore, Mumbai, Chennai, Calcutta, and New Delhi—contribute a total of 15% to India’s GDP and similar figures can be gathered for [the People’s Republic of] China. Large disruptions in such cities may therefore also cause economy-wide disruptions. What is more, megacities in Asia are often considered to serve a gateway function to the global economy and also as those cities exhibit a high percentage of skilled labor, natural disasters may result in the economic disruption of entire regions.”

Asian megacity risk was relatively unexplored territory before the workshop, so this workshop necessarily followed a more exploratory direction than the simultaneous workshop on risk pooling for the Pacific, where the World Bank and others have been developing a program for some time. While some Asian megacity

risk management programs may be in advanced stages of development, it is more commonly the case that an Asian megacity is not prepared to shop for risk transfer solutions without first analyzing risks and creating a comprehensive risk management and disaster response strategy.

### Box 7: Report Highlight: Risk Pooling

In a broad sense, a risk pool is any mechanism for sharing risk among two or more parties. Insurance, reinsurance, and pools mandated by government are all examples of risk pools. The main economic benefit of pooling is an improved ability to plan and budget for sudden and unexpected losses. The main risk management benefits of risk pooling are risk diversification and scale. In some cases, a pool may provide the valuable collateral benefits of focusing attention on catastrophe risk management and facilitating communication and knowledge sharing among pool participants. The primary drawbacks of pooling are related to the assumption of other parties' risk, which may be subject to moral hazard, asymmetric information, or differences of opinion regarding the proportion of cost borne by each pool participant.

As used in this document, a "standalone risk pool" is a special risk pool established to satisfy a particular risk transfer need that is not addressed adequately in existing risk transfer markets. This definition excludes pass-through entities and other mechanisms established to repackage risk for existing third party risk takers. Thus, a standalone risk pool is generally self-funded and retains most or all risk within the pool.

A stand-alone risk pool may be viable under certain conditions:

- Pooled risks are similar in terms of economics and hazard assessment (for example, it would be ineffective to pool a \$10 million potential wind loss with a \$50 billion potential earthquake loss).
- Any information asymmetries can be adequately resolved.
- An enforceable pooling agreement can be negotiated among pool participants.
- Pool participants have sufficient financial strength to sustain the pool over time, or appropriate credit enhancement is provided by a financially strong third party.
- The number of pool participants is sufficiently high to keep loss costs relatively steady and predictable.

Pool participants see benefits that outweigh costs (in the long run, this means they should receive payments after most significant catastrophic events).

Because of the difficulty of satisfying the conditions outlined above, pure stand-alone catastrophe risk pools are rare in practice. However, the concept of a stand-alone risk pool has been used successfully as a starting point for building catastrophe risk transfer programs in regions such as the Caribbean and in countries such as Indonesia. Pooling structures like Caribbean Catastrophe Risk Insurance Facility and MAIPARK may operate on a stand-alone basis up to a point, but may also secure capacity for the most costly events through reinsurance, securitization, and other risk transfer mechanisms.

A pool may begin as a stand-alone pool with the intent to transfer risk to third parties when the pool's track record provides sufficient data to transfer risk to third-party risk takers. Conversely, stand-alone catastrophe risk pools are sometimes proposed when a catastrophe in one area reduces the capital and capacity of global reinsurance companies, resulting in increased reinsurance prices everywhere. While a stand-alone pool can charge lower premiums in the short term, critics question whether such pools can survive significant catastrophes in the long run when premiums are set below market rates by design.

In the workshop on Asian megacities, all panelists supported the application of risk pooling principles to manage megacity risk. However, it became clear early in the first session that the bulk of catastrophe risk faced by Asian megacities would not satisfy many of the conditions that would make a stand-alone risk pool viable. Although there may be special cases in which a new risk pool might be established for a particular risk, the panel discussions emphasized the need to study the special requirements of each megacity individually before pursuing a particular program such as a regional risk pool.



## Overview: Tailoring Solutions for Each Megacity's Situation and Priorities

Two workshop sessions were held to illuminate the characteristics of natural catastrophe risk faced by Asian megacities and to explore possible approaches to managing these risks. The first session began with two papers on the special nature of catastrophe risk in megacities, followed by a panel discussion of key considerations in approaching these risks. The second session began with a paper that outlined the present catastrophe insurance program in Manila and proposed a new program to provide coverage for government subsidized housing. The Philippines case served as a launch pad for a panel discussion of the options available to address the highest priority needs identified in consultation with key megacity and country officials.

As mentioned above, risk transfer solutions for Asian megacities can have immediate and far-reaching impact. However, panelists noted that the differences among Asian megacities are significant and multidimensional to such an extent that a new, stand-alone risk pool single-handedly might not be able to provide risk transfer solutions that would address the most important needs of all megacities. Instead, it might be better to characterize the unique circumstances and priorities of each megacity and develop individualized programs for both hazard management and risk transfer. Building on the range of risk transfer products available, solutions can then be tailored to provide coverage that is feasible with current data quality and market preferences, as well as laying a foundation for future improvement and growth.

The following types of coverage were identified as high priorities for megacities:

- Households
- Infrastructure
- Relief and response

These coverage types were considered in the context of the goal of eliminating poverty.

Amid a multitude of needs, some priorities stand out

Natural catastrophes can cause both human and economic loss in megacities. No single risk management program can eliminate all risk, but a handful of coverage types are considered most urgently needed in megacities.

*Coverage for households is key to sustainable development*

A natural catastrophe, like other causes of loss, can erase many years of economic progress for a family and eliminate savings originally intended to secure future prosperity, such as funds for education. In effect, without catastrophe insurance or other aid, a family that has risen out of poverty can be thrust back into poverty with no clear path to recovery. Catastrophe coverage for households therefore has significant implications for sustainable development and elimination of poverty.

Indemnity insurance is the principal form of risk transfer for households, as parametric and index-linked products by themselves are not generally practical for individuals and families. Natural disaster protection for households is a lower priority than basic life and property insurance and it is most efficient to include catastrophe coverage with other forms of insurance rather than through stand-alone catastrophe insurance. Thus, the first challenge is to improve penetration of life and property insurance in Asian megacities. The second challenge is to strengthen the management of catastrophe risk by domestic insurers with significant risk concentrations in megacities.

Various types of insurance for households are already available in most, if not all, megacities and developing member countries in general. Country-level risk pools such as MAIPARK in Indonesia provide coverage for natural catastrophes, but their usefulness for megacity risk is limited by the dearth of uncorrelated risks of similar size and likelihood within the same pool. Capacity for megacity risk in such programs is typically obtained through reinsurance or the capital markets. However, when data scarcity and lack of models repel risk takers,

governments may be forced to absorb the risk through public funds or allow the pool to fail.

In developing countries, many households are unable to pay for any insurance without drawing from scarce funds needed for basic necessities such as food and shelter. Attempts to sell insurance to these households will most often fail for obvious reasons. It may be worthwhile in some cases to develop microinsurance programs more fitted to the needs of households.

The special case of subsidized public housing in Manila was presented as a possible pilot program to develop an indemnity-based catastrophe insurance program for households. The idea is for household catastrophe coverage to be integrated with the existing housing program. As the government funds the program, administrative costs may be contained while the program would provide learning applicable to both private and public insurance for households in the region. Details on the Manila case are included in the papers available on the ADB website.

In addition, the People's Republic of China (PRC) government's response to the Szechuan earthquake was discussed as a possible model for providing for the basic needs of people who have lost their homes to a natural catastrophe. After the 2008 Szechuan earthquake, the PRC government offered housing to people whose homes had been destroyed. Providing shelter to those who had lost the most was seen as a positive step in recovery. It was noted that the provision of housing for victims of natural disaster might be formalized *ex ante*, through cooperation among private insurers, governments, and international organizations, rather than reallocating resources after a disaster.

#### Better catastrophe protection for infrastructure has widespread benefits

Damage to critical infrastructure can have far-reaching consequences, particularly in megacities, the survival and prosperity of which rely heavily on the uninterrupted

supply of power, fuel, telecommunications, water, food, transportation systems, health care, and law enforcement. Infrastructure in Asian megacities is rarely insured. Where international financial institutions are involved directly in development of infrastructure, they can play a direct role in improving catastrophe risk management by implementing policies to encourage disciplined management of catastrophe risk along with other threats to infrastructure.

Because of the many facilities involved in providing critical infrastructure, no single risk transfer solution is available to cover all infrastructure exposures. Furthermore, each megacity's infrastructure has unique characteristics that require tailored solutions, so a one-size-fits-all approach is not feasible except in the context of providing building blocks for a more comprehensive solution. It is usually important to pursue risk reduction and mitigation programs and to solidify recovery plans first, and only then to explore financial or economic risk transfer. Often, risk mitigation is cheaper and lasts longer than insurance. Sometimes, insurance is not available unless effective mitigation and recovery programs are in place.

One suggestion voiced by the panel was to develop an index of city landmarks, key government buildings, and other well-known properties to manage infrastructure risk as well as other government and city-wide exposures. Under such a "landmark index" scheme, payments might be tied by formula to measurable damage at each pre-specified location to offset infrastructure-related losses above and beyond the direct physical damage to these structures. This approach would combine aspects of parametric risk transfer with traditional indemnity insurance with the aim to provide both speedy recovery and minimal basis risk.

It was suggested that India's large cities be considered for pilot programs for infrastructure risk management. While India is not alone in its need for critical infrastructure protection, it may have enough cities of sufficient size to develop a catastrophe risk pool or

similar mechanism without the added complexity of a multi-country facility.

Development organizations can promote prudent management of infrastructure risk by requiring disciplined catastrophe risk-management programs to accompany any infrastructure project funded by ADB.

*Programs to enhance relief and response are critical to minimizing the impact of disasters*

Timing is essential to effective disaster risk management (DRM). In the case of human loss, the speed of response may be a matter of life or death. Economic loss may also be reduced dramatically by expediting relief and response. For governments, hospitals, aid agencies, and others involved in early relief and response, parametric risk-transfer products can add a definitive amount of funding that can be used for disaster relief without reallocating public money. Parametric risk-transfer products carry basis risk and funds are transferred only after the event parameters are final, in some cases a month or more after the event. Still, parametric risk transfer is suited for response and recovery, being the most transparent, the quickest to settle, and the most cost-effective of all catastrophe risk-transfer forms currently available.

As with critical infrastructure, financial risk-transfer mechanisms are most useful when an effective relief and response plan is in place with all necessary components on hand. Where relief and response plans are nonexistent or inadequate, these plans should be developed before or in conjunction with setting up financial risk-transfer mechanisms. For example, if evacuation plans require more buses than are currently on hand, it may be best to acquire more buses before developing a parametric risk-transfer program.

*Poverty elimination and catastrophe risk management are inseparably connected*

ADB's interest in catastrophe risk management is driven by its overarching goals of eliminating poverty and

catalyzing sustainable development. More proactive risk reduction and transfer by low-income households will help ensure that development is sustainable. Better management of critical infrastructure risk and disaster relief and response will help the poor as well as those who might otherwise fall into poverty in consequence of a catastrophe. However, while improved catastrophe risk management generally benefits the poor whether or not they are the direct beneficiaries of a risk transfer program, it is important to keep the poverty reduction agenda in mind while considering projects.

*Chief risk officers: To keep adequate focus on catastrophe risk, name a point person*

It was suggested that each megacity, member country, and development organization assign an official to manage all kinds of risk. The chief risk officer would identify exposures to a wide variety of possible risks and coordinate with multiple divisions to prioritize these exposures and to explore coverage options. It might be valuable to host information exchanges, training, and educational programs, and gatherings of chief risk officers and their representatives to define their roles and responsibilities more clearly, since it is quite probable that some people will begin this position without specialized training or knowledge of risk management. The role of "risk officer" at an aid or development organization may be split into two functions. First, a risk officer can monitor and analyze the organization's risks. Second, a risk officer can develop programs to assist country and city risk officers in fulfilling their duties. Given the broad set of skills and knowledge needed to perform either of these two functions, risk officers need access to internal resources and external specialists to develop an understanding of enterprise-wide risk.

*Risk mitigation and reduction enhance the value of financial risk transfer programs*

It has been suggested earlier that risk mitigation and reduction measures generally take priority over economic or financial risk transfer. Several more specific

suggestions were made to encourage better risk mitigation and reduction practices. First, seismic and other building codes may need to be strengthened and newly constructed facilities should be engineered to withstand severe catastrophes. Second, insurance companies in developed countries often play a role in enforcing prudent construction and risk mitigation standards by imposing strict engineering and construction requirements on those insured and, in some cases, by offering lower premiums to individuals and businesses that abide by certain risk reducing rules.

Priorities can be addressed within a larger development agenda

In some cases, programs for catastrophe risk management and reduction may be incorporated into broader development plans. In particular, in areas where financial market development is a high priority, catastrophe-linked financial products may be included in the overall financial market-development priorities.

Roles for multilateral development finance institutions

- Help promote management of natural catastrophe risk in projects by raising awareness of the issues and by including explicit requirements for catastrophe coverage in new projects.
- Mobilize international expertise as demonstrated by the conference.
- Act as an impartial advisor to governments seeking to improve catastrophe risk-management practices.
- Organize open-source model development to supplement commercial models.
- Encourage public-private partnership to facilitate transactions.
- Finally, in some cases, multilateral development institutions might act as a guarantor or provide a contingent capital facility linked to natural catastrophes. In this way, they might improve the ability of member countries to tap into global

risk-taking capacity and transfer risk on favorable terms.

## Key ideas raised in the megacity workshop

### Standards

- Require DRM plans and compliance with internationally accepted building codes and other standards before a project may receive funding or other assistance.
- Promote compliance with standards through training and education and by supporting organizations that develop standards.

### Development institutions' portfolios

- Collect catastrophe risk data for each project that receives funding or other assistance from international organizations.
- Analyze ex post response to recent natural catastrophes and formalize policies and procedures for future disasters to better understand and model own portfolio risk.
- Securitize a portion of own-portfolio megacity catastrophe risk to encourage growth in the market for these risks.

### Research

- Provide funding to develop state-of-the-art catastrophe models for megacities.
- Support development of publicly available resources to analyze and plan for catastrophes.
- Facilitate education, exchange of information, and learning that can be transferred from one project to another among megacities and among countries in the region.

### Pilot programs

- Invite developing countries and megacities to submit proposals for programs to satisfy their high-priority catastrophe risk-transfer needs.
- Work with government counterparts (i.e., the chief risk officer or another point person or megacity to develop a comprehensive DRM

program that includes mitigation, relief, response, recovery plans, and funding mechanisms to support these plans.

- Assist in efforts to secure catastrophe coverage for subsidized housing in megacities such as Metro Manila.
- Develop programs to provide contingent funding for shelter that would be given to people left homeless after catastrophe.
- Support programs for infrastructure risk management, for example, risk transfer linked to damage at key public facilities and landmark buildings in a megacity.
- Establish a regional pool or other facility to be used for catastrophe risk-transfer programs and use the first pilot program as the inaugural transaction of the new facility.

### **Suggestions for regional countries and megacities**

- Assign a chief risk officer to coordinate all types of risk management.
- Develop detailed disaster response and recovery procedures.
- Identify the highest-priority vulnerabilities of government, private enterprise, households, and infrastructure.
- Study ways to reduce or transfer high-priority risks.
- As needed, seek assistance in developing and implementing risk reduction and risk transfer programs and submit proposals to organizations that may provide assistance.







# Areas for Consideration

## Framework Statement

The key finding of this report is that many opportunities exist for transferring natural disaster risk in Asia and the Pacific if addressed within a regional public–private partnership (PPP). That partnership must necessarily include national governments, ADB, and other regional donors and institutions, and key private sector players, both global and local. The opportunities discussed in this report will largely remain opportunities unless obstacles and gaps in knowledge, research, and experience are bridged. A regional approach to bridging these gaps, involving all critical parties, represents the best chance to unlock the resources necessary to move the region forward to better disaster risk management (DRM).

ADB has an opportunity to exercise leadership, or at least assume a facilitator role, in the field of catastrophe risk finance. By sponsoring the Tokyo Conference on financing catastrophe risks, it has made a statement regarding the importance of DRM in achieving sustainable development in its member countries, and it has led by convening wide-ranging interests in catastrophe risk finance to assess opportunities for PPP.

Because ADB finds itself at the center of such an array of interests, countries, and institutions, and because catastrophe risk finance has emerged as such a potent instrument of DRM and sustainable development, it is vital for ADB to consider its actions going forward in the context of a larger framework for action.

That framework, as articulated by many at the Tokyo Conference, should serve as both a platform upon which the individual action plans described below can be launched, but also an overarching purpose under which all initiatives can share a common objective. The platform in this case could be a detailed statement of commitment to press forward with coordinated efforts to leverage its resources to bridge gaps in knowledge, research, and experience in catastrophe risk finance in Asia and the Pacific. Under such a statement of commitment, ADB could generate significant private sector activity to invigorate greater investment and natural hazards risk management in the region.

At a more advanced level, this framework could take the form of a PPP entity, perhaps organized as an advisory committee to ADB management that would meet to discuss the progress and results of individual initiatives and make recommendations on a continuing basis. This advisory committee would be made up of ADB's regional partners, including national governments and private sector interests. Such a PPP could serve as a focal point to attract incremental capacity and risk management to the region and encourage private sector involvement. The objective of such a PPP would be to create a liquid and vibrant marketplace for catastrophe risk in Asia and the Pacific, using ADB's convening power and resources where appropriate. Ultimately ADB would terminate its involvement when the market matures and the private sector is fully engaged. We estimate that ADB's involvement in this effort will be necessary for at least 5 years.

All the recommendations below fit within such a framework. In one way or another, they seek to bridge a knowledge or experience gap that has been identified as an impediment to building a full array of catastrophe risk opportunities for developing member countries (DMCs).

The conference discussions identified many initiatives that could promote catastrophe risk financing in Asia and the Pacific. The following seven recommendations were the most prominent among many sound proposals. The first four appear in order of priority, based on the opinions expressed.

## Recommendations

1. **Establish a regional PPP for catastrophe risk finance. The partnership should link national governments and ADB programs and resources to commercial interests in the region.**
  - This tripartite partnership should first, in a preliminary study, assess the resources, needs, and requirements of all its constituent elements, most critically the requirements of member countries.
2. **Conduct an internal assessment of ADB programs and resources to identify actions that it could take to advance catastrophe risk financing in the region. Following are examples of where ADB could exert a more powerful role.**
  - Any effective PPP in this area will depend on the private sector having a broad and detailed understanding of ADB programs and resources. Currently, this is not the case. Understanding among ADB's natural constituency of what tools and powers it has to deploy in this area seems limited. For the private sector to assess the potential value of a PPP, it must first have an accurate and detailed understanding of what those resources are. ADB must actively participate in creating such a document so that it provides a clear representation of its resources, but also addresses issues and requirements of its private sector partners.
  - As ADB considers how best to leverage its resources in the area of catastrophe risk finance, it must understand the capability and interests of the commercial market as it views opportunities in the region. This is essential, since in developing a PPP framework, ADB must be able to identify the proper entry and exit points for its own resources. Since it should focus on playing a catalytic role to draw in private sector–risk capital, it must first understand what the commercial market perceives as impediments to market entry.
  - An assessment of commercial market interests and capabilities should include global insurers, reinsurers, intermediaries, rating agencies, and capital market interests. It is also important that the assessment cover local and regional insurance and reinsurance companies that have the potential to provide access to local risk capital and expertise.
  - ADB could demonstrate its commitment to DRM “best practices” by more aggressively managing its own catastrophe risk exposure. It could start

by consistently and uniformly assessing its catastrophe risk exposure for each project loan or guarantee. In this way it could use its own book of business as a catalyst for drawing in private sector capacity to the region. Doing so would help address the harmful follow-on effects of disasters on its own lending resources following a catastrophic event. Insuring such risk into the private market sector would also help eliminate the opportunity costs to its own mission resulting from natural catastrophes.

- It could also explore ways to spread protection benefits to DMCs by directly providing subsidized catastrophe risk protection to project loans at a small surcharge. It could also sponsor a catastrophe (CAT) bond issue that could provide indirect benefits to DMCs by, for example, providing a debt service holiday (back stopped by CAT bond protection) in the event of a natural disaster.
- ADB could also consider using its guarantee authority to backstop CAT bonds issued within Asia. Development of CAT bonds in Asia as an asset class worthy of local investor interest is an important goal and would be aided by the use of its guarantee authority in this manner.

### **3. Establish funding for catastrophe model development in Asia and the Pacific as part of a Regional Catastrophe Risk Financing PPP.**

- Perhaps the most consistent message received during the conference was that the dearth of catastrophe risk models in DMCs was impeding both the development of catastrophe risk–financing opportunities and the entry of key market participants.
- Development of high-quality catastrophe models in the region may be a critical missing link needed to draw in private sector risk financing. Development costs can be considerable and rigorous, ongoing maintenance is essential.
- As part of a PPP framework, ADB should initiate funding of a catastrophe-model pilot project in a

select area or group of countries that can demonstrate the incentive value of such models by drawing in private sector participation. Once established, such models can be licensed or spun off to private sector entities.

- A regional data bank on catastrophe hazards and vulnerability that would be open for all to access should be established. The introduction of catastrophe insurance in the Pacific, and insurance modeling generally, would be well served by improved data in five areas: hazard data, consequence data, economic and financial loss data including data on emergency losses, exposure data, digital terrain models, and bathymetric data.

### **4. Sponsor a small workshop focused on development of a megacity catastrophe risk financing pilot program in one or two Asian DMC cities.**

- The four objectives of this targeted workshop are to
  - (i) determine the benefits these megacities need to derive from a catastrophe risk scheme and how such a scheme would fit into existing DRM plans and institutions;
  - (ii) analyze specific natural catastrophe risk factors and parameters in one or two DMC megacities;
  - (iii) discuss the relative merits of different risk financing alternatives, e.g., whether pooling and/or parametric insurance could be used to greatest advantage; and
  - (iv) agree to launch a pilot project in one or more cities to establish feasibility, demonstrate the application of PPP, and attract global risk capital.
- A megacity workshop aimed at developing catastrophe risk–financing opportunities would dovetail with ADB's urban sector strategy and be consistent with its urban development objectives, including achieving sustainable urban development.

- Key technical issues to be discussed at the workshop would include
  - (i) Establishing specific data requirements in terms of hazards, exposures and vulnerability of populations, and infrastructure;
  - (ii) Determining what risk modeling is essential to structure a program; and
  - (iii) Analyzing costs, funding, and affordability issues.
- If the feasibility of such a megacity pilot project can be determined, the great value of this effort will be the establishment of a real, functioning program that can power other CAT risk financing endeavors that are based on the PPP model and that can pave the way for private risk capital.

**5. Organize an educational curriculum and supporting programs to train DMC chief risk officers and others with related responsibilities.**

- Training could be conducted primarily through web tutorials with matching printed materials, which might be translated into various languages as necessary.
- Upon completing a basic core curriculum, participants might become eligible to join an organization of risk officers, which could host events and training workshops, and publish periodicals or journals for its members. Completion of training might also be linked to funding for conferences, workshops, and further training programs.
- To leverage existing resources, a group of experts could be convened, under ADB's oversight, to work out the details of curriculum, certificates, publications, organizations, and ongoing management. Brokers, reinsurers, insurers, risk modelers, and existing regulatory and professional organizations already have abundant

educational resources, many of which are publicly available and only need to be adapted to the audience.

- The curriculum should maintain a clear, consistent vocabulary throughout and concentrate on areas where DMCs would derive the greatest benefit. Eventually, the curriculum could be expanded to include insurance, risk management, mitigation, and disaster response.
- ADB should consider how the training module could be integrated with other activities in risk management, such as a potential megacity pilot workshop, risk modeling support, and implementation of a general catastrophe risk management framework.

**6. Launch a small microinsurance catastrophe risk insurance-pilot project in several DMCs to study issues of insurance acceptance, awareness, and relevance to the needs and concerns of ordinary people.**

- One explanation for the very low penetration of insurance (as a percent of gross domestic product) in DMCs is the absence of a relevant connection to the daily concerns of average people. A pilot study such as this could reveal what natural catastrophes mean to people, as opposed to what they mean to governments.
- The importance of socioeconomic factors in the acceptance of insurance has perhaps been underestimated. A microinsurance project could illuminate cultural and socioeconomic factors of insurance acceptance by building an insurance program from the ground up. As such, people's interests and concerns would tend to take precedence. For example, protecting human life and livelihoods, including livestock and farm implements may take precedence over infrastructure.



## 7. **Champion the adoption of uniform building standards throughout all DMCs.**

- ADB has an opportunity to lead in the area of uniform and technically up-to-date building standards appropriate to catastrophe risk. ADB is in a unique position to launch an initiative as part of its disaster management PPP to work with national disaster authorities to establish a workable set of standards and to offer incentives to DMCs to adopt them.
- For example, the Institute of Professional Engineers of New Zealand has proposed the development of a South Pacific–wide set of building codes, with an appropriate training component. ADB could support such an effort and view it as a pilot program for broader efforts at code modernization and enforcement.
- ADB should also require compliance with internationally respected building codes before a project may receive funding or other assistance.



## Appendix I: List of Conference Papers

The full reports and summaries are available at:

[www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp](http://www.adb.org/Documents/Events/2008/Catastrophe-Insurance-Mechanisms/program.asp)

Title	Author
• Leveraging Insurance and Capital Markets Against Natural Catastrophes	Jonathan Hill Consultant Asian Development Bank
• Catastrophe Risk and Insurance Availability: Indonesia Case Study	Rionald Silaban (presented by Suprayoga Hadi) National Development Planning Agency (BAPPENAS), Indonesia
• Catastrophe Risk Financing in Asia and the Pacific: A Regional Approach	Andreas Bollman Swiss Reinsurance Company Ltd. Singapore
• Catastrophe Risk Financing in Asia and the Pacific: The Potential Role of a Regional Approach	Felton Johnston Consultant Asian Development Bank
• On the Building Blocks of Catastrophe Insurance	Robert Muir-Wood Risk Management Solutions Ltd. United Kingdom
• The Special Nature of Disaster Risk in the Pacific	Russell Blong Consultant Asian Development Bank
• Catastrophe Insurance Triggers—What is the Best Fit for the Asia and Pacific Region?	David Simmons ReMetrics, Benfield Group Ltd. United Kingdom
• The Caribbean Catastrophe Risk Insurance Facility as a Technical Model	Simon Young and Milo Pearson Caribbean Catastrophe Risk Insurance Facility, Cayman Islands



Title	Author
<ul style="list-style-type: none"> <li>• The Cayman Islands Experience with the Caribbean Catastrophe Risk Insurance Facility</li> </ul>	<p>Michael Nixon Cayman Islands Government Portfolio of Finance and Economics Cayman Islands</p>
<ul style="list-style-type: none"> <li>• What do Pacific Developing Member Countries Want from Catastrophe Insurance?</li> </ul>	<p>Moses Sikivou Pacific Islands Applied Geoscience Commission, Fiji Islands</p>
<ul style="list-style-type: none"> <li>• Special Nature of Disaster Risk in Megacities</li> </ul>	<p>Michael Spranger Munich Reinsurance Germany</p>
<ul style="list-style-type: none"> <li>• The Special Nature of Natural Disaster Risk in Asian Megacities and the Case for Megacity Risk Pooling</li> </ul>	<p>Reinhard Mechler, Stefan Hochrainer, and Keith Williges International Institute for Applied Systems Analysis, Austria</p>
<ul style="list-style-type: none"> <li>• What Asian Member Countries with Megacities Require from a Catastrophe Risk Insurance Program</li> </ul>	<p>Jonathan Uy National Economic and Development Authority, Philippines</p>

## Appendix II: Conference Report Summaries<sup>1</sup>

### Leveraging Insurance and Capital Markets Against Natural Catastrophes

Jonathan Hill

- In both reinsurance and capital markets, capacity for Asia and the Pacific's catastrophe risk is abundant and the convergence of insurance and capital markets further supports catastrophe risk transfer in the region.
- Three general trigger mechanisms are available for catastrophe risk transfer. These are
  - (i) indemnity risk transfer—where payments are linked directly to the amount of loss;
  - (ii) index-linked risk transfer—where payments are linked to a third-party index of insurance industry-wide losses; and
  - (iii) parametric risk transfer—where payments are provided based solely on the geophysical parameters of a catastrophic event, e.g., wind speed, ground-shaking intensity, depth of flood water, temperatures, and others.
- Legal forms for risk transfer include primary insurance, reinsurance, securitization, and derivatives.
- Capital market mechanisms may be used alone or as part of a larger risk transfer program, such as a regional risk pool. Parametric catastrophe derivatives could facilitate efficient trading of catastrophe risk among anonymous counterparties.
- Asia and the Pacific can benefit from leverage in the capital markets directly or indirectly as these are used by reinsurers to improve their capacity and financial strength.
- Asia and the Pacific countries are encouraged to develop risk transfer products tailored to their particular situations and to optimize these to leverage their present or future global risk-taking capacity.
- Through decisive action in key areas such as Asian megacities and in large development projects, Asia and the Pacific can leverage existing knowledge, technology, and state-of-the-art capital management systems to build a market tailored to the specific needs of the region.
- Three general recommendations are provided:
  - (i) Enact laws and regulations to facilitate stable and secure risk markets.
  - (ii) Contribute actively to global efforts to set standards.
  - (iii) Promote technological advances and public information.

Further refinement and additional recommendations are expected as outcomes of the conference.

<sup>1</sup> The views expressed in these papers are those of the authors and do not necessarily reflect the views or policies of the Asian Development Bank (ADB), its Board of Governors, or the governments they represent. ADB does not guarantee accuracy of the data included in these papers and accepts no responsibility for any consequence of their use. Terminology used may not necessarily be consistent with ADB official terms.



## Catastrophe Risk and Insurance Availability: Indonesia Case Study

Rionald Silaban

Ministry of Finance, Indonesia

Suprayoga Hadi

National Development Planning Agency, Indonesia

- Following the recent history of natural disasters in Asia, governments in the region began to adopt comprehensive disaster risk management programs that address both pre- and post-event requirements.
- Among the new tools to manage and transfer catastrophe risk in Asia are insurance pools. Such pools may be regional or national in nature. One example of a national pool is PT Asuransi MAIPARK Indonesia, an earthquake reinsurance pool formed in 2003. Participation in this pool was made compulsory for all general and reinsurance companies in Indonesia.
- As part of its program, Indonesia created the National Disaster Management to develop disaster mitigation strategies and fund both pre- and post-event disaster management costs.
- Advantages of insurance pools include the following:
  - (i) coverage of special hazards that are beyond the capacity of individual insurers to pay for,
  - (ii) a pool's joint and several liabilities eliminate single-party credit risk, and
  - (iii) reinsurance and securitization can be used more creatively.
- Obstacles to developing catastrophe risk insurance programs include
  - (i) low insurance penetration (estimated at 1.6% of the country's gross domestic product),
  - (ii) reluctance of domestic insurers to cover catastrophes, and
  - (iii) lack of government encouragement and/or incentives for homeowners to purchase catastrophe risk coverage.
- Recommendations:
  - (i) Increase national catastrophe risk awareness as has been done in Japan.
  - (ii) Government should mandate homeowners to purchase catastrophe risk coverage.
  - (iii) Government should shift its programs from reactive to proactive and to focus on local instead of central government responsibility.
  - (iv) Expand MAIPARK's mandate beyond earthquake coverage to include other catastrophe risks.
  - (v) Future actions should take the form of public-private partnerships to develop the private insurance industry.

## Catastrophe Risk Financing in Asia and the Pacific: A Regional Approach

### A Private Sector Perspective on ADB's Potential Roles in the Areas of Catastrophe Risk Financing

Andreas Bollmann  
Swiss Reinsurance Company Limited

- There is significant value in shifting the traditional post-event “disaster relief” approach to one that accumulates funds before a disaster occurs.
- Relying only on unpredictable international aid inflows in the aftermath of a natural catastrophe can be an extremely dangerous strategy. Aid can never be an appropriate substitute for planned and adequate catastrophe insurance.
- From a political perspective, there is often a reluctance to invest in catastrophe risk transfer as costs are incurred today while the timing of future payouts is uncertain. Distributing public funds to affected regions and individuals after a natural catastrophe is often more appealing to politicians.
- Meanwhile, insurance markets in the majority of developing countries are underdeveloped and coverage for natural disasters is limited.
- Under this scenario, the Asian Development Bank (ADB) could play many roles in ensuring the move toward proactive risk management through catastrophe risk financing. These include
  - (i) ADB as **promoter** of catastrophe risk management in Asia. ADB is uniquely situated to raise awareness, transfer knowledge, and influence change.
  - (ii) ADB as **financier** of catastrophe risk transfer instruments by being
    - a **buyer** of catastrophe risk–transfer instruments to protect its current loan portfolio and projects,
    - a **sponsor** to jumpstart catastrophe risk–transfer mechanisms, and
    - a **provider of technical** assistance in catastrophe risk management.
  - (iii) ADB's role is not seen as manager of domestic or regional catastrophe risk–insurance facility.
  - (iv) ADB is seen to have a limited role as a **guarantor** of premium payments for risk transfer instruments.
  - (v) ADB could be an **investor** in catastrophe bonds.

## **Catastrophe Risk Financing in Asia and the Pacific: The Potential Role of a Regional Approach**

Felton Johnston

Catastrophe risk insurance is an area in which the Asian Development Bank (ADB) can play important roles. ADB currently assists member countries in Asia and the Pacific in developing a regional approach to disaster risk management.

Regional activities that could enhance the development of catastrophe risk transfer include

- knowledge management and capacity building related to natural catastrophe risk,
- encouraging domestic risk mitigation and avoidance,
- supporting domestic insurance market development,
- supporting hazard exposure and vulnerability data development,
- cooperating with private insurers and development partners to develop risk insurance mechanisms,
- exploring prospects for pooling catastrophe risks of megacities and pacific islands,
- supporting the development of regional catastrophe bond market and catastrophe reporting mechanisms,
- conducting bridging roles in catastrophe bond transactions, and
- providing relief for sovereign borrowers either directly or through insurance of their sovereign portfolios.

## On the Building Blocks of Catastrophe Insurance

### —With Relevance to the Asia and Pacific Region

Robert Muir-Wood  
Risk Management Solutions Ltd.

- Catastrophe or CAT models are fundamental to catastrophe risk management, including risk pricing, risk transfer structuring, insurer capital adequacy, and risk securitization (through parametric or loss-based triggers).
- The CAT model creates a “universe” of all possible events, including their areas of impact (footprint) and the vulnerabilities of property, people, or other assets in the path of the catastrophe.
- The standard output of the CAT model is the exceedance probability relationship (that shows the annual likelihood of a loss being in excess of some magnitude) and its integral (the annualized average loss or its technical risk cost).
- The development of CAT models has become increasingly technically sophisticated. However, while the essential architecture of the model is simple, there are open-source CAT models and challenges of relating the localized hazards to specific vulnerabilities.
- CAT model results are extremely sensitive, which is why it is easy to build a bad model. For example, a 1% variation in wind speed (in a hurricane model) makes a 7% variation in loss. A 1-meter difference in elevation of a property may typically make a 50% difference in the technical rate for flood risk. In developing a new commercial CAT model, the period of research and iterative calibration takes much longer than actually assembling the model.
- While a horizontal resolution of 1–5 kilometers might be appropriate for an earthquake CAT model (except in relation to landslide and liquefaction risks), a flood CAT model will require a horizontal resolution of 100 meters or better, and a vertical resolution of no less than 50 centimeters.
- For Asia and the Pacific, flood is the principal hazard along with earthquake and typhoon wind. In modeling typhoon impacts, it is important to model the wind, storm surge, and inland flood perils separately as they will have very different microzonation characteristics.
- For modeling the risk to megacities, high-resolution data are required for land elevations, locations, and vulnerabilities of all properties and infrastructure, river channels and flood defenses, and the characteristics of catchment run-off (and for storm surges in coastal cities).
- In expanding the creation of CAT models for the developing world, it is important not to compromise on model resolution or on the quality of research and calibration. With the widespread availability of Digital Terrain Models and GoogleEarth, there are many new tools that can assist in efficiently developing good quality models.
- Given the lack of an agency that vets the quality of CAT models, the Florida Hurricane Commission process remains the only way to check how different modelers build and calibrate their models.



## The Special Nature of Disaster Risk in the Pacific

### Russell Blong

- Natural hazards in the south Pacific include earthquakes, volcanic eruptions, tsunamis, landslides, tropical cyclones, floods, storm surges, drought, and frost.
- These hazards and their wide-ranging consequences reflect five broad influences: tectonic controls, formation of coral at a narrow range of elevation below sea level, incidence of tropical cyclones, occurrence of El Niño, and to a more limited extent, global warming.
- Natural hazard losses are usually small but for small economies, these could reach several times their annual gross domestic product and can regularly average half their normal gross domestic product growth, thereby significantly limiting their economic development.
- Tropical cyclones and earthquakes are probably the most significant natural hazards in terms of death and damage. However, the actual cause of most deaths and damages in the Pacific countries may be storm surge, riverine flood, tsunami, or landslides rather than strong winds and ground shaking.
- State-of-the-art building codes for cyclone winds and earthquake ground shaking may limit death tolls and building damage but much less than casual investigation suggests.
- Catastrophe insurance that provides payments to governments using simple measures of wind speed and ground shaking will fail to compensate adequately when storm surge, riverine flood, tsunami, or landslide produce greater consequences.

## Catastrophe Insurance Triggers

### —What is the Best Fit for the Asia and Pacific Region?

David Simmons

ReMetrics, Benfield Group Ltd.

- The paper discusses the different types of catastrophe triggers available in the reinsurance and capital markets, namely
  - (i) indemnity,
  - (ii) pure parametric,
  - (iii) parametric index,
  - (iv) modeled loss, and
  - (v) market index.
- **Indemnity** covers are those coverages where basis risk may be reduced to near zero but requires the insured to maintain an accurate inventory of risks and to be able to quantify loss.
- **Pure parametric** covers have no explicit link to the actual or potential loss suffered by the insured; rather, payment is made if a predefined event occurs. Such covers, which use triggering measures such as wind speed or ground shaking at point locations, however, contain the greatest basis risk, but their simplicity is welcomed by the markets and may be rewarded by greater capacity and lower premiums.
- The paper presents the case study of the Caribbean Catastrophe Risk Insurance Facility (CCRIF). The CCRIF selected a **parametric index** approach, favoring speed of settlement and transparency of loss calculation over any basis risk (i.e., the risk that a loss may be suffered but one which the parametric index does not trigger, so no recovery is made).
- A **parametric index** uses transparent, published formula to calculate an index, which is aimed to map closely a likely loss. This should reduce basis risk but increases complexity.
- A **modeled loss** basis is similar to parametric index except that the loss is calculated by a named, fixed proprietary model. Again, it is hoped that basis risk is significantly reduced but at the cost of transparency.
- A **market index** trigger is based on market losses. If available, market loss and exposure data may be segmented (e.g., by region) to allow more complex market share calculations. Market loss contracts can be the most freely tradable (e.g., Industry Loss Warranties or US ILWs) but basis risk can be huge and these rely on good market data.
- A model is the key to all catastrophe business. Its function is to assess the likely attachment and exhaustion of a cover, its average recovery, and the variability of those recoveries. A pure parametric cover may require a relatively simple model but it must be credible. A full proprietary peril model is usually applied to minimize the basis risk, even for an indemnity trigger. Investors and rating agencies normally prefer the modeling to be done by known names such as RMS, EQECAT, and AIR.

- In Asia, the lack of a reliable, recognized modeler is a hurdle for many countries. This implies the need for a simpler parametric or parametric index product for some countries and for perils. Where more than one model exists, it is likely that they disagree. Unlike reinsurers, capital markets have been, so far, relatively insensitive to this though this is likely to change.
- Care must be taken as to which perils are included in the trigger. Traditional indemnity covers often have broad coverage with minor perils included, even if not adequately modeled, for little or no additional premium. Parametric covers are more defined but they could miss the peril (or subsidiary peril) that causes the bulk of the loss, e.g., fire following earthquake, or flood following typhoon.

## The Caribbean Catastrophe Risk Insurance Facility as a Technical Model

Simon Young and Milo Pearson

Caribbean Catastrophe Risk Insurance Facility

- The Caribbean Catastrophe Risk Insurance Facility (CCRIF) is designed to provide short-term liquidity needs to Caribbean governments due to loss from tropical cyclones and earthquakes.
- The CCRIF offers parametric policies because
  - (i) payouts can be calculated and made quickly,
  - (ii) calculation of payouts is objective, and
  - (iii) risk is uniformly defined.
- For tropical cyclones, damage is based on wind speed and is a proxy for loss. Currently, there is no coverage for storm surge or flood-induced damage.
- The Dynamic Financial Analysis model is a valuable tool for determining survivability and sustainability of a catastrophe fund and is particularly flexible as the program begins to fully develop.
- Developing accurate exposure data can be a challenge in many parts of the world. Hence, it is important to involve local experts in such work to help obtain and confirm the accuracy of data.
- If possible, storm surge and excess rainfall should be explicitly modeled and included in the policy. The CCRIF experiences show that considerable damage can occur from storm surge and rainfall from tropical cyclones—the type of losses that policies do not trigger because wind speeds do not exceed the attachment point.
- Clear and consistent communication with stakeholders is paramount.
- Government participants should view a program such as the CCRIF as only one tool in their efforts to mitigate financial loss from natural catastrophes.
- Efforts to obtain government commitments to join a catastrophe fund should include the use of local expertise and knowledge. The CCRIF used a consortium of organizations with considerable local experience during its development and implementation phases and it paid great dividends.



## The Cayman Islands Experience with the Caribbean Catastrophe Risk Insurance Facility

Michael Nixon

Cayman Islands Government Portfolio of Finance and Economics

- Cayman Islands' Exposure to Natural Catastrophe Risks
- Mitigation of Financial Risks Associated with Catastrophe Risk Exposures
  - (i) Property Insurance
  - (ii) Reserve Funds
  - (iii) Physical Mitigation Measures
- Launch of the Caribbean Catastrophe Risk Insurance Facility (CCRIF)
  - (i) Regional initiative supported by the World Bank and international donor community
  - (ii) Challenges of Achieving Regional Consensus
- CCRIF: Cost–Benefit Analysis
  - (i) Alternative Risk Transfer Options
  - (ii) Fiscal Policy Considerations
- Why CCRIF is Attractive
  - (i) Benefits of Risk Pooling
  - (ii) Parametric Insurance
- The Cayman Islands' Experience with CCRIF: Year One
  - (i) Communication and/or Dialogue
  - (ii) Challenges: Managing Expectations versus Reality
- CCRIF Enhancements
  - (i) Wider Coverage
  - (ii) Higher Initial Payouts
- CCRIF Recommendations
  - (i) Understand the Risk Exposure
  - (ii) Apply a Diversified Approach to Catastrophe Risk Management
  - (iii) Conduct Territory–Specific Cost–Benefit Analysis
  - (iv) CCRIF not the Only Solution
  - (v) Create a Forum for Communication

## What Do Pacific Developing Member Countries Want from Catastrophe Insurance?

Moses Sikiyou

Pacific Islands Applied Geoscience Commission

- Initial studies on catastrophe insurance in the Pacific were undertaken around 2000. These studies were prompted by the Pacific Forum Economic Ministers' Meetings (FEMM) which looked at a catastrophe risk–insurance pool as just one in the range of financial risk–transfer and/or risk–sharing mechanisms that can be developed either on a national or a regional basis. FEMM encouraged putting priority on the implementation of strategies, enabling public policy, the use of the private insurance market, and expenditure on hazard assessment and risk management.
- There is a need for better interface between insurance and risk management (including financial risk management), which can be achieved through regional and national capacity building, to address the following issues and challenges:
  - (i) Developing a management structure that creates appropriate interface between finance management, insurance management, and disaster management, with institutional arrangements that link national and regional level structures, and such structure should promote government–private sector partnership.
  - (ii) Raising national capacity in financial risk analysis since disaster managers do not practice day-to-day risk management, hence, risk management culture in government is hardly instilled. Risk reduction measures should be mandatory in development planning and projects while risk management should be linked with government budgeting and legal processes.
  - (iii) Establishing systematic data collection and management systems to build databases at national level.
  - (iv) Identifying the legislative, institutional, and operational framework to support the establishment and management of catastrophe risk insurance, and to strengthen the regulation of the insurance industry.
  - (v) Strengthening the standards of good governance since moral hazards and bureaucracy are risks that must be reduced at all levels of the fund's operation, e. g., inflated assessment, unplanned expenditure, and political interference.
  - (vi) Understanding of catastrophe insurance options, in particular, understanding insurance pool fund and the benefits of product diversification (done through fund interface with existing loss-sharing approaches as in supporting the National Disaster Relief Fund, with development banks, and microinsurance).
  - (vii) Understanding all the preparatory works and attached costs needed to sustain catastrophe risk insurance.
- Pacific developing member countries (PDMCs) are interested in the meaningful articulation of key technical and administrative issues by defining premium and affordable pricing with regard to:
  - (i) the interdependency of deductibles and retained risk with the preparedness of a country (i.e., the efficiency of contingency and emergency plans and its impact on insurance pricing). Government financial risks are contained in assets, revenue, personnel, and liabilities, and there will be movement of retained risk (attrition) if there are trends to privatize public services and rent office premises;
  - (ii) the inclusion of content and business interruption of governments since they generally carry the liability for national economic losses;
  - (iii) the limit of what the economies of PDMCs can afford and the benefits to donors that support a regional fund pool; and
  - (iv) consultations, advocacy, and awareness-raising activities at national, regional, and international levels.

- PDMCs' venture into catastrophe risk insurance require the following: a good damage database and economic impact modeling, a high-level lobbying and sensitization activities, a guarantee for the pool funds, a diversification of products to support existing approaches, and the establishment of a regulatory and management framework. There is high expectation these would be addressed in the ongoing World Bank's Pacific Catastrophe Risk Insurance Pool Project Initiative.
- A regional catastrophe insurance scheme will need the strong support of donors and multilateral lending institutions. The South Pacific Applied Geoscience Commission supports this conference as being very timely for the recent and current initiatives.

## Special Nature of Disaster Risk in Megacities

Michael Spranger  
Munich Reinsurance

### Main Trends

- In 1950, the world was home to 2.6 billion people. Today, this number has grown to 6.6 billion and by 2050, it will probably increase by another 40% to 9.2 billion people.
- At the same time, people are becoming wealthier and more productive while urbanization is increasing at an unprecedented scale.
- The number of natural catastrophes is increasing. About one-third of these catastrophes occur in Asia. However, the insured losses in Asia are only about 10% of the worldwide insured losses yet registered about 70% of all fatalities, highlighting the vulnerability of Asia to natural catastrophes. Since 1980, more than 1 million people perished in Asia because of natural catastrophes, accounting for more number than in all other continents together. But not only has the number of registered events increased, it is well documented that the economic and insured losses are rapidly increasing as well.

### Special Risk Megacities

- Megacities present major opportunities because for every high-rise building, underground railway system, manufacturing company, and people who live and work in these cities, there is a need for insurance. Given that the density of insurance in the megacities of developing countries is still far lower than in industrialized countries, the business potential for the insurance industry is large. The risks that go hand in hand with global urbanization, however, are also large.
- Owing to the high concentration of people, values, and infrastructure in a very confined area, the loss potential in megacities are very much higher than in rural areas. Consequently, even small occurrences can cause severe losses.
- The long-term risks are also much more serious with many megacities being virtually predestined to suffer major natural disasters.
- The ever-increasing global interdependence in the flow of goods, finance, and information—especially in cities, which are also economic centers—harbors major risks. Depending on the degree of global interconnection, a business interruption in an Asian metropolis can lead to production losses in Australia, Europe, or elsewhere in the world.
- For international reinsurers, the main risk associated with megacities is the accumulation risk, i.e., when a single loss occurrence can also have far-reaching negative consequences for other economic sectors.

### Top-Down and Bottom-Up Approaches: Risk Index

- The role of insurance is to provide tools to minimize risk and to maximize awareness.
- Two approaches help make the risks transparent: bottom-up and top-down. On the one hand, there is geospatial analysis, which allows risks to be recorded for small areas, and on the other hand, there is an index that makes it possible for the potential extent of a loss in a megacity to be assessed in its entirety.
- The Munich Re risk index is geared for the risk of material losses without including the insurance density or the insurance terms and conditions. Its modular structure means that the index can easily be adapted for either underwriting or other purposes. It enables the risk potential to be identified quickly and makes risks comparable and transparent.
- High-quality geospatial analysis of portfolio and claims data is crucial for risk management and portfolio optimization in businesses that involve natural hazards. Geocoding may be performed using various levels of detail such as countries, postal codes, towns, and addresses. For megacities, however, “coarse” geocoding (e.g., at country or at region level) is not sufficient.
- Geocoded liability data is also helpful in evaluating risks of change (e.g., risk of thunderstorm in connection with climate change).



## The Special Nature of Natural Disaster Risk in Asian Megacities and the Case for Megacity Risk Pooling

Reinhard Mechler, Stefan Hochrainer, and Keith Williges  
International Institute for Applied Systems Analysis

- The paper examines the general nature of natural disaster risk in the context of megacities with special attention to Asia. It discusses the special characteristics of megacities that may alter catastrophe risk management such as urban growth, migration, geolocation, and climate change.
- The megacity disaster risk, particularly in developing countries, was found to be highly dynamic, difficult to assess, often comprising of substantial informal risks, and risk management uptake is low, among others, due to lack of incentives.
- Recently, there emerged an interest in exploring whether megacity disaster risk may be suitable for a donor-assisted, regional Asian risk pooling scheme that is broadly similar to what was done in the Caribbean.
- The paper suggests that a key risk financing opportunity may relate to insuring public sector liabilities for infrastructure, liquidity support, and relief to population as conducted in the Caribbean regional pooling of hurricane and earthquake risk, and by the Government of Mexico for earthquake risk.
- The rationale and key constraints to such deliberations were assessed, given the highly dynamic nature of vulnerability and risk, and conditions for conducting similar transactions for Asian megacity risk were discussed.
- The paper suggests further discussion of the following issues at the conference:
  - (i) the case and/or demand for megacity risk financing and risk pooling,
  - (ii) the types of disaster risk to insure,
  - (iii) urban governance and financial authority,
  - (iv) the scope for regional risk diversification, and
  - (v) harnessing of regional institutional capacity for regional cooperation on risk financing.

## What Asian Member Countries with Megacities Require from a Catastrophe Risk Insurance Program

Jonathan Uy<sup>2</sup>

National Economic and Development Authority  
Philippines

- The Philippines is one of the countries in Asia and the Pacific with the fastest-growing and dense urban concentrations. Approximately half of the country's population resides on the island of Luzon. Manila, the country's capital, is considered the 11th most populous metropolitan area in the world.
- Because of its geographic location and archipelagic situation, the Philippines is one of the countries that is highly vulnerable to various types of disasters. Tropical cyclones, flood, and earthquake (seismic activity) are among the top three natural hazards experienced by the country for the past several decades.
- With the rise of urbanization and population in a megacity like Manila, there has been a parallel increase in urban infrastructure and technology which are exposed to a variety of risks and tremendous exposure to catastrophic disturbances such as seismic activities. At present, the cost of infrastructure is getting more expensive as the cost of technology increases and disturbance to processes and transactions is deemed to decrease opportunities and productivity. The approximate total building value in Metro Manila, based on a 90-million square meter total floor area, is \$20 billion.
- For developing countries with less financial resources, catastrophic events may result in higher public deficits and debt. In cases where the national government needs to augment the resources of the local levels, the government's financial status and capacity are highly exposed to risks because of the costly and cumbersome efforts of disaster recovery.
- In disaster risk management, investing in insurance mechanisms is recognized as one of the options in managing risks of natural hazards and disasters. However, the insurance market only provides catastrophe or disaster insurance coverage to a few governments mainly because the insurance premiums are high and the degree of damage is difficult to measure.
- Despite social and fiscal exposure and vulnerability of the country to natural disaster, insurance penetration remains low. In 2000, the nonlife insurance premium collected was \$458 million, which accounts for only 0.6% of the gross domestic product.
- It is imperative to revisit existing mechanisms in addressing or managing disasters for effectiveness and efficiency. The option to establish a proactive approach in transferring risk must be considered because the cost of disaster relief and rehabilitation is increasing.
- At present, the major source of funding for disaster recovery efforts are the National Calamity Fund and the Local Calamity Fund (LCF) whose resources have been increasing since 2004. From 2006 to 2008 alone, the National Calamity Fund has a total of \$32.71 million or an average increase of \$16.40 million equivalent to 112% per year. Also, 5% of the annual budget of the local government units is set aside for the LCF. For

<sup>2</sup> Jonathan L. Uy is director of the National Economic and Development Authority's (NEDA) Public Investment Staff. This paper was written in collaboration with Rachelle C. Cerrera and Jonah Karl R. Manalang of the same office.

the same period, the total LCF was \$50.92 million or an annual average increase of \$25.46 million. These government resources could be pooled as part of the catastrophe risk insurance program for the country.

- The proactive or pre-event response in managing disaster is by pooling of government resources before catastrophe occurs. Financial and insurance markets can play a key role in preparing for the impact of natural catastrophic events and in helping spread the risks to lessen the burden of the government.
- The private sector or the insurance market's involvement is vital in the development of risk transfer mechanisms but the cost of insurance premiums in developing countries is high, coupled with market imperfections. The challenge is getting the insurance industry involved in sharing the risks of catastrophe and natural disasters.
- One of the key challenges in disaster management is the preparedness of developing or middle-income countries with megacities in addressing the financial gaps brought about by natural disasters and/or catastrophe. This is an opportunity for development partners and the insurance market to provide assistance by guaranteeing and ensuring the government's pool of resources, by extending models, and by sharing best practices.
- For the Philippines, it is clear that market maturity has yet to be developed for catastrophe risk insurance mechanisms but the national government is increasingly providing resources at the subnational government levels to be able to respond to local disasters. An initiative for setting up a regional mechanism for intercountry cooperation and cross-insurance among the neighbor countries may be an initial platform for cooperation in the development of a regional catastrophe risk-insurance mechanism.



## Natural Catastrophe Risk Insurance Mechanisms for Asia and the Pacific—Main Report

Natural catastrophes are a major threat to sustainable development, especially in Asia and the Pacific. ADB's developing member countries are particularly vulnerable. Catastrophe risk could be transferred through a regional public-private insurance partnership. This is the key finding of the Asian Development Bank Conference on Natural Catastrophe Risk Insurance Mechanisms for Asia and the Pacific held in Tokyo in November 2008.

This report answers questions about disaster risk management and shows how ADB can ease access to catastrophe risk transfer mechanisms. It also suggests that a regional approach is an appropriate mechanism to bridge existing gaps and to unlock resources needed to better manage risk.

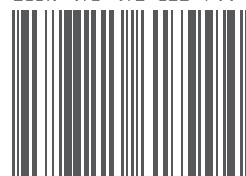
### About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries substantially reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two thirds of the world's poor: 1.8 billion people who live on less than \$2 a day, with 903 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

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

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