Deepening Regional Cooperation for Disaster Recovery and Reconstruction: A Proposal for Proactive Approach to Risk Financing

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Whatever affects one directly affects all indirectly. I can never be what I ought to be until you are what you ought to be. This is the interrelated structure of reality.

Martin Luther King

Abstract

Studies find increasing frequency, intensity, and impacts of natural disasters, especially as they interplay with the negative effects of climate change, environmental degradation, and rapid urbanization. The financial implications could be massive, especially in terms of damages on private assets, public infrastructure, and productive agents of the economy. Various estimates show that the magnitude of damages and losses on economies could hover around a fraction of one percent to a tenth of GDP, depending on the degree of exposure.

It is quite common that the individual governments bear most of the cost of disasters, especially in emerging economies where the private sector and the capital markets are not fully developed. The available resources within governments are mostly insufficient to address the cost of response, rehabilitation, and reconstruction, which could result in adverse impacts on the overall fiscal and macroeconomic condition of the particular economy. On top of that, the burden on the society, particularly the poor, is prolonged by the inability to deliver services due to the financial constraints resulting from a disaster.

As such, there is a need to improve the current system of financing the cost of disasters in a manner that would enhance the roles of the domestic private sector and international financial market. In addition, in this age of globalization and close interconnectedness, disasters tend to carry risks that cross borders, calling for a greater and more concerted global/regional effort. The paper proposes to expand the prevailing regional cooperation within APEC toward improving access to finance for disaster recovery and reconstruction and taking a more a more proactive approach to risk financing. Regional cooperation is seen as a mechanism to promote the development of financial systems and products to effectively reduce the fiscal burden arising from disasters, as can be gleaned by looking at the experiences of other economies in this regard.

Keywords: Natural Disasters, Financial Market, Cooperation, APEC, Disaster Recovery and Reconstruction

Increasing Impact of Natural Disasters

The importance of the APEC region in the global economy has long been established. With a membership of 21 countries, APEC accounts for 56 percent of the world GDP and 49.6 percent of the world trade in 2012. As one of the most dynamic regions, APEC is home to a population of around 2.8 billion in 2012. However, these gains can be easily undermined by the ever-increasing impacts of natural disasters, as attested by the catastrophic tsunami and the devastating earthquakes in Thailand (2005), China (2008), Chile (2010), New Zealand (2011), Japan (2011), and various parts of the Philippines in 2013.

According to the APEC Economic Trends Analysis report of the APEC Policy Support Unit in 2012, the pace of growth momentum was predicted to slow in many APEC economies, but it is more pronounced among the Newly Industrialized Economies (NIEs). However, Australia, Japan, New Zealand, and Thailand had been projected to grow in 2012, partly because of the recovery process from the natural disasters in 2011. It was then confirmed from the APEC Economic Trends Analysis report of 2013 that Japan, New Zealand, and Thailand posted high GDP growths in 2012. Part of the acceleration of the GDP was attributed to the reconstruction process as the aftermath major natural disasters in 2011. The posted GDP growth rates in 2012 for Japan, New Zealand and Thailand were 2.1, 2.3, and 6.2 percent, respectively. (Refer to Annex I for additional details.)

All statistics point to an increasing frequency, intensity, and impacts of natural disasters. Disaster risks arise from the interplay among physical, social, economic, and environmental factors, the growing concentration of people in urban areas, and poor environmental practices contribute to the vulnerability of an economy to natural disasters. The sheer number of recorded disasters—fewer than 100 in 1975 to more than 400 in 2005[1]—points to an increasing probability of a catastrophic event in any vulnerable area. As it is, more people have been affected by natural disasters, from 1.6 billion in the previous decade to 2.6 billion in the last ten years.[2] With more than 40 percent of the global population concentrated in megacities, indeed, it matters a lot where disaster strikes.

In 2013, there were 356 natural disaster in the world recorded by the Centre for Research on Epidemiology of Disasters (CRED). The different disaster types are drought, earthquake (seismic activity), epidemic, extreme temperature, flood, insect infestation, mass movement dry, mass movement wet, storm, volcano, and wildfire. Over the last decade, China, United States, Philippines, India, and Indonesia belong to the top five countries that most frequently hit by natural disasters. The highest estimated damage recorded was the earthquake-tsunami in Japan in 2011 that cost USD 210 billion. It is followed by the hurricane Katrina in 2005 in the United States with USD 125 billion estimated damage.

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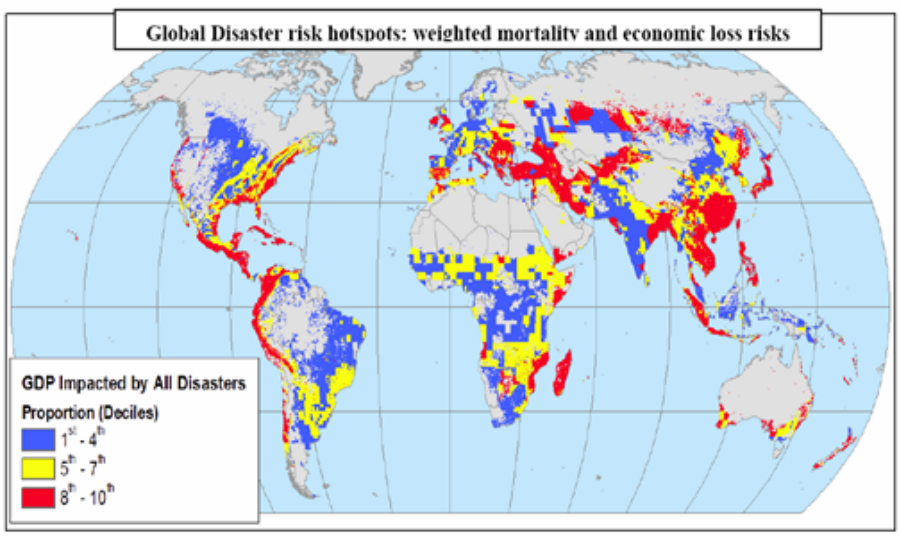
1 Figures from the Independent Evaluation Group of the World Bank, http://siteresources.worldbank.org/EXTEVAWBASSND/Resources/natural_disasters_fact_sheet.pdf.

2 Ibid.

In a period where economies are gearing up for higher growth, disasters could seriously hamper the efforts being undertaken by individual economies. Natural disasters destroy existing physical assets and tend to take away spending for new investments, in order to rehabilitate or restore damaged facilities. The poor also suffer the most, as many of them are located in unsafe urban settlements and unprotected rural areas, exposing their lives and properties to bigger risks. When a disaster strikes, restoration of lost livelihoods also tend to deplete the limited resources of the poor, locking them in a vicious cycle of poverty. The issue of disaster risk is therefore crucial for both poverty alleviation and sustained economic development. Unless economies grow at double digit rates, the impacts of natural disaster only absorb the gains. While world GDP per capita has increased by an annual average of 3.4 percent over this period, disaster costs rose by an average of 7.4 percent (IMF, 2003).

On the other hand, the GDP growth rate in 2012 decreases to 2.4 percent from 2.9 percent in 2011, and the estimated total damage cost of the natural disasters also decreases from USD 62.23 billion in 2011 to USD 0.16 billion in 2012.

Figure 1. Economies most impacted by disaster risks[3]



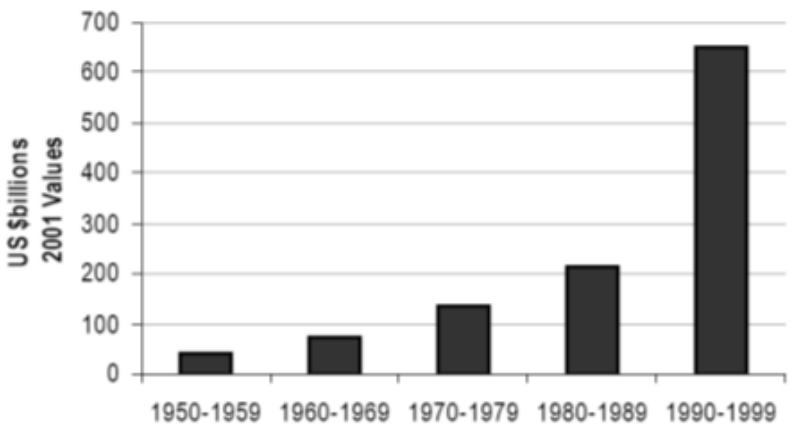
Source: Natural Disaster Hotspots Study:A Global Scale Risk Analysis(WB and Columbia University)

3 In an attempt to establish the vulnerability of all economies to multiple hazards, the World Bank and the University of Columbia prepared the Natural Disasters Hotspots: A Global Risk Analysis in 2005. The study looked at two major factors–mortality and economic losses–that ultimately determine the magnitude of disaster risks. Six major hazards were incorporated into the analysis: earthquakes, volcanoes, landslides, floods, drought, and cyclones. Should major disasters strike, those in red would be severely affected as a large part of the economy and population are at risk. More in-depth analysis is needed though by each economy to be able to disaggregate data within its geographical bounds.

Munich Re, which specializes in the disaster business, estimated that economic losses in the last decade increased sevenfold from those incurred in the 1960s. Of the direct losses, less than 1 percent was insured in the developing economies, compared with the 40–100 percent coverage in developed ones, such as the USA. Notwithstanding this fact, data on economic loss and livelihood erosion are generally not considered to be complete or reliable at this stage. While the reinsurance companies give more emphasis to economic loss, given their focus on insured losses, this is unlikely to provide a clear picture of livelihood losses, particularly in developing economies (UNDP, 2004).

Moreover, while the nominal magnitude of damages and losses is recorded in the developed economies, the relative impact is more felt by the emerging economies. Of the more than 6,000 natural disasters recorded during 1970–2002, three-fourths of the events and 99 percent of the people affected were in developing countries. In developing countries, natural disasters have, on average, affected over 2 percent of the population each year and caused more than one half of 1 percent of GDP in damage (Tobias, 2004).

Figure 2. Aggregate costs of major disasters, 1950–1999, in USD billions



Many scientists especially from the Intergovernmental Panel on Climate Change have generally accepted the relationship between climate change and the worsening frequency and intensity of natural disasters, particularly those related to the weather. The projected rise in sea level and the extreme weather events threaten communities and economic activities, especially those living along coastal zones. It is estimated that a one-centimeter rise in sea level is expected to displace some 56 million people around the world and impact a conservative estimate of 1.30 percent of the global GDP. Easily, the APEC economies account for more than half of this projection. Moreover, in the identification of the most vulnerable megacities in the world, 8 of the 19 belong to the APEC (see Annex II).

However, it is not only the rapid onset disasters (e.g., tsunami and earthquakes) that wreak havoc on economies. Recurring disasters also seriously constrain public finances and contribute to the cycle of poverty in affected communities. In the case

of the Philippines, it is visited by an average of 20 typhoons per annum, five of which are expected to be devastating. The Philippine government has estimated that for the past 30 years, direct losses alone from natural disasters account for an average loss of 0.7 percent of GDP per annum, most of which could be attributed to typhoon losses and damages.

The impact of natural disasters is likewise becoming transborder not only because of their intensity, magnitude, or severity but also because of the interconnectedness of economies. A catastrophic event in one area can seriously affect the lives and public policies in another area. Given that the decisions that generate such conditions (such as free trade agreements) are taken at the international level and without detailed knowledge and data of the territories potentially affected, it is uncommon that existing risk patterns are taken into account in such partnerships or arrangements (UNDP 2004).

Despite growing knowledge and understanding of disaster risks, many economies are saddled with various constraints, especially on institutional and financial fronts. The catastrophic events in the last two years alone (e.g., in India, Thailand, China, Philippines, Myanmar, etc.) have seriously undermined the capacity of economies to respond to disasters, much more to address the requirements for rehabilitation and reconstruction. As the world braces itself for more intense and more frequent disasters, there is a need to improve the current system for disaster risk management, in order to enhance the technical and financial resources of economies to effectively address and contain the impacts.

Some Basic Considerations in Disaster Management

First of all, it is important to have an understanding of possible costs of natural disasters. The most immediate and most obvious, of course, is the destruction of human and physical assets of the economy, including infrastructure, utilities, and the productive assets, among others. On top of these immediate costs, there are other associated (economic) costs arising from the disaster. Damages caused by natural disasters have significant implications on the macroeconomic and developmental conditions of an economy, both in the short and the long-term horizons. While the results vary across economies, IMF enumerates the following conditions as generally associated with natural disasters: (a) worsening of the fiscal position (e.g., contraction of tax base, increase in expenditure requirements, etc.); (b) weakening of the export trade balance as the capacity to export falls due to decreased production, accompanied by the rise in the demand for imported inputs for reconstruction; (c) downward pressure on the exchange rate, which reflects the weak trade balance and the concerns of foreign investors; and (d) inflationary pressures arising from exchange rate depreciation, and increased money holdings in the face of reduced incomes and wealth, among others.

Second, disaster management should cover both pre- and postdisaster scenarios. Timely and effective response, and actions addressing long-term recovery, reconstruction, and rehabilitation, are key elements of disaster management. However, it is equally important to put in place measures for disaster preparedness and adaptation (e.g., adoption of better building codes, construction of protective infrastructures such as sea walls, etc.).

Third, while we should not underplay the importance of various measures for disaster preparedness and adaptation, damages could not be totally avoided. Dealing with the aftermath of disaster would require financing and resource mobilization conducive to timely delivery and effective response. For developing economies, financing would be a serious constraint. In more developed economies, there are more financial instruments available, and the private sector could substantially complement public resources. For developing economies, residual funding would be severely lacking and governments in many cases tend adopt a reactive approach and rely heavily on foreign aid relief and domestic donation. This dependence can create a moral hazard problem, resulting in underinvestment in mitigation measures, thereby ultimately increasing disaster vulnerability.

Fourth, another important element is the adoption of institutional reforms to enable markets to play a more effective role in arriving at optimally structured risk sharing arrangements. This is a big challenge for developing economies due to the underdeveloped domestic insurance markets and a resultant inability to transfer risk to international insurance markets.

Finally, there is a need to incorporate and strengthen the regional platform. Natural calamities will increasingly be a threat to global development and security. Regional cooperation to promote resilience and preparedness of communities for emergencies and natural disasters should be strengthened. Disaster risk management should be part of the development agenda. Efforts along these lines should be further developed and supported at all levels: national, bilateral, regional, and global.

Current Initiatives to Curb the Impact of Disasters

Amid the challenges, the landscape for disaster risk management is changing. At the global level, disaster risk reduction is being refined as a development agenda. In 1994, the Yokohama Strategy and Plan of Action was introduced as the first blueprint and policy guidance for disaster reduction. It placed emphasis on actions at the social and community levels. After six years, the International Strategy for Disaster Reduction (ISDR) was established. The ISDR is essentially a system of partnership among governments, United Nations system, international and nongovernmental organizations, international financial institutions, academic and research institutes, networks, and civil society. ISDR sought to increase public commitment and linkage to sustainable development.

In 2005, 168 governments adopted the Hyogo Framework for Action (2005–2015). It calls for building the resilience of nations and communities to disasters and for the involvement of governments and private sector. The target outcome is the substantial reduction of disaster losses, in lives and in the social, economic, and environmental assets of communities and economies.

In response to the Hyogo Framework for Action, the Global Facility for Disaster Reduction and Recovery (GFDRR) was established in 2006 to help the developing countries reduce their vulnerability to natural hazards and adapt to climate change. GFDRR is being managed by World Bank with a partnership of 41 countries and 8

international organizations. One of its initiatives is the Disaster Risk and Financing and Insurance (DRFI) Program, which aims to assists developing countries in increasing their financial resilience to natural disasters by establishing natural disaster microinsurance programs and then intermediating it between governments and international financial markets.

Disaster risk reduction is incorporated in a holistic framework of human security, along with other issues such as human pandemics and infectious diseases, terrorism and proliferation of weapons for mass destruction, and drug trafficking, among others. In various summits, APEC Leaders have recognized that human security is an indispensable component of sustained economic growth and prosperity. They have emphasized the need to strengthen regional cooperation to promote resilience and preparedness of communities for emergencies and natural disasters and have promoted the use of available resources for disaster preparedness, rehabilitation and reconstruction.

Within the APEC system, a Task Force for Emergency Preparedness was constituted to facilitate the exchange of information and expertise among the member-economies. Acknowledging the importance of disaster preparedness and response, the cooperation forged through APEC enabled the members to better prepare for emergencies caused by natural disasters and for addressing the long-term recovery needs of these economies. Several initiatives were undertaken in relation to this, including the formulation of the APEC Framework for Capacity Building Initiatives on Emergency Preparedness. The Task Force is also working on a strategic action plan that will refocus and reinvigorate its work on emergency preparedness and risk reduction, and timely and effective disaster response.

In the 6th Emergency Preparedness Working Group Meeting in China in February 2014, there was a proposed project on Disaster Risk Financing and Insurance (DRFI), which aims to establish cross-continental linkages among APEC economies to facilitate exchange of experiences in disaster risk financing and to foster an early thinking of an APEC regional risk transfer market and mechanism.

New Paradigm for Financing Disasters

Individual governments utilize various instruments to finance the cost of disaster. The use of fiscal resources, in the form of existing budgets, taxes, and borrowings, has been the more traditional means to finance the costs of disaster. Many governments also earmark a portion of the budget in a form of contingency fund that can be tapped whenever disaster strikes. For the residual costs, or those that could not be included in the fiscal envelope, it is uncertain when and how these things will be addressed by the individual governments.

When disaster happens, developing economies retain most of the attendant risks due to the underdeveloped state of domestic insurance markets and a resultant inability to transfer risk to international insurance markets (Gurenko, 2004). Individual governments are faced with the lack of liquidity in the aftermath of disasters that may severely impact economic recovery. Governments are usually expected to provide

compensation support to affected communities, particularly to restore damaged homes and livelihoods, which are not covered by private insurance. At the same time, recurrent disasters put a heavy toll on public finances that excessive borrowing is resorted to rehabilitate or restore damaged assets and infrastructure. However, these resources are generally insufficient to cover all the costs, especially in the weaker economies, which may be saddled by high level of indebtedness, limited economic base, and poor economic infrastructure. Given fiscal constraints of developing economies, there is a need to adopt a more strategic approach to cover the residual requirements. One way to do this is to transfer such risks to parties which may have better capacities to manage or absorb such risks.

The big variance on the availability of resources among the developed and developing economies reflects the financing strategies in place. In more developed economies, financial instruments like insurance both at macro and micro levels are significant sources of funds in coping with disasters. Private sector funding substantially complement public resources to cover damages and losses.

For developing economies, funding the residual requirements tends to be *ad hoc* and *ex post*. Governments, in many cases, adopt a reactive approach wherein resources are mobilized or generated only after the catastrophe. In this case, the usual sources of funds come from internal and external donor assistance and even remittances from migrant workers. At a time of disaster, relief aid flows quickly but is definitely not sustainable in the long run, especially in meeting the massive needs for reconstruction and rehabilitation. Moreover, dependence on relief aid does not provide incentives to undertake measures for resilience, e.g., retrofitting of assets, adoption of better construction standards and building codes, etc. This dependence tends to further exacerbate disaster vulnerability through underinvestment in mitigation measures and through degradation in the quality of infrastructure.

There is a need, therefore, to shift the paradigm into a more proactive approach that links with the private resources at the international level and that promotes appropriate incentives. Policies should be set in place to address market failures that deter private sector funding for disaster. Domestic insurance in developing economies tend to be undercapitalized and most do not have the capacity to retain exposure linked to the risk of natural disasters. Insurance markets appear to be sufficiently segmented and shallow that spreading of the risks remains problematic (IMF, 2003). As a result, whatever limited catastrophe risk coverage they offer has to be largely insured through international markets, where pricing has become highly volatile in recent years (Gurenko and Lester, 2004).

There are other constraints to the adoption of market-based instruments. Vickers identifies them as (a) low insurance penetration (caused by the lack of appreciation for insurance services by the individual households, private business especially the smaller ones), (b) politically captured compensation schemes (governments crowd out the private sector in terms of relief measures, which have high political returns), (c) low use of catastrophe models to assess risks, (d) tight public finances, and (e) economic shocks postdisaster.

As experiences on risk transfer are growing, there have been efforts to develop new instruments that better manage risks. There are emerging models and experiences in many economies of the world that utilize the more proactive and innovative financing instruments, which include, among others, weather derivatives, catastrophe bonds, index insurance, contingent credit, etc.

While there are many experiences available from which to draw lessons, only two examples are presented in this paper. They are the Caribbean Catastrophe Risk Insurance Facility and the Turkish Catastrophic Insurance Pool. The former is a regional example and the latter is an individual effort, which is now becoming more and more attractive to many developing economies.

Caribbean Catastrophe Risk Insurance Facility. The smaller island states in the Caribbean[4] were found to be among the most vulnerable to natural disasters. They are heavily exposed to various forms of physical hazards, such as windstorms, earthquakes, etc. Based on the experience since 1970, a natural disaster inflicting damage equivalent to more than 2 percent of the affected country's GDP can be expected to hit the [region] roughly once every two and a half years (Rasmussen, 2004).

However, each economy is too little to tap additional resources to build their resilience against hazards. In most cases, these economies have heavily depended on postdisaster financing, especially aid from international donors. Insurance, even at the household level, is limited and costly.

To address this problem, these smaller economies have decided to pool their risks to create economies of scale, resulting in the creation of a captive insurance company. Three major instruments were utilized to facilitate the establishment of the captive: (a) formulation of an individual and regional catastrophic risk models, (b) design of individual country parametric insurance policies, and (c) blueprint of the insurance captive's risk financing strategies. Jointly owned by the members of the pool and international donors, the captive insurance company acts as the primary insurer, which issues insurance cover using parametric triggers[5] to the members. The captive then purchases reinsurance from the private insurance market.

This innovative scheme allows the smaller economies to access a more affordable insurance by pooling their risks and creating economies of scale. The members and international donors provide risk capital to the captive, which helps reduces the cost of premium. Apart from this, the operational costs of running the captive are shared among the members. The scheme offers a multiyear and multihazard coverage at a specified premium, which enables the governments to be liquid at a time of disaster.

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4 Namely, The Bahamas, Jamaica, St. Kitts and Nevis, Antigua and Barbados, Dominica, St. Lucia, St. Vincent and the Grenadines, Barbados, Grenada, and Trinidad and Tobago.

5 Parametric types of insurance refer to those wherein claims are paid based on a predetermined intensity of a natural hazard occurring within a given period of time (usually one year) in a given area. As opposed to an insurance of indemnity, compensation is paid immediately once a trigger has been measured, without necessarily accounting for the actual losses incurred.

This scheme is not without a negative side to it. For one, the compensation that would be received may not actually cover the actual total losses. Two, it relies heavily on the commitment of each member to operate under the scheme for a long period of time. Thirdly, the loss of a member may adversely impact the future premium of other members in the future. So far though, the members deem that the benefits of the scheme far outweigh the negative.

Turkish Catastrophe Insurance Pool (TCIP). Turkey is highly vulnerable to earthquakes, with recorded 66 events in the last 100 years. The TCIP was developed through the partnership among the Turkish government, domestic private insurance sector, international reinsurers, and multilateral development banks. The facility was created after the dramatic 1999 Marmara earthquake, which killed around 16,000 people, injured 44,000, and damaged assets amounting to about 5 percent of the country's GDP.[6]

The facility was established to (a) make liquidity readily available to owners of residential properties destroyed or damaged by an earthquake to repair or replace their dwellings, (b) reduce the Turkish government's fiscal exposure and the risk to the economy due to major earthquakes, (c) reduce the government's financial dependence on multilateral development banks and other donors' financial assistance in the aftermath of major earthquakes, and (d) encourage appropriate building standards for housing (Gurenko and Lester, 2004).

The Turkish government legally required urban homeowners to avail of earthquake insurance cover under the TCIP, and, at the same time, it abolished all forms of assistance that it used to provide to homeowners affected by earthquakes. Prior to this scheme, homeowners availed of the usual insurance for fire, with a limited coverage of less than 5 percent.

The premium varies depending on the seismicity and the construction materials used for the dwelling. The scheme enables risk-sharing among the homeowners, removal of the risks from the government and transfer of a portion of the risks to international reinsurance markets. In 2006, the TCIP was estimated to reach around EUR 1 billion capacity that can cover assets worth more than EUR 45 billion. This means that the TCIP was able to leverage EUR 80 million of private premiums per year to guarantee approximately EUR 1 billion of private cover, while removing government exposures and associated fiscal costs. Following the successful model in Turkey, many developing economies are now planning to create a similar catastrophe risk insurance program.

In both cases, the adoption of institutional reforms allowed catastrophe losses to be passed onto the markets, resulting in financial benefits to local industries, domestic insurance companies, households, and governments, through the use of more optimally structured risk sharing arrangements. The partnership forged between public and private institutions generated additional and diversified sources to leverage the limited domestic resources. The two schemes were likewise anchored on the incentives that promote disaster prevention, both at the macro and micro levels. On

6 Figures from Gurenko and Lester, 2004.

the part of the Caribbean economies, the pool only works if there is an assurance that disaster mitigation measures are in place to minimize the risks that would be shared among the members of the pool. For the Turkish experience, the households, albeit a compulsory implementation of the insurance, saw the benefit of spreading the risks.

The developments in the global capital markets present themselves as opportunities for developing economies to minimize the potential financial burden arising from disaster risks. Each developing country that takes interests in tapping these resources should take note of some of the following key questions that shall outline the financing strategy to be adopted: What are the disaster risks faced by the economy? What is the level of vulnerability to disaster risks? How can these be funded? What is the residual requirement? What are the risks to be transferred? To whom, how, and through what kind of instrument?

Using Regional Platform

Disasters brought about by natural hazards will continue to be a threat to global development and security for many years to come. The need to mainstream or incorporate disaster risk management on the development agenda, processes, and plans and programs has long been accepted. This effort should therefore be supported at the national bilateral, regional, and international levels.

The financial burden of response, mitigation, rehabilitation, and long-term recovery can be massive to be singly assumed by governments and, hence, calls for an effort to share such risks internationally. As such, the role of regional institutions and organizations can be expanded from the current setup that facilitates sharing of information, knowledge, and capacities toward disaster preparedness and mitigation. The learning tools among the members may be utilized toward a refined index of risks and vulnerabilities at regional levels to enable better comparison and to guide decision makers. This information can then guide the formulation of appropriate instruments for risk financing, which clarify the sharing arrangement among stakeholders and distribute the risks to the international capital market.

In many cases, developing economies do not have the capacity to come up with such an assessment on their own and would have to rely on international scientific and technical institutions to provide the necessary assistance. The technical cooperation of building up and sharing of information, experiences, and technology as a cross-cutting effort that informs governments of the risks is an initial step that should be complemented by other forms of partnerships, including exploring better options for financing disaster risks.

Given these challenges, there is a need to apportion roles and responsibilities not only within economies and across tiers of the public sector. There are efforts that may be initiated at the regional and international level to distribute risks and leverage resources. The paper only presents examples but does not preclude the development of more innovative instruments for the region. What it attempts to do is to sensitize the members to consider the adoption of risk sharing and transfer options that would widen the access to finances in case a disaster strikes. Such instruments can reduce the funding gap, if not totally eliminate it.

The region has risen to such challenge in the aftermath of the financial crisis that hit the region a decade ago. The contagion triggered the launch of various initiatives toward promoting institutionalized regional financial and macroeconomic interdependence, such as the Changmai Initiative and the Asian Bonds Markets Initiatives. These initiatives have demonstrated a commitment by the region's leaders to seek cooperative regional solutions to economic and financial problems (Kuroda, 2006). The establishment of the Changmai bond following the Asian financial crisis has akin intentions to the establishment of innovative instruments among the vulnerable members of the APEC. The scheme should be linked to the establishment of appropriate systems that would lessen the vulnerabilities of the economies to natural hazards, such as the adoption of an integrated disaster and climate change in the development plans and priorities.

The benefits of pursuing a regional financial framework and instrument for disaster could not be underscored enough given the increasing interdependence in these economies. The vulnerability of economies to natural disasters necessitates the formulation and adoption of relevant policies, which will better utilize market mechanisms. Complementary policies at the regional level can be instituted to provide better incentives to individual economies to set appropriate policies at the national level.

The international capital market can reduce the immediate financial impact at the national level by providing compensation for the loss of capital and income and by spreading the burden in a spatial and temporal manner. But the utilization of such market mechanisms clearly needs to be enhanced and promoted. Within APEC, this effort can be contextualized in the overall attempt to improve economic environment, especially the financial intermediaries and the capital market. Efforts can then be targeted toward setting the appropriate institutional mechanisms and policies and widening the range of market-based instruments available at the international or regional level.

Natural disasters also open up opportunities to rebuild safer and more resilient communities. Arranging funds in an *ex ante* manner would help facilitate this process by adding up to the available funds that each economy has for reconstruction and rehabilitation. As the APEC economies continue to commit to deepening regional integration, reducing vulnerabilities to exogenous shocks, such as disaster, has clear benefits for the members. Enhancing the resilience of economies to disaster risks has clear implications on sustained productivity and strong rates of growth.

Identifying possible sources of funds should be linked to the promotion of appropriate incentives that foster a culture of prevention. Investments that save lives, assets, and properties should be complemented by schemes that help to spread risks among stakeholders.

To see the figures and tables in color, please see the online version at http://dfa.gov.ph/index.php/apec-2015-policy-studies

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Countries Most Exposed to Multiple Hazards

Three or more hazards (top 15 based on land area)

Country	Percent of Total Area Exposed	Percent of Population Exposed	Max. Number of Hazards	Country	Percent of Total Area Exposed	Percent of Population Exposed	Max. Number of Hazards
Taiwan	73.1%	73.1%	4	Viet Nam	8.2%	5.1%	3
Costa Rica	36.8%	41.1%	4	Solomon Islands	7.0%	4.9%	3
Vanuatu	28.8%	20.5%	3	Nepal	5.3%	2.6%	3
Philippines	22.3%	36.4%	5	El Salvador	5.1%	5.2%	3
Guatemala	21.3%	40.8%	5	Tajikistan	5.0%	1.0%	3
Ecuador	13.9%	23.9%	5	Panama	4.4%	2.9%	3
Chile	12.9%	54.0%	4	Nicaragua	3.0%	22.2%	3
Japan	10.5%	15.3%	4				

Two or more hazards (top 60 based on land area)

Country	Percent of Total Area Exposed	Percent of Population Exposed	Max. Number of Hazards	Country	Percent of Total Area Exposed	Percent of Population Exposed	Max. Number of Hazards
Saint Kitts and Nevis	100.0%	100.0%	2	Kenya	16.9%	8.8%	2
Macau	100.0%	100.0%	2	Mexico	16.5%	9.6%	4
Antigua and Barbuda	100.0%	100.0%	2	Korea, Dem. People's Rep.	16.4%	13.5%	3
Hong Kong SAR (China)	100.0%	100.0%	2	Lao People's Dem. Rep.	15.2%	12.6%	3
Taiwan	99.1%	98.9%	4	Turkey	15.1%	11.3%	3
Vanuatu	80.8%	75.6%	3	Panama	15.0%	12.6%	3
Costa Rica	80.4%	69.2%	4	Swaziland	14.3%	14.2%	2
Philippines	62.2%	73.8%	5	Nicaragua	12.4%	49.8%	3
Nepal	60.5%	51.6%	3	Afghanistan	11.1%	29.5%	3
Guatemala	56.6%	83.4%	5	Myanmar	10.7%	10.4%	4
Korea, Republic of	53.0%	53.6%	2	India	10.5%	10.9%	4
Ecuador	47.6%	74.6%	5	Lesotho	10.3%	3.7%	2
Réunion	45.7%	45.7%	2	Iceland	9.4%	4.8%	2
Viet Nam	45.1%	38.7%	3	Colombia	8.9%	7.5%	3
Somalia	43.1%	53.8%	2	China	8.4%	15.7%	3
South Africa	43.1	46.9	2	Kyrgyzstan	8.3%	5.8%	2
Japan	38.1%	48.4%	4	Dominica	8.1%	6.2%	2
Cayman Islands	36.8%	45.6%	2	Peru	7.4%	26.3%	3
Bangladesh	35.6%	32.9%	4	Iraq	7.3%	9.6%	3
El Salvador	32.4%	39.7%	3	Cuba	6.6%	4.3%	2
Cambodia	27.9%	4.4%	3	Papua New Guinea	5.9%	6.4%	3
Chile	26.2%	62.6%	4	Jamaica	5.7%	7.2%	2
Thailand	25.2%	17.7%	2	Pakistan	5.6%	18.2%	2
Fiji	23.2%	29.0%	2	Indonesia	4.5%	14.1%	3
Tajikistan	23.2%	9.5%	3	New Zealand	4.3%	1.7%	3
Solomon Islands	22.8%	16.6%	3	United Arab Emirates	4.1%	6.8%	2
Madagascar	20.2%	9.9%	2	Armenia	3.1%	1.5%	3
Bhutan	20.1%	29.2%	4	Mongolia	2.8%	0.7%	2
Georgia	17.4%	5.9%	3	Nigeria	2.7%	6.7%	2
Iran (Islamic Republic of)	17.1%	22.2%	4	United States	2.6%	11.2%	4

Center for Hazard and Risk Research
The Earth Institute at Columbia University
www.ldeo.columbia.edu/chrr/research/hotspots

Source: Tables 1.1a and b. *Natural Disaster Hotspots – A Global Analysis*

Megacities at Risk

Cities with 10 million or more inhabitants
2000 and 2015

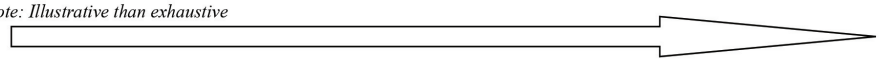
City (as of 2000)	Population (in millions)	City (projected by 2015)	Population (in millions)
Tokyo/1	26.4	Tokyo/1	26.4
Mexico City	18.1	Bombay/1	26.1
Bombay/1	18.1	Lagos/1	23.2
Sao Paulo	17.8	Dhaka/1	21.1
Shanghai	17.0	Sao Paulo	20.4
New York/1	16.6	Karachi	19.2
Lagos/1	13.4	Mexico City	19.2
Los Angeles/1	13.1	Shanghai/1	19.1
Calcutta/1	12.9	New York/1	17.4
Buenos Aires/1	12.6	Jakarta/1	17.3
Dhaka/1	12.3	Calcutta	17.3
Karachi/1	11.8	Delhi	16.8
Delhi	11.7	Metro Manila/1	14.8
Jakarta/1	11.0	Los Angeles/1	14.1
Osaka/1	11.0	Buenos Aires/1	14.1
Metro Manila/1	10.9	Cairo/1	13.8
Beijing	10.8	Istanbul/1	12.5
Rio de Janeiro/1	10.6	Beijing	12.3
Cairo/1	10.6	Rio de Janeiro/1	11.9
		Osaka/1	11.0
		Tuanjin/1	10.77
		Hyderabad	10.5
		Bangkok/1	10.1

Source: United Nations Population Division, March 2000; Quoted from IMF, 2003
1/Cities located in coastal areas

Matrix of Available Instruments for Risk Funding

Level	Post-Event	Pre-Event
International	International aid/relief	Reinsurance Capital Market instruments like Catastrophe Bonds and Weather Derivatives Global Index Insurance Facility Government Pool
National	Sovereign borrowing Domestic aid/relief Development assistance National budget Increased taxes	National Insurance Pool Insurance Index-based Instruments Contingent Credit Reserve Funds
Local	Local budgets Local borrowing Aid/relief from various possible sources (*e.g.*, kinship arrangements)	Household and private sector insurance Community or social insurance Microinsurance Reserve funds

Note: Illustrative than exhaustive



Reactive Proactive

Annex IV

Salient Features of Risk Financing Instruments

Weather derivatives are financial instruments that can be used by organizations or individuals as part of a risk management strategy to reduce risk associated with adverse or unexpected weather conditions. It is essentially structured as a stock derivative, but the major difference is that the underlying asset (e.g., rain/temperature/snow) has no direct value to price the weather derivative (as opposed to a stock price).

Catastrophe bonds, or "cat bonds," are risk-linked securities that transfer a specified set of risks from a sponsor to investors. They are often structured as floating rate corporate bonds whose principal is forgiven if specified trigger conditions are met (e.g., earthquake of a certain magnitude). This enables spreading the risks not just among the insurance and reinsurance markets but also in the wider capital market.