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Système Economique
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Financial Mechanisms, Insurance and Reinsurance against Disasters in Latin America and the Caribbean: Recent Experiences

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against Disasters in Latin America and the Caribbean: Recent Experiences*
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F O R E W O R D

This document forms part of the Work Programme of the Permanent Secretariat, Latin American and Caribbean Economic System (SELA) for 2010 (Activity II.2.2), as a contribution to the discussions that will be held in the "Regional Seminar on Public Investment and Financial Mechanisms, Insurance and Reinsurance against Disasters in Latin America and the Caribbean: Recent Experiences" (Mexico City, 22 and 23 November 2010).

The study contains four sections. The first section is an overview about the significance of counting on a public policy on protection or risk financial management from the standpoint of disasters and refers to methodologies, models and procedures for risk assessment. In the second section, a description is made of main financial facilities for risk transfer and retention and some relevant regional and international experiences are described. The third section introduces the view of several regional and international parties to risk reduction about hedging mechanisms. Finally, the fourth section summarizes some recommendations to strengthen and bolster risk financial protection in the Latin American and Caribbean region.

The document was prepared by consultants Omar Darío Cardona A. and Mabel Cristina Marulanda F. The Permanent Secretariat recognizes their effort and thanks them for their work.

EXECUTIVE SUMMARY

The financial risk arising from potential disasters that might hit a city, a region or a country means an obligation or non-explicit contingent liability which may affect, from the macroeconomic standpoint, governments' fiscal sustainability. The need for economic resources to handle emergencies and engage in rehabilitation and post-disaster reconstruction means fiscal exposure or vulnerability which should be measured according to the responsibility of each State. Governments are risk takers, aware or not, that should set a strategy to face the after-effects of natural disasters and, therefore, prevent untoward economic effects which harm their economic sustainability. In other words, both extreme and minor recurring disasters mean fiscal exposure and are contingent liabilities that should be borne in mind in the domestic balance of account.

As to measuring any contingent liability related to an extreme disaster, one of the most representative works have been the development of the Disaster Deficit Index (DDI), in the context of the System for Indicators and Disaster Risk Management in the Americas, led by the Inter-American Development Bank (IDB). Considerations about fiscal responsibility and the need to have a strategy for hedging have been partially or barely addressed in specialized literature.

Assessment of fiscal vulnerability to disasters depends on potential economic losses that may be suffered by a country and its economic capacity or resilience to cope with them and carry out post-disaster replacement or reconstruction. For such reason, appropriate risk modelling techniques should be used by means of probabilistic models which account for potential, expected maximum losses for a return period, as well as analytic models able to ascertain the capacity or access to economic resources in order to cover a deficit arising from a disaster. Such techniques are usually actuarial models which help measure fiscal exposure or vulnerability; they assess in a probabilistic manner damages and losses on assets or real estate under the responsibility of sovereign States.

Probabilistic catastrophe risk modelling and the inventory of economic effects of minor recurring events are a substantive input to plot feasible financial facilities and alternative structures for risk retention and transfer based on an analysis of financial optimization. Said actuarial modelling helps recommend indexes to prioritize rehabilitation or structural reinforcement of properties by using the cost-benefit ratio in such operations.

From the standpoint of hedging, actuarial models have been historically used. Their purpose has been appraising expected maximum losses and, generally, applying risk management, as known in finances. Main metrics used by those methods include Probable Maximum Loss (PML) and risk pure premium, in order to determine the economic reserves needed to handle extreme catastrophic events and set the value of the policies established by a risk taker for risk transferors. Risk assessment techniques have been substantial in contracting of insurance and reinsurance and, lately, for investors in the capital market. However, few models have been globally deemed as appropriate, and they are owned and exclusively used by firms, such as RMS, EQECAT, AIR Worldwide and ERN. These models, regarded as "black boxes" as their theoretical basics are unknown, have been questioned. Therefore, some "open source" models have been devised to counter their business privileges.

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Presently, the Comprehensive Approach for Probabilistic Risk Assessment (CAPRA), taken by the Natural Risk Assessment Consortium – Latin America (NRA-LA) with the support of the World Bank, the Inter-American Development Bank (IDB) and the United Nations International Strategy for Disaster Reduction (ISDR) is under way. Such an initiative thoroughly describes the analytical base of risk assessment and embraces “open source” criteria concerning both the threat modules and the risk assessment module. By the same token, the Global Earthquake Model (GEM) is being devised. The purpose of this project is providing a platform for assessment of the worldwide seismic risk.

As to the design of hedging instruments or mechanisms, only recently, since the late nineties, the first catastrophe bond (CAT Bond) was issued and the first captive off-shore reinsurance companies have proposed new alternatives to risk retention and transfer, of interest for the insurance business and the capital market. However, the potential use of such financial instruments is not common practice in the government sector for the purposes of protecting their fiscal goods and fulfilling their fiscal responsibility.

Major financial instruments that could be replicated are, for instance, an insurance consortium created in Turkey to cover losses against earthquake for buildings property of citizens; the Caribbean Catastrophe Risk Insurance Facility (CCRIF), intended to handle emergencies in the Caribbean; Mexico’s reserve fund policy; the CAT Bond issued by the Mexican government in 2006 to handle emergencies; taking of contingent credits with multilateral organizations, such as the CAT-DDO of the World Bank and re-channelling of credits upon the IDB consent; voluntary collective insurance and protection of the poorest with cross subsidies, and insurance of public property by means of a single multi-risk policy, among other widely known mechanisms or instruments.

In this way, several financial instruments could be explored in order to set an optimum strategy for hedging; devise a method to assess the economic and social cost-benefit ratio of risk reduction measures; prioritize the assets to be covered, and take a comprehensive approach of the risk financial management. Now, therefore, note that despite the sheer importance for governments to have a hedging policy for risk retention and transfer, by using several mechanisms or instruments available, such public policy has somewhat been acknowledged over the past few years and just recently has been advocated mainly by International Financial Institutions (IFI). There are more and more contributions, instruments, projects and publications about the subject matter, championed in the region by the World Bank and the IDB. Also, the ECLAC, CAF, OAS, other subregional development banks and organizations, such as the Project on Support for Disaster Prevention in the Andean Community (PREDECAN), the Andean Committee for Disaster Prevention and Assistance (CAPRADE), the Coordination Centre for Natural Disaster Prevention in Central America (CEPRENAC), and the Office of U.S. Foreign Disaster Assistance (OFDA/USAID), among others, have made a contribution. Surprisingly, the insurance and reinsurance sector has given governments little input to understand and set financial strategies in the face of the sovereign risk in the event of disasters. As a result of the endeavours in this regard, this subject started to be addressed in workshops, conferences and seminars on risk comprehensive management. Also, the Ministries of the Treasury and Finances, planning entities and other interested ministries (for instance, agriculture) have scheduled related activities and commissioned studies intended to guide potential alternatives for improved efficiency in handling reserve funds, subscription and subsidy of insurance/reinsurance and even to explore instruments such as catastrophe bonds and captive firms. The main recommendation herein is that such efforts should remain, consolidate and complement each other to gradually have more illustrative and replicable examples of good practices for hedging, which could eventually spread over the region.

To sum up, based on the Latin American and Caribbean experience, while most policies on risk comprehensive management are novel, risk financial protection or management are barely mentioned. Therefore, it could be said that this is a virtually new area which should be prioritized by regional authorities and institutions.

In the whole region, such an action has not actually been an explicit public policy and it has not been linked to other public policies that comprise risk comprehensive management. If any related provisions, it could be said that no progress has been made either in analyzing the efficiency of such provisions. For such reason, in this paper it is concluded about the need, first of all, to identify such a situation and move forward in analyzing and making proposals with a view to conducting further study on risk assessment including suitable, appropriate models based on available technical data. This would be a prerequisite to set effective hedging strategies, by using several feasible instruments to cover potential losses of the State and society upon the occurrence of natural events at different sizes.

INTRODUCTION

The risk of disasters depends not only on the possibility of intense natural events or phenomena, but also on vulnerability conditions which favour or help unleash disasters when such phenomena occur. Vulnerability is closely linked to ongoing social processes in prone areas it is usually related to people's fragility, susceptibility or lack of resilience in the face of any threats. In other words, disasters are socio-environmental events resulting from the risk social construction. Therefore, reducing them should form part of decision making, not only with regard to post-disaster reconstruction, but also public policy making and planning for development. For such reasons, institutional development should be reinforced and investment should be made to lessen vulnerability in furtherance of the countries sustainable development.

In addition to their role as decision makers and regulators, governments at the national, subnational and local levels are also major owners of goods. In the event of natural disasters, reconstruction or replacement of public assets and services is the government's responsibility. For such reason, expected losses, or the risk of disasters, should be estimated, as "future disasters" are contingent liabilities for the State. Similarly, mechanisms or instruments on reasonable retention and/or transfer of potential risks should be set at the government different levels, so as to count on economic resources to handle emergencies and carry out post-disaster recovery. Now, therefore, while covering the losses of the private sector is seemingly not the government responsibility, because protecting themselves and protecting their property should be an individual responsibility, sometimes reconstruction needs of the poorest communities stricken by a disaster cannot be disregarded from the political view. In sum, covering the losses of public infrastructure and low-income communities is generally the State fiscal responsibility (Andersen 2002, 2003).

Based on the foregoing, governments should include in their fiscal sustainability analysis a contingent liability which has not been considered accordingly – future disasters. That is, governments should estimate potential losses for natural events, as such losses may entail extreme contingent commitments resulting in macroeconomic unbalances or, in any case, arising from implied warranties included in the estimates of private agents. This is tied to the problems inherent to the operation of insurance markets, provisional inconsistency of public policies and the so-called Samaritan dilemma¹ (Cardona 2009a, Marulanda et al., 2008a).

In most Latin American and Caribbean countries, the funds to handle emergencies (of calamities or disasters) and for reconstruction are diverse and tend to focus mainly on *ex post* action. Diversion of budgetary allocations, setting new taxes, renewed domestic and foreign leasing and relying on international aid whenever a disaster occurs is common practice. Lack of liquidity immediately after a disaster usually delays recovery, and it undermines development and public investment programs. For such reason, governments should set more effective financing strategies by taking *ex ante* actions. Plausible alternatives include the establishment of reserve funds, contingent leasing, insurance and reinsurance underwriting and use of hedging instruments in the capital market.

¹ If people are certain that they will count on transfers, subsidies or private charity in the event of suffering big losses as a result of a disaster or negative shock, they would rather reduce the optimum insurance expenditure level, binding the State to take on said losses.

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Ex ante financing programmes fit in a more proactive, effective context of risk comprehensive management. Therefore, the Ministries of the Finances, or the Treasury, or Economy, as appropriate, and the agencies responsible for general accounting of countries should formally expand the nation balance to include changes in implied assets and liabilities and not only explicit flow variables, such as total expenditure (wages, investment, debt interests, etc.), current income (taxes, expected loans) and fiscal deficit.

Provisions for future disasters are implied contingencies which are not usually included in the nation balance. For such reason, governments should quantify the risk (for the State) by means of appropriate modelling and assess its impact on public finances. Furthermore, the governments that might be the target of catastrophic events or minor recurring events should set a strategy for financial coverage of the risks faced by them (Marulanda et al., 2008a).

This paper contains four sections. The first section is an overview about the significance of counting on a public policy on protection or risk financial management from the standpoint of disasters and refers to methodologies, models and procedures for risk assessment. In the second section, a description is made of main financial facilities for risk transfer and retention and some relevant regional and international experiences are described. The third section introduces the view of several regional and international parties to risk reduction about hedging mechanisms. Finally, the fourth section summarizes some recommendations to strengthen and bolster risk financial protection in the Latin American and Caribbean region.

I. MODELS, METHODOLOGIES, INDEXES, AND PROCEDURES TO IDENTIFY AND ASSESS RISK

1. The role of governments

The significant socio-economic impacts suffered in recent decades in the wake of disaster due to natural events reveal the high vulnerability of the cities of Latin America and the Caribbean. Similarly, those consequences illustrate the levels of financial and social protection that should be implemented to meet the associated economic costs, not only in terms of direct losses, but also in relation to the reduced productivity of the agricultural and industrial sectors, the downturn in tax revenues and the allocation and use of resources required to address the emergency. Vulnerability to natural disasters has increased in recent decades driven by a number of factors, including population growth, urban expansion and development of infrastructure projects, which have generally increased the number of assets exposed in regions prone to natural hazards.

The modern vision of disaster risk management involves four distinct components or public policies (Cardona et al., 2005b):

- a) risk identification (involving individual perception, social representation and objective assessment of risk);
- b) risk reduction (specifically involving the prevention and mitigation of social and physical vulnerability);
- c) financial protection (which is related to the transfer and retention of risk from the financial and public investment points of view); and
- d) disaster management (which corresponds to the stages of preparation, warning, response, rehabilitation and reconstruction once the disaster occurs).

It is easy to deduce that the first three are *ex ante* actions and the latter corresponds to actions *ex post*. Another clear conclusion is that risk management is inevitably transverse to development and various social stakeholders are necessarily involved in the process.

Despite the considerable research that has been conducted internationally in relation to the impact of natural phenomena on development, the formal incorporation of disaster risk in the planning processes has been much too timid so far. While institutional changes have been implemented introducing modern schemes to cope with disasters, there are still problems of organization and allocation of resources to risk prevention and mitigation. And, while there has been acknowledgement of the importance of risk reduction and financing as well as that of the probabilistic estimation of losses from natural events, the necessary information to consider and evaluate alternatives towards reducing or covering such losses is generally missing. Consequently, market imperfections persist and the expansion and development of mechanisms for economic loss coverage remains limited, especially in developing countries. For this reason, it is necessary that policies aimed at reducing risk actually receive the attention they deserve. As global experience shows, insurance against natural disasters has two major advantages: it encourages prevention as directed by the insurance companies themselves and ensures funding for and efficiency in the activities of post-disaster reconstruction.

Governments play an important role in establishing public policies and regulations that modify the conditions of risk and the financial costs of its retention or transfer. Some government regulations (building codes, land use rules/regulations, etc.) and incentive policies (tax breaks, low-cost loans, subsidies, etc.) can reduce the potential for disaster. However, apart from prevention and mitigation activities, in preparing for disasters,

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governments must also have a financial strategy for retention and transfer of disaster risk which allows them to access resources for response and reconstruction. Annex 1 contains basic terminology useful for understanding the various issues discussed in this document and other similar reference publications (Cardona 2002, Marulanda et al., 2008a).

2. Estimation of catastrophe risk

Any type of catastrophe risk involves a financial effect on governments that are responsible for taking or retaining risk. Failure to understand the risk from potentially hazardous natural phenomena has several important implications, the most obvious of which being that not understanding the contingent exposure to natural hazards limits the country's ability to evaluate how desirable the financial planning tools are for the purpose of addressing the risk, as well as developing appropriate models and indicators to quantify the risk somehow. Therefore, it is necessary to have special studies on seismic micro-zoning and cadastral update to be able to conduct evaluations leading to high benefits and gains from the perspective of financial protection and risk management in general. While it is possible to make policy decisions with a certain kind of approximations or without probabilistic estimates,² failure to quantify the risk when it is possible to do so limits the decision making process in terms of physical planning, risk reduction and risk financing. To this extent, the risk estimation models are an important and powerful tool in the development of the activities specific to economic and financial planning institutions. Risk retention and transfer should be a study-based, planned and controlled process, since it is possible that the magnitude of a particular disaster exceeds both the financial and response capacity of the affected government, especially if it is a developing country where a high economic resilience to these and other financial shocks does not usually exist.

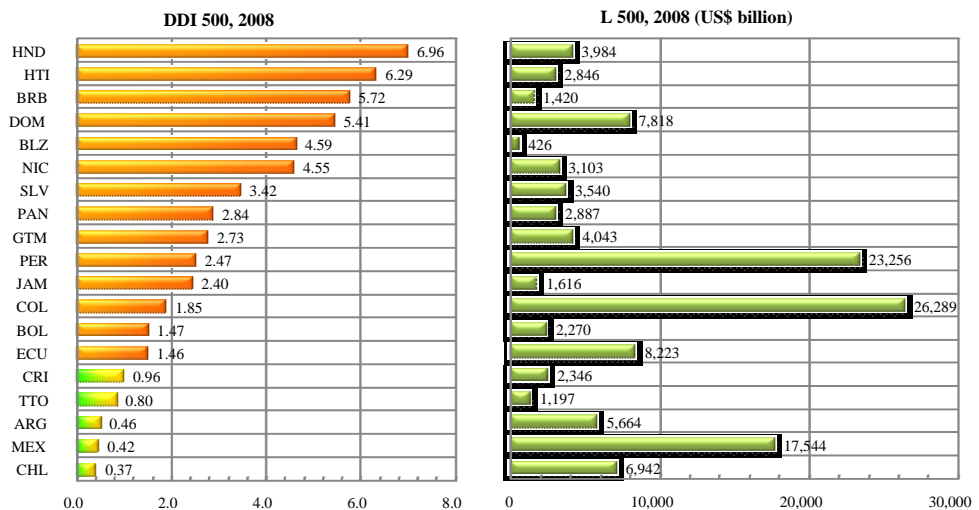
In the early 2000s, the IDB established the System of Disaster Risk and Risk Management Indicators in the Americas to help make clear the risk of disasters and to point out to various actors and stakeholders the need to propose not only ex ante strategies for prevention and mitigation, but also strategies for risk retention and transfer, and not wait until disasters occur to make decisions. This system was developed by the Manizales-based Institute for Environmental Studies (IDEA) (2005) of the *Universidad Nacional de Colombia* with the objective of measuring risk and risk management in the countries by using indicators and a holistic approach (Cardona 2005, 2009; Carreño et al., 2005, Carreño 2006). Among the different families of indicators in this programme, the Disaster Deficit Index (DDI) was proposed, which is an indicator that accounts for the fiscal vulnerability stemming from extreme disasters that may occur in each country (Cardona et al., 2008a, 2010b; Marulanda et al., 2008b, 2010b).

The DDI measures country risk from a macroeconomic and financial perspective, according to possible catastrophic events, for which it is necessary to estimate the critical impacts during a given period of exposure and the country's financial ability to cope with the situation. This index measures the economic loss that a particular country may suffer when a catastrophic event occurs, and the implications in terms of the resources required to address the situation. The construction of the DDI involves conducting a forecast of potential losses, such as Probable Maximum Loss (PML) and Average Annual Loss (AAL), calculated with a risk assessment model (Cardona 2005, Cardona et al., 2005, IDEA 2005).

² Thus establishing the Probable Maximum Loss (PML) and the Expected Annual Loss that correspond to what is called the pure risk premium or technical premium, which is the basis for negotiation of financial instruments for risk retention and transfer.

There are two types of DDI. The first, DDI_{MCE} , which captures the relationship between the demand for contingent resources to cover potential tax liability or loss to be borne by the public sector because of an Maximum Considered Event (MCE) – which may well be the PML – and the economic resilience of the public sector (i.e., availability of or access to internal and external funds for restoring the affected inventory). This country-specific financial capacity to address the situation depends on the following: *the payment of insurance and reinsurance* the country would approximately receive for assets and infrastructure insured by the government; *the reserve funds for disasters* that the country has in the year of the evaluation; the values that can be received as *grants and donations*, both public and private, national and international; the potential value of *new taxes* that each country could collect in case of a major disaster; the *margin for budgetary reallocations* of the country, which usually corresponds to the margin of discretionary government spending; the possible value of external credit the country can obtain from multilateral agencies and at capital markets abroad; and the domestic credit the country can get from commercial banks and in some cases from the central bank. A DDI_{MCE} greater than 1.0 reflects the country's inability to cope with extreme disasters even if their debt is maximized. A higher DDI_{MCE} means a wider the gap between the losses and the country's ability to address them. If there are restrictions on further indebtedness, this situation would imply the impossibility to recover. Chart 1 presents a classification of a large number of countries in Latin America and the Caribbean using the DDI (Cardona 2005, IDEA 2005, Carreño et al., 2007, Cardona 2009, Cardona et al., 2010b).

Chart 1
Disaster Deficit Index (DDI) and maximum loss in 500 years for some LAC countries

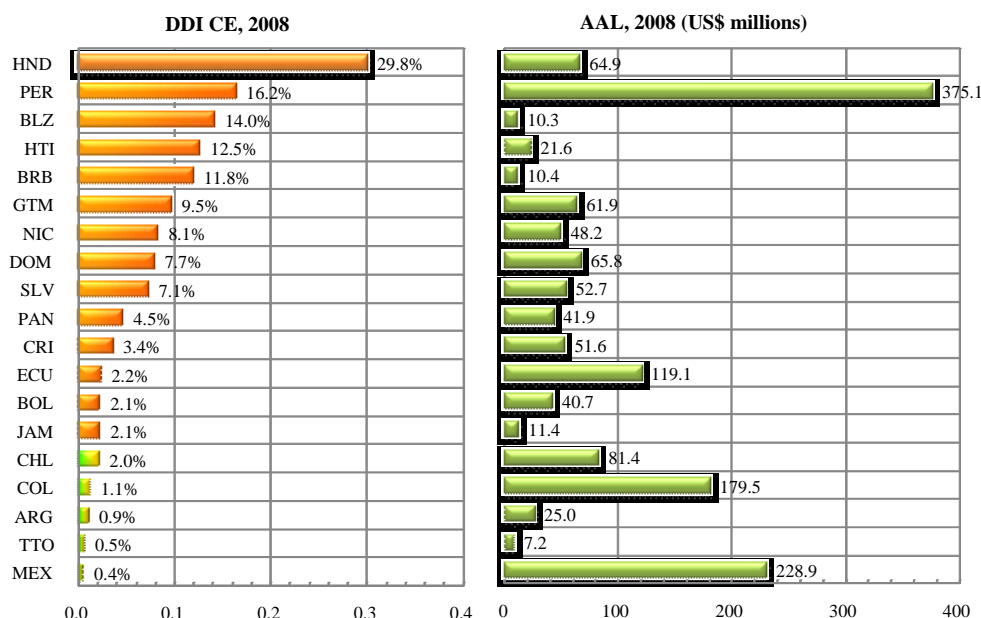


The second, the DDI_{CE} , captures the portion of Capital Expenditures in the country that corresponds to the expected annual loss (AAL) or the pure risk premium, i.e., what percentage of the investment would be the annual payment for future disasters. In this case, the value of the pure premium is equivalent to the annual average investment or savings the country would have to make in order to approximately cover losses from future disasters. In the event that annual losses represent a significant fraction of a country's capital investment, an eventual disaster-generated deficit is to be expected, leading to an inevitable debt increase. In other words, the country lacks sufficient resources to address future disasters. Again, restrictions on additional indebtedness would

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imply the impossibility to recover. Chart 2 shows the DDI in 19 countries in Latin America and the Caribbean.

Chart 2
DDI-Capital Expenses (CE) and Average Annual Loss for some LAC countries



For the evaluation of these indexes, it has been necessary to analyze the possible economic loss in each country due to natural phenomena using a simplified method for sizing the inventory of exposed assets based on proxy values validated by local institutions and consultants in each country. Basically, a set of parameters are estimated using the cost per square metre of building types, the number of constructed square metres in each of the major cities in relation to population size, and the distribution of built up areas in the portfolios of public and private buildings, an inventory of assets that, in case of disaster, would mean fiscal responsibility. Using a proxy of exposure, the indexes have been valued based on the losses leading to fiscal responsibility (public infrastructure and lower-income owners) for hurricane and earthquake events.

In general, the DDI has helped ensure that the Ministries of Treasury or Finance have grown increasingly aware of the importance of estimating future disasters as contingent liabilities of governments and central banks. As a result of using this indicator, several countries have included contingent liabilities in their fiscal analyses in order to understand and contextualize the fiscal risks each nation is exposed to. The DDI has allowed for the evaluation of the macroeconomic situation and fiscal sustainability taking into account the impact of disasters, for which it has been necessary to assess the fiscal vulnerability of an economy to internal and external shocks.

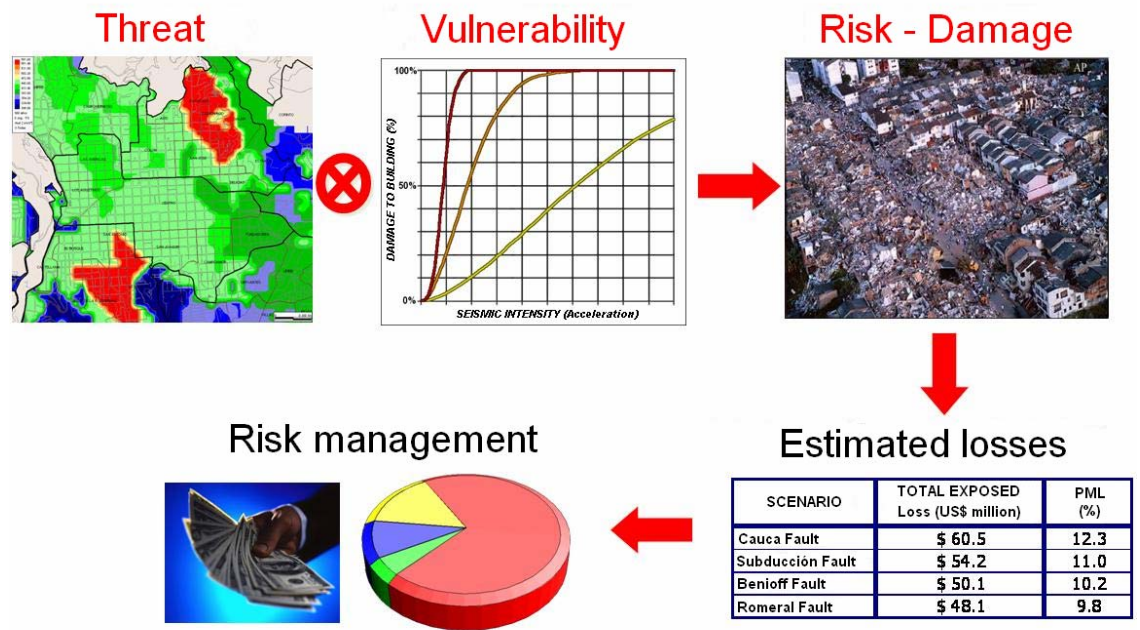
Reports from the risk indicators and risk management programme, technical details and results of the application for the countries of the Americas in 2005 and the recent update in 2009 are available on Internet at <http://www.idea.unalmz.edu.co>.

Such indexes has been used by employing simple and very approximate models, based on very conservative assumptions that are within an order of magnitude of the deficit that each country could have. Nevertheless, to build a financial model that enables the

definition of optimal disaster risk handling and management strategies it is necessary to have more detailed and reliable information about probable losses. A simulation of this type can be made for disaster risk assessment as designed by engineers and specialists in earth sciences. Once the sizes of losses and their respective probabilities have been estimated, it is possible to choose the financing tools and options best suited to minimize the economic and social losses. The optimization criteria are simple. A general model is built by including the benefits and costs of the available options in capital markets, insurance, and government sponsored enterprises. The resulting portfolio of resources would enable subnational authorities to make use of them in order to face the consequences of an earthquake or other major disaster, without compromising their financial and fiscal stability (Ordaz and Santa Cruz 2003, Grossi and Kunreuther 2006, Cardona et al., 2008b).

The existing methodologies for risk assessment are rather few and essentially base themselves on the same approach. Risk assessment should be based on probabilistic models which enable the use of the limited information available to predict catastrophic scenarios and consider the high uncertainty involved in the analysis. In general, there exists a limited amount of data and historical information about catastrophic events due, in some cases, to the occurrence of disasters with low repetition rate and, in other cases, to disasters that are given a recent and short time-window attention. Consequently, risk assessment should follow a prospective approach, anticipating scientifically probable events that may occur in the future (Ordaz, 2000). Chart 3 outlines the steps required to assess risk and define risk management and financial protection options.

Chart 3
Probabilistic model to assess catastrophe risk



To measure the frequency and severity of potential losses, robust scientific methods are used that take into account the probability of occurrence of extreme events such as earthquakes, hurricanes, floods. Additionally, these models include the relations between intensity of the phenomenon and the damage to exposed assets, also known as relations of vulnerability. These relationships are used to determine the amount of damages a

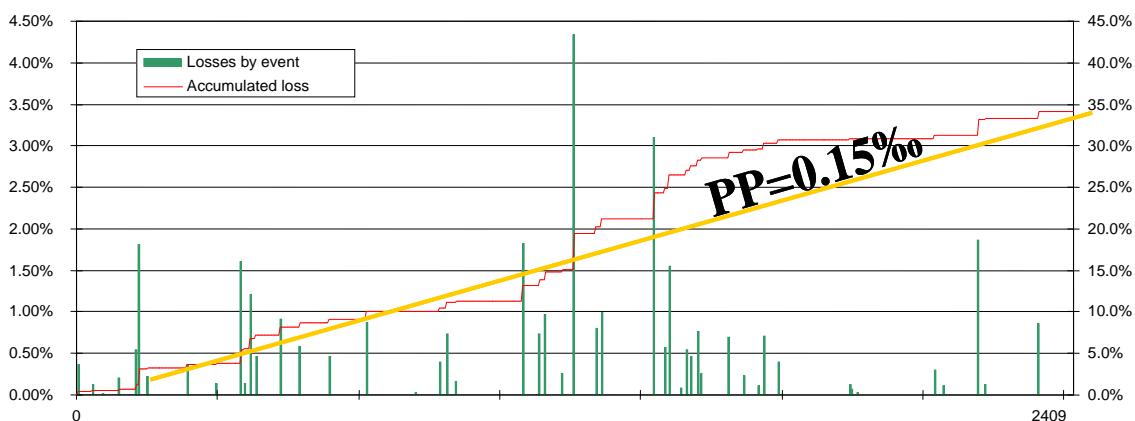
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portfolio of structures would suffer if an event, at a specific location, had a given intensity (Woo, 1999).

Thus, the overall objective of risk models is to estimate the overall level of exposure of infrastructure or a group of buildings or assets, based primarily on such evaluation parameters as the Pure Risk Premium or Technical Premium (AAL) for each record and for whole group of buildings, and the Probable Maximum Loss (PML) for the whole group of buildings (Ordaz and Santa Cruz 2003, Cardona et al., 2008b).

Pure Risk Premium (AAL) is defined as the expected annual loss for the property under study. Should this premium be charged for an indefinite time, all damages that might arise during that period in that building on the site location could be covered. Therefore, the Technical Premium should include operating, acquisition and usage costs, among others. From the sum of Pure Risk Premiums in the group of buildings, the Current Risk Reserve and the Catastrophe Reserve can be estimated. Chart 4 illustrates a hypothetical example. With a premium of 0.15 per thousand, all future losses are covered in the long-term (Ordaz and Santa-Cruz, 2003).

Chart 4
Losses by small and large-scale events during a long period of time



Meanwhile, the Probable Maximum Loss, for which there is no standard (200, 500, 1000 or more years of return period) represents the amount of expected losses for a given annual exceedance frequency, or its opposite, the return period. Depending on the risk tolerance of an organization, the risk manager may decide to handle the losses for a given return period (e.g., 1 in 300 years).

There are actuarial and probabilistic models suitable for disaster risk assessment which are usually proprietary (i.e., they are owned by firms specializing in the field of insurance / reinsurance and financial risk, such as RMS, AIR Worldwide, EQECAT, ERN, among others.) These models are focused on capturing potential and undesirable insolvency situations for insurance / reinsurance companies or risk-taking capital market institutions. Moreover, specialized firms in Mexico (ERN and II-UNAM) and Colombia (INGENIA Ltd., ITEC Ltd.) have developed risk models that have been applied to assessments conducted for some countries in the region of Latin America and the Caribbean, not only for the insurance industry but they have also been used to help governments define programmes of disaster risk management.

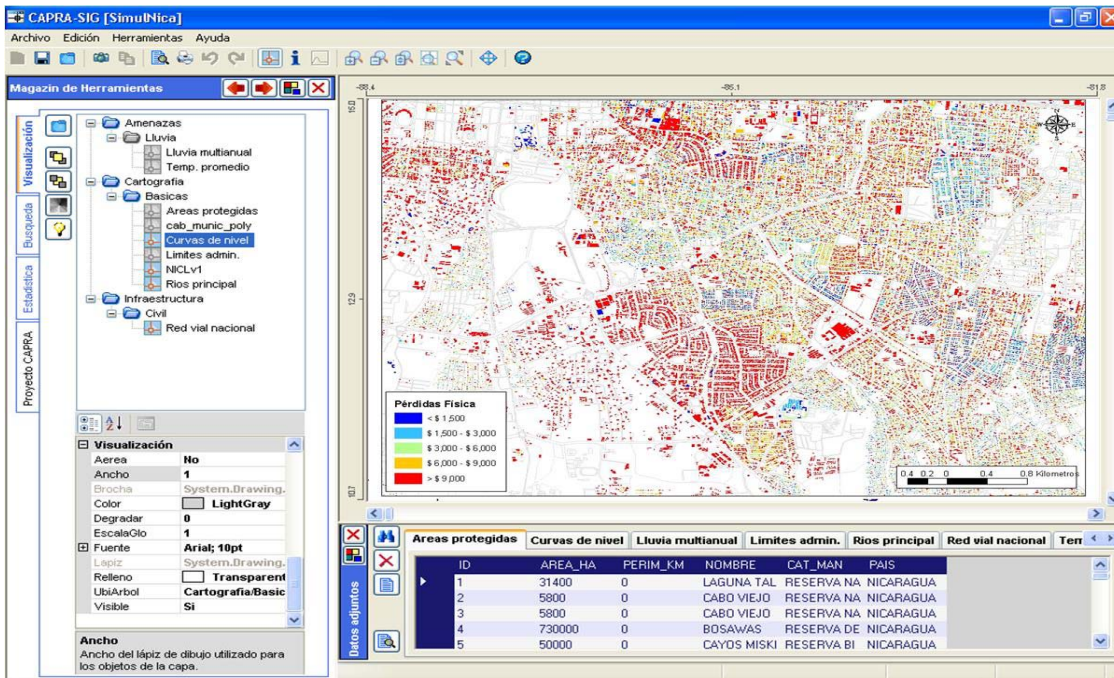
Since long ago the insurance and reinsurance industry has relied on the Catastrophe Risk Evaluating and Standardizing Target Accumulations (CRESTA) organization to establish a comprehensive and uniform system for transferring data on aggregate exposure between insurers and reinsurers in order to model and control clusters of risk. The main reason for this aggregation lies both on the high cost of high-resolution catastrophe risk modelling and on the lack of detailed data, either because they do not exist or cannot be supplied on legal grounds. CRESTA zones are generally independent of the threat, but these areas reflect the relationship between the desired high resolution and the actual data availability in the market (Cardona 2002).

Generally, there has been a notable deficiency in terms of risk assessment in most developing countries and in the region due to the lack of an adequate methodological and instrumental framework for each level of analysis (national, local). Although a number of studies do exist, countries have not had the appropriate hazard maps or real risk studies. There has been a significant dispersion of work done without a proper framework to monitor its quality and to turn it into true inputs for planning. Also, the insurance market has been smaller than in the developed world and the resources have not been adequate to sustain the fixed costs and operating costs of risk models which hinders risk mitigation and management programmes.

Considering these limitations, an initiative was proposed in 2008 to create a multi-hazard, open code and open architecture-based information platform to support decision making in the management of natural disaster risk: Probabilistic Risk Assessment for Central America (CAPRA).³ This initiative was originally developed for Central American countries with support from the World Bank, the IDB and the ISDR (UN-ISDR), but has already been used in several countries in South America and the Caribbean. Chart 5 illustrates a deterministic risk scenario for a Central American city using CAPRA, simulating the occurrence of a historical earthquake in the present-day city. (Cardona et al., 2010).

³ CAPRA is now known as "Comprehensive Approach for Probabilistic Risk Assessment." This platform has been developed by INGENIAR Ltd., ITEC Ltd, ERN I.C. and the CIMNE in Barcelona, Spain.

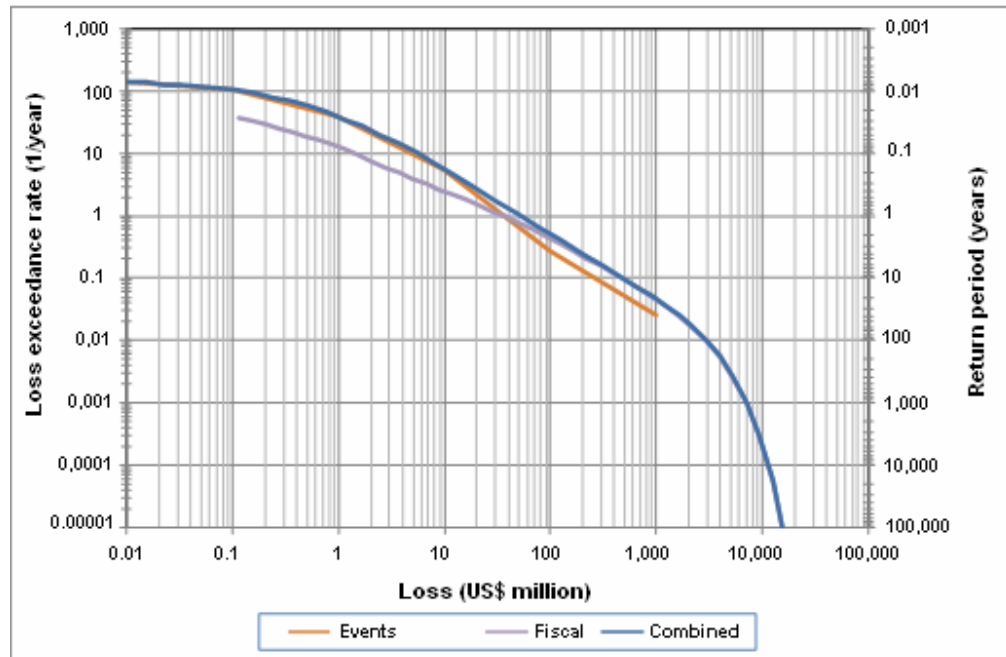
Chart 5
CAPRA-GIS Module showing a simulation of losses in a city due to a specific earthquake



This tool is primarily a mechanism for proper risk communication, understanding and managing through the use of advanced methodologies for risk assessment and spatial database technologies. Using the CAPRA platform, the IDB has financed the development of catastrophe risk profiles in several countries (Peru, Bolivia, Guatemala, Jamaica, El Salvador, Belize, and Honduras), and so has the World Bank (Costa Rica and Nicaragua). Other countries, such as Guyana, Panama, Suriname, Dominican Republic and Trinidad and Tobago, are also expected to conduct similar studies soon.

In turn, the ISDR has complemented two cases that had previously been studied with similar techniques (Colombia and Mexico) for the purpose of illustrating the use of LA RED DesInventar database (for empirical and retrospective estimation) and the CAPRA database (for analytical and prospective estimation) in the development of these countries' loss exceedance curves, for purposes of risk stratification (ERN-AL 2010). These results will be included in the updated 2011 UN Global Assessment Report on Disaster Risk Reduction. Chart 6 illustrates a "hybrid" loss exceedance curve obtained through the above-mentioned techniques.

Chart 6
Hybrid curve showing country risk, generated with CAPRA and DesInventar



Such studies and projects include innovations not only in relation to risk assessment for minor and extreme events, but also as regards the possibility of conducting cost-benefit analyses of the alternatives for risk prevention, mitigation and transfer. In this sense, CAPRA means a significant leap compared to what had been done previously. Further information about CAPRA is available through the virtual forum and conference Understanding Risk at <http://community.understandrisk.org/> and on the platform's wiki space and Web site at www.ecapra.org.

II. FINANCIAL MECHANISMS FOR RISK RETENTION AND TRANSFER

1. Financial protection mechanisms

Fast changes in the financial sector worldwide have allowed emerging alternatives to address losses caused by hazardous phenomena such as earthquakes, hurricanes, floods, and others. In the insurance and capital markets, mechanisms available are not substitutes for one another but are complementary and should be used simultaneously in a combined setting covering different layers of risk. Within this setting, different types of agents are involved, including insurers, reinsurers, private investors, investment bankers and financial intermediaries, and multilateral institutions, which means that in spite of this institutional setting, a regulatory framework for the use of such instruments is beyond "national level", even. For this reason, in addition to a detailed study specifying the design and positioning strategy of the finance structure, it is necessary to work on achieving multilateral agreements that allow for local institutions to access international markets and the establishment of agreements to consolidate a common regulatory framework for the various national and international participants in the system.

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1.1. Insurance and reinsurance

Insurance and reinsurance are financial hedge instruments that transfer risk to an insurance company and the reinsurance market worldwide. Insurance is the mechanism best used by the private sector and governments to transfer the risk of economic losses caused by natural disasters. The international insurance market has great experience in handling this type of risk and insurance and reinsurance companies have found a significant number of mechanisms that transfer disaster risk to the global capital market. Various international companies have the capacity to subscribe contracts under which an excess coverage cluster is considered. The advantage of such alternative is that the subscriber transfers the risk to the insurance company and incurs in less management costs. Once the risk is assigned or transferred to the company, as policyholder, it decides how to best diversify its portfolio. Large institutions such as governments have easy access to this market making this risk transfer mechanism a viable alternative. Small local authorities may resort to the central government and, through it, channel their risk transfer to an insurance company.

Generally, when considering natural disasters, the type of insurance used is insurance for excess loss (XL). In the case of reinsurance, it is a non-proportional type contract that allows the primary insurer to retain a greater share of the gross premium without having to resign to coverage against major disasters. In exchange for this benefit, the reinsurer is exposed to greater risks by having to answer for the entirety of the established funds priority. The priority or deductible is the amount for which the insured (in the case of reinsurance the primary insurer) retains all risks, meaning that at this point the insured is responsible for all losses. The insurer (or reinsurer) is responsible for all losses occurred in the amount equal to the priority or deductible established and up to a maximum amount known as the limit. The insurer (or reinsurer) then agrees to cover losses that exceed the deductible up to the limited amount. The distance between the deductible and the limit amount is known as a layer. Depending on the dimensions of the disaster, the insurance and reinsurance market may be arranged in several layers.

The reinsurance system in particular has implemented variations in the excess of loss contracts; in these, priority and limit are not determined by the amount of the loss suffered by the insured, but by the loss rates of the insurance market or by objective parameters such as the level of rainfall or seismic activity that are used as parametric indexes or triggers. To calculate the contract premiums, a relation must be established between losses occurred to the insured and factors that determine priority and limit (Marulanda et al., 2008a).

1.2. Capital markets

In general, the insurance and reinsurance companies cover the first two or three layers (coinsurance) of losses owing to catastrophes. The following layers or level of losses are generally brought to the financial markets by means of financial instruments and risk transfer; and, finally, in most cases the highest layers are covered by lines of credit originated in multilateral institutions (such as IDB or World Bank). In capital markets, there are two basic categories of financial instruments and risk transfer: fixed income security (Catastrophe bond or CAT bond) and derivatives (options, *swaps*). These are generally issued by insurance or reinsurance companies (Swiss Re, AON, among others) and the valued issued can be quite high (issues may range from US\$ 50 million to US\$ 1,500 billion).

As to the first type of securities, the market has shown high transaction capacity and these are still being issued; quite the opposite with derivatives and options, which have

generate low levels of transaction and have been dropped from markets such as CATEX (*Catastrophe Risk Exchange*). Consequently, in terms of feasibility, the issuance of catastrophes bonds covering State responsibilities in matters of risks for the catastrophes previously indicated becomes a viable option, in addition to traditional insurance and reinsurance.

The catastrophes bonds (Cat Bonds) are set apart from a bond in its simplest form, in that they are subject to credit risk (the risk of non-payment or default by the issuer) partially or all of principal and / or coupons in case certain pre-specified natural disaster occurs, then becoming a risk-transfer instruments. In general, in the process of issuing a CAT bond the two parties involved (issuer and investor) resort to a Special Purpose Vehicle (SPV) as an intermediary for the process of risk securitization through bonds.⁴ This SPV is a legal and independent entity that issues a CAT bond by receiving payment from investors purchasing the securities. The funds obtained from the bond sale are then invested at a risk-free rate and yields from the latter are used, in turn, to pay interest or for the coupon. Payment of bond principal or interests depends on the occurrence of a catastrophe or lack thereof, as per parameters previously defined (characteristics of the threat or location of the catastrophe). In other words, if the catastrophic event takes place the bond issuer pays for compensation with SPV funds and the bond buyer fails to receive part or the entire principal amount and interest. If the catastrophe does not occur, the investor will receive total payment of principal and interests (fixed rate and the premium paid by the insured). Custom duration of CAT bonds is one to five years, at an average of three years (Cardona 2002, Marulanda et al., 2008a).

1.3. Risk retention

Occasionally, it may be of interest to combine a commercial insurance with self-insurance or to have insurance limits, and to take the outstanding directly. In some countries where private insurance has not been feasible, local governments have established a pool of insurances, which, with some limits, covers the costs of emergencies, compensation, and even other obligations. These risk reinsurance funds are sometimes directed to specific sectors such as schools and hospitals. Although insurance against earthquakes is not common under this formula, there are cases of captive insurance companies, such as the one recently created with the participation of governments from 16 Caribbean countries, which cover emergency assistance expenses in cases of hurricanes or earthquakes. Caribbean Catastrophe Risk Insurance Facility, CCRIF (<http://www.ccrif.com>)

With accumulation of reserves, these mechanisms or funds may obtain very favourable insurance and reinsurance rates because they commonly offer geographical diversity and large portfolios. In other words, risk retention is also an option to be considered when there is good information on risk retention and transfer. In this case, the right thing to do would be to estimate the value of premiums and place them in a fund that may produce yields. However, it is necessary to review existing restrictions on reserves pursuant to existing budgetary legislation in each country. Several financial instruments of retention, self-insurance, and institutional arrangements can be found.

⁴ Securitization of assets is the issuance of bonds (in this case Catastrophe bonds) by resorting to one or various assets as collateral. The assets backing the issuance are insurance premiums received from the insured parties.

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A subnational or national government can therefore promote initiatives whereby partial risk retention is possible through financial retention mechanisms. The more appropriate ones may be the following:

- *Disaster funds:* Authorities can create a fund to provide disaster assistance. The resources accrued in that account must be kept in liquid assets, i.e. paper or bank accounts that can be cancelled quickly without large transaction costs. In other words, the resources needed to face contingencies and catastrophes must be available when needed. Investments made with these funds will have a low yield owing to high availability and low risk, which ultimately means that it should be a deposit on demand. Naturally, the problem lies on the fact that government expenditure are opportunity expenditures, that is, these funds may be assigned to other investments with greater rates of social yield such as education, health programs or employment. Yet, the decision depends on the balance between costs and the marginal benefits of keeping idle money while the worst comes true.
- *Indebtedness:* Governments may turn to national or international bank markets and borrow funds whether to cover for direct catastrophe costs or to contract contingency credits. In the first case, problems may arise when obtaining funds owing to the fact that in a disaster situation credit demand increases across all sectors, which increases the cost of resources as well as the financial risk. Intermediaries are less prone to grant credit and rationing problems will most likely worsen. On the other hand, if loss is in excess, the government may not be able to obtain the necessary resources and may even need to ask for help from the central government or international banks. The latter may be even more reluctant to grant credits without the endorsement of the central government especially when risk classification for public debt bonds has deteriorated significantly. The problem with contingency credit, however, is similar to that of disaster funds. The government incurs in financial costs that imply a reduction in expenditure in areas of greater social yield.
- *New debt bond issuance:* An alternative way of obtaining funds is the issuance of public debt bonds. Again, this source can be seriously limited if markets believe the fiscal situation to be deteriorating and, therefore, demand higher risk premiums that can make it practically impossible to place new papers in the market.

1.4. Captive companies for risk retention and transfer

Within risk transference alternatives complementary to traditional reinsurance structures found in the local reinsurance market under legislative and restrictive known characteristics, an interesting product is visible and should be analyzed within the competitive offshore world: the captive reinsurer. In practical terms, a captive reinsurer is a corporate entity created and controlled by a head enterprise, a professional association, or a group of companies, with the sole objective being to provide risk coverage for the head corporation, the association, or the group. This is an alternative to purchasing insurance in the traditional market. The captive insurance company represents commercial advantages for the parent companies that incorporates and capitalizes it. They make an ideal vehicle for cost reductions (providing coverage in exchange for inexpensive premiums and reinsurance that can be purchased directly without having to purchase insurance policies in the traditional insurance markets). It also contributes to a better and more comfortable administration of risks and helps with the cash flow of related economic groups or associations, which, in turn, conveys economic growth. In other words, a captive insurance company is an insurance and reinsurance company, depending on the nature of the activity, organized by an economic group for

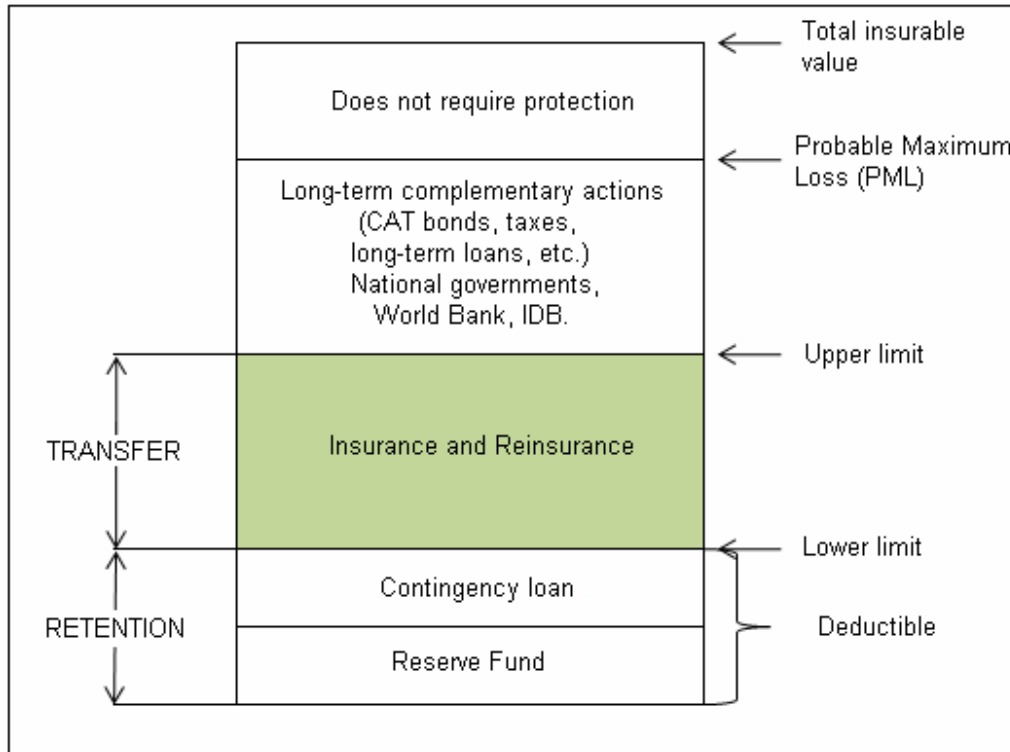
the benefit of the companies that make it up. Established according to a special foreign legislation such as that found in the Bermudas or Cayman Islands, where strong insurance and reinsurance emporiums are domiciled and have a place of business, operating with infrastructure of their own or through facilities offered by a captive insurance and reinsurance administration company duly credited and acknowledged for the purpose of insuring and reinsuring from abroad risks pertaining to the economic group or corporation or institution to which the captive insurance company belongs to. (Cardona 2009a).

1.5 Optimal financing structure

In short and as indicated before, basically, the State is responsible for the coverage or insurance of its assets, public infrastructure, and those sectors of the population at a greater risk. Insurance of assets and public infrastructure must be purchased from insurance companies, which transfer part of the risk to a reinsurance company; which, in turn, transfers part of its risk to the capital market. This is justifiable owing to the fact that these companies are experienced in designing the financial instruments that securitize the risk of catastrophes and, in addition, they have representation in the stock markets, where these types of securities are negotiated.

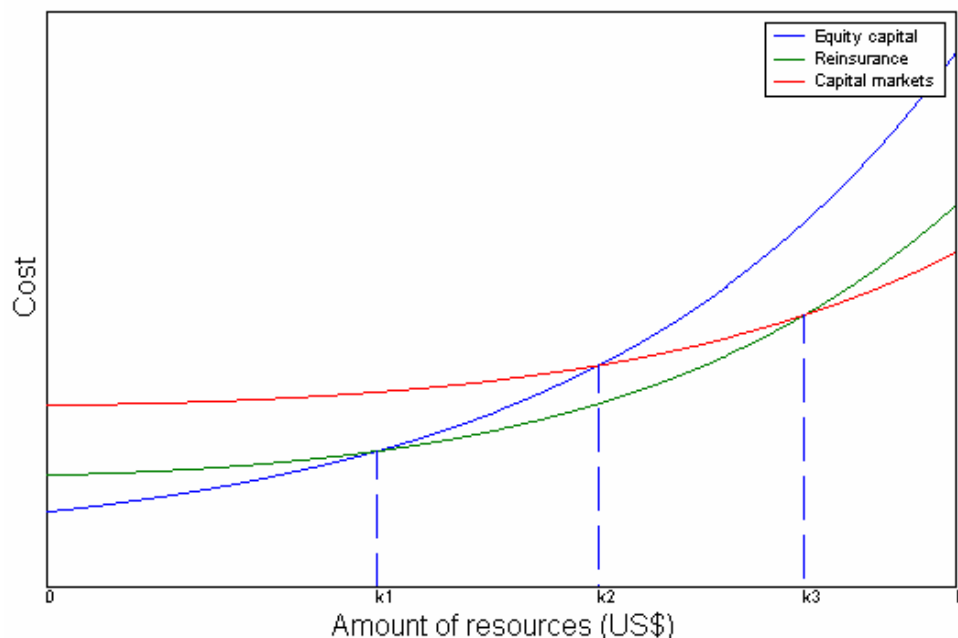
On the other hand, insuring sectors of the population with low income needs to be done under a scheme of incentives that will promote competitiveness in these communities, in terms of government mitigation and subsidy schemes with the long term purpose of getting the population to purchase insurance from the private sector. Once the State's fiscal responsibility has been established, simulation exercises may be undertaken to determine the best cost effective financing structure. And, once the information has been obtained regarding the costs of financing sources, it is necessary to design alternative financing structures and select among those with lower costs but able to provide coverage for the same risk level. The challenge for governments in developing countries and for insurance companies is to agree on the best mechanism to cover for residual State obligations and to strengthen the sector by promoting a collective mass insurance. It is important to point out that not having the most efficient option represents risks in light of the greater implications of centralization, the high costs in terms of subscription to the stock markets where the financial instruments for risk coverage are negotiated, and the possibility of being unable to successfully manage the portfolio. A financial structure is setup by assigning one or more financial instruments for each different levels of loss. Each mechanism allows coverage of specific intervals of the lost amount, making it possible to structure the coverage system by layers. Chart 7 represents a financial and transfer structure with layers of loss excess.

Chart 7 risk retention and transfer



The different layers of the retention and transfer structure are established depending on payment capacities of those agents involved and cost convenience for the government of all the financial sources available. It is common that for different amounts of loss, costs for each financial source may vary. For example, the excessive increase in insurance premiums for higher layers of coverage owing to the greater degree of uncertainty represented by catastrophes of great proportions. Thus, it is necessary to establish the costs for each one of the financial sources in proportion to the different loss amounts. Once that information is available, it is possible, by means of cost minimization algorithms, to determine the best setup for the different financial mechanisms available within the structure. This is done by assigning each financial source a layer of coverage. In other words, once the costs for the different financial sources are known for each of the amounts for probable loss, it is possible to determine each mechanism's best percentage coverage. This information allows for establishing and assessing the terms of insurance and reinsurance contracts, and the feasibility of emitting, for example, a catastrophe bond. The problem is similar to that in Chart 8.

Chart 8
Financial cost of risk retention and transfer instruments



This chart represents the costs for each source of financing available for the State, in order to cover disaster risks. The graphic indicates that it is not the best option to finance the entirety of resources with one sole financial source, and that at certain intervals other financial sources may result less expensive (Marulanda et al., 2008a, Cardona 2009a).

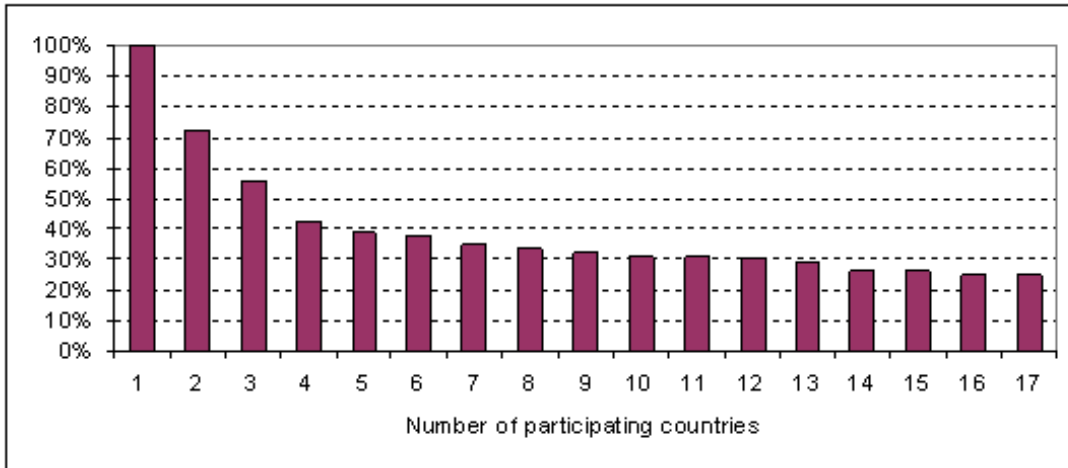
It is worth noting that global insurance and capital market conditions are constantly changing therefore permanently monitoring cost changes for the different risk transfer mechanisms and financial options is of great importance. This allows economic policy designers to benefit from the different opportunities present in the market, in order to diversify risks and reduce costs.

2. National and international experiences

2.1. Caribbean Catastrophe Risk Insurance Facility (CCRIF)

After the damages caused by hurricane Ivan, in 2004, the governments of the Caribbean Community, with the endorsement and assistance of the World Bank, created the Caribbean Catastrophe Risk Insurance Facility (CCRIF), a joint reserve mechanism designed to provide short-term funds to the 16 participating countries immediately after a disaster. The CCRIF provides access to the financial international market by placing in a common and diverse portfolio the specific risks of each country. In this manner, participating governments may have loss coverage following a catastrophic event. The CCRIF operates as an insurance mechanism with partial retention of risk transferred by the underwriting countries and as intermediary between these and the international reinsurance market. Today this mechanism only operates in case of hurricane threats (strong winds) and earthquakes (ground acceleration). Chart 9 illustrates how premiums charged by the CCRIF, with the participation of all the countries (currently 18), represents almost half of what the market pays for individual coverage (Cummins and Mahul 2008).

Chart 9
Premium decreases as the number of participating countries increases



This insurance pool is an intermediary between the reinsurance market and the final insured. With enough reserves said pool may negotiate the cost of risk transfer (catastrophe insurance is generally very volatile) by modifications at risk retention level. As reserves increase so does its capacity to retain risks, generating stability vis-à-vis the international market.

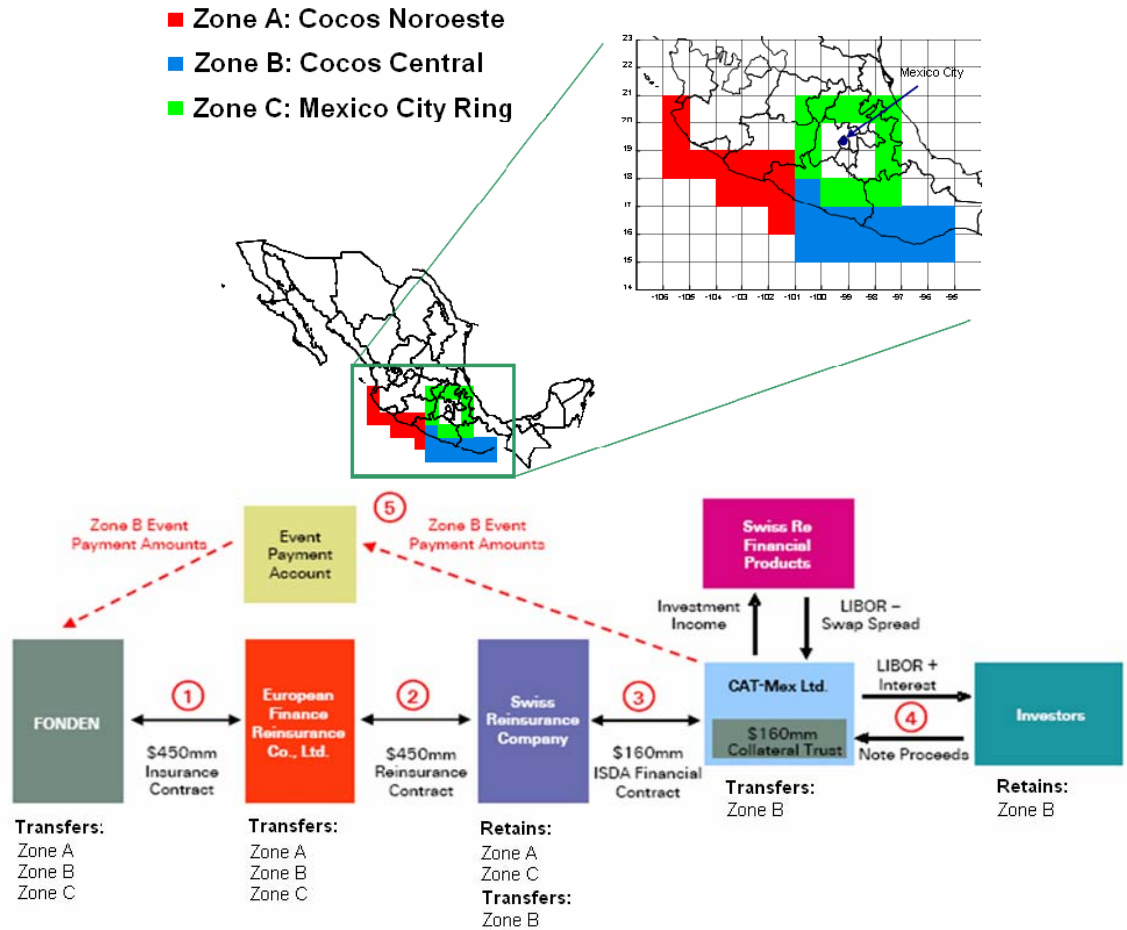
The operative structure of the CCRIF comprehends a Council of donor representatives and participating countries. A specialize firm provides expertise (*front-office*) in matters of risk management, financial affairs, policy management, premium collection, and compensation payments. A captive manager is also available and responsible for *back-office* functions pursuant to the laws of the Cayman Islands. The CCRIF is an independent legal entity registered as an insurance company property of the trade consortium commercial *CCRIF trust* headquartered in the Cayman Islands.

The system’s financial backup originates with the participation quotas from each member country, equal to each yearly premium. In addition, the *CCRIF Multidonor Trust Fund* was created for possible associate donators, and is managed by the World Bank. Release of funds and/or payments is made to cover for operation expenses, transference of premiums, and compensation payments.

2.2. Mexico’s CAT Bond

In May 2006, the Mexican government through the National Disaster Fund FONDEN – holder – initiated with Swiss Re a combined parametric insurance solution (US\$ 140 million) and a catastrophe bond (US\$ 160 million). The implementation of the CAT-Mex was for three years as a risk transfer financial strategy aimed at obtaining the necessary resources to assist the population affected by earthquakes of serious consequences. This CAT bond is a combination of traditional parametric insurance and a parametric bond covering earthquakes in three specific areas, as shown in Chart 10.

Chart 10
Zones and mechanisms triggering insurance and CAT-Mex. Source: FONDEN



The bond and the insurance are paid if Zones A and B suffer an earthquake equal or greater to 8 Mw, at less than 200 km deep or with intensity of 7.5 Mw in Area C, at no less than 150 km deep. The Mexican CAT bond was designed to transfer the risk to investors, which allows the country to avoid payment of principal in case of major disaster (Cardenas et al., 2007).

2.3. Voluntary collective insurance in Manizales

Currently, the city of Manizales, in Colombia, has a collective voluntary insurance coverage for the lower income population. It is an alliance, with which the municipal government, through systematic information management, facilitates the billing and collection of the insurance for each city area against damages caused by natural disasters, per the value of realty. The charge – a voluntary one – is made through the unified zoning tax invoice. Chart 11 is a promotional advertisement for this new collective insurance.

Chart 11

Advertisement of the Manizales municipality, Colombia, and the insurance company

**Pague su predial
y asegure su predio**

Manizales
predio seguro

La Alcaldía de Manizales como un beneficio para la comunidad, le ofrece a través de la Previsora s.a. Compañía de Seguros, un seguro voluntario al que pueden acceder todas las personas naturales y/o jurídicas, cuyos inmuebles construidos se encuentren ubicados dentro del área urbana o rural del municipio, y cancelen el valor correspondiente a la prima que aparece en el desprendible que hace parte del formulario del Impuesto Predial.

ALCALDIA DE MANIZALES
TRABAJEMOS TODOS
por la ciudad que queremos

La Previsora S.A.
COMPANIA DE SEGUROS

CONTACTENOS: Línea Nacional 01 8000 91 0554

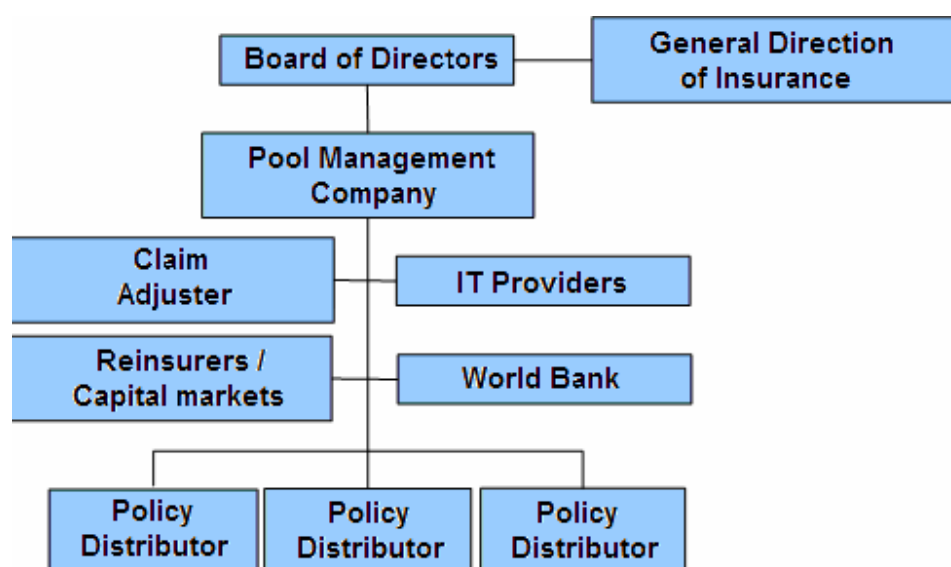
With this programme, called “Manizales, a safe area”, the yearly premium was initially estimated, together with the insurance company, in 2.2% of each property value. The deductible was set at 3 % of loss value in case of earthquake and a minimum of three (3) minimum monthly wages (SMMLV by its Spanish acronym). In case of other natural phenomena or events such as strikes, mutiny, coup, civil or popular commotion, ill-intended acts from third parties or terrorism, the deductible was set at 10% loss of the property affected and a minimum of two (2) SMMLV. The insurance company (*La Previsora*) issued a general policy underwritten by the Municipality of Manizales. The municipal government only collects the premiums, and the insurance company is directly related to the insured, thus, finds the solutions, and manages the claims derived from the policy. Currently, with a premium of 2.5% over individual properties which pay zoning tax and with a 15% participation (properties with mortgages are not included for these have mandatory insurance coverage), the lower income population is covered entirely, a sector which is exempted of zoning tax (ITEC 2004, ERN-Manizales 2005, Marulanda 2009).

2.4. Turkish Catastrophe Insurance Pool (TCIP)

The TCIP (Turkish Catastrophe Insurance Pool) was implemented on 27 December 1999, following the Marmara Sea quake. The TCIP is a public legal entity that offers mandatory insurance coverage for residential properties. The project received assistance from the World Bank in terms of an insurance program design capable of managing a national catastrophe exposure. It is an insurance system created to warrant compensation for housing damages resulting from earthquakes, and its main objectives are: to provide coverage against earthquakes for all tenement obliged at an affordable

premium; to provide a mechanism for risk transfer distribute within the country; to transfer partial risk to the international market and capital markets; to reduce State financial responsibility as a result of losses owing to earthquakes; to use the insurance system to improve the quality of housing construction; to guarantee long term accumulation for a compensatory fund to cover for earthquake damages; to contribute to social awareness on risks and to eventually avoid a tax increase owing to high loss occurrences as a consequence of earthquakes and other natural disasters in the country. The structure of the TCIP is shown in Chart 12.

Chart 12
Organizational structure of the TCIP



With this programme, the government of Turkey seeks to reduction its obligations with homeowners when having to rebuild their houses after earthquakes. Pursuant to law, the government will not provide compensation in the form of housing credits or reconstruction of damaged buildings. Compliance with mandatory policies is monitored by asking owners to provide documentation to that effect when undertaking any real state transaction and when opening accounts for services such as water, natural gas, electricity, and telecommunication. The insurance coverage includes earthquakes, fires, explosions, and landslides resulting from earthquakes, which may cause damages to the buildings insured and up to the capital covered by the TCIP. It does not contemplate the loss of items in the homes, losses thereafter, or indirect losses (Gurenco et al., 2006).

2.5. Other collective insurance mechanisms

There are many different experiences on successful catastrophe insurance funds and programmes, as well as failures and problems. As an example of the latter, the insurance of poor communities in Brazil where moral risks were of such dimensions the program had to be cancelled. An important number of impoverished homeowners burnt their houses once they learned they would be compensated in case of disasters.

Another example would be the multiple claims and disputes arising after hurricane Katrina in New Orleans, owing to the fact that the insurance against hurricanes did not include insurance against floods, since this type of coverage in the United States is only issued by

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the government through the Federal Emergency Management Agency – FEMA (<http://www.fema.gov>), and because most damages were caused by floods owing to the overflow of a lake and the Mississippi River, which are located at higher altitudes from city locations and, in particular, owing to the breakdown of the levee systems. Most of the people insured against hurricanes did not have FEMA insurance against floods.

A few government instruments similar to the TCIP have been implemented in countries where insurance has greater acceptance. Among them: the Florida Hurricane Catastrophe Fund (FHCF), the Hawaii Hurricane Relief Fund (HHRF), the California Earthquake Commission (CEA), the New Zealand Earthquake Commission (EQC), the CAtnat of France, the Taiwan Residential Earthquake Insurance Pool (TREIP), the Japanese Earthquake Reinsurance Company (JER), the Norsk Naturskadepool of Norway and the *Consortio de Compensación de Seguros de España* (Insurance Compensation Consortium of Spain).

None covers public assets nor do they finance emergencies. Most of them have in common that: (i) they tend to provide coverage against specific natural threats; (ii) tend to have a regional focus; (iii) provide coverage mainly for houses and their contents; (iv) Premium rates tend to reflect risk characteristics with a solidarity element involved; (v) as a rule, they are not subsidized by governments; (vi) up to different degrees, promote and foster safe construction practices by offering premium discounts although mitigation is not their traditional main focus; and, (vii) trust the distribution and service capacities of private insurance companies and their agents (GAO 2002, *Consortio de Compensación de Seguros* 2008 [Insurance Compensation Consortium]).

III. PERCEPTIONS OF PARTNERS INVOLVED IN RISK MANAGEMENT ABOUT FINANCIAL PROTECTION MECHANISMS

1. Retention mechanisms at the governmental level

Over recent years, many countries in the region have introduced significant changes in their respective legal frameworks and institutions in the area of risk management. Notwithstanding, it is difficult to find financial measures that render this particular management sustainable, not only in countries with scarce budget resources. From the perspective of financial management, it is worth noting that the Latin America and Caribbean region lacks well-developed financial markets and insurance culture. Little progress has been made in treating new financial options in addition to the traditional ones, which essentially consist of responding to emergencies and disasters (Cardona et al., 2005b).

In most countries of the region, resources required to carry out activities related to risk reduction are taken from the regular budgets of the different governmental entities involved, without a specific item existing for this purpose. National systems for disaster risk reduction regularly receive resources for their operation, which are not enough vis-à-vis their functions. These functions include dissemination, education and public information. Several countries have a yearly budget that is used to pay their administrative expenses and regular programmes of education and training, early alert, etc., and have a fund to cover immediate needs of disaster victims. Moreover, calamity or risk management funds, which are allocated a specific percentage of the yearly budget, have been created; however this rule is not duly complied with. For instance, laws in Colombia provide for that all public entities should include items in their budgets, earmarked for disaster prevention and attention. However, details have not been released on the percentage and the kind of activities or investment corresponding to this area. Therefore, after an experience of

more than 15 years, it has been concluded that at least a percentage of the budget of sector or territorial entities should be earmarked for risk management, because the current mandatory provision of including a non-specified amount in the budget does not guarantee that proper resources are allocated (ERN-Colombia, 2005, 2006).

Nationwide, the cases of Manizales and Bogota in Colombia have been two good examples of specific resource allocation for risk management within the region. In the first case, at least 1% of the city's and decentralized entities' current income should be transferred to the local fund for risk management, although each municipal administration secretariat has its own resources for this purpose. This would mean that about 2% or more of the municipality's income is being used for this purpose, without including the contributions of the Regional Environment Corporation for stability work, which come from an environmental surcharge rate that is charged along with property tax. This tax corresponds to 2% of the value of the property, 0.5% of which is applied to identify and reduce risk. In the second case, the city fund for risk management receives a yearly lump sum lower than 0.5% of current tax income of the city's central administration. Defining at least a minimum percentage of budgetary allocation, as well as explaining or regulating what kind of actions can be performed with the resources is considered a best practice that should be promoted in the different countries (Cardona et al., 2005b).

In relation to emergency reserve funds that are a risk retention mechanism, although they are only one of the risk management policy, it is worth pointing out that they have been one of the most used financial mechanisms in most countries. A detailed study is not required to recognize that resources earmarked for these funds have been insufficient. It would be desirable that emergency reserve funds are governed by an optimum rule of accumulation and expenditure based on the quantification of the effects of recurring minor disasters (for instance, using the DesInventar database developed by RED). However, this does not happen in any country within the region.

Probably the most remarkable example of an emergency reserve fund in the region is the case of the Fund for Natural Disasters (FONDEN) created in Mexico in 1996. FONDEN is a financial mechanism aimed at addressing the effects of disasters whose magnitude exceeds the response financial capacity of federal dependencies and entities. It is understood as a supplementary instrument with respect of the actions that should be implemented in these dependencies and entities to address disasters in compliance with the current legal framework.

During its early years, this fund faced serious operational and capitalization problems that rendered allocated resources insufficient to cover even half of each year's needs. Therefore, at the beginning of this decade, the fund substantially increased its resources through a loan granted by the World Bank, which contributed to the fund's stabilization. FONDEN certainly represent an important leap as a compensation mechanism vis-à-vis eventual outlays of the government in the case of disasters, because before the Federal Government's response to disaster situations consisted of reorienting expenditure to overcome damage.

Based on its budget availability, FONDEN contributes additional resources for federal dependencies and entities so that attention devoted to disasters does not affect their current programmes and projects. The objectives of this Fund are possibly the most complete in terms of emergency relief and reconstruction and they can be an example to other countries. Later on, the Mexican government established FOPREDEN, which was aimed at financing risk reduction and disaster prevention projects. FOPREDEN is supplementary to the Fund for disaster relief (Cardona et al., 2005b).

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In the region, transfers from national to regional governments are required or unrequired.⁵ The most suitable way to promote risk management would consist of defining a fixed value of unrequited conditioned transfers and/or providing contributions or subsidies with a certain level of requital. However, it is necessary to consider that to promote risk management in a coherent and non-disperse fashion, the huge differences in terms of regional development, disaster risk and resources of territorial entities in each country have to be recognized. In almost all countries within the region, subnational governments have a close manoeuvre margin and low economic resilience to address their investment expenditure and other items such as expenses related to risk management. Considering the urgent character of infrastructure and social expenditure in the region, funds earmarked for risk management are minimal.

Fiscal decentralization in most countries is characterized by the concentration of the economic activity on a few municipalities and departments, which results in the concentration of fiscal revenues. Efforts should be deployed to identify investment that comes from municipalities' own resources and that from nationwide transfers, which is not earmarked for a specific purpose. This identification of investment in development, which can be understood as preventative actions, is very important so as to have an idea of the investment that could be considered as risk management but that has not been identified as such yet. These initiatives are considered convenient and recommendable in countries with this same transfer system and where co-financing processes may be promoted. This would make it possible to explicitly determine that the central government will not cover the entire costs in a case of emergency (and thus avoid the Samaritan's dilemma), and that, concerning risk identification, reduction and transfer, the central government would not be essentially responsible for performing projects at the subnational level, but it could provide technical counselling and partial economic support to promote said projects. Of course, this would require that resources from the national budget are explicitly and properly earmarked for both promoting co-financing through funds and for the creation of budgetary items in national entities by sector (CEDERI 2002, 2005).

Furthermore, in most countries, projects implemented by non-governmental organizations, municipal associations and other kind of community or base associations are financed with funds from international cooperation, accounting for a substantial percentage of resources invested in risk management, particularly in emergency relief and reconstruction programmes. A considerable dependence on foreign resources has been detected, which renders risk management unsustainable. No country will be able to reduce disaster risk just by waiting funds to flow when a disaster occur, which would make it possible to implement measures to reduce risk of future disasters. This is particularly true in countries where, due to their social and economic characteristics, the lack of resources is so severe that they are increasingly necessary to perform any kind of activity. Moreover, projects executed with these funds respond to donors' agendas rather than to the needs of the own country, with the resulting dispersion, and frequently duplication, of effort.

⁵ Unrequited transfers can be conditional and others are earmarked for free investment at the subnational level. Unrequited conditional transfers usually correspond to a fixed value that has a purpose established by law. Required resources or subsidies or shared cost programmes are conditional transfers that require fund to be spent for a specific purpose and required resources are contributed.

2. Transfer instruments at the governmental level

From the perspective of risk transfer, in general, governments in Latin America and the Caribbean typically manage their financial risk vis-à-vis disasters through insurances and by means of self-insurance (which is a risk retention mechanism). Nationwide public properties insurance is usually contracted independently by each government entity and there is not any pre-established strategy in place that orients the insurance contracting process toward efficiency. Similarly, risk retention is not conscious or results from the lack of budget resources. In general, it does not follow any strategy based on the convenience of public entities and essentially at the country level, only with a few exceptions, fiscal assets are not insured.

No precise data is available on the percentage of public buildings in the different countries that are covered by insurance against disasters; however, it is accepted that this percentage is low or moderate, and infrastructure is considered to be completely unprotected. This means that the State is retaining the total cost of losses in case of disasters. Now, one of the ways used to cover losses of public properties has been the *ex post* strategy of collecting taxes in case of disasters. This is nothing but an insurance form based on the community, according to which each citizen of the community ends up paying a portion of the insurance.

Concerning private sector insurances, it is worth highlighting that insurance in Latin America and the Caribbean currently accounts for 1.5%-2% of insurance premiums collected worldwide. The fact that insurance market is not well developed is due to several reasons: substantial portions of the economy are informal, individuals have little assets to insure, or insurance is not a tradition.

The lack of development of the insurance market is often due to the lack of formality in terms of insurance or because it does not operate properly and, therefore, it is not competitive. The training and professionalism level is poor, thereby preventing the market from being robust. Hyperinflation during the 1990s was another factor that had a negative impact because it undermined replacement values to a certain degree. Furthermore, there are problems with insurance firms or their agents, because in the users' opinion, compensations for insured asset losses have not been paid timely or have not been paid at all. Notwithstanding, in several countries efforts have been made to improve and promote insurance in the private sector (Cardona 2002, 2009).

Furthermore, demand for reinsurance is very limited because contracts use to be excessively onerous due to the lack of information. A more reliable and accessible information system would facilitate the expansion of the market of this type of contracts. In most countries in Latin America and the Caribbean, insurance against earthquakes is mandatory in the case of mortgages. In Colombia, one of the aspects corrected in the past is that only the value of the mortgage debt was covered, with the aim of financially protecting the lending entity. Currently, the total value of the property is covered, which means that debtors are also covered. It is also mandatory to insure common zones; however, a worrying aspect is that once the mortgage debt has been paid, a substantial percentage of owners do not insure their homes or belongings. This situation may be partly due to the lack of information. Therefore, it is important to stress the need to implement extensive dissemination campaigns, which could be supported by governments, promoting the extension of insurance coverage.

In conclusion, although countries and their respective entities include some items in their budgets to address emergencies and, in certain cases, efforts are made to earmark

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resources for planning activities related to risk mitigation, in most countries, probabilistic losses resulting from natural phenomena are not accounted for as a permanent component of their budget development process.

True effectiveness of inter-institutional structures created in several countries, their financial resources and participation and support degree varied and many times inadequate vis-à-vis risk reduction. The statement in the sense that the disaster issue is really important only when an event of certain magnitude occurs and solidarity demands a significant response from governments is still valid. In fact, interventions have been punctual and based on projects and products; however, what is really needed is that processes are supported over longer periods than the current ones.

3. Role of international and private organizations

Concerning international organizations, it can be said that, over recent years, the IDB and the World Bank have been playing a significant role in the promotion and development of innovative risk financing solutions for countries within the region. These entities are very influential due to their capacity to support public investment and the promotion of specialized technical assistance for development, thus favouring the implementation of risk retention and transfer structures.

The IDB and the World Bank have supported risk profiles and studies (for instance, through CAPRA) and have offered contingency loans. The World Bank has favoured the development of the Caribbean Catastrophe Risk Insurance Facility (CCRIF), which was briefly described above. Colombia, Costa Rica and Guatemala have contracted contingency loans for US\$ 150 million, US\$ 67 million and US\$ 85 million with the World Bank, which will be immediately disbursed in case of a disaster decreed according to the legal framework. This type of contingency credit, known as CAT-DDO by the World Bank, is currently of interest in countries such as Peru, El Salvador and Panama.

As already explained, in Manizales, Colombia, there is a case of collective insurance against disasters provoked by natural phenomena, which has been considered exemplary and worth being replicated in the region and other places of the world. This is a voluntary collective insurance that covers the poorest sectors. It is also worth mentioning the case of the mandatory insurance in Turkey (TCIP) as well as the creation of captive insurers to cover losses in most Caribbean countries (CCRIF), an initiative that has been promoted by the World Bank, to illustrate how risk can be diversified among groups of countries.

Other international organizations have also promoted the issue of risk transfer and financial protection in general. The regional institutional framework for risk reduction in case of disasters, such as ECLAC, CAF, OFDA/AID and OAS, have organized seminars and workshops and have released publications on this issue, with a view to promoting the relevance of these subjects. Consequently, the region is increasingly informed and demands more information in relation to risk modelling for financial protection purposes and to explore the implementation of different feasible financial instruments.

It is also worth noting that several reinsurance firms such as Swiss Re, Munich Re, in addition to insurance brokers have contributed to disseminate information and promote possible practical applications of insurances with governments, at the national level, and with cities at the local level. One of these reinsurance firms and brokers is currently promoting the development of the Global Herat-quake Model (GEM), which is aimed to developing over a three-year period (by 2013) an international platform that favours the

standardization of seismic risk modelling procedures and of data formats required to characterize exposure, i.e. assets or elements exposed.

IV. POLICY PROPOSALS AND RECOMMENDATIONS ON FINANCIAL PROTECTION VIS-À-VIS DISASTER RISK

There must be awareness of the importance of adopting measures on diversification of potential losses arising from the occurrence of dangerous natural phenomena. Mechanisms, such as insurance or transfer of losses to the capital market, which could be subsidized by national governments, would help lessen the State fiscal burden in the event of a disaster. Based on the definition and setting of the State responsibility and its fiscal capacity, hedging instruments with a modest scope could be gradually set up and expanded in the course of time, according to the levels of income and development of an insurance culture, both in the public and private sectors.

Making careful assessments and modelling of losses with several return periods is fundamental to define an amount of loss or the probable maximum loss. In this way, governments can measure the contingent liability entailed by disasters. In addition, the expected annual loss, or pure premium, of portfolios of fiscal goods at risk should be estimated. A strategy should be set in order to identify which resources are needed to cover said losses by means of accrued reserves or by entering into agreements on contingency loans, or loss transfer, with the insurance sector or the capital market. Besides making provisions in line with such reality, in order to reduce fiscal vulnerability, the acknowledgment of such contingent liabilities is the best ground to encourage risk reduction (handling the existing vulnerability in development processes) by means of prevention and mitigation measures to diminish potential damages on the country's capital stock and its socio-economic implications or impact.

The first and foremost, or immediate, responsibility of governments is counting on resources to reconstruct or repair the real estate property of public agencies in the event of a disaster. Pursuant to most regulations, all public properties should be insured or there should be an *ad hoc* reserve fund. Presently, in no country the percentage of insured properties is known. Nor is there knowledge about a careful inventory which shows for each property its insurable value, the premium value and coverage conditions, any deductibles and its seismic-proof features. For such reason, it is advisable to develop programmes on management of public assets to record such data and minimum information about the buildings in order to assess their vulnerability. This includes the structural type, number of floors in the building, date of construction and geographical location. Based on such information, the impact of intense natural phenomena could be accurately established.

Upon completion of modelling of the potential damage of the portfolio of buildings with accurate risk techniques, several deductibles and several protection or coverage layers, a deal can be made with the insurance/reinsurance sector or the capital market. For public properties, a special agreement could be considered for overall, unified risk transfer to attain a scale economy. Such decision by countries means estimating the costs of the coverage that should be defrayed by each agency as part of their budget and according to the properties under its responsibility, and setting a mechanism on budget collection or withholding at the Ministries of Finances. In the absence of a detailed portfolio of properties, a policy known by insurance companies as "treaty" could be negotiated for all the buildings, for a specific value relative to an excess loss limit

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amenable to coverage by insurance companies or under which the government is ready to transfer losses for a reasonable premium.

A pattern similar to the aforementioned standard for coverage of national public properties might be implemented for department and municipal properties. These properties should be covered by territorial or subnational entities. However, most municipalities and departments cannot afford contracting such hedging. History has shown that national governments eventually take on losses and reconstruct buildings upon the occurrence of major disasters. Such a situation is far from being appropriate. National governments could set a strategy aimed at encouraging territorial entities to share such responsibility. The most appropriate incentive to be set by a national government is taking on a percentage of premiums in each case. Such a percentage could be established on the basis of the type of municipalities or departments and according to the fiscal effort of each territorial entity.

Experience has shown that in the past, the State has rebuilt houses for the poorest sectors hit by major disasters. This action has had a big impact on public opinion. Such a fiscal responsibility means that the State ought to cover losses of a segment of the private sector. This is generally deemed as acceptable, taking into account the principles of solidarity, subsidy and equity. Paying for a premium to cover this segment is unfeasible for any country in the region, because buildings are very vulnerable. As a result, the value of premiums is quite significant. Nevertheless, there is the possibility that national governments could complement the role played by territorial, subnational entities.

To improve insurance effectiveness it is important to further a neat modelling of the catastrophe risk in the portfolios of insurance companies in order to have PML variable values and the value of risk pure premiums based on appropriate technical-scientific data. Furthermore, compulsory insurance both of the debt and the total value of private real estate bought under the mortgage system, common areas in high-rise buildings, and also farming insurance could be advocated in most countries in the region. The possibility of furthering voluntary collective insurance instruments of private goods should be noted as well.⁶ Its purpose, in addition to foster the insurance culture among individuals with payment capacity is protection in the form of subsidy of the poorest who are not able to pay neither insurance nor the property tax, that is, the owners of tax-exempted property. Such an initiative could be sponsored in multiple cities in the region, including incentives of national governments for territorial governments to back the conduct of appropriate, necessary risk surveys and engage insurance companies that are able to supply such collective policies.

Countries could explore the individual or joint establishment of an off-shore captive insurance or reinsurance company for better risk management. Through this modality or instrument, countries could manage their own risks and, concomitantly, withhold the premiums paid for insurance to companies which would basically engage in *fronting* in each country. Such a facility, if implemented, would raise the financial effectiveness of the insurance and reinsurance mechanism (single policy for overall risk transfer), thus getting better reinsurance conditions and the establishment of government reserve funds with the same objectives of financial protection, within which the deductible could be covered.

⁶ Similar to that implemented by the municipal government of Manizales in Colombia. This insurance has been collected with the property tax and has been recently perfected to always cover the poorest sectors in the form of subsidy.

Issuance of a CAT Bond could heighten financial efficiency if the cost of public or private properties is substantial. This instrument is deemed to be more and more competitive and feasible with the passage of time. Anyhow, it is a choice or alternative to cover the higher tiers of a retention and transfer, financial structure. Similarly, contingent leasing to increase fund reserves for disasters, cover the priority or deductible, foster public investment or the establishment of local insurance consortiums to shorten premiums and expand the insurance base of the private and public sectors is also an ancillary mechanism which could improve the governments' financial effectiveness and strengthen comprehensive risk management.

To sum up, central and subnational governments are advised to outline and implement new strategies to further the development of the insurance primary market against the various threats represented by disasters, and pay special attention to risk transfer of damages in public facilities. This first step could help lessen the tax burden of governments after a disaster and give the private sector access to the insurance market.

Subnational and the central government are urged to provide the resources acting as protection and offset mechanisms for the poorest in order to minimize deterioration of social well-being. Following the rule of thumb (Freeman et al., 2003), half the amount of expected future losses should be saved. In this regard, the central or subnational government would act as an automatic stabilization mechanism which will not only improve effectiveness but also reduce losing social well-being.

Finally, as part of the activities on risk management promoted in Latin American and Caribbean countries, special emphasis should be made on decreasing risk by means of land layout and planning and by handling the vulnerability of essential buildings. This has a high return rate both in the economic and social fields. Similarly, minimizing the risk of private buildings is of the essence. This could be easier by means of subsidies such as reduction of property tax and otherwise when handling structural vulnerability of buildings. There is the need to drive enforcement and observance of regulations on seismic-proof buildings and subsidies for housing improvement in order to handle structural vulnerability. It should be recalled that insurance and, generally, risk retention and transfer are not a mitigation measure *per se*, as they do not diminish damages and their objective is covering losses once the damage has been materialized.

These recommendations emerged from a survey of possibilities in Latin American and Caribbean countries. It must be noted that there are glaring asymmetries in this regard and, in general, advances are recent. Hence, virtually everything is yet to be done in this area.

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ACRONYMS

AAL	Average Annual Loss (Expected loss or pure risk premium)
CAF	Andean Development Corporation
CAPRA	Comprehensive Approach for Probabilistic Risk Assessment
CAPRADE	Andean Committee for Disaster Prevention and Relief
CAT	Catastrophic
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CEPREDENAC	Coordination Center for Natural Disaster Prevention in Central America
CIMNE	International Center for Numerical Methods in Engineering, Universitat Politècnica de Catalunya (UPC)
CRESTA	Catastrophe Risk Evaluating and Standardizing Target Accumulations
DDI	Disaster Deficit Index
ECLAC	Economic Commission for Latin America and the Caribbean
ERN	<i>Evaluación de Riesgos Naturales</i> (Consultancy consortium)
ERN-AL	<i>Consortio Evaluación de Riesgos Naturales - América Latina</i> (Consultancy consortium)
FEMA	Federal Emergency Management Agency
GAR	Global Assessment Report on Disaster Reduction of the United Nations
GEM	Global Earthquake Model
IDB	Inter-American Development Bank
IDEA	Institute for Environmental Studies, National University of Colombia
IFI	International Financial Institutions
II-UNAM	Engineering Institute, National Autonomous University of Mexico
LA RED	Network for Social Studies on Disaster Prevention in Latin America
MEE	Maximum expected event
OAS	Organization of American States
OFDA	Office for Foreign Disaster Assistance of USAID
PML	Probable Maximum Loss
RMS	Risk Management Solutions
SELA	Latin American and Caribbean Economic System
TCIP	Turkish Catastrophe Insurance Pool
UNDP	United Nations Development Programme
UN-ISDR	United Nations International Strategy for Disaster Reduction
USAID	United States Agency for International Development

ANNEX: GLOSSARY

Adverse selection: Situation in which it is not possible to distinguish between different classes of risks; i.e., the probability of loss for good-risk categories (low vulnerability) and bad-risk categories (high vulnerability).

Ambiguity: In the area of risk management, ambiguity refers to a situation in which there is a high degree of uncertainty about the probability for a specific loss to occur and its magnitude. That is, when the risk is not well specified.

Attachment point: The level at which an insurer's liability comes into effect under a policy and the transfer to cover a loss is initiated, on a layer or the total risk transfer contract. It is also known as priority.

Basis risk: The risk of loss resulting from an imperfect match between the value of probable losses and the foreseen compensatory payment; i.e., between an underlying exposure or risk and the transfer value agreed upon, or hedge.

Blanket premium: Single premium value corresponding to an average value of all premiums in a portfolio, or that indicates that there is an average valuation of risk.

Captive: A mechanism that is used to facilitate a company's own insurance/reinsurance, risk financing or risk transfer strategies; a captive is generally formed as a licensed insurance or reinsurance company and can be controlled by a single owner or multiple owners (or sponsors).

Cedant: A party that transfers, or cedes, risk to another party; also known as an insured or beneficiary.

Coinsurance: The insured party's percentage share of the risk or, in other words, the percentage of risk retention by the insured party.

Contingency loan: A bank line of credit that is arranged in advance of a loss and is invoked when one or more trigger events occur. Unlike a traditional line of credit, the contingency loan is only available for drawdown to cover losses arising from a previously defined event.

Deductible: An amount that the insured party agrees to pay in order to cover the first loss, usually up to the first priority or attachment point. The amount is determined as a percentage of the total amount covered by the insurance.

Excess of loss reinsurance (XL): In this type of reinsurance, the amounts of losses determine the proportion of risk transfer. The direct insurer takes full responsibility for the loss up to the amount determined by the priority, regardless of the amount insured. The losses exceeding the amount set by the priority must be paid by the reinsurer.

Exhaustion point: Limit of liability for a layer of loss transfer.

Indemnification: Amount paid to compensate for a cedant's real losses. It entails a quantification of such losses through an adjustment process.

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Index trigger: A circumstance defined on an insurance-linked security where the suspension of interest and/or principal occurs when the value of a recognized third-party index reaches a certain threshold.

Insurable value: In general, the insurable value corresponds to the replacement cost. In the case of policies without first risk coverage, the insurable value should be considered as the insured amount set forth in the policy. In the case of first risk insurance, this value is equivalent to the value of the property.

Limits of liability: The maximum amount that an insurer or reinsurer agrees to pay for damage coverage. Since it is the maximum loss for the insurer or mutual insurance company, the aforementioned amount must be less than, or equal to, the total amount insured.

Moral Hazard: An increased probability of loss which occurs when the insured party behaves in a non-pre-emptive or irresponsible way, thus raising costs for the insurer.

Non-proportional reinsurance: In this type of insurance claims are distributed according to the losses that actually occurred. The direct insurer defines a specific amount up to which it is accountable for the totality of the losses. This amount is known as priority or deductible. When the losses exceed such priority, the reinsurer must proceed to pay for the remainder of the losses up to the respective coverage limit agreed.

Parametric trigger: A circumstance defined on an insurance-linked security or bond where interest and/or principal are suspended when a specific damage metric reaches a certain value.

Probable Maximum Loss (PML): An estimate of the maximum losses that could be reasonably expected in a portfolio of buildings during an extreme event. It corresponds to the average loss that would occur for a given period of return. It is used as a fundamental indicator to determine the volume of reserves to be kept.

Proportional reinsurance: A type of reinsurance arrangement where insurer and reinsurer share premiums, exposures and loss expenses on the basis of a pre-defined formula.

Pure premium: Also known as technical premium, the pure premium reflects the expected value of the loss that would occur in any given year, assuming that the occurrence of disasters could be seasonal and that the damages in buildings are restored immediately after a disaster. It is equivalent to the value of the expected annual loss.

Quota share reinsurance: A type of proportional reinsurance agreement in which the reinsurer assumes a fixed percentage or quota of all policies that the insurer has signed in a specific area. Such quota determines how the direct insurer and the reinsurer agree to split premiums, risks and claims.

Rate-On-Line (ROL): It is calculated as the insurance Premium divided by the amount of coverage of a layer of financial risk transfer.

Retention rate: Percentage of risk retained in the coverage of damage on the insurable value. Is the layer or layers of the potential loss assumed by the insured before transferring the risk.

Risk Retention: It involves assuming the potential losses or risk. It can be a conscious strategy resulting from an analysis of financial optimization. Self-insurance is a retention

strategy that involves taking measures to control risk and assuming the losses that may occur.

Risk transfer: An agreement or contract where one party agrees to assume exposures and risks and to pay for the losses that a cedant may have during a specific period of time, in exchange for a risk premium.

Surplus share reinsurance: A type of proportional reinsurance in which the direct insurer retains the risk up to a maximum portion of the amount insured. From that limit on, the reinsurer assumes the rest of the amount insured.

Trigger: A circumstance, threshold or barrier on a transfer contract that determines whether an event has occurred. Usually, fixed triggers do not have an impact on the value of the contract, only if they indicate that the contract should be paid.