

Evaluación de Riesgos Naturales
- América Latina -
Consultores en Riesgos y Desastres

ERN

**SPECIFIC RISK EVALUATION
OF BOLIVIA, GUATEMALA, JAMAICA AND PERU
ATN/JF-9349-RS**

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**ALTERNATIVES OF FINANCIAL INSTRUMENTS FOR
RETENTION AND TRANSFER OF RISK**

JAMAICA



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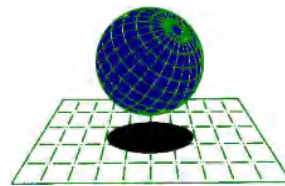


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INTRODUCTION

The general purpose of this report is to describe tools for financial protection (retention and transfer of risk) and their relationship with public investment activities, in the context of a definition and implementation of public policy and national financial mechanisms for prevention, mitigation, preparation, recovery, rehabilitation and reconstruction, and the incorporation of the disaster risk variable into development planning.

We present a series of general guidelines on the mechanisms for retention and transfer of disaster risk, including:

- Recommendations for policy recommendations to optimise the definition of fiscal responsibility and contingent liabilities of the State for disasters, and estimates of monetary resources required, based on widely-accepted technical, legal and financial criteria.
- Policy recommendations to define mechanisms for the financial protection of the portfolio of public and private property, such that State resources can be optimised through complex strategies and products for retention and transfer, in order to reduce contingent liabilities of the State for disasters.
- A description of feasible financial instruments for risk retaining and transfer for publication and allocation in each country, depending on current legislation and existing institutional structure.

This document is divided into four sections. First, there is a general description of what is meant by the financial management of the disaster risk, including the transfer and retention of risk in the context of the availability of resources to cover losses associated with disasters. This section includes a general analysis of fiscal responsibility and of the implied contingent liabilities which disasters represent for national governments. Second, there is a diagnosis in relation to the financing of risk management in general, and in relation to the implementation of a financial management policy for losses, which includes a description of progress and difficulties involved. Third, there is a proposal for a description of several feasible mechanisms whose applications could be explored in general, and which are the instrumental basis for the establishment of certain guidelines which would allow policy on this issue to be advanced. Fourth, the document presents a series of schedules which should be useful as a reference for better understanding of the policy for integrated risk management, from the point of view of public investment and financial protection.

1 FINANCIAL MANAGEMENT OF DISASTER RISK

Modern developments in risk management have defined the role of the State in a number of aspects which originally referred only to remedial action, or response to crisis. In Latin America and the Caribbean, for many years, institutions such as the Civil Defence, the fire services, the Red Cross, the Armed Forces or the health authorities responsible for emergency medical attention had been the organisations which the public in general recognized when referring to disasters; that is to say, they were the entities responsible for preparing for emergencies and subsequent actions after disasters. Nonetheless, an understanding has gradually gathered strength that "disaster" and "risk" are social, economic and environmental problems linked to the process of accumulation of vulnerabilities, which in turn are the product of models which are neither sustainable nor optimum for growth. In other words, a disaster is a development problem, or a risk not managed, and therefore the reduction of vulnerability and risk must be an explicit objective of advance planning for disasters; and this involves a wide range of industries and interests in the public sector.

In Latin America and the Caribbean, this change began with the appearance of inter- institutional organizations or structures in the last 20 years. Since their creation, many details have been worked out and improved from a conceptual point of view, to the extent that at international level we now prefer to talk of "integrated risk management", rather than "disaster prevention", although the latter expression helps to stress the need for advance thinking about consequences, and this has in turn succeeded in making a difference between the concept of attention or response to emergencies, and to reconstruction. The modern vision of risk management involves four distinct public policies.

- a) Risk identification (involving individual perception, social representation, and objective evaluation of risk);
- b) Risk reduction (which involves prevention or mitigation of physical and social vulnerability as such);
- c) Financial protection (related to transfer and retention of risk from a financial point of view and in public investment); and
- d) Disaster management (related to preparedness, warnings, response, rehabilitation and reconstruction after a disaster).

It is easy to see from this that the first three actions take place in advance of disaster, and the fourth refers to ex-post actions; at the same time, and inevitably, risk management is transverse to development, and a range of interested parties and actors in society are necessarily involved in the process. From this, therefore, and from experience, we can say that while it is true that some of these public policies are only incipient, one of them is practically non-existent: the protection or financial management of risk. Throughout Latin America and the Caribbean, such considerations have not really been explicit public policy, and if there has been such a policy, it has not been articulated to other public policies which form part of integral risk management. While some provisions have been made for it, we can also say that there has been no concern as to whether they are efficient or not. Therefore, this work attempts to draw out the situation, and

tries to illustrate the convenience of in-depth studies on risk evaluation, given the technical information available, and of formulating an efficient strategy for financial protection in the face of possible losses to the State and to society as a whole.

For many years, financial protection in the context of trade, banking, and Ministries of Economy, or Ministries of Finance has been styled risk management, for the application of economic and financial measures designed to counter or reduce imbalances or adverse effects due to situations which may affect economic stability, productivity and assets. There are five steps involved: i) identification and analysis of hazard, and the economic or fiscal vulnerability (also known as risk appraisal); ii) examination of the feasibility of alternatives or techniques to reduce that risk; iii) selection of the best feasible strategy; iv) implementation of the strategy chosen; and v) follow-up of implementation. These steps are very similar to those which are generally known as disaster risk management, but from an economic point of view, identifying and analyzing exposure to loss, they examine the possibilities of transfer and retention of risk, and perform the transactions which this implies, watching out for changes or adjustments that need to be made.

In this first section of this document, we present a synthesis of the importance to the State of a public policy for a financial protection or management of risk, in the context of disasters. We refer to legal and fiscal responsibility, to contingent obligations and liabilities which disasters imply for the State, and the implications of not having an *ex ante* policy which is well-defined from a financial point of view in a country prone to disasters of different kinds, and in general to catastrophic risk. At the same time, we present some basic concepts regarding the traditional role of the insurance and reinsurance industries, securitization and other financial schemes which may be used or explored in order to bring them into integral risk management, and which will be described later in Section 3 of this document. Annex 1 presents some basic terminology.

1.1 *Ex ante* and *ex-post* responsibility of the State

In almost all countries the issue of state responsibility starts with the principle that the fundamental duty of the State is to protect its citizens. Usually, the foundations of each legislative system determine that the State must protect the life, honour and goods of the individual, and this is the basis for providing security and safety in the case of extraordinary situations such as disasters, with the necessary creation of institutions or organizations which will provide an efficient response to counter their effects. In general, for many years there has been awareness that there must be operational organizations in place to respond to emergencies. Some countries have been an example for others, and thus all countries have little by little adapted models which in general have had a common denominator in some form of preparation to attend to potential emergencies.

When the risk materialises, with the manifestation of some dangerous phenomenon, the disaster will be the aggregate impact of loss of life, housing, employment, abandonment of property, the cost of public services, etc. These are social and economic costs which are in general supported by the social system and they require that there must be direct government assistance. If a risk or a potential risk of damage is reduced, for example, in public buildings where services are provided or social functions take place, this is a direct benefit not only for the government sector but from the public which pays its taxes. When private risk becomes a public or social risk, the reduction or mitigation through voluntary (private) action and government (public) action

requires regulation which on the one hand promotes prevention and on the other lends it consistency. In this context, there are two fundamental aspects to be analysed:

- Whose is the responsibility for taking risk-reduction measures against dangerous natural phenomena? First, it must be accepted that a series of individual and private decisions are involved; and second, that there is a public problem which requires the intervention of the public sector (i.e. Where is the threshold above which the government should define the basic standards of prevention or mitigation of natural phenomena?)
- What factors are necessary to motivate the owners of private property to become involved in voluntary mitigation actions that may reduce risks from natural phenomena, in particular from events which are more or less unlikely, but would have serious consequences if they occurred?

The answer to these questions requires a broad understanding of the risks posed by threats from nature and man to the public and private sectors, the cost and effectiveness of alternatives of mitigation or reduction of risk, perceptions of risk by different actors or sectors of society, and the fundamental factors which are required to motivate conduct that will lead to risk management. So, the design of a risk management programme entails the obtaining of the correct answers to two central questions, because decision-taking processes will depend on them:

- Who should assume the cost of making communities exposed to danger or threat safe?
- Who will pay for the loss caused when a disaster occurs?

There are two criteria, which are normally used to answer these questions: efficiency and equity. In terms of efficiency, we can say that the appropriate location of economic resources helps to maximise welfare and the quality of life of society. The quality of life is defined by the public itself, and therefore it varies from one political entity to another. A society which believes that each citizen should share the losses of disaster victims may find that taxes are the most efficient policy instrument to generate the revenues needed to cover those costs. But if society believes that each individual person should be responsible for assuming his own burden of natural risks, then some form of insurance, with variable rates based on the risks involved, may be the most appropriate way to cover the cost of disaster. In terms of equity, we refer to the concern for welfare and the distribution of resources. An equitable distribution of resources may mean special treatment for certain individuals or groups, at the expense of others. Now, what that may at one point be seen as equitable -for example, immediately after a disaster- may later be seen as inefficient in the longer term, if many people suffer continuously from such damage. For example, if the uninsured victims of a disaster are guaranteed subsidies and low-interest loans to recover or reconstruct their properties in disaster-prone areas, taxpayers will be obliged to absorb ever-increasing burdens to attend to the victims of future disasters. In other words, what may be seen as equitable after a disaster may be seen as inefficient from a sustainable, long-term perspective.

We therefore find questions such as, "Who loses?", "Who pays for the damage?", "Who decides what to repair and how?", "Who designs the notion of acceptable risk?" "Is it a choice that individuals may assume their own risks, without considering effects on the community?" "Is it a choice for the government to assume risks, for account of the State?", "Is it a choice to share risks

with private interests?", "Transfer them?", "To whom?", "Can a loss caused by a disaster be fully recovered?", "What portion of it could be recovered?"

Most legal systems around the world seem to suggest that the State has an unlimited responsibility to help private interests affected by a disaster. It would seem that the sum of a certain number of adverse effects on private interests turns the effect of the damage -simply by weight of numbers- into an effect on society collectively, regardless of the quantity, nature or extent of public goods affected. And this collective effect automatically brings the need for State intervention. But, does the necessary intervention of the State in the solution of adverse effects on society as a whole in turn imply that the responsibility of the State should compromise public funds in broad and unlimited terms?

This question invites the inevitable consideration of ex ante responsibility and duty of the State. In order to clarify how the safest community should act, we should begin by describing how the risk is constructed, and how communities become unsafe. Economic models today are focused on consumption, from which the incapable are excluded. Therefore, if safety is to become an object of consumption (that is, a tradable), there must be a solution to the lack of capacity of those excluded from the consumption circuit. Therefore again, private insurance seems to be a necessary instrument. But it is not sufficient, and therefore the mechanisms of social solidarity cannot be ignored. Further, it must be made clear that aside from the many questions posed here on the ex-post responsibility of the State, we should add others such as "What can we do not to build more risk?", and "How can we reduce existing risk?". These would be the starting points for many other questions related to the ex-ante responsibility of the State. A community which recognizes risk management as an expression or form of exercising the right to life, housing, work, and so on, might possibly suggest that "it should be helped to avoid disasters and not just to repair the consequences".

1.2 The economic impact of disasters, and implications for the State

In macroeconomic terms, disasters slow down economic growth. The effectiveness of measures adopted and the prediction of expected results depend on a macroeconomic analysis model. So, the reconstruction of property is a healthy activity in replacing lost stock, but aside from that replacement, should there not be a model which takes account of sustainable development in the community affected? Further, we must answer the question "up to what point can State action contribute to reconstruction?" So far, little attention has been paid to the recovery of "income flows", which are abruptly reduced by disasters, and require structural economic measures with robust investment for recovery and renewed strength, so that a local economy can generate its own dynamics to recover and replace losses of stock. Therefore, there must be a review of the scope of State action in "rehabilitation", and efforts must be oriented towards the recovery of income flows.

For decision-makers, it is doubtless important to have good information regarding the economic cost and benefits associated with a particular strategy to reduce risk. In any event, we must know how easy or difficult it would be to implement that strategy, what the social and community benefits would be, and what the indirect effects would be. It is also important to mention that official entities need to be treated as private enterprises in relation to the evaluation of risk management decisions in financial terms. In conclusion, the complexities associated with the

process mean that the setting up of strategies to reduce, transfer or retain risks is a challenge for today. The selection of the technique for adoption is a complex one, because it depends not only on cost and targets to be met, but to a great extent, on public opinion.

A mechanism for risk transfer, such as insurance, may pay part of the cost of reparations and reduce economic loss caused by damage to buildings. Nonetheless, insurance can do little to protect life, the loss of functionality, the protection of wealth, or the mitigation of other social costs involved. So, risk management must be comprehensive. From the point of view of earthquake and hurricane engineering, for example, the reinforcement of structures is a most effective technical strategy to be chosen in reducing risk, because it has a favourable influence on the reduction of all types of loss to which the government is exposed. Nonetheless, cost and feasibility of implementation have always been limiting factors in adoption. Although reinforcement should be implemented before any dangerous event materializes, all too often it becomes part of the updating of structures damaged after an earthquake or hurricane, because that is when there is a greater availability of funds. Sources of funds vary markedly at each level of jurisdiction, and indeed at local level there is usually the possibility of access to regional or national resources. At national level, there is a possibility of receiving support from multinationals, but they equally end up performing the role of providing contingent loans, without any previous agreement or negotiation.

Fiscal sustainability and vulnerability

An analysis of fiscal vulnerability of an economy to internal and external commotion makes it necessary to have information regarding total debt and contingent liabilities. There is increasing awareness of the importance which contingent liabilities may have for governments and central banks when analysing the macroeconomic situation and fiscal sustainability. Many countries are including contingent liabilities in their fiscal analyses, in order to understand fiscal risks to which they are exposed, and put them in context.

The multilateral and private organisations which have taken on the responsibility for reappraising credit risk and the solidity of public finance in any given country are increasingly interested in incorporating contingent liabilities into their analyses for public agencies. Indeed, a diagnosis of the fiscal situation of a country is half-baked or incomplete if there is no reliable information on the assessment of contingent obligations assumed by government agencies. So, organisations such as the IMF have proposed methodological and accounting changes, in order to introduce greater transparency into public budgets and financial statements, and to show explicit demands for resources which State commitments may entail.

Here, it can be said that a good institutional system requires that the government consider any non-monetary programme which implies a contingent fiscal risk as a budget or debt item. More importantly, the system should allow for the potential fiscal costs of off-budget programmes to be reflected. Budget and accounting systems based on revenues encourage fiscal discipline, but they are not entirely sufficient or necessary. The rules for guarantees and State insurance programmes, and the conduct of entities guaranteed by the State, public agencies and provincial and regional administration, are of critical importance.

In Latin America and the Caribbean, academics have only now come to recognize pension liabilities and infrastructure construction contracts with sovereign guarantees to be the main commitments which give rise to contingencies. The guarantee of a minimum pension provided by private funds, social security obligations to private-sector contributors, and obligations to the public sector affiliated to a widespread network of pension funds -also of a public nature- are the principal source of contingent liability. At the same time, there are infrastructure construction contracts in the electricity, telecommunications and road-building sectors.

A contingent liability becomes an actual liability when the guaranteed event arises. This means that, when State-guaranteed employees retire, existing pension funds are insufficient, or when a contract is liquidated and the results are below the minimum supported. In either case, funds have to be allocated from the budget to cover the liability. These resources are new, and need to be financed like any other public spending item, such that other purposes must be sacrificed in order to satisfy these new needs, or alternative sources of finance must be found, to reforms to the pension or tax system, or through loans.

The analytical framework best suited to evaluate the financial and budget implications of contingent liabilities is undoubtedly that of fiscal sustainability. This means that the value of estimates must be made of commitments, taking account of all social, economic, political, geographical, demographic and natural factors which come together in the event that a contingency materialises. The exercise requires an estimate of the most probable result for a given time-horizon, and the subsequent incorporation of annualised flows into the primary deficit is required in order to be able to maintain gross "explicit" debt on a stable path. The reason why the contingent liability is separated from explicit debt lies in the fact that the contingency does not depend on the performance of the interest rate or on the growth rate.

Disasters as contingent liabilities

Although free-market reforms and the privatisation of public assets have allowed State responsibility to be reduced in respect of infrastructure, it is difficult to imagine that in developing countries the market will allow the levels of government assistance to be reduced when large-scale disasters occur. On the one hand, insurance markets are not deep, and there are serious imperfections and institutional problems which prevent their development. To give just one example, while countries such as United States insure about 30% of the cost of disasters, the percentage in developing countries may be no more than 2%. Also, access to financial markets is restricted to the rich and to business, and leaves the mass of the population with no protection.

Thus, the principle of fiscal transparency would apply to make the value of contingent obligations which might be generated by a disaster explicit in the balance sheet and in public budgets. However, as many specialists recognize, this rarely happens even in developed countries, whether due to lack of, or to the absence of robust methods to appraise losses. Nonetheless, "a simple declaration of the maximum probable loss as a memorandum item -the approach sometimes adopted for other contingent obligations- together with a broad-based report on the effectiveness of an occurrence (for example, whether it might be an event once in 10 years or once in 20, etc), could clearly be informative in an appraisal of the fiscal sustainability of the government" (Paul Freeman, Michael Kenn and Mutkhukumara Mari, 2003). If we take the suggestion at its face

value, we could say that using the contingent liability for the national government could be estimated through a calculation of probable maximum loss defined for a certain period of return (50, 100 or 500 years); (see the complementary report in the context of this consultancy, in relation to catastrophic risk profile). It might be thought that the government in principle should not call on the assistance of the middling-rich or rich sectors of society, but for the reasons noted in general, the State must also sometimes attend to the demands they make for assistance. Some facts confirm this appreciation. During a financial crisis, governments have made major transfers to debtors of housing loans in the middle-income socioeconomic strata. At the same time, with the revaluation of some currencies, economic authorities have designed schemes to subsidise exporters, a group which mainly consists of large landowners and rich farmers.

Thus, when such situations arise in developing countries, the dilemma of the Good Samaritan almost unavoidably raises its head. In effect, in the previous case, agents have available a series of financial mechanisms which will change exchange rates and futures markets, but the use of these instruments has been minimal, perhaps expecting that the government will come to their aid, as indeed it did. All that we need for our argument is that agents should have some knowledge of how the decisions of the economic authorities will change as a result of changes in economic conditions. Naturally, amounts can be reduced by deducting insured losses, but in the case of flood, there is no information about the amount of cover, or expense in insurance.

Studies made in Latin America and the Caribbean indicate that countries are not in a position to retain all their probable losses, and must necessarily look for alternatives to transfer them. To the extent necessary to reduce government exposure to shocks such as those mentioned, the literature recommends that while the State should continue to make transfers to agents in situations of vulnerability, it is important that the government should also coordinate actions designed to ensure that the poor acquire insurance, which they can do in a number of ways -for example, in subsidies conditioned on the purchase of hedging instruments. In effect, the way in which this is done is not important. The essential thing is to promote the optimum use of market mechanisms to transfer risks, including those for the lowest-income strata.

The conclusion is that government should incorporate the new contingent liability into its analysis of fiscal sustainability, so far not properly considered: disasters (losses from natural phenomena), which may create commitments for a national or subnational government as a consequence of the implied guarantees incorporated into the calculations of private agents. This is associated with problems inherent in the functioning of the insurance market, the inconsistency of public policy over time, and the so-called "Good Samaritan" dilemma.

In short, the Minister of Finance or the Minister of the Economy, as the case may be, and the organisations responsible for the general accounting service in each country should make a formal extension to the nation's balance sheet, to include changes in assets and liabilities in which there appear implicit and not only explicit flow variables such as total spending (salaries, investment, debt servicing, etc), current revenues (taxes, loans programmed), and the fiscal deficit. Provisions for disasters which may occur imply contingencies which do not appear on the balance sheet. The liabilities (external public debt, bond issues, national debt, Treasury issues, and government loans) sit side-by-side with contingent liabilities (guarantees of bank deposits, net present value of pensions, guarantees of public sector debt, infrastructure or concession

operations); however, these liabilities are explicit, where there would be a need to cover for example differences when expected values are not achieved or agreed, or because the guarantees are well defined. Thus, disasters imply contingent liabilities: they are not agreed, but they are "payable on demand" at any time, as are the implicit contingencies in the rescue of financial entities, and the protection of savers, regional government, or unsecured debt, court decisions ordering the State to pay for its mistakes, and so on. In other words, the probability of disasters represents a contingent liability which becomes a certain liability when the event occurs. In the Catastrophe Risk Profile Report there is a calculation for the Disaster Deficit Index, which is an indicator of fiscal vulnerability derived from extreme disasters which might occur in one specific country or another.

Residual responsibility of the State

Governments have an obligation to attend to victim-families efficiently and equitably, when they not only lack the protection or the economic means to assume the financial costs of coverage, and further, in the lower-income strata. This perspective, if limited, is consistent with the guidelines of modern "social policy" at national level. In effect, the idea is that the State should concern itself with solving the problems of the poorest members of its society, eliminating all cross-subsidies. Therefore, the authorities must clearly define the set which forms the target population, and must adapt the rules of the composition to mitigate the exposure of such households in high risk. However, in many circumstances it is almost impossible to determine the allocation of costs and benefits in any optimum manner. In disasters, sectors of the population which were not policy targets prior to the disaster may end up losing all that they had, and falling into conditions of poverty. A utilitarian would defend the subsidiarity of the State in this situation¹. Thus, the responsibility of governments may be extended, depending on the gravity of the event and of the negative external factors generated as a consequence of the disaster. Here, it is important to set up a coherent framework which will allow the most rigorous possible determination to be made of the compatibility of macroeconomic equilibrium with decisions and responsibilities of each of the agents in the economy.

Now, we need to define the critical points of intervention by the government, or levels of government. Evidently, the sub-national administration can act to offset the effects of small disasters among the poorest groups in their jurisdiction, but the dividing line at which sub-national administration ceases to have responsibility becomes fuzzy, when the event involved is an earthquake, or a high-intensity occurrence which destroys an important part of the capital of a town or city or region and causes a significant number of fatalities and other casualties. It seems that the way that this problem might be approached is to assign the role of "insurer of the first instance" to subnational government, and to make the national government a kind of "reinsurer". In other words, a minimum value of loss could be determined, above which the National Government will assume the cost of the disaster, given that the magnitude of the shock exceeds the financial capacity of local or subnational administration. A schematic way of expressing this appears in Figure 1, and illustrates a structure for retention and transfer in which some

¹ Amartya Sen (2002). Desarrollo y Libertad, Planeta.

hypothetical values of the total of a portfolio of assets are shown. The feasible thresholds are based on economic and financial factors, and on the political economy of the problem.

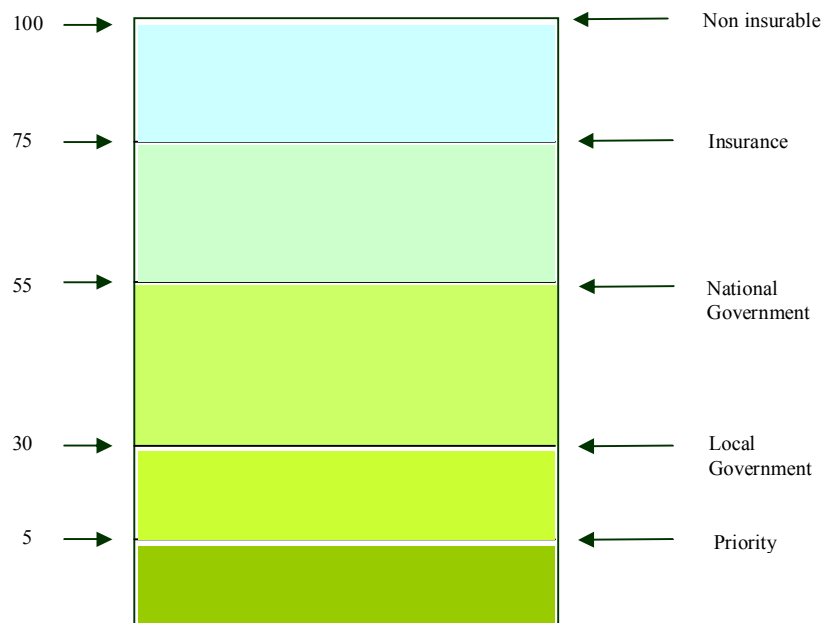


Figure 1. Structure for retention and transfer of risk

This example is optimistic. Of a total of losses of 100, we see that 75 could be covered. This distribution follows economic, political and the political criteria, and the principle of equity. Households can assume five points of the total. Subnational government acts when losses exceed that level, and covers up to 25 percentage points. If the event is sufficiently violent to exceed 30 points, then the national government contributes 25 additional points. Losses which exceed the threshold must be covered by private and public insurance.

The construction of a financial model which will permit a definition of optimum strategies to be followed in managing the risk of a disaster means that there must be information on probable losses from this type of event. Solutions of this kind come from catastrophe models designed by engineers and specialists in Earth sciences. Once the ranges of loss and related probabilities are established, instruments and financial instruments and options must be selected as being most suitable to minimise the loss to society. The criteria for optimisation are simple. A general model is constructed, and the costs and benefits of existing options in the insurance market, capital markets, and government resources are introduced into it; this constructs a portfolio of resources which will allow subnational authorities to make use of them, in order to face the consequences of a large-scale earthquake or other disaster, without compromising financial and fiscal stability.

The first step in the design of a financial engineering model is an estimation of probable maximum loss (see complementary report on the catastrophe risk/profile in the context of this consultancy). The indicator is a measurement of risk corresponding to the maximum loss which the government can experience based on attack calculations from the catastrophe model. In

general, the probable maximum loss is estimated over a given period of return. For example, the probable maximum loss of US\$ 100 million over a return period of 500 years implies that losses in excess of this amount will have a probability of 0.2% of occurring in any given year. A complementary tool is the exceedance probability curve for a given value of monetary loss. Once the function of exceedance probability is estimated, risks become explicit. Government authorities must establish what part of the probable losses will be their responsibility, in accordance with constitutional mandate or government programmes. Subsequently, a determination must be made of the portion of the risk which can be retained, and the portion which can be transferred to other agents, whether national government, insurance company, or the capital markets. Let us suppose a hypothetical example in which the simulation model for catastrophic events produces a functional probability of exceedance losses as illustrated in Figure 2.

The authorities define a fiscal crisis probability as (TRP), that is, the probability that social losses under the responsibility of subnational government will exceed a value of LE. In this case, the cost of the earthquake may imply gigantic demands on public resources, and will leave local or subnational administration in a critical financial situation. This obliges the authorities to interrupt the payment of their liabilities, and to reallocate resources to attend to the disaster. In addition, tax revenues may fall considerably if the disaster destroys a good part of the capital of businesses or homes. Therefore, it may not be convenient for the subnational authorities to retain the entire risk. Indeed, it would be advisable to transfer part of the risk to the capital market or insurance companies. Figure 2 shows that if A million of loss is covered with capital or insurance market mechanisms, the subnational government needs to bear only LA million of total losses.

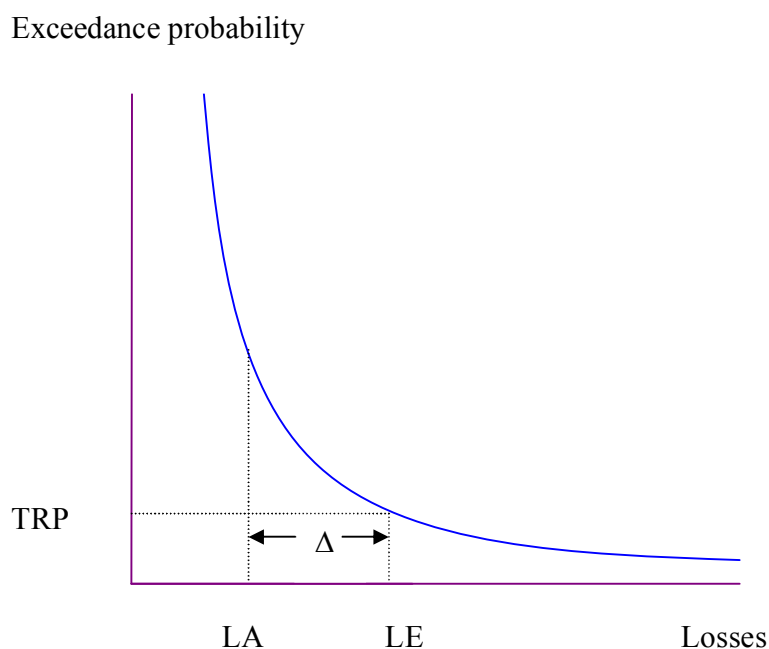


Figure 2. Probability of exceedance of losses

Thus, how does Government bear the cost of attending to emergencies and reconstruction? It may decide to do so after the disaster has happened, that is, ex post. This is the least efficient and effective way of doing so, through the application of new taxes, looking for international donations, diverting budgets or approved loans, and requesting new loans from the multilaterals. The other way of doing it is to make provision before the disaster occurs, that is ex ante, which is usually more efficient and effective in financial terms. Reserve funds are set up, insurance is contracted, contingent loans are agreed, catastrophe bonds are issued, or other mechanisms in the capital market are applied. We now describe the various mechanisms for the transfer and retention of risk that governments may explore to have an ex ante policy to finance disaster risk.

1.3 Alternatives for transfer and retention of losses

In international terms, rapid changes in the financial system have led to the appearance of alternatives to face losses caused by dangerous phenomena such as earthquake, hurricane, flood, etc. The capital market is worldwide, and allows the possibility of making investments in different parts of that world. A combination of new knowledge, engineering techniques and science, including more accurate modelling of potential losses and a better scientific understanding of risk, advances in information technology and computing –as well as the financial market innovations- have opened up new horizons and new sources of capital to deal with losses caused by disasters.

The government sector has a number of options to transfer risks through insurance, including private insurance, even risk pooling, and mutual protection between government agencies. Risk pooling is defined as elements of risk transfer where a number of private and/or mixed entities - that is, organisations involving private and state capital- share mutual responsibility within parameters of exposure, costs and utilisation which they agree in advance. Another option which could be considered is the transfer of risk to the capital markets through financial instruments.

Based on the definition of state responsibility and the State's fiscal capacity, agreements can be made with insurers and reinsurers, through which risks can be covered through the design of appropriate financial instruments. In this context, it would be important to note that "catastrophe bonds", unlike other instruments, have become more popular in the world's markets, and are therefore the most appropriate instrument to cover the risk of State responsibility in the event of large portfolios. In the case of other instruments, the basic problem is that there are low levels of tradability, and indeed some instruments have stopped being traded altogether.

After a detailed review of the workings of the various mechanisms to transfer risks to the market, we note that there are two responsibilities which the State must assume in the face of possible disasters: on the one hand, infrastructure and public constructions; and on the other, the low-income population which does not have the resources to acquire insurance policies, and which also tends to live in disaster-prone areas.

Insurance and reinsurance as the traditional mechanism

Insurance and reinsurance are instruments of financial protection, and they allow risks to be transferred to an insurance company and to the reinsurance market worldwide. For extreme

natural events such as earthquakes or hurricanes, the risk, understood as the potential for economic loss, signifies the possibility that a number of assets in a portfolio may suffer an adverse effect simultaneously.

Insurance is the mechanism most used by the private sector and by governments to transfer the risks of economic loss caused by disasters. The international insurance company has wide experience in the management of this type of risk, and the largest insurers and reinsurers have found a number of mechanisms to transfer the disaster risk to the global capital market. There are a number of international companies who are in a position to sign contracts in which cumulative excess cover can be taken.

This alternative has the advantage that the party ceding the risk discharges it into to the insurance company at a lower handling cost. Once the risk is ceded or transferred, the insurance company decides on the best way to diversify its portfolio. Large institutions like governments may have easy access to this market, and it is therefore a viable alternative for the transfer of risk. Small regional government agencies may resort to the central government in order to channel the transfer of risk to an insurance company through it.

As a general rule, the type of insurance used for disasters is excess of loss (XL). In the world of reinsurance, this is a non-proportional type of treaty, which allows the primary insurer to retain a larger part of the gross premium, without having to give up its cover against major losses. In exchange with this benefit, the reinsurer is exposed to a greater risk, since it has to respond for the totality of funds established by the priority. The priority -or deductible - is the amount up to which the insured (in the case of reinsurance, the primary insurer) retains in the totality of risk, that is, the point up to which the insured responds for the totality of its losses. As an amount equal to the deductible or priority, the insurer (or reinsurer) responds for losses presented up to a maximum amount, known as the limit. The insurer (or reinsurer) is therefore committed to cover losses which exceed the deductible, up to the amount established as the limit. The gap between the deductible and the limit is known as a layer. Accordingly, and depending on the size of the loss, insurance and reinsurance market may organise themselves in several layers.

A national or subnational government can therefore promote actions to transfer part of their risk. As shown in Figure 2, the intention is to cover probable losses LE-LA, through insurance mechanisms. The most highly developed instruments are the following:

- *Insurance* is a contract through which an insurance company undertakes to assume the risk of occurrence of an uncertain event, and obliges itself to pay losses which the taker may incur due to the effect of the loss determined in the contract. As a consideration for this, the taker must pay the insurer a premium. The mechanism is possible as a result of the principle of mutual treatment: this proposes compensation between individuals subjected to the same risk. Now, the insurance market in Latin America and the Caribbean represents a small percentage of GDP. The insurance sector is highly concentrated in these countries. A few large companies controlled most of the market. The most popular risks are life and motor vehicle cover. The share of natural disaster in insurance is extremely small. Therefore, it is of vital importance that central and subnational government implement new strategies to stimulate the development of the primary insurance market against the various threats represented by

disasters, with particular importance to the transfer of risk of damage to public physical infrastructure. This first step would reduce the fiscal burden for governments after a disaster, and would open up the way to be followed for access of the private sector to the insurance market.

- *Reinsurance* is the insurance taken by insurance companies. In other words, it transfers the risk to a second insurer from a company which has acquired a direct risk from its client. The insurer uses reinsurance to limit fluctuations of losses over time, for its account, and to protect itself against insolvency in the case of a disaster. However, there are some inconveniences in using it. The prices of insurance and reinsurance worldwide tend to be very unstable. After a major disaster, insurance and reinsurance premiums tend to rise suddenly and dramatically. Premiums then tend to wane over time, but much more slowly than they rise. This pattern in prices may be explained by attempts on the part of reinsurers to obtain offset their disaster losses through pricing, given that the treaties between insurers and reinsurers are long term agreements. Another factor which influences this cyclical comportment in prices is the review which insurance companies make for potential disaster losses. As a result of such reviews, the insurers may be prepared to interrupt insurance, or to increase premiums as a condition of continuing with a contract. Studies in the United States show that for one part of the reinsurance sector, premiums offered for XL contracts are much higher than expected losses, and this shows that insurers tend to reduce their level of reinsurance as the magnitude of the disaster increases, and the probability of occurrence increases.

Capital markets

In general, the first two or three layers (coinsurance) of loss against a disaster are covered by insurance and reinsurance companies. The next level or layer of loss is generally taken to the financial markets, using risk-transfer financing instruments, and finally, the top layers in most cases are covered by lines of credit from the multilaterals (such as IDB). In the capital markets, there are two basic kinds of instruments for financing and transfer of risk: fixed income securities (CAT bonds), and derivatives (options and swaps). The securities are usually issued by major insurers or reinsurers (Swiss re, AON, etc.), and the face value of issues is quite high (between US\$ 50 million and 1,500 million).

With regard to the first kind of securities, the market has made them highly tradable, and indeed they are still sometimes being issued made. The opposite has happened with derivatives and options, which had low levels of tradability, and they have ceased to circulate in markets such as CATEX (catastrophe risk exchange). Thus, in terms of feasibility, the issue of catastrophe bonds to cover the two responsibilities of the State with regards to disaster risk mentioned above, becomes the most viable option in addition to insurance and reinsurance of a conventional kind.

As shown in Figure 2, the intention is to cover probable LE-LA losses through the capital markets, and the most highly developed instruments are the following:

- *Catastrophe Bonds (Cat bonds)*. These bonds are distinct from the simpler form of bond, to the extent that they are subject to credit risk (default by the issuer) for all or part of the face value and the coupons, should a certain, previously specified natural disaster occur. This

makes them a risk transfer instrument. The proceeds of the sale of the bond are invested at risk-free rates, and yields are in turn used to play the interest or coupon on the bond. It is a consideration for credit risk, and the yields and interest rates are higher than those generally offered in the market. In general, the issue process for a Cat Bond requires that both parties (issuer and investor) use a special purpose vehicle (SPV) as an intermediary in the process of securitisation of the risk from the bond². The SPV is a legal entity which independently issues the Bond, and receives payment from the investors who buy it. At the same time, the SPV sets up an insurance contract with an insurance company, in which the latter agrees to cover the risks established in the bond in exchange for regular premiums which are used by the SPV to pay the coupons to the investor. The amount received by the SPV for the sale of the bond is deposited with an investment company or trust, which issues Treasury paper -which offers no credit risk- as collateral. The insurance companies which seek to cover their risk through the bond have incentives to use an SPV given the tax benefits and accounting requirements involved, and the fact that they are generally to be found in places with fewer restrictions of this kind. Investors use the SPV to avoid the solvency risk which an insurance company may occasionally face³.

Governments may combine instruments for the transfer of risk from the insurance market or the capital markets to cover losses caused by a catastrophic, high-intensity event. The use of these instruments depends on financial cost, or opportunity cost, and the possibility of access to such resources.

Retention of risk

On some occasions, it may be of interest to combine commercial insurance with self-insurance, or to have insurance with a limit, and to assume the remaining risk directly. In some countries where private insurance is not possible, local governments have set up an insurance pool, which, within certain limits, covers the costs of emergencies, reparations, and even other obligations. These self-insurance funds are sometimes designed to address specific sectors such as schools or hospitals. Although earthquake insurance is not common in this context, there are cases of captive insurance companies, such as that which was recently created with the participation of the governments of 16 countries in the Caribbean, to cover the expenses of attending to emergencies from hurricane or earthquake. These mechanisms or funds, as they accumulate their reserves, increasingly have capacity to offer very favourable rates for insurance and reinsurance, since they offer geographical diversity and large portfolios. In other words, the retention of risk is also an option which may be considered where there is good information as to which risks may be retained and which should be ceded. In this case, the right course would be to estimate the value of premiums, and to keep those amounts in a fund where they can earn yields. However, there must be a review of existing restrictions in order to maintain reserves in accordance with the budget legislation applicable in each country. There are a number of financial instruments for retention or self-insurance, and institutional arrangements available.

² The securitisation of assets is defined as the issue of securities (in this case, Cat Bonds) using one or more assets as collateral for the issue. In this case the assets that support the issue are the insurance premiums received from the insured

³ Patricia Grossi and Howard Kunreuther (2005). Catastrophe modeling: A new approach to managing risk, Springer Science.

A subnational or national government may therefore promote actions to retain part of the risk. As shown in Figure 2, the intention is to cover the probable LE-LA losses through financial mechanisms for retention, and the most suitable instruments may be the following.

- *Disaster funds.* The authorities may create funds to attend to disasters. The committed resources in that account may be kept in liquid assets -paper or bank accounts- which can be cancelled quickly with no major transaction costs. To the extent that funds are required to meet contingencies and catastrophic events, the investments must carry a low level of risk, and indeed a correspondingly low yield: in effect, they should be simply considered as "sight deposits". Naturally, the problem lies in the fact that the government pays an opportunity cost, since the same funds could be used for other investments at higher social yields, such as in education, health or employment programmes. However, the decision will depend on the balance between marginal costs and benefits in keeping money idle, until the rainy day occurs.
- *Debt.* The government may resort to local or international financial markets, and request loans to cover the direct costs of a disaster or it may contract contingent credit. In the case of loans, the main problem lies in obtaining funds, since in a disaster situation the demand for credit increases in all sectors, and this makes funds and financial risks more expensive. Intermediaries will be less ready to make loans, and possibly rationing problems may become more acute. Also, if losses are excessive, it is possible that the government may not be able to obtain the funds it needs, and will have to resort to the help of social institutions or the international banks. The loans may be even more adverse in their conditions for lending to the administration if there is no endorsement or support from central government, particularly at a time when risk ratings for public debt bonds will have suffered significant deterioration. On the other hand, the problem of contingent credit is similar to that of the disaster fund: the government takes on a financial cost which entails reducing expenditure in other areas of greater social profitability.
- *The issue of new debt in the form of bonds.* One alternative to obtain funds is the issue of public debt bonds. Again, this source may be seriously limited if the market considers that the fiscal situation has deteriorated, and therefore requires a high risk premium which may make the placing of new paper on the market almost impossible.

Captive sources for retention and transfer

Amongst the alternatives for risk transfer which are complementary to the traditional structures of reinsurance obtainable on the local insurance market, with known legislative and restrictive characteristics, there is also the interesting product, analysed in the competitive offshore market, which is defined as captive insurance. In practical terms, "captive" is a corporate entity created and controlled by a parent company, a professional association or group of companies, whose sole purpose is to provide hedging against the risks of the parent company, association or group, as an alternative to the acquisition of insurance in the traditional market. The main categories of captive companies are:

- *Pure captive*. 100% subsidiary of another company, ensuring it exclusively against specific risks
- *Mutual captive*. In Shaw's collective risks of specific members of an industry
- *Association captive*. Provides cover to individual risks of members of a professional, commercial or industrial association.

The captive companies represent commercial advantages for businesses which incorporate and capitalise them. They are ideal vehicles to reduce costs (giving coverage against cheaper premiums, and contracting reinsurance through them without the need to acquire policies on the traditional insurance market); they help to provide better and more comfortable management, and facilitate the cash flow of the economic group or company in question; and this all aids economic growth. A captive company is an insurance or reinsurance business -depending on its nature- organised by an economic group, for the benefit of companies which form it, incorporated under some special foreign legal regime such as that of the Bermudas or Cayman Islands, where there is a strong market for insurance and reinsurance, domiciled and with registered offices in the country of incorporation from where it operates, with its own infrastructure or using facilities provided by an insurance or reinsurance management company for captive business, recognized and accredited, to insure all the risks of the same economic or business group or institution to which the captive insurer or reinsurer belongs, from abroad.

The incorporation of a captive insurer or reinsurer is mainly a response to the need to reduce costs paid in insurance premiums, and to achieve better risk management, pursuing fiscal advantages under certain legal systems. Through this legal figure or instrument, a business can manage or administer its own risks, and at the same time retain premiums paid for insurance. The risks to be insured by the captive are selected, such that important risks are insured by alien companies to the economic group. The premiums are set by the captive itself, which belongs to the business or businesses that contract the insurance. The premium is paid to the captive insurer or reinsurer abroad, where the latter has its registered offices, and where the risk is insured. The expense incurred by the takers of the insurance, and which form part of the same group as the captive company, is in many cases tax-deductible, since the payment of insurance premiums is considered to be necessary expense for the generation of income.

Optimum financing structure

To summarise, the State basically has the responsibility to cover or insure its assets, public infrastructure, and the low-income sectors of the population. But the insurance of assets in public infrastructure should be contracted with insurance companies, which will transfer part of the risk to reinsurers, who in turn will pass it on to the capital markets. This is justified by the fact that these are businesses which have experience in the design of financial instruments to securitize catastrophic risk, and furthermore, they are represented in the securities exchanges on which this type of security is traded.

Further also, this coverage of the low-income population must be achieved by incentive schemes to promote competition within the communities, in terms of government measures for mitigation and subsidy, whose purpose is to bring this population to take insurance with the private sector, over the longer term.

2 DIAGNOSIS OF FINANCIAL MANAGEMENT

In recent years there have been important changes in legislation and institutional structure for risk management in many countries of Latin America and the Caribbean. Despite this, it is difficult to find financial measures which would lend sustainability to this particular form of management, and not only in countries with little room in their budgets. In general, the institutions which coordinate and execute policy in this area will say outright that, except in special situations, they have not been able to secure enough funds, either to attend to emergencies or to encourage the reduction of risk through activities of prevention and mitigation. In general, they say that it is difficult to speak of progress in the availability of resources and the sustainable use of funds for institutional development in this area, in a way which could be claimed, even with limitations, in other fields of development in other sectors.

This is a genuinely delicate situation. While some countries, such as Jamaica, have a greater awareness of the need to have the right institutional structure to manage the risk, however partially or imperfectly, it is a matter of concern that these institutional adjustments are not matched by the availability of budget funds required for the normal development of that institutional responsibility. In particular, because of the introduction of changes in institutional structures or arrangements, percentages of allocation of budget resources or reserve funds have been defined, but in practice and in most cases, they have not been implemented.

Further, even accepting that there are allocations for risk management in institutions through the ordinary state budget, when we try to obtain figures from the institutions themselves or from agencies that control the budget in each country, with very few exceptions we find that the information is not available, or highly scattered or simply non-existent. In conclusion, there are major limitations in information. The main problem is that in the records of budget allocation we usually find information which refers only to "attention to emergencies", for example, to identify resources earmarked for reserve funds (where they exist), or simply to refer to the running expenses of operating agencies or inter-institutional coordination and their internal programmes. These programmes are usually very modest, and refer to activities to promote and inform the public. Unfortunately, figures for investments in mitigation and prevention in Jamaica are mixed in with many others which do not refer to risk management properly speaking, or which simply cannot be differentiated or explained because they are institutional actions for development proper to the ambit of the agencies. This situation also applies to the payment of mandatory insurance, since undifferentiated joint payments are made, containing a range of cover, not only related to the financial protection against disaster.

In other words, in Jamaica, as in most countries in Latin America and the Caribbean, there are no information systems or specialised agencies which process or establish the terms on which the various entities which should supply it, so that it will be reliable and useful for comparative study. This is of very great importance, since the existence of these mechanisms allows priorities to be established and resources to be allocated in favour of high-risk zones, for example, and at the same time there will be a clear definition of the adjustments needed in national and regional programmes for risk management.

Finally, we should not forget that Jamaica does not have a well-developed financial market, and even less, a culture of insurance. This makes it difficult to diversify risks and to use market mechanisms in order to transfer losses to specialised agencies in this area. Although there have been improvements, there is also no clarity as to how the risk management policy is to be integrated into social policy, or how to coordinate operations in decentralised schemes of social protection networks. In most cases, the policies for the reduction of poverty are implemented separately from actions taken to manage disaster risk.

The real effectiveness of inter-institutional structure created in a Jamaica, its financial resources, degrees participation and support vary greatly, and are often deficient in the matter of risk reduction. It is still true to say that the problem of disasters is really important only when an event of a certain magnitude occurs and solidarity demands a major government response. Interventions have been specific and project-based or product-based, while what is wanted is support for processes over longer periods of time than those which have been sustained so far.

The absence of proper risk studies

Despite the substantial amount of research which has been conducted internationally in relation to the impact of disasters on development, the formal incorporation of disaster risk in national planning processes is still very tentative. As already noted, although Jamaica contains some items in its budget, mainly to attend to emergencies and to provide a budget for some agencies to operate, and in some cases efforts are made to direct resources towards planning activities for risk mitigation, there has so far been no calculation of probable losses due to natural phenomena as a permanent component of the budget process. If potential contingent losses are not calculated, there will be no information of the kind required to consider or evaluate alternatives designed to reduce or finance those losses. Therefore, policies designed to reduce risk do not in fact receive the attention which they need. Although in Jamaica there are large numbers of studies, principally referring to threats, their focus and methods for most part mean that they not useful in making estimates which would allow decisions to be taken on the transfer and financing of risk. The fact is that risk represented by dangerous potential natural phenomena is not understood, and this has a number of important implications. The most obvious is that if there is no understanding of the contingent exposure to natural threats, there is limited local capacity country to evaluate how desirable financial planning tools might be to combat the risk. These tools, of which insurance is the best-known, require that the risk should be reasonably quantified as a precondition for its use. While it is possible to adopt policy decisions without probabilistic decisions, the fact that there is no related quantification shackles de decision-making process. Only a few countries have in recent years become aware of this limitation, and have tried to solve it by promoting studies more relevant to this type of public policy in risk management; and this consultancy is one contribution in that direction. Efforts which have been made in Colombia and Costa Rica, and on a smaller scale in Peru, are a good practice which has been identified as an activity to be promoted in Latin America and the Caribbean, and results of this consultancy are now an important contribution to countries which have been the subject of specific studies of catastrophic risk due to extreme events.

The studies of risk from a probabilistic point of view⁴ enable us to assign a value to the responsibility of the state and its fiscal capacity. In recent years studies have been made on this subject in Colombia, due to the interests of ministries or public finance departments; and in Costa Rica by the insurance institute INS; in Jamaica and other Caribbean countries, work has been done due to the interest in promoting the Caribbean Catastrophe Risk Insurance Facility (CCRIF), with the support of the World Bank. Other countries, such as Peru, are currently exploring the possibility of making studies of this kind in greater detail. In the context of this consultancy, this type of study has been made, using a proxy for Bolivia, Guatemala, Jamaica and Peru, which is now an important step forward to encourage the financial protection in these countries. The objective of this type of study is to obtain information which will allow countries to explore agreements between government and insurance/reinsurance companies to design the appropriate financial instruments for transfer. It is important to note that arrangements such as catastrophe bonds have been considered as feasible instruments due to their possibility of trading them on the capital markets; one such case is the catastrophe bond developed in Mexico. In terms of optimization, most have reached the conclusion that the least expensive and most efficient options are in general: insurance, captives, and contingent loans.

There are precedents, such as the government of Colombia, which contracted a contingent loan of US\$150 million, for immediate disbursement in the event of a disaster declared in accordance with local law. Other similar cases have been agreed in Costa Rica and some other countries are exploring the possibility of obtaining contingent loans of the same kind. Further, Colombia is exploring the possibility of a mass negotiation of insurance premiums for national public property and property in the city of Bogota, which would produce economies of scale. This payment would be made once the amounts concerned had been agreed with the reinsurers, and would be disbursed by the Ministry of Finance and the Bogotá treasury department. With regard to public properties in regional administration, there are difficulties in bearing the cost of protecting public assets, but it does not seem appropriate that central government should bear the cost. Therefore, a study is being made of the possibility of taking up the percentage at subnational level. Here, the intention is to encourage the production of studies such as that made in Manizales, which has for some years insured all public buildings, and has promoted a collective insurance for private buildings which is collected along with the property tax. This city made a detailed evaluation of seismic risk for each building and of the complete portfolio, in order to optimise the policy to transfer and retain risk in the city.

The conclusion is that it is important for Jamaica to have special studies of seismic micro-zoning and to update property registration data required to be able to make this kind of evaluation, which has shown been shown to have many benefits and advantages both from the point of view of financial protection and from the point of view of risk management in general. These developments are very recent, and in part are still no more than paper proposals. Therefore, it is not possible to make an evaluation of their effectiveness or sustainability, but we consider that these initiatives are innovative and beneficial and that they could be promoted nationwide.

⁴ This allows Probable Maximum Loss, annual expected loss and pure premium to be calculated.

Low level of private insurance underwriting

In relation to insurance in the private sector, we should note that Latin America and the Caribbean account for only 1.5%-2% of worldwide insurance premiums written. It is therefore one of the markets with the greatest prospect of expansion in terms of penetration of insurance: business has increased, but the level is still low. In general, it is an incipient industry, and has major defects.

In Jamaica, the insurance companies, brokers and reinsurance companies are part of the financial and insurance system, which is regulated by Insurance (Finance or Banking) Superintendencies, whose main function is to guarantee the rights of the insured, and to secure the development of a healthy and competitive insurance market. The insurance sector and Jamaica is highly concentrated. Life and automobile insurances represent the bulk of the market. The share of disaster insurance is very small and represents a tiny percentage, most of it being represented by earthquake insurance. The demand for reinsurance is very limited. There are a number of local companies which act as reinsurance brokers. However, the reinsurance service is usually supplied by foreign companies accredited by the Superintendencies. Reinsurance treaties are usually much too onerous due to the precarious nature of available information. On many occasions, the treaty is made through a broker, and the primary insurer and the reinsurance company have no contact with each other. A more reliable and accessible information system would make it easier to expand the market for this type of treaty. Companies that manage layers of reinsurance of the higher layers of insurance usually diversify the risk in the capital markets, through a range of financial mechanisms.

It is important to appreciate the novel character of collective voluntary insurance for private property in the region, as promoted by the municipal administration of Manizales, Colombia. A summary description appears in Annex 2. The insurance premium is collected every two months, along with property tax instalments. This insurance has been working since 1995, and has been gradually refined.

The objective, aside from encouraging a culture of insurance in the private sector, is to provide subsidised protection for the poorest groups, who cannot afford to pay for insurance or state-tax (and indeed, their properties are tax-exempted). The Bogota city administration is currently exploring the promotion of a similar collective voluntary insurance. Central government has been making a careful study of this case in order to replicate it in other cities, and consideration has been given to the possibility of bearing part of the cost of protection and/or retention, depending on the deductibles to be borne by the municipality in the case of exempted properties. This type of instrument or protection for the poorest in the private sector may be promoted throughout Latin America and the Caribbean.

It is also important to mention the Caribbean Catastrophic Risk Insurance Facility (CCRIF), which is a mechanism of joint reserves designed to provide short-term liquidity for the contributing countries, immediately after the occurrence of a natural disaster caused by hurricane or earthquake. The Caribbean countries, due to their small size and scale of resources, have little financial capacity to meet the needs of natural catastrophes, unlike larger countries which can divert resources from areas which have not been affected to areas which have. This lack of

financial capacity leaves the Caribbean countries also on the sidelines of access to external credit, which, even if they could obtain it, would take time to disburse. CCRIF is a tool which allows access to the international financial markets, placing the specific risks of each country in a common and diverse portfolio. Thus, the participating governments can obtain similar cover for the loss of opportunity in the wake of a catastrophic event. CCRIF acts as an insurer, retaining part of the risk ceded by the participating countries and it acts as intermediary between them and the international reinsurance market.

Conclusions

Even in the case of far-reaching changes in legislation and institutional structure, it is difficult to find financial measures which will lend sustainability to risk management in general, and in particular, where budget funds are short and the options to transfer losses to third parties are few. Most of the financial measures which have been most appealing in terms of functionality and sustainability in Jamaica have been the reserve funds for response and prevention, as instruments of co-financing, and incentives for local or municipal effort. At the same time, where institutional functions have been clearly established, and budget allocations have also been well-defined, based on the rules for public spending, there has been a greater participation by the agencies responsible, and a greater stimulus for investment by sectors of civil society and the private sector.

Although in Jamaica there are budget items specifically earmarked to attend to emergencies or to finance certain agencies, and in some exceptional cases, for the planning activities referring to risk reduction, in most countries the probabilistic of loss are not calculated (true evaluations of risk), in relation to natural phenomena, as a permanent component of the budget process. Clearly, if the potential losses are not calculated in terms of contingent liabilities, fiscal responsibility or residual risk, there will be none of the information needed to consider and evaluate alternatives to reduce or finance those losses. As a consequence of that, no policy designed to reduce or transfer the risk and provide a natural protection receives the attention it really deserves.

It is therefore of special importance that central and regional government must become more aware of the importance of adopting measures to diversify disaster risk, particularly those which relate to damage to physical infrastructure. Mechanisms such as insurance will allow the fiscal burden of the government to be reduced after a disaster. Based on the definition of the responsibility of the state, the value assigned to it, and fiscal capacity, mechanisms of protection can be established. The responsibility of the state in the face of possible disasters is basically for infrastructure and public buildings, and the low-income groups who cannot afford to acquire insurance policies. In relation to this policy, there have been only incipient achievements in Latin America and the Caribbean. Further, there is a consensus that the private sector, and the middle and high-income groups, should take out insurance policies for themselves in the private sector. However, there are inefficiencies in the local insurance market which cause problems of offer by the insurance companies (high prices and restrictions on the sums insured). In these terms, if these sectors of the population in Jamaica are to be covered, there will have to be some appropriate regulation of the insurance market, and companies will have to look for capitalisation. On this last point, some progress has been made, but an important effort is also needed from the government to improve and accomplish the transfer of risk into a consolidated, sustainable policy.

3 DESCRIPTION AND PROPOSAL OF FEASIBLE ALTERNATIVES

We now present the mechanisms for financing coverage of the state risk, taking account of the role of national government, and the possible participation of sub-national administration. For this purpose, we will provide a general explanation of the existing instruments and financial innovations available today around the world to face disasters, with some comments on the context of the country, in order to find what possible financial schemes might be used by national and regional government. At bottom, what is wanted is a detailed examination of the workings of the insurance and reinsurance market, with a capacity to cover the risk of disaster, and its eventual limitations; and on the other hand to present instruments which the capital markets have recently developed as a complement to the insurance industry, as a way of distributing the risk of major losses from disasters, through diversification. At the same time, there is reference to the deliberate retention of risk, and the importance of mitigation or reduction of physical risk, given its relevance in this context, although the transfer of risk is an ex-ante measure which allows resources to be pre-allocated among the State's contingent liabilities, but this in itself is not a measure of mitigation, since it does not reduce the potential physical damage.

This will be the basis, in conjunction with existing evaluations and technical support, for Jamaica to be able to analyse options and technical, financial and legal implications; and to make a proposal for an optimum scheme of financing. For this reason, it is desirable that the proposals developed here should be made known to officials responsible for this type of issue at national level, and that their opinions, suggestions and comments should be disseminated.

3.1 Transfer of financial risk

Extreme disasters are characterised by the occurrence of quite rare and highly severe phenomena, in addition to the fact that it is difficult to predict the time or place where they will occur. Due to their characteristics, the losses which these events cause give rise to solvency risks in the insurance market, increase the price of the premiums, and reduce the offer of available insurance and reinsurance, thus creating major distortions which will harm the efficiency and functioning of the market. The capital markets have provided a response to this problem by developing financial instruments which are complementary to the insurance industry, and which make it possible to transfer and finance the financial risk which are represented, for the insurance and reinsurance companies, by the losses which they may suffer due to the occurrence of a disaster (disaster risk, in economic terms). In this way, we can now present a study of the financial mechanisms available in the insurance, reinsurance and capital markets which may be alternative ways to finance and transfer possible losses generated by extreme disasters away from the state. Specifically, the intention is to define the functioning and structuring of each of these instruments, to place their current position in the markets mentioned in context, and in a subsequent phase, to provide estimates of the risk or exposure of the state depending on the responsibilities to be assumed in the event of disaster, and risk scenarios considered as reference points, with an analysis of technical, legal, fiscal and budget capability, cost, and possible processes of disbursement.

The insurance and reinsurance industry

Insurance is a financial arrangement that allows the transfer of risk (understood in this case as the potential economic loss) to an insurance company. Usually, insurance is based on the law of large numbers (insured events are seen as independent of each other, the probability that many will occur at the same time is low). However, for disaster insurance, such as that for earthquake or hurricane, the situation may be different, since the loss may occur simultaneously to a large number of properties over a wide area. In such cases, it may be said that the losses are correlated. The lower the correlation, the lower the risk of loss to the insurance company.

Insurance is a product which addresses a market. It has a value for the client and, and it has a price (premium). But the insurance business has a characteristic which distinguishes it from most other consumer products: the cost of the product for the insurer is determined only after the product has been sold. The cost depends on claims paid during the life of the policy, and therefore expected losses and other costs must be estimated in advance. These estimates are the work of actuaries, who must similarly project payments of insurance. Disaster insurance, for its part, is a major challenge for actuaries, because the past cannot necessarily be used to predict the future. Actuaries have to rely increasingly on scientific knowledge and engineering when trying to quantify the probability of relatively rare and highly severe events, and their effects on elements exposed to them.

Insurance policies include a kind of deductible, which means that the insured must cover the first part of the loss. This means that the insurance company is only liable for property damage when the amount exceeds the percentage of loss established in the deductible, and for up to a maximum also specified in advance as the cover limit. In order to reduce the size of its loss, the insurance companies resort to high deductibles, or to co-insurance arrangements, in which the insurer pays a fraction of any loss that which occurs, producing an effect similar to that of a deductible. Insurance companies use the reinsurance industry to transfer their own risks and manage them. Therefore, in order to cover the excess of loss, insurers usually turn to reinsurers under treaties which provide cover as from a certain amount agreed, which may also have a limit, or share the losses above a certain threshold, in proportion to some definition made in advance. The reinsurance companies write policies for different parts of the world, and thus they distribute their risk geographically.

The insurance companies need answers to questions such as these:

- What is the expected annual loss? Based on the estimate, they can define how much the premium should be, that is, they identify what makes a difference in the determination of the premium to be collected.
- How can the company adjust the premium for different conditions of place, types of building and quality of construction? Each building is different in terms of structure and particular conditions, some are built on rock, and others on soft soil. Due to the circumstances, the annual expected loss for each may be different in case of earthquakes.

The annual expected loss, or pure premium, is the expected value of loss which may be suffered in any year. This is the annual amount which is to be paid in order to secure a balance of premiums paid and losses covered in losses indemnified in the long term. One hypothetical example is illustrated in figure 3: a premium of a 0.15 per mil provides long-term cover to all possible future losses.

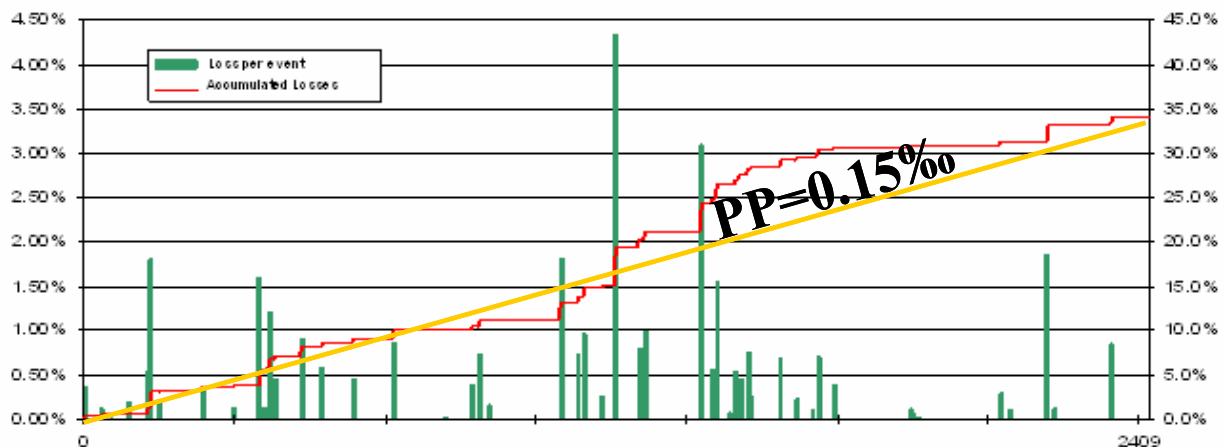


Figure 3. Losses due to small and large events over a long period of time

Further, the probability of the maximum loss in a defined period of time must be determined for the purposes of each company's portfolio. This estimate, known as the probable maximum loss (PML), for which there is no standard (200, 500, 1000 or more years return period), is basic information for the companies and regulators, in order to guarantee solvency, and therefore to know whether additional funds are required over and above those available to attend to excess of losses arising.

Governments in general have exercised strong pressure to maintain the availability of disaster insurance at a price within the reach of home owners, and at the same time, the insurance companies want to increase their prices for this type of cover in order to reduce their risk and remain profitable and solvent in the event of a major catastrophe. This conflict has created major tensions between industry regulators and insurers in places where risks are high. It has been one of the factors which have encouraged the setting up of complementary insurance and reinsurance mechanisms.

We often hear that the purchase of insurance should be mandatory in order to distribute risk and to make disasters insurable. However, some critics say that if the objective of the policy is to ensure that the owners of low-risk buildings are subsidising the owners of high-risk buildings, then instead, there should be some kind of mandatory levy or tax. Also, it is not clear why insurance should be sold to cover old buildings, since policies usually have cover for the replacement of the building destroyed, which would have to be new, and whose value in such cases would be far greater than that of an old building. Another argument against mandatory insurance is that strategies to increase insurability will not be feasible, because the insurer has no opportunity to select the risks or to control the probable maximum loss. Nonetheless, some countries have shown interest in promoting mandatory insurance, at least for up to a defined

value. One such country is Turkey, which after the 1999 earthquake created the Turkish Catastrophe Insurance Pool.

Insurance in itself is not considered to be a means of mitigation, because while it redistributes the loss, it does not reduce it. A carefully-designed insurance program can nonetheless help to encourage the adoption of measures for mitigation, by assigning a price to the risk and creating financial incentives through discounts applicable to premium rates, lower deductibles and/or higher cover limits, conditional on the implementation of these measures of risk reduction.

The *Pool* is a scheme in which, in common with the insurance companies, there is an insurance or an operation through which a number of interested parties threatened by a known risk organise themselves to be able to use the premiums collected in order to indemnify those who suffer a loss; but in this case the insured, when signing the policy, acquires the twin nature of insured and member of the pool, with all related rights and duties. This type of figure has been used by large businesses, and recently by some municipal administrations. From this we conclude that although there is no panacea, insurance and reinsurance play an essential role in sharing the risk of individual properties in the event of disaster, through the principles of portfolio diversification.

In addition to specific asset insurance, a country which has a proper system or comprehensive programme for risk management may well be in a better position to negotiate contingent cover for extreme events. Countries may achieve this by pooling, forming groups of retention, and/or by taking reinsurance with more favourable premiums and high deductibles, given the achievements recorded in prevention. Available insurance instruments may help countries to manage their risks more efficiently and effectively. That is, if a country does not buy insurance, it may in any event use the same industry to obtain availability of a contingency fund to cover unexpectedly high losses, provided that it has a good plan for risk management which promotes prevention and mitigation.

Reinsurance: roles and modes.

The insurer uses reinsurance to limit fluctuations in losses over time for which it is liable, and to protect itself against insolvency in the case of a disaster. There are different types of reinsurance which are important for the purposes of discovering the best schemes for risk transfer through this mechanism.

Proportional reinsurance. In this type of insurance, premiums and losses are distributed between the direct insurer and the reinsurer in a fixed proportion. This reinsurance may be on the basis of each party paying a share, or on the basis of an excess.

- *Quota share reinsurance.* In this type of treaty, the reinsurer is liable for a fixed sum for all policies which the insurer has underwritten in a certain class of insurance. The quota determines the way in which the direct insurer and the reinsurer divide up the premiums and losses. Due to its simplicity, this form of reinsurance is easy to manage, and usually saves costs. However, it has the drawback that it does not allow the risk of the largest losses to be effectively included, because it generates a risk portfolio which is not very homogeneous.

- *Excess sum reinsurance.* In this type of reinsurance, the direct insurer retains all the risk up to a maximum limit of the sum insured. Above that limit, the reinsurer is liable for the rest of the sum insured. The reinsurer obligations are limited to losses no greater than a defined multiple of the maximum limit. A portion of the risk insured is obtained through this distribution of retention and ceding to reinsurers, and this determines the way in which premiums and losses will be divided up.

Non-proportional reinsurance. In this type of insurance, losses are distributed in accordance with actual events. The direct insurer defines a specific amount up to which it will be liable for all losses. This amount is known as a priority or deductible. Where the loss exceeds this deductible, the reinsurer will be liable for payment of the remainder, up to the limit of cover agreed. Unlike proportional reinsurance, the reinsurer must calculate the price of reinsurance based on statistical information and the distribution of probabilities of the threats. One of the non-proportional types of reinsurance is the excess of loss reinsurance business.

- *Excess of loss reinsurance.* This is the type of reinsurance most commonly used for disasters or catastrophic risks. In this type of reinsurance, the amounts of losses are those which determine the proportion of risk ceded. In this mode of reinsurance, the direct insurer takes full liability for the loss up to the amount determined by the deductible in the total policies in a given class of insurance in the treaty, regardless of the amount of the sum insured in them. Losses exceeding this amount established by the priority must be paid by the reinsurer. The reinsurer only takes part in payment of losses which are in excess of the priority.

3.2 Transfer and financing in the capital markets

The capital markets have a new and emerging role in the transfer of catastrophic risks. One basic characteristic of more solid economies is a system of well-developed capital markets. These systems place savings and investment capital in several sectors of the economy, following rules based on risk and reward. In practice, the financial risk is packaged and transferred to investors through financial instruments, as well as through own funds (such as common shares), stocks or derivatives (options for securities, future interest rates, for in trade, future trade contracts). There is therefore the possibility of transferring risk from sectors which have to bear them (owners, in the wider sense), to capital markets, as an alternative which is increasingly being used.

As mentioned, the lack of capital capacity in the insurance and reinsurance sector, locally and internationally, of a size to support the financing required by a disaster generates a scarcity of the offer of reinsurance in countries which are prone to this type of risk, with disproportionate increases in insurance and reinsurance premiums, and in general a major distortion of the proper functioning of markets. On some occasions, depending on the size of the disaster, local capital markets are not able to absorb the demand for funds and liquidity which this type of disaster requires. Even the global insurance markets have been through times in which there has been a slight increase in the frequency of disasters, and this has brought them to very low levels of capital and solvency. Finally, local governments do not have the capacity to finance losses from this type of disaster either, due to their limited fiscal capacity.

There is no theoretical reason why it the risk run by investors in the case of disaster could not be securitised. At present, market forces have accelerated the convergence between insurance and the capital markets, allowing issuers who have ambitious growth plans or excessive exposure to disaster to be able to have direct access to other sources of capital. Further, investors have the opportunity to invest in new kinds of asset which are not correlated to other debt or risk funds, while earning an attractive return. The portfolio risk in conventional securities increases with the addition of non-correlated items, and the significant improvements in methods of management and modelling techniques may ensure that investors unfamiliar with disaster insurance can understand and accept the quantification of the risk.

Table 1 summarises some of the benefits for issuers (sellers), and investors (buyers) of disaster risk.

Table 1: benefits for sellers and buyers of catastrophe risk

Issuer	Investor
New sources of risk capital	Attractive valuation gain
New capacity for risk capital	Non-correlated diversification
Knowledge of financial structures	Sophisticated risk estimating
No credit risk	Competitive comportment
Stable prices	

Securitisation has its costs. There are commissions, risk analysis, placement in external companies to reduce taxes, accounting and/or regulatory matters, legal costs, and associated printing costs. These costs increase the discount on securitisation, and in the time and money required for a new product. In addition, securitisation is promising, but the feasibility of looking at a low-cost alternative for catastrophic risk which can be obtained in the traditional market, is not. Over time, it is reasonable to think that there will be some very competitive sources for the placement of catastrophic risk insurance, especially after certain regulatory aspects and matters of accounting and tax have been resolved.

Further, and going back to the conceptual elements of the capital markets, one way of classifying these markets is to determine whether these securities are "new", that is, whether the acquisition is made directly from the issuer, or whether the security is being dealt between investors. In the former case, the market for new securities is called the primary market, while in the second case the market for securities already issued (or dealt between investors) is the secondary market. The secondary market gives liquidity to the market as a whole, and allows issuers of securities or financial assets to determine the receptiveness of investors to the new securities issues. This in turn will allow us in subsequent sections to make an analysis of the demand for financial instruments. Starting with these basic concepts, we now presents the financial instruments used to finance and transfer risks related to disasters in the main capital markets.

The purpose of this section is to present the financial instruments which are available today in the main capital markets, and which may be an alternative for disaster financing in Latin America and the Caribbean. We will give a basic definition of the structure of each instrument, with an explanation of the general form and a general way in which it is appreciated in the market. In

general, there are two types of instrument which should be considered: financing instruments, and risk transfer instruments. In the financing instruments, the issuer of a security or instrument must at some time return the capital sum to the investor which the investor has provided in exchange for security; and in the risk transfer instruments, the investor runs the risk of losing his capital, but earns a high return.

Bonds

Bonds are fixed-rate financial assets. As in any other bond, the investor buys a security for a certain sum (principal), which will be returned to him at the end of a certain period (maturity date). In the course of this interval of time, he receives coupons (cash flows based on the interest offered by the bond), on a regular basis. These bonds are differentiated from a simpler form of bond in that they are subject to credit risk (risk of default by the issuer) for all or part of the principal amount and/or of the coupons, should a certain and previously specified disaster occur; and this converts them into risk transfer instruments. The funds obtained from the sale of the bond invested at a risk-free rate, and yields on the investment are then also used to pay the interest or coupon on the bond. As compensation for the credit risk, interest rates and yields are greater than those usually offered on the market.

The bond agreement mechanisms which are to be used to determine the circumstances which will cause all or part of the principal or coupons to be used to finance the disaster, called “triggers”. They may be of two types: indemnity for loss, or payment based on indicators. In the former case, compensation is determined based on the sums insured by the insurance company issuing⁵ of the bonds. Although this alternative gives good cover in losses for the issue, it may generate problems of moral risk, and adverse selection⁶. In the latter case, the basic idea is to use indicators which may not be influenced by the insured, and which have a direct relationship with the disaster risk cover which the bond or security is giving.

In addition to these indicators, some treaties are established on the basis of parametric indicators with information on due to geological or climatic conditions, such as for example the Richter scale of magnitude, in the event of an earthquake or the velocity of wind in a given area. Unlike the former case, in this case there may be a basis risk, that is, the risk that the indicator does not properly reflect the true losses which a disaster might generate.

It is worth remembering that the CAT bonds have some advantages in comparison to other financial schemes for risk coverage, although we have a long way to go before they are frequently used (i) the CAT Bond does not offer credit risk, that is, the possibility that the insurer or insurer will not pay the government does not exist, since the money for paying the losses was delivered by the investor who bought the bond; ii) if the catastrophic event occurs, the government immediately has the funds to combat the disaster, and does not have to wait for the insurer or

⁵ Although as mentioned earlier the issuer is usually the SPV, it is only an intermediary, and the party that really wants the funds in this type of operation is the insurance company. It is therefore assumed that it is the issuer

⁶ Moral risk here refers to a situation in which the insured neglects preventive measures established in the insurance contract (treaty) and may thus report excess losses. Adverse selection occurs when one of the parties to the treaty has information on the basis of which he obtains more favorable terms in the treaty (Andersen, 2002; Lewin and Davis, 1998)

insurer to pay; iii) the cost of the bond to the government may be lower than the insurance premium, should there be an insurance company prepared to insure damage caused by the catastrophic event; iv) the CAT bond is not correlated in the financial market, and therefore it is useful in the diversification of investment portfolios; (v) the issue of a bond may avoid serious distortions in government budgets which could occur after a catastrophic event, if it were necessary to increase taxes, or to impose a special tax to finance government spending to repair damage caused by the disaster⁷. However, as mentioned, the CAT bond is not an alternative to replace insurance except in relatively special cases, for lower layers of cover. CAT bond is without doubt of interest for the higher layers and a, relatively, large portfolios, where the cost of insurance is not optimum.

Therefore, governments or insurers may become issuers of this type of bond, and transfer part of the risk to be insured to the market. Further, investors see this type of financial instrument as an attractive investment alternative, not only because of the higher yield but also because of other factors, such as the low probability that a disaster will occur., the absence of correlation between the credit risk of the bonds and market movements, and the possibility of reducing the risk of loss through diversification of securities from different parts of the world (a low probability that two natural disasters will occur at the same time into different parts of the world)⁸.

Contingent surplus notes

Contingent surplus notes belong to the type of financial instrument known as options. Options are financial derivatives, that is, they derive their value from the price of an underlying or base financial asset. In contrast to futures contracts, an option contract is defined as a contract which grants the right (and not the obligation) to buy -a call option- or to sell -a put option- an underlying asset, such as currency, shares, bonds, indexes, amongst others), on a future date at a price set today. In an option contract, there are two parties –the issuer or seller, and the buyer. The issuer sells the option to the buyer in exchange for a premium or option price, and further, is the party to the contract which has the obligation to complete the option. The purchaser, by definition, has simply acquired a right (and not an obligation), and therefore his maximum loss will be the premium or price which he paid to acquire the option.

The price of an option on the market basically depends on six factors: the current price of the underlying asset, the price at which the underlying asset is valued in the option contract (strike price), the time remaining before the option expires, the expected volatility in the price of the underlying assets over the life of the option, the short-term risk-free interest-rate, and finally, advance cash payments made against the underlying asset. The effect which each of these factors has on an option price depends on the type of option (put or call) which is being analysed.

⁷ J J Fernandez Durán and MM Gregorio Domínguez (2005) Valoración actual de bonos catastróficos para desastres naturales en México” El Trimestre Económico Vol LXXII No, 288 October-December

⁸ In some cases, there is the impossibility that two mutually exclusive events could happen at the same time in the same area, and this makes this type of security attractive (e.g. drought and flooding).

Catastrophe options trading on exchanges

As their name indicates, these are financial derivatives -options- where the underlying assets or base asset is an industry index⁹ (PCS, RMS and Carpenter index, amongst others), for insurance which reflects the amount of funds which insurance companies have had to disburse as a consequence of the coverage of their policies (payment of losses). These options are sold by investors, and can be acquired or bought by insurers or reinsurers. The options therefore give the right to the insurer or reinsurer to demand cash payment by the investor or seller of the option when the index (underlying asset) goes above a certain level. In these terms, these catastrophe options are instruments of transfer (and not of financing), of the disaster risk. In order to assign value to this type of option, arbitrage arguments are used, to construct binomial models and Black-Scholes-type models. Finally, we should note that these options are currently traded on the Chicago Board of Trade (CBOT) and on the Bermuda Commodities Exchange.

Catastrophe Equity Put.

In this case, the purchaser of the option is an insurer or reinsurer, and the seller is the investor. These options give the buyer the right to sell his interest in the equity to investors at pre-negotiated prices. So, if the loss from a disaster exceeds a certain level, the insurer exercises the option and sells his interest in the equity to investors, obtaining immediate liquidity. By their nature, these financial instruments are used to finance risk and not to transfer it. Currently, they are also dealt on the CBOT and the Bermuda Commodities Exchange.

Catastrophe Swaps

Swaps are financial derivatives, and are defined as agreements in which the two parties undertake to "swap" payments at a set regularity. The amount of each payment corresponds to a proportion or rate on a notional principal.

In catastrophe swaps the insurer undertakes to make certain regular payments to the investor¹⁰, and in exchange the investor will make payments to the insurer in the event of a disaster, or may otherwise make all payments generated by a portfolio of insurance, when a disaster occurs. The indexes already mentioned (PCS, RMS, etc) are used to determine when the investor must make payments to the insurer. This financial instrument may, due to its nature, be classified as an instrument which transfers risk.

Climate derivatives

These are financial instruments which derive their value from an underlying asset which in this case are indicators which give information about climatic conditions, such as temperature,

⁹ The use of an index or indicator instead of another underlying asset may create additional risks in this type of operation, the "base risk". It basically consists of the fact that an indicator or index will not properly reflect the loss on assets caused by a disaster, and hence the possibility that it will not cover certain types of catastrophe.

¹⁰ In a way, due to the nature of the financial asset, these payments, like those made on other financial instruments, are similar to the payments an insurer makes to a reinsurer.

seismic activity, drought, flooding, hurricanes, etc. Basically, the instrument consists of a contract in which the party purchasing the instrument receives payment at the time in which the indicators exceed a certain limit. Thus these instruments are used to transfer risk.

3.2 Retention of financial risk

Losses generated by natural disasters may represent very large amounts of money, and may exceed the risk coverage achieved by using a single financial instrument. However, these losses can be segmented into different ranges or layers, and a specific financial instrument may be used in each layer. In this way, and in most cases, the best option to cover the risk of the primary insurer, which may be the government, is to combine insurance or reinsurance with other financial instruments on the capital markets, and even to retain losses with an appropriate financial criterion through a reserve fund, contingent loans, debt bonds, or through a captive offshore reinsurance company owned by the insured.

There is also self-insurance, which is considered to be a risk-retention choice. This strategy consists in taking measures to control risk, and to assume potential losses. Self-insurance is designed to improve the ratio between premiums and guarantees offered by insurance companies, and therefore to lower the cost of risks. Some say that self-insurance cannot be considered as a type of insurance, for the following reasons:

- There is no transfer of risk to another entity
- It is not normally based on the law of large numbers
- There are often no accumulations of reserves for the future payment of losses
- It may force funds or reserves intended for other purposes to be used, in the event of exceptional losses.

In this type of policy, there is the "tax" factor, which depends on whether the premiums and payments made for disasters or for retained risks may be considered as deductible expenses for income tax purposes, or whether there are special taxes applicable. Usually, the creation of funds and reserves for full or partial retention has no incentives, and therefore on many occasions it has been said that the situation should be reviewed. At government level, it is common to find that at the end of an annual tax period it is mandatory to return unused funds to the National Treasury. Exceptions must be made in budgetary laws for this type of national institutional reserve, and schemes must be worked out to solve this type of problem. One alternative is to create trust accounts. This has been one of the reasons why many developing countries have not found it possible to create efficient reserve funds for the reduction of risk, or post-disaster reconstruction, or even to attend to emergencies. And we must not forget that on occasion, these funds have not been properly estimated on the basis of risk evaluation, and it is no surprise that the necessary funds are not received in the normal process of disbursement of the budget. Possibly, in countries such as those of Latin America and the Caribbean, funds may have to be set up which allow a balance between investment and risk reduction (prevention-mitigation), and the transfer of risk.

Disaster reserve funds

The management of disaster risk requires the conjunction and coordination of actions by a number of agents: the government, families, and operators in the finance and insurance markets. Since almost always the interests of these agents are different from each other, there may be "prisoner's dilemmas", which leaves society without protection, and this can only be overcome if institutional mechanisms are established to favour co-operation and a reinforcement of commitment. Naturally, the agent who can achieve efficient equilibrium is the government, since the government has the funds and the instruments to implement actions directly and effectively.

Thus, a reserve fund can be created to attend to disasters. Accumulated funds in the account must be maintained in liquid assets, that is, in paper or bank accounts which can rapidly be realised without major transaction costs. To the extent that resources are required to face contingencies and catastrophic events, investments have to be low-risk, and therefore low-yield. In the last analysis, they should be considered as "sight deposits". Naturally, the problem lies in the fact that the government has an opportunity cost, because these funds could be used for other purposes with greater social yields, such as education, health or employment. However, the decision will depend on the balance between marginal cost and benefits, in having money lying idle until a disaster occurs.

A reserve fund, or trust account, can contribute its own resources to cover minor damage which has not been covered by insurance, when the government entities affected are unable to cover this from their own budgets. If the decision is taken to make this reserve to cover the first layer of retention (or deductible), in the event of a mass negotiation it could be expected that the transfer could also be a transfer to the fund of an amount for each entity insured, in order to accumulate the reserves which can be used to attend to damage up to the amount of the deductible. The fund could also receive such resources from the agencies involved for a specific purpose, in order to cover losses, and this situation would be consistent with the scheme in which each is responsible for making payment of premiums, and for provisions which will provide the reserves needed to cover deductibles. This form of management of a reserve fund would not offer many difficulties, and its nature would allow it to play its part.

At the same time, a fund of this kind might receive disbursement of contingent loan contracted for the same purpose, given that the process of contracting reconstruction and reparations would also be facilitated through the fund. Therefore, a fund could be proposed for minor disasters on the basis of the rule of accumulation and optimum spending, which can be defined as the basis of studies of the costs of minor disasters. The unconscious comportment of accumulation and spending in certain reserve funds in Latin America and the Caribbean, whose annual balances have slowly been declining, is a scenario which indicates that there would be no interest in any increase in minor disasters, or no change in the rate of losses in the future. This could be a very optimistic assumption and not very far-sighted, given trends in the region. The creation of one or more sub accounts in order to accumulate reserves for minor disasters, or for that matter, to cover deductibles or losses retained in the event of extreme disaster, would be of special relevance in stimulating the culture of precautionary saving, which the reserve funds now existing have not so far adopted. If properly justified, this could be achieved, though slowly. Unfortunately, these reserves are noticeable, or accumulate rapidly, and tend to generate a temptation to use the

accumulation funds for other purposes; or again, they are the object of criticism, due to the opportunity costs generated. This is the reason why a contingent loan may be a justifiable alternative from an economic point of view, and this depends on the cost of maintaining such availability.

Lines of credit

The government may resort to the domestic or foreign banking markets, and may request loans, whether to cover the direct costs of an actual disaster or to contract contingent loans. In the former case, there may be problems in obtaining resources, since in a disaster situation in demand for credit from all sectors increases, and this makes funds more expensive and increases the financial risk. Lenders will be less ready to grant loans, and possibly the problems of rationing may become more acute. Further, if the losses accepted are excessive, it is possible that the government may not be able to obtain the resources it needs, and will need to resort to the central authorities or international banks. The international banks may be even less willing to grant loans to central government, if there are no guarantees from central government, particularly where the risk rating of public debt bonds may have deteriorated significantly in practical terms.

Loans are usually used in the higher layers or ranges (top loss levels), where there is no way of transferring risk, or it becomes necessary to limit losses. In other words, if losses from a disaster exceed levels already covered by the insurance and other financial instruments, the excess may be covered by a line of credit from a multilateral such as IDB. This is usually the last option to be selected.

Contingent loans

In these lines of credit, the insurer pays a commission for an agreement which usually costs between 0.25% and 0.375% a year, or for a longer period, and guarantees that the institution will provide the funds of the time in which disaster losses occur, or exceed a certain value. For this purpose, there are also trigger-indicators or circumstances which are well defined -such as the declaration of a disaster by national government.

This scheme has been used in Latin America and the Caribbean by the governments of Colombia and Costa Rica, and it is being studied by other countries in the region, as a way of making resources available to attend to emergencies after a disaster. It has also been a mechanism used by governments to facilitate the formation of insurance consortia when contracting loans which will allow them to increase reserves available and to retain risk: but which are not disbursed if the losses which imply that they would have to be used do not occur. The fact of being the guarantor of this type of loan and paying a commission makes the state a facilitator for the local insurance industry to grow, reducing insurance for private individuals and the government itself, and enabling reserves to be set up which will put the consortium in a better position to negotiate with reinsurance. We should explain that the entities that grant lines of credit of this kind are in general multilaterals, and they address their efforts to ensuring that countries autonomously diversify their risk, generating systems of incentives to encourage diversification of agents, and promoting mitigation of physical damage.

3.3 Transfer and retention to a captive

A “captive” is an insurance or reinsurance company, organised by an economic group and for the benefit of companies which form it, incorporated under special foreign legislation such as that of Bermuda or the Cayman Islands, where there are major insurance and reinsurance interests registered, and with offices in the country of incorporation, where they operate. They may use their own infrastructure, or they may use facilities which an insurance or reinsurance captive management company, duly recognized and accredited, may provide, in order to insure or reinsure from abroad risks of the economic or business group or institution to which the insurer the captive insurer or reinsurer belongs.

The objective of setting up a captive insurer or reinsurer is usually an answer to the need to reduce costs paid in insurance premiums, and to secure better risk management, pursuing fiscal advantages which certain countries’ laws offer. Through this scheme or legal instrument, people can manage or administer their own risks, and at the same time retaining insurance premiums paid. The risks to be insured by the captive insurance company are selected, so that important risks are insured by companies outside the economic group. The premiums are set by the captive company itself, and the captive belongs to the businesses which contract the insurance. The premium is paid to the captive insurer or reinsurer abroad, where the captive has its registered offices, and from where it insures the risk. The expense incurred by the takers of insurance, who form part of the same group as the captive company, is in many countries deductible for income tax purposes, since it is considered that insurance premiums are a necessary expense for the generation of income.

As can be noted, the captive insurers or reinsurers are specially designed instruments for foreign operations, with the objective specifically indicated above, which may only be used by foreign groups or entities with registered offices outside the country in which the captive is incorporated: given the nature, objective and functioning of the captives, their use by a company established in the host country of the risk would deny them their offshore nature. The captive insurance and reinsurance companies may insure almost any kind of risk, such that with the incorporation of the company of this kind, the owner of the captive may transfer part of its own risks to the captive belonging to the group, and leave other risks insured with conventional insurance companies.

We should note that recently 16 Caribbean countries formed a captive insurance company (CCRIF), with the support of the World Bank, to cover the cost of attending to emergencies. In Colombia, entities such as Ecopetrol have already explored the idea, but this type of scheme is very recent in the world market (even though in 2003 there were more than 5000 captive companies around the world), and given their characteristics of accumulating reserves offshore, there may be a time-consuming process of having to justify this to those who know nothing of the subject, and to inform public opinion in the event of criticism arising as a result of some normal (or ill-intentioned) questions from political detractors of the government of the day. For this reason, although this alternative would today be the most efficient scheme financially, it is recommended that it should be promoted very gradually, so that in the medium term it can be adopted by countries, or by some subregional coordinating organisation.

3.4 Combination of alternatives for financial protection

After reviewing the workings of the various mechanisms used to transfer risk to the market, we note that there are two responsibilities which the state should assume in Jamaica, in the face of possible disaster. First, there is infrastructure and public buildings, and second, the low income groups who cannot afford to buy insurance, and who also tend to be located in the most fragile and vulnerable places. In general, there is a consensus that the private sector and the middle and upper-income groups should acquire their own private sector insurance policies. However, there are inefficiencies in the local insurance market, which entail problems of offer by the insurance companies (high prices and restricted sums insured for this type of risk). In these terms, the only type of state intervention we can suggest to cover the sectors of the population is to introduce appropriate regulations into the insurance market, and to encourage it to capitalise. Once the responsibilities of the state had been defined, the simulations can be run to determine the optimum structure for financing or transfer, in terms of cost-effectiveness. In sum, when choosing the most appropriate financial structure, the process should be conducted, with the following steps:

1. Catastrophic risk models should be used to calculate the probabilities of accounts of certain types of disaster, with information on exposure (responsibilities, premiums, etc), to determine losses in the event of potential disaster, and to establish how much capital will be required to finance the risk incurred. In the context of this consultancy, an evaluation has been made using a useful product proxy for this type of estimate (see complementary report on catastrophic risk profile).
2. The cost of using state capital with the cost of insuring, reinsuring or securitising the risk (using available financial instruments) should be compared.
3. Using optimisation algorithms, we can determine the combination of capital, credit, reinsurance and securitisation which will minimise the overall cost of covering disaster at risk.

In this context, the data which will be used to calculate the portion to which financial instruments apply are basically:

- Information derived from a technical analysis of the various disasters (vulnerability, population affected, estimated loss levels, etc). Information of possible triggers (indicators).
- Data from the insurance/reinsurance market and the catastrophe bond market (profitability, and their indicators of credibility, issuers, and risk-free rates, special purpose vehicles).

Based on this information in Jamaica, we can propose different forms of financing, and conduct a simulation to establish which of them generates the lowest cost to the state. The state should then define the level of risk to be retained for its own assets, infrastructure, and low-income groups. It should be noted that there is a risk that this may not be the most efficient choice, given the implications of greater centralisation involved, in addition to high cost in terms of underwriting operations on the stock exchanges, in which the financial instruments used to cover the risk would be traded, and the possibility that the portfolio might not be successfully managed.

Design of the structure of retention and transfer

A financing structure is configured by the allocation of one or more financial instruments of each of the various levels of loss. Table 3 summarises these instruments.

In Jamaica, insurance and reinsurance -where the captive company might be included- and the catastrophe bonds are the mechanisms which could be most relevant to risk transfer. Contingent loans and reserve funds are the alternatives which in general would be the most appropriate for the financing of retained layers, due to the existence of accessible markets and level of credibility. Catastrophe bonds and the insurance and reinsurance system, far from being mutually exclusive options, are mechanisms which complement each other and allow a more efficient diversification of risk.

Table 3. Financial instruments to cover disaster risks

INSURANCE AND REINSURANCE
CATASTROPHE BONDS
CONTINGENT SURPLUS NOTES
CATASTROPHE OPTIONS TRADED ON EXCHANGES
CATASTROPHE EQUITY OPTIONS
CATASTROPHE SWAPS
CLIMATE DERIVATIVES
CONTINGENT LOANS

Each mechanism allows cover for certain intervals which depend on the level of loss, and it is therefore possible to structure a system of coverage of risks by layers. Insurance contracts allow coverage of the first three layers of loss, but in order to reduce the value of premiums, the state must use reserve funds for disasters and contingent loans with multinationals to cover a first important layer. Given the nature of insurance in Jamaica, there is a need for a reinsurance system which will provide cover if the size of the loss exceeds the solvency of the underwriters. In the high relative amount of the losses, the topmost layers of the coverage structure against disaster risk may be assumed by the capital markets, with catastrophe bonds, and by the multinationals with another scheme of credit. The use of catastrophe bonds for the first layers allows us to eliminate the counterpart risk which would exist if insurance contracts were made for such levels of loss. And, contingent loans have the great disadvantage that if it is decided to use them, the government would increase its debt with the multilaterals. Figure 4 illustrates a structure for financing risk transfer with excess of loss layers.

The priority or deductible is the amount to which the insured (in the case of the reinsurers, the primary insurer), retains all the risk, that is to say, up to that point the insured is liable for the entire loss. Then, as of an amount equal to the priority or deductible, the insurer (or reinsurer) is liable for losses which occur up to a maximum amount, i.e. the limit. The insurer (or reinsurer) is therefore committed to cover the losses which exceed the deductible, up to the amount indicated as the limit. The distance between the amount of the deductible and the limit is known as a layer. Depending on the size of the disaster, the insurance or reinsurance market may organise itself in various layers. The cost of insurance and reinsurance in layers is generally determined by the

indicator known as the rate-on-line. The rate-on-line is defined as the premium on the cover limit. Annex 3 describes the elements and parameters for assigning values to the premiums in the structure of this kind.

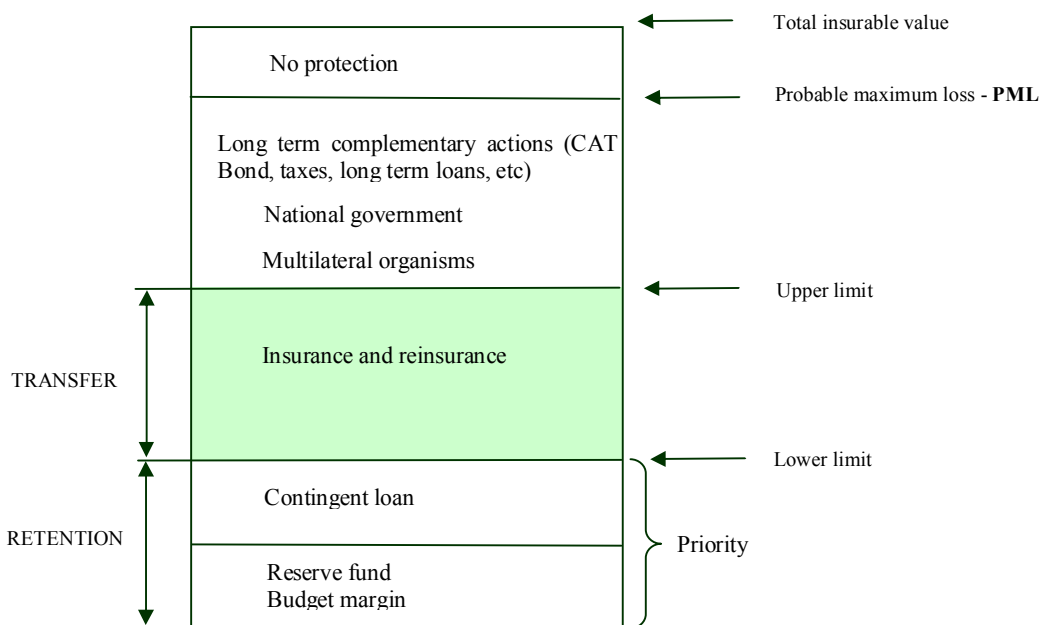


Figure 4. Structure for retention and transfer

Once the information mentioned above has been obtained, the government and the insurers will be able to decide on the tariff for an excess-of-loss contract. There are, however, variations of the excess-of-loss contract, particularly when implemented by the reinsurance system, in which the deductible and the limits are not determined by the amount of the loss suffered by the insured, but by loss indicators in the insurance market, objective parameters such as the level such as rainfall, wind speed, or seismic activity, which are used as triggers or parametric indicators. The relationship between the losses occurring for the insured, with factors which determine the deductible and the limit, must be determined when calculating premiums for these contracts,

The analysis of financial optimisation

The various layers of the structure of retention and transfer established as a function of the capacity or solvency of each of the participating agents, and the terms of convenience of their cost for the government must be determined for each of the various sources of financing available. It is quite common that the cost of each source of financing may vary among different amounts of loss caused by a disaster. One example of this is the excessive increase in insurance premiums for the highest layers of cover, due to the greater degree of uncertainty represented by very large disasters. It is therefore essential to establish the cost each of the sources of financing for each level of loss.

When this information has been obtained, it will be possible to use algorithms for the

minimisation of costs, in order to establish the optimum configuration of the various financial mechanisms available within the structure, allocating a layer of cover to each source of financing. That is to say, once the costs of the various sources of financing are known for each of the amounts of probable loss, it is possible to establish the optimum percentages which each mechanism should cover. This information will enable the conditions of insurance and reinsurance contracts to be established and evaluated, and, for example, the feasibility of the issue of a catastrophe bond.

The problem of optimisation is similar to that presented in Figure 5. The figure shows graphically the costs of each of the sources of financing available to the state to cover disaster risks. The graph shows that it is not an optimum position to finance all amounts from the same single source of finance, and that at certain intervals there are other sources of finance which may be less expensive.

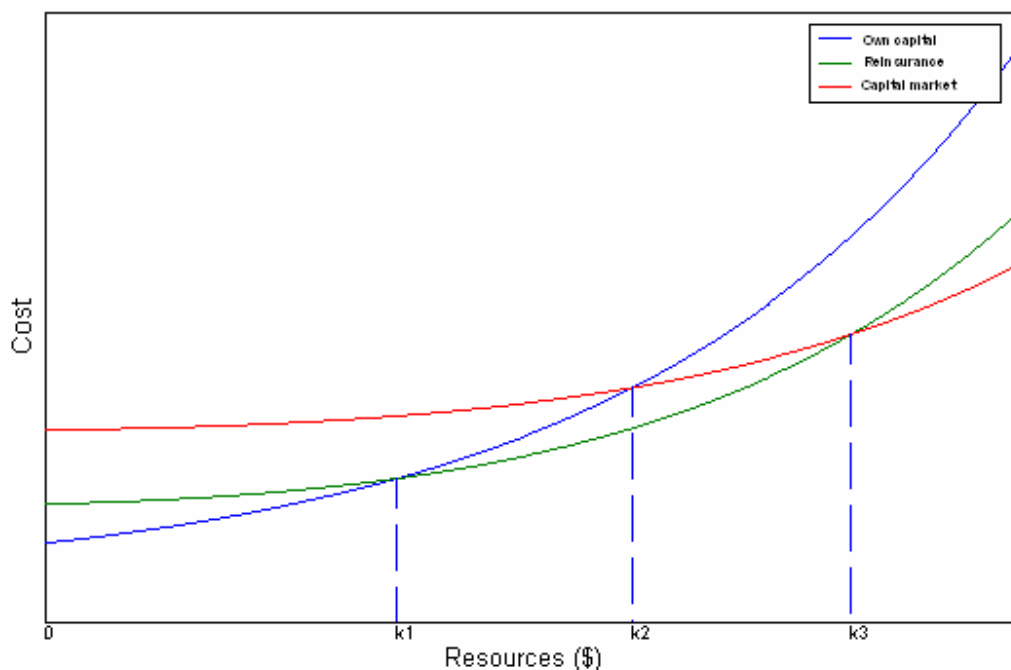


Figure 5. Financing costs

For this reason, a function of total costs must be constructed, to represent the weighted sum of the sources of finance. There are optimisation algorithms which will allow us to find the optimum (in this case, the minimum), based on the expert's definition of the function.

3.5 Recommendations to encourage protection or financial management of risk

1. In Jamaica, we must be aware of the importance of adopting measures for the investigation of potential loss, particularly those which relate to damage to public buildings. Mechanisms such as insurance or the transfer of losses to the capital market, which may be subsidised by central government, mean that the fiscal burden to the state in general may be diminished in the wake of a disaster. Based on the definition of the responsibility of the state, estimates, and fiscal

capacity, it will be possible to build up instruments of financial protection slowly, on a modest scale, which may then be extended over time, depending on economic prosperity and the development of a culture of insurance, in the private and public sector alike.

2. Once the responsibility of the state has been defined, there must be careful work of evaluation and modelling of losses, with different periods of return, and meanwhile use the results obtained in the context of this consultancy (see complementary report on the catastrophe risk profile of Jamaica), which will allow us to define an amount or probable maximum loss, and with this the government may determine a dimension for the contingent liability represented by disasters. At the same time, there must be detailed estimates of the expected annual loss, or pure premium, for portfolios of fiscal assets at risk, and meanwhile use those obtained in the context of this study, and to establish a strategy which allows identification of the resources required to cover those losses, through the accumulation of reserves, or by setting up contingent loan agreements, or by transferring losses to the insurance sector or the capital market. Aside from establishing provisions which match these realities, and in order to reduce fiscal vulnerability, the recognition of these contingent liabilities becomes the best argument to promote the reduction of risk (intervention of existing vulnerability in development processes), through preventive measures and mitigation, to reduce potential damage on the country's capital stock and socioeconomic implications or impact.
3. The first and most immediate responsibility of the government is to have funds available to reconstruct or repair public property in the event of disaster. According to most legal systems, all public buildings must be insured, or there must be a reserve fund for this purpose. In Jamaica, there is no knowledge yet as to what percentage of such properties are protected by insurance, and there is no thorough inventory to indicate what the insurable value might be for each property, nor the premium or the conditions for which it is covered, nor the deductible, nor characteristics of resistance to extreme events. Therefore, it would be desirable that programmes be developed the management of existing public assets, to record these data and to give minimum information about buildings, in order to evaluate vulnerability. This will include structural details, the number of floors, date of construction and geographical location. This information would make it possible to refine the impact of intense natural phenomena, to a very desirable level of detail.
4. Once the potential damage to the portfolio of state buildings has been modelled with refined risk techniques, for different deductibles and for different layers of protection or cover available, there may be negotiations with the insurance/reinsurance sector or the capital markets for a special contract for a massive and unified transfer of the risk of all public buildings, which will help to achieve economies of scale. Such a decision in a country like Jamaica means that an estimate must be made of the cost of cover which each entity must bear in its budget, depending on the properties for which it is responsible, and a mechanism must be defined for collection or retention in the budget by the Ministry of Finance or Industry. If there is no detailed portfolio of properties, a policy or treaty may be negotiated for the entire set of buildings for a defined value, which corresponds to an excess-of-loss limit, up to which the insurers, or up to which the government, would be prepared to transfer the losses for a reasonable premium.

5. A figure similar to that described for the cover of public buildings on a national scale could be implemented on property at subnational level. The cover of these assets in a decentralised country may be achieved by regional administration, but the majority of the regional agencies cannot afford to contract this financial protection on their own, and history has shown that it is national governments that finally assume the loss, and reconstruct buildings after a major disaster. The situation is not ideal, and in Jamaica central government could promote a strategy to encourage regional administration to bear part of this responsibility. The most appropriate incentive which central government can establish is to bear a percentage of the premiums in each case, and this could be defined as a function of the categorisation of regional units, and in accordance with the fiscal effort of each regional agency.
6. Experience shows that in most countries, the state has in the past rebuilt housing for the poorest groups where they have been affected by major disasters which cause an impact on public opinion, and which demand a response from the government to support the lowest income levels. This fiscal responsibility means that the state would have to cover losses of a segment of the private sector, which is in general considered to be acceptable in the observance of principles of solidarity, subsidiarity and equity. Payment of the premium to cover this segment is not feasible for any country in Latin America or the Caribbean, since the vulnerability of buildings is very high, and therefore, the premiums would be correspondingly high. However, the possibility that the Jamaican central government could play a complementary role to the efforts of regional administration at subnational level could be explored.
7. It is important to promote refined catastrophic risk modelling for the insurance companies' portfolios in order to raise the efficiency of insurance, and to ensure that there will be variable values for the probable maximum loss and pure risk premiums, on the basis of appropriate technical and scientific information. Further, the mandatory insurance not only of the debt but also of the total value of the private property acquired under the mortgage system, and the common areas of condominium buildings, and crop and animal husbandry risks are figures which could well be promoted in Jamaica. It is also important to note the possibility of promoting instruments for voluntary collective insurance in private property¹¹. The objective, aside from stimulating the culture of insurance among private individuals who can afford it, is to implement a subsidised project for the protection of the poorest, who cannot afford insurance, nor property tax, that is, the owners of tax-exempt properties. This initiative could be promoted in a number of population centres with central government incentives for regional administration, to support the production of appropriate risk studies required to bring in the insurance companies who can offer this type of collective policy.
8. Jamaica could explore the idea of an individual or joint offshore captive insurance or reinsurance company, which might reduce costs paid in insurance premiums, and secure risk management. This figure or instrument could be used to manage the country's own risks, and in turn retain premiums paid by insurance companies which would basically be fronting operations for Jamaica. This mechanism, if feasible, would increase the financial efficiency of

¹¹ Similar to the example of Manizales, Colombia. The insurance has been collected for the last five years alongside the property tax, and has recently been refined, through subsidies, as always, to cover the poorest groups.

the insurance and reinsurance mechanism (a single policy for the mass transfer of risk), achieving better conditions of insurance, and the formation of government reserves with the same objectives of financial protection; and those reserves could also cover the deductible.

9. The issue of a CAT bond could increase financial efficiency if the cost of the portfolio of public or private properties is significant. It is considered that over the years, this instrument may become increasingly competitive and feasible, and at all events it is an option or alternative to complement others, in covering the upper layers of the financial structure of retention and transfer. At the same time, the contracting of contingent loans to increase reserve funds for disasters covers the deductible or priority, promotes public investment or the formation of consortia of local insurers, in order to reduce premiums and expand the base of private and public sector insurance. It is also a complementary mechanism which may increase the financial efficiency of the government, and strengthen the overall risk management that government provides.
10. Finally, the conclusion is that within the risk management activities promoted in Jamaica, special emphasis should be paid to the reduction of risk through regional regulation and the intervention into the vulnerability of essential buildings, in the first instance, because they have a high return in economic and social terms. At the same time, encouragement must be given to the reduction of risk in private buildings, in order to make it easier to promote subsidies such as the reduction in property tax or other taxes, when there is intervention in the structural vulnerability of buildings. The updating, application and observance of seismic-resistance and hurricane-resistance regulations or safe building practices is essential in interventions of structural vulnerability. It is important to remember that insurance, and in general the retention and transfer of risk, is not a measure of mitigation as such, because it does not reduce the damage and its objectives are to cover losses only when the damage has occurred.

These recommendations are the result of an evaluation of general possibilities in Jamaica, the rest of the Caribbean and Latin America. In general, progress in Jamaica is very much in the early stages, and on these issues we can say that practically everything has yet to be done. Several years of work may be needed if for Jamaica to achieve the degree of relative progress made by Colombia, Mexico and Costa Rica in studies, proposals and implementations of financial protection policy.

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ANNEX 1 SOME RELEVANT DEFINITIONS

Ambiguity. In terms of risk, this refers to a situation in which there is a high uncertainty in relation to the policy of occurrence of a specific loss, and its magnitude. In other words, when the risk is not properly specified.

Attachment point corresponds to the amount agreed as of which the transfer of the loss of a layer or of the entire risk begins. Also known as *priority*.

Captive. The mechanism used to facilitate self-insurance/reinsurance, financing or the transfer of risk; a captive is usually incorporated as an insurance or reinsurance company with a licence, and can be controlled by a single owner, or several owners (sponsors).

Co-insurance. This refers to the percentage participation on the insured in the risk, or, in other words, it refers to a percentage of retention of risk by the insured.

Contingent loan. A line of credit arranged in advance of a loss, established when one or more trigger events occur; it is unlike a traditional loan, since the line of credit is defined in such a way that it is only disbursed to cover losses which arise once a previously-defined event has occurred.

Ceding party. The party which transfers or cedes the risk to the other parties, also known as the *insured* or *beneficiary*.

Deductible. The amount agreed up to which the insured must cover the first portion of the loss that is the first priority or *attachment point*. It refers to an amount expressed as a percentage of the sum insured.

Trigger. Circumstance, threshold or barrier in a transfer contract, which determines whether an event has occurred. Fixed triggers usually do not affect the value of the treaty, they only indicate whether a payment should be made under the contract.

Indicator trigger. A defined circumstance in a security or bond linked to an insurance contract, in which the suspension of interest and/or capital occurs, when the value of an indicator issued from a third party reaches a certain threshold

Parametric trigger. A defined circumstance in a security or bond linked to an insurance contract, where there is the suspension of interest and/or capital when an indicator of specific damage reaches a certain value

Exhaustion point. The limit of liability of a layer of loss transfer

Indemnity. The amount paid to cover the actual losses experienced by a ceding party. This implies quantification of loss, through an adjustment process

Limit of liability. This is the limit value assumed by the insurer or reinsurer to cover damage.

Since this is the maximum loss for the institution or pool, the amount must be less than or equal to the sum insurable.

Probable maximum loss. This is an estimate of the size of the maximum loss which would be a reasonably be expected in a portfolio of buildings during the currents of an extreme event. It corresponds to the average loss which will occur in a determined period of return. It is used as a basic piece of information to determine the size of the reserve to be maintained.

Percentage retained. The percentage of the risk retained in cover for damage on a sum insurable. It is the layer or layers assumed by the party interested in the potential loss before transfer.

Blanket premium. A lump sum premium, corresponding to an average value of all premiums in a portfolio, or which means that there is an average valuation made of the risk.

Pure premium. Also known as *technical premium*, this reflects the expected value of the loss in any year, supposing that the process of occurrence of disasters is stationary, and that property damaged will be restored immediately after a disaster. It is the annual expected loss.

Rate on line (ROL). Defined as a premium on the limit of layer cover of a transfer of financial risk

Quota share reinsurance. A form of proportional reinsurance in which the reinsurer assumes a fixed quota of all policies which the insurer has underwritten in a given class of insurance. The quota determines the way in which the direct insurer and the reinsurer will divide up premiums and losses.

Excess sum reinsurance. This is *proportional* reinsurance, in which the direct insurer retains all the risk up to a maximum limit of sum insured. In excess of this limit, the reinsurer assumes the rest of the sum insured.

Excess-of-loss reinsurance. In this type of insurance, the amounts of losses determine the proportion of the risk ceded. In this mode of reinsurance, the direct insurer is fully liable for the loss up to the amount determined for the priority, regardless of the sum insured. Losses in excess of the amount established by the *priority* will be paid by the reinsurer.

Proportional reinsurance. In this type of reinsurance, premiums and losses are divided up between the direct insurer and the reinsurer, in a fixed ratio.

Non-proportional reinsurance. This type of insurance divides up the losses in accordance with actual losses. The direct insurer defines a specific amount up to which it will be liable for all losses. This amount is known as the *priority* or *deductible*. When losses exceeded this *priority*, the reinsurer will be liable to pay the rest of the loss, up to the limit of cover agreed.

Retention of risk. This means the assumption of potential losses, or risk-taking. It may be used as a conscious strategy, arising from an analysis of financial optimisation. Self-insurance is a strategy for retention, taking measures to control the risk and assume losses that may arise.

Basis risk. The possibility of a loss as a result of an imperfect matching between the value of probable losses and the compensation arrangements; that is, between the underlying risk and the agreed value transferred.

Moral risk. This refers to the probability of a loss due to failure to take preventive measures, for which the taker of a risk-transfer treaty is responsible.

Adverse selection. The situation that arises when there is no distinction to be drawn between the probability of a loss for categories of good risks (low vulnerability) and bad ones (high vulnerability).

Risk transfer. An agreement, contract or treaty, in which one party undertakes to take the risk, and to pay losses which may arise to a ceding party, over a period of time, in exchange for a risk premium.

Insurable value. This corresponds in general to replacement value. In the case of layouts which are not the prior the first risk, this must be considered to be the sum insured established in the policy. In the case of insurance for first risk, the venue corresponds to that of the property.

ANNEX 2 EXAMPLE OF COLLECTIVE INSURANCE OF PROPERTY

In Manizales, Colombia, there is a collective voluntary insurance policy to protect the poorest strata of the population. This is an alliance in which the city administration uses its information systems to process and facilitate the collection of insurance for damage caused by disasters, for every property in the city, depending on its official valuation. The scheme is voluntary and makes use of the property tax system, for which billings are sent out every two months or every year with a discount (for advance payment) in Manizales. The billings include a form which allows the taxpayer to pay the property tax only, or to make an extra payment for the insurance premium, with the related sales tax.

The attraction and the social benefit of this collective insurance consists of the fact that once a defined percentage or threshold of the value of insurable properties in the municipal area - that is, of those that pay estate-tax pay the premium, insurance protection extends to properties whose value and social stratum exempt them from property tax. The exemptions correspond to the poorest strata, and legally established owners and occupiers, in Strata 1 and 2. The possibility of covering the poorest socio-economic structure and the promotion in general of a culture of insurance in Manizales is the object of special interest to the city administration, which restrict its activities to the collection of premiums. The insurance company is the organisation which has the direct contractual relationship with the insured, and therefore solves problems and processes claims derived from the policy.

This instrument of financial protection was refined on the basis of technical and scientific studies of risk, in which the Manizales Disaster Prevention and Attention Office has invested during several years. Specialists in the valuation of vulnerability and risk have made detailed studies of probable maximum losses, and of pure risk premiums, property by property, using the seismic threat microzoning of the city, amongst others for example. Based on the studies, a scheme has been designed which today covers all properties exempted, with robust technical and financial foundations.

In this programme, known as “Manizales, predio seguro” (Manizales, safe estate”), the annual premium estimated and agreed with the insurance company is 2.2 per mil of the value of each property. The deductible is 3% of the value of the loss in the event of earthquake, and a minimum of three minimum monthly salaries (approximately US\$750). In the case of other natural phenomena or events such as strike, riot, civil commotion, vandalism or terrorism, the deductible is agreed at a 10% of the loss of the property affected, and a minimum of two minimum salaries (approximately US\$500). La Previsora, the insurer, has issued a master policy and the taker is the city of Manizales. The policy is displayed in the Mayors office, a notary’s office and in the insurance company’s branch in the city, for public consultation. This instrument has the benefit of ensuring all exempted properties –those that do not pay property tax- when 20% of the insurable value of the portfolio of properties which are required to pay property tax, take part in the programme, with payment of an insurance policy that corresponds to them. Nonetheless, if 20% of this value is not reached, the insurance company will partially cover the exempted properties, which in this case are urban and rural properties used for housing, with a value of not more than 25 minimum salaries (US\$6,250). A table of ranges from COPD 300,000

(US\$150)-for which in the event that any between 1% and 5% take part, up to COP 10 million (US\$5,000 (when 20% of the insurable value of the portfolio is reached. The lowest level of participation by properties which pay property tax has been 12.4%, which means that all the exempted properties, in this case, will be covered by a value of the order of COP 5.5 million (US\$2,750). The deductible in these ranges is the same, but the minimum value is half a minimum salary (US\$125).

This operative instrument for financial protection implemented in Manizales has been refined with careful technical, scientific and actuarial studies, supported by this consultancy group, and with the financial support of the city administration, the national planning department (DNP) and the World Bank. This mechanism of risk transfer is undoubtedly a successful experience, and good practice promoted by the state and private sector, which can be replicated in other cities such as Bogota, and in general in other disaster-prone developing countries, if the appropriate risk studies are made for implementation.

ANNEX 3 PARAMETERS FOR RETENTION AND TRANSFER

There are a number of parameters which can form part of a risk transfer scheme. In Figure 1, we show an illustrative scheme of different elements which might be considered.

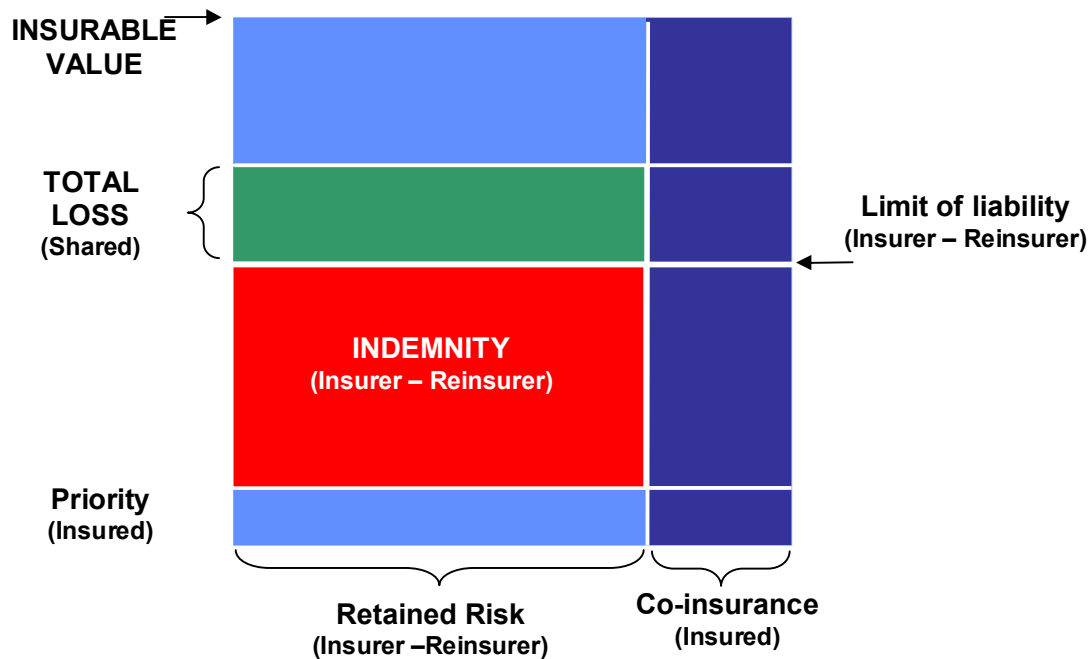


Figure 1. Elements for risk transfer

The principal elements of schemes of this kind are the following:

- Insurable value: This corresponds in general to replacement value. In the case of plans which are not first-risk, it should be considered as the sum insured as written in the policy. In the case of first-half and risk insurance, the value corresponds to the value of the property.
- Percentage of retention: this corresponds to the percentage of risk retained in their damage cover of the insurable value. It is the player or players which the interested party in the potential loss assumes, prior to transfer.
- Limit of liability: corresponds to the limit value assumed by the insurer or insurer for damage cover. Since this is a maximum loss for the insurer or pool, this amount must be less than or equal to the insurable amount.
- Deductible: This refers to the value applied to property insured, expressed in terms of a percentage of the sum insured. There are contracts or treaties in which deductible to expressed in other modes, but in these cases and, and for purposes of comparison, this must be re-expressed using technical criteria to produce a percentage of the insurable amount.

- Co-insurance: Corresponds to the percentage participation of the insured in the risk, or, in other words, the percentage of retention of risk by the insured.

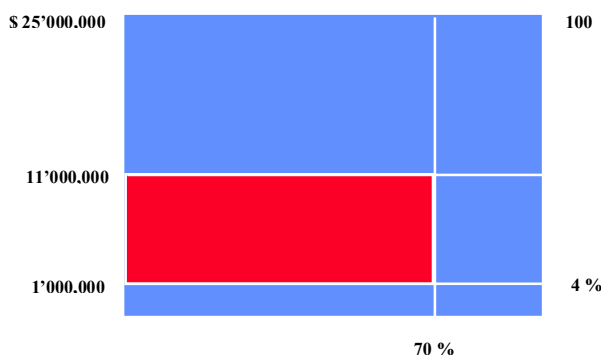
Figure 2 presents an example of the above parameters. The net loss for the layer transferred is indicated in the red square, as a function of policy variables such as sum insurable, percentage of retention, maximum limit of liability, deductible, and co-insurance.

Example 1:

INSURABLE VALUE 25'000,000
 RETENCION PERCENTAGE 100 %
 UPPER LIMIT 25'000,000
 PRIORITY 4 %
 CO-INSURANCE 30 %

TOTAL LOSS 11'000,000

Loss for who retains the layer
 $Pa = (11'000,000 - 1'000,000) \times 0.7$
 $Pa = 7'000,000$

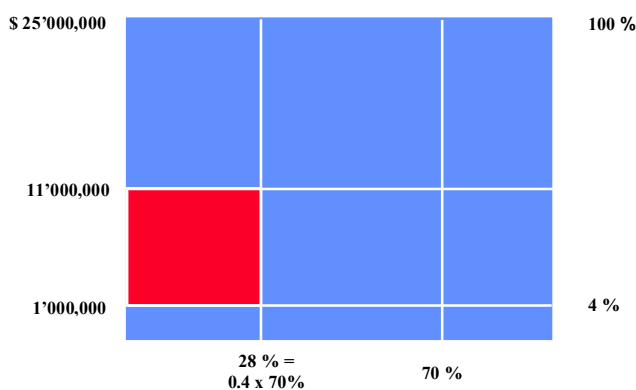


Example 2:

INSURABLE VALUE 25'000,000
 RETENCION PERCENTAGE 40 %
 UPPER LIMIT 25'000,000
 PRIORITY 4 %
 CO-INSURANCE 30 %

TOTAL LOSS 11'000,000

Loss for who retains the layer
 $Pa = (11'000,000 - 1'000,000) \times 0.7 \times 0.4$
 $Pa = 2'800,000$



Example 3:

INSURABLE VALUE 25'000,000
 RETENCION PERCENTAGE 40 %
 UPPER LIMIT 10'000,000
 PRIORITY 4 %
 CO-INSURANCE 30 %

TOTAL LOSS 11'000,000

Loss for who retains the layer
 $Pa = (10'000,000 - 1'000,000) \times 0.7 \times 0.4$
 $Pa = 2'520,000$

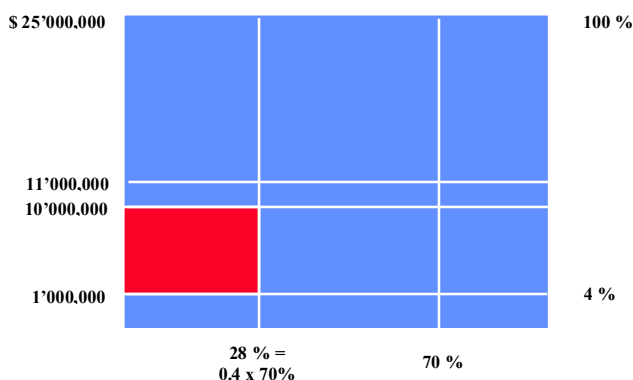


Figure 2. Examples of alternatives for parameters of transfer

