

Disaster risk financing: Reducing the burden on public budgets



New forms of public-private partnership can make societies more resilient by addressing the rising cost of natural catastrophes. Several recent risk transfer solutions offer a model for governments, development banks and relief organisations to access pre-event financing and use their relief funds more efficiently through insurance and capital market instruments.

Disaster risk financing: Reducing the burden on public budgets

The rising impact of natural catastrophes is driving up the cost of disaster relief and reconstruction for the public sector. New forms of private-public partnership can make societies more resilient by absorbing the financial impact of large catastrophes. Such partnerships allow governments, semi-governmental agencies, aid organisations and NGOs to manage disaster expenses more efficiently by funding them before – instead of after – a catastrophe occurs.

Private sector insurers have developed innovative financial risk transfer products to mitigate the impact of disaster events. These provide models for public sector entities to leverage their available funds through the use of capital market instruments – allowing governments to smooth and protect their budgets at lower opportunity costs and ensuring more adequate funds for relief activities.

One recent example for this approach is the GlobeCat securitisation structured by Swiss Re. Launched in December 2007, this solution uses financial instruments with an innovative trigger mechanism to transfer Central American earthquake risks to the capital markets. GlobeCat provides a payout based on the size of population exposed to a specified earthquake. The transaction offers a new model for governments and relief organisations to access pre-event financing in order to fund the growing impact of natural disasters in developing countries.

Natural catastrophes: a rising burden for society

The impact of natural catastrophes on societies and economies has increased considerably over the last two decades and is likely to grow further as a result of two complementary trends. Firstly, climate change is expected to increase the scale and frequency of major weather-related events. Secondly, the economic severity of natural catastrophes is growing due to a rise in both population and economic activity in areas with a high risk exposure. Also, the nature of the risk is changing, for a variety of reasons: Buildings have become more expensive to build and rebuild, and higher interdependencies in the production process have increased the likelihood of business interruptions following a flood or a storm.

In 2005, economic losses from natural catastrophes hit a record high, with direct financial losses of about USD 230 billion. This represents 0.5% of total

worldwide GDP.¹ Despite a record insurance payout of more than USD 83 billion world-wide, uninsured direct losses of USD 150 billion had to be carried by individuals, companies and – last but not least – the public sector.

Most recently, in 2007, a total of 335 natural catastrophes led to overall economic losses of USD 64 billion across the globe, of which USD 40 billion were uninsured.² Europe was hit particularly hard, with winter storm Kyrill causing an insured loss of USD 6.1 billion – making it the third most expensive winter storm on record – while the UK was hit twice by extreme rains and flooding resulting in a total insured loss of USD 4.8 billion. In terms of fatalities, however, Asia suffered the greatest impact, with 4 140 persons dead or missing in Bangladesh following Cyclone Sidr in November. In the Korean peninsula, heavy rainfalls and resulting flooding left 610 dead or missing.

Figure 1: Natural catastrophe losses 1970–2007



Source: *sigma* catastrophe database, 1970–2007

1 Swiss Re sigma report 02/2006: Natural catastrophes and man-made disasters in 2005
2 Swiss Re estimate published in sigma 1/2008

Financial impact on governments

Natural disasters have a significant financial impact on individuals, business and insurers. However, events such as strong flooding, severe storms or heat waves also place a huge burden on the public sector, which not only shoulders the cost of relief efforts, but is also responsible for rebuilding public infrastructure. This is intensified by the fact that public entities consciously or unconsciously decide to retain risk by not insuring their infrastructure. Depending on the level of insurance penetration, governments may also be expected to support private rebuilding efforts. The overall impact on the public sector varies greatly: In smaller and developing countries with less financial resources, a catastrophic event can result in higher public deficits and debt. Earthquake and flood are in many countries – in contrast to storm – only scarcely insured, and tend to destroy important parts of the infrastructure, ie have a larger impact on the public sector.

The burden of natural catastrophes on the national economy varies greatly by region. Although developed countries typically account for the majority of economic losses, the burden in terms of GDP is dramatically higher in developing countries, emerging markets, and in countries of smaller size. For example, in Turkey an earthquake in 1999 caused an economic loss of 11% of GDP, while a 1986 earthquake in El Salvador cost as much as 37% of GDP. For Jamaica, the World Bank estimated the possible loss from a hurricane scenario with a return period of 250 years to exceed 200% of the GDP.³ In the absence of widespread insurance coverage, economic losses of this magnitude can only be addressed with significant public sector funding by governments or relief organisations.

Shifting from post-event to pre-event financing

Traditionally, the public sector has adopted a post-event approach to disaster funding. This includes increasing taxes, reallocating funds from other budget items, accessing domestic and international credit, and borrowing from multilateral finance institutions. Many developing countries also rely on assistance from international aid.

Pursuing a post-disaster financing strategy has several disadvantages. Diverting funds from key development projects in order to pay for emergency relief and recovery efforts entails significant opportunity costs. It may also be costly to raise new domestic debt in an expensive post-event capital market, which can significantly raise the cost of servicing the country's debt. Raising taxes following a disaster may further weaken an already impaired economy and provide a disincentive to new private investments that are important for a speedy and sustainable recovery. Finally, international aid often arrives too late for immediate disaster relief.

Clearly, there is significant value in shifting the traditional "disaster relief" approach – raising scarce funds after the event hits – to an approach that accumulates funds and funding sources before a disaster occurs. The financial and insurance markets can play a key role in preparing for the impact of extreme natural events and can also help to spread risks. Pre-event risk financing instruments include setting up financial reserves, contingent debt agreements, insurance and alternative risk transfer solutions.

A new generation of financial risk transfer solutions

Risk avoidance and mitigation strategies must be the first priority in managing natural disasters, in order to reduce the extent of any loss and thus also the required funding. However, no organisation or country can fully insulate itself against extreme events. Transferring catastrophic risk has to be a key element in the financial strategy of every disaster-prone country or region in order to enable and sustain growth – just as corporations and individuals pass on peak risks to insurers in order to reduce financial volatility and avoid potential ruin from events that exceed their resources.

Example 1:

Earthquake coverage for Mexico

In May 2006, Swiss Re structured, placed and reinsured parametric earthquake coverage for FONDEN, the Mexican government's natural catastrophe fund. The transaction combined securitisation and reinsurance instruments.

What it does:

In the event of an earthquake which exceeds a certain threshold (defined by magnitude, depth and location – which is why the cover is called "parametric"), the coverage provides financing for disaster relief and post-disaster reconstruction. Three events of USD 150 million each are covered within a three-year period.

How it works:

Of the total amount, USD 160 million was placed in the capital market through a parametric cat bond and the remainder was reinsured.

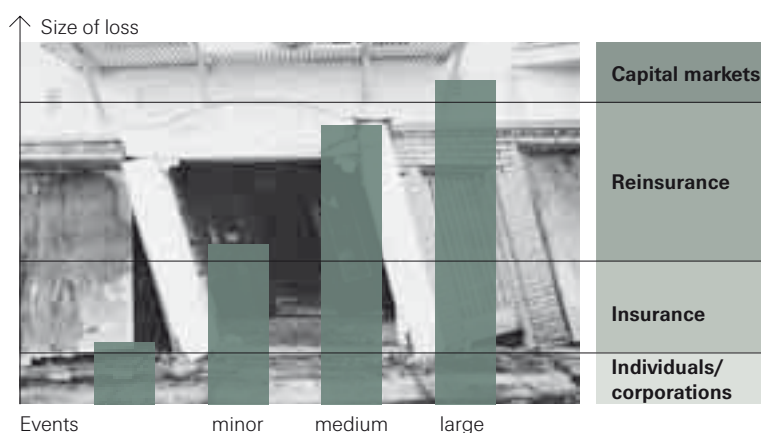
³ 2008 estimate by the World Bank

This is where the insurance industry can offer its expertise in developing innovative solutions. A new generation of sovereign insurance (or “macro-insurance”) instruments can make it easier for local and national governments to cope with disasters. In parallel, innovative micro-solutions can protect previously uninsured individuals and small enterprises from the catastrophic financial consequences of weather-related risks. Such products can help governments and individuals in a number of ways, by:

- ensuring that funds are in place for recovery and rebuilding efforts as well as to compensate victims of catastrophic events, particularly in developing countries or in rural areas of developed countries with no insurance access;
- protecting their budgets and reducing financial volatility, with potentially positive implications on debt levels, sovereign ratings and foreign exchange fluctuations;
- reducing income volatility for individuals in developing countries, thus providing greater financial security in the face of changing economic circumstances, reducing distress and conflict, and providing access to credit for farmers with little income diversification (by allowing them to borrow against insurance as collateral).

One way of securing access to disaster funds is through reinsurance solutions and insurance-linked securities. In recent years, several innovative private sector schemes have provided models for both the public sector and NGOs. These include a combined earthquake reinsurance and catastrophe bond for the Mexican government (example 1), a parametric securitisation of UK flood risks (example 2), a weather reinsurance solution for small farmers in Mexico (example 3), coverage for the Canadian

Figure 2: The larger a disaster, the more players are needed to share the risk.



state of Alberta which finances the cost of fighting wildfires and restoring damaged forests (example 4) and the Climate Adaptation Development Programme which provides financial protection against weather risks in several African countries (example 5).

Big risks are best shared over many shoulders

The larger and more complex a disaster, the more players are needed to share the risk. If a small event occurs, an individual or company will bear most or all of the cost in form of a deductible. However, large natural catastrophes can only be borne by a broader community, by sharing risks between many individual and corporate policyholders, the domestic insurance industry, the global reinsurance industry and the capital markets. Different partners contribute different strengths and perform different roles. In developed countries with a functioning insurance market, there is no need for the government to actively absorb risk. Here the role of the government centres around risk prevention and mitigation by setting building codes

and land use regulation, insurance market enabling and potentially widening the boundaries of insurability. In less developed countries, the government may need to play a more active role as an enabler – and sometimes even as a risk taker, if the insurance market is not yet able to absorb the risks.

Example 2: Flood bond in the UK

In April 2007, the first catastrophe bond covering peak flood risk was placed. Swiss Re provided risk structuring support and placed the securitisation for a local insurer.

What it does:

The USD 150 million bond is triggered in the event of severe flooding, as defined by a specified parameter: At least four of fifty reference locations in the UK must be on a severe flood warning issued by the UK Environment Agency.

How it works:

If the bond is triggered, investors may lose some or all of their principal, which will be used to fund the payout to the insurer.

Example 3:

Satellite-aided weather insurance in Mexico

In Mexico, the state-owned reinsurance company Agroasemex insured small cattle ranchers against droughts and other climatic events that would reduce the animal feedstock on their pasture. Swiss Re supported the transaction as an international reinsurer.

What it does:

The insurance scheme allows farmers to buy supplemental feedstock for their cattle if a drought substantially diminishes the natural vegetation on their fields.

How it works:

Infrared and red spectral analyses of daily satellite images are used to measure the available biomass and generate a vegetation index. Vegetation is calculated objectively and moral hazard can be largely excluded.

Public-private partnerships

The effective reduction and financing of catastrophic risks requires a combined response by both private and public sector players. As complexity and costs rise, single organisations can no longer meet the challenge alone. This is particularly true for developing countries, which, besides having fewer funds, also bear the brunt of the effects of global warming. Public-private partnerships can help governments absorb catastrophes – and thus also provide individuals and businesses with greater financial security.

New forms of risk transfer partnership between the public and the private sector can play an important role in improving disaster preparation and adapting to the consequences of climate change:

- The public sector has the political and legal power to set framework conditions that facilitate adaptive responses by individuals, the public and the private sectors; however, it typically operates under significant financial constraints. As costs rise, the ability of governments to cope with natural disasters will be stretched even further.
- The private sector has the financial resources but lacks the power to set up the required frameworks. Global reinsurers like Swiss Re also have the broad geographical diversification which is required to absorb these risks in a cost-efficient way. In addition to their financial potential, insurance and reinsurance companies have accumulated valuable knowledge and experience in dealing with catastrophes.

Possible division of roles between the public and the private sector

Contributions	Public sector	Private risk transfer industry
Risk awareness		
Raise awareness for risks and solutions	✓	✓
Risk prevention		
Strengthen public resources and set the regulatory framework for appropriate risk prevention measures and reduction of vulnerability (eg building codes, land use laws)	✓	×
Risk transfer		
Build and improve the environment for risk transfer solutions (eg regulatory and legal framework, data series for new covers)	✓	(✓)
Enable efficient access to markets and distribution (eg changes in legislation)	✓	×
Develop risk transfer products and structures that address the needs most effectively	×	✓
Manage and absorb risks; determine adequate risk premiums	(✓)	✓
Financial support, particularly for start-up phase and pilots	✓	(✓)
Transfer of global “best practices”	✓	✓

✓ = key role (✓) = limited role

As a first step, governments and the private sector must work together to raise awareness for risks and their possible solutions through risk transfer schemes. This is critical as many perils (for example major earthquakes) have rather low probabilities – ie long return periods – and are thus frequently ignored. Risk awareness also includes showing possible solutions for risk prevention, as well as for risk transfer and financing.

Example 4:**Wildfire suppression cost coverage in Canada**

In Canada, Swiss Re insured the state of Alberta against wildfires.

What it does:

The insurance scheme helps the Forest Protection Division of Alberta finance the cost of fighting a wildfire and restoring a damaged forest. This significantly increases the agency's budget certainty.

How it works:

Under the scheme, Swiss Re pays the agency CAD 300 per hectare burnt by a wildfire. The annual cover is limited to CAD 100 million above a retention of CAD 100 million.

Partnership in risk prevention

In many cases, the public sector and the insurance industry are implicit partners. Insurers will only insure against floods if the government implements flood prevention measures or against fire if public fire brigades exist. Insurance can also stimulate prevention and mitigation efforts by using risk-adjusted pricing as an incentive for measures such as building codes and protective measures.

While insurers contribute expertise and premium incentives, the public sector is better placed to enforce or finance risk prevention measures in order to reduce vulnerability to disasters. This includes building codes to enhance the resilience of structures, as well as intelligent zoning to reduce exposures in hazard-prone areas. Zoning is especially important in coastal areas, which are heavily exposed to windstorms and flooding but have experienced accelerated growth in population and economic activity. The exposure of such areas is expected to increase even further as sea levels rise and storm intensity grows due to the effects of climate change.

Partnership in risk transfer and financing

For insurance to work effectively, governments must ensure a framework that allows market mechanisms to work unhindered. Government intervention in a functioning insurance market should be limited since it can trigger unexpected side-effects such as moral hazard and may lead to further interventions rather than addressing the root causes. For example, public and semi-private insurance schemes that keep rates artificially low may encourage homeowners to stay in highly exposed areas or neglect risk prevention by maintenance, thus further increasing the burden of natural disasters for society and the public sector.

The public sector plays a key role in setting a legal framework that enables risks to be reduced by prevention and transferred to insurers, reinsurers and the capital markets. In addition to passing the necessary legislation, it must provide insurers with efficient access to its markets.

Where a market does not yet exist – as is often the case in emerging markets – governments and non-governmental organisations can also play an important role in facilitating the development of risk transfer solutions. This may involve collecting critical exposure data, as well as commissioning specialised firms to model, assess and define triggers and terms of liability. In doing this, they can also draw on the support, advice and know-how of insurers and reinsurers.

In some situations, governments and international organisations can help to expand the availability of risk transfer solutions for individuals and corporations. For example, they can encourage or enforce the creation of "risk communities" through compulsory insurance in order to establish a critical mass and make an event insurable.

Governments may also act as reinsurers in order to supplement private insurance schemes. For example, governments – and NGOs – can encourage the development of an insurance market by initially subsidising insurance premiums. However, the public sector should limit its involvement in order to avoid establishing false incentives. Instead, it should focus its intervention on expanding the availability of insurance schemes – with the ultimate aim of establishing an efficient private-sector market.

Example 5:**Climate Adaptation Development Programme (CADP)**

CADP will aim at providing financial protection against drought conditions for up to 400 000 people in Africa.

What it does:

The programme is designed to develop a financial risk transfer market for the effects of adverse weather in emerging countries.

How it works:

Based on climate risk indices, CADP will contribute to develop a risk transfer market that will help smallholder farmers in Africa buy agricultural inputs, overcome a lack of collateral, draw upon agricultural extension services and accumulate income.

New risk financing instruments for the public sector

On the other hand, it is the primary role of private insurers to develop risk transfer products and structures, as well as to absorb and manage those risks most efficiently. The resulting public-private risk transfer mechanisms can involve both insurance and capital market instruments. Sharing risks with international players and the capital markets allows local governments and NGOs to benefit from global diversification, thus reducing their risk transfer costs (cf box 1).

The GlobeCat transaction mentioned at the beginning of this focus report is an example of how governments and NGOs can efficiently secure pre-event funding through capital market securitisations. GlobeCat uses an innovative trigger to determine coverage based on an index of the population exposed to specified levels of ground-shaking intensity (as expressed by the Modified Mercalli Intensity scale).

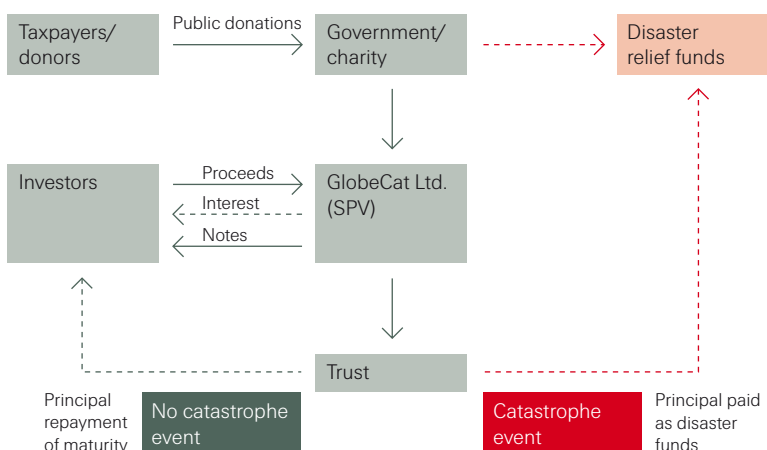
Parametric triggers based on measurable factors such as affected population, flood levels, wind speeds or earthquake intensity are ideal for public sector entities, which typically carry broad relief and infrastructure rebuilding expenses that are not linked to a particular damaged property. As they avoid the need for damage assessment, such triggers allow for the swift payment of funds. Finally, due to their objective – and typically scientific – nature, they are also preferred by investors. Compared to traditional indemnity transactions, where the payment depends on the actual loss, the insured party, however, bears the so-called basis risk – the difference between the actual loss and the payment determined by the parametric trigger.

The goal of the GlobeCat transaction is to create a platform and a model by which charitable foundations, governmental relief organisations and corporations can leverage donations, government funds or international aid in order to reduce the burden of future natural

disasters. Such a programme will help public sector organisations become more pro-active in planning and anticipating relief needs in areas of the world affected by severe catastrophes. If a triggering event happens, the funds will be quickly available for relief efforts rather than being raised after the event. As with other financing mechanisms, such a scheme requires a number of framework conditions to be successful, not least an efficient distribution channel for the relief money to actually arrive where it is needed most.

GlobeCat has shown that this concept is viable and that the leverage of own funds to coverage can be as high as 45 times. For example, USD 1 million of donations or government funds can be used to secure contingent disaster relief funds of USD 45 million. Other triggers are being developed for a wide variety of disasters.

Figure 3: How the GlobeCat platform works



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Conclusion

Public-private risk transfer partnerships clearly have an important role to play in managing the increasing level of disaster expenses. They enable the public sector to fund disaster relief before – instead of after – a catastrophe occurs. As a result, governments will be able to deliver immediate relief to the victims of climate catastrophes without creating a significant sudden burden for public finances.

On a micro-insurance level, private-public partnerships can smooth individual incomes, provide greater financial security and reduce potential distress for small farmers or entrepreneurs who live from hand to mouth in developing countries. For example, small farmers can borrow against insurance as collateral or insure themselves against droughts by securing additional payments to supplement animal pasture with animal feed.

In addition to providing traditional (re)insurance solutions, such partnerships can help public sector entities protect themselves against climate risks and natural catastrophes by using innovative financial instruments. Structures such as GlobeCat provide swift access to relief funding and offer a means to increase contingent funding for catastrophic events by using public funds and donations to purchase coverage on the capital markets.

Such risk transfer partnerships can include diverse partners such as governments and semi-governmental agencies, but also multinational bodies, aid agencies or NGOs. Given the different insurability challenges, the public sector participant can assume a different role in a transaction and each partnership can be tailored to individual needs.

Important questions for the public sector

1. What potential catastrophic events is the country/region/agency exposed to? How will these be affected by climate change? Other natural perils such as earthquakes may be even more devastating but are often neglected as they happen infrequently.
2. How can the public sector assure the functioning of its infrastructure in the event of a natural disaster?
3. In which areas can disaster risk prevention be improved to reduce the potential loss (eg zone planning rules)?
4. How can different state agencies work together to prevent, reduce and fund disaster risks – for example in catastrophe prevention, zone planning, construction permissions, dams etc?
5. How can the public sector benefit from partnerships with the private insurance sector to transfer financial risks and help absorb the increasing burden of natural disaster relief?