Closing the protection gap

Disaster risk financing: Smart solutions for the public sector
Every year natural and man-made catastrophes cause a distressing loss of lives and considerable economic costs around the world. Both industrialised and developing countries are affected. Surprisingly, both are also materially underinsured.

This financing gap is borne largely by the public sector, and may create long-term fiscal instability at a time when government budgets are stretched. Furthermore rating agencies are starting to take a closer look at such contingent liabilities faced by public administrations.

But there are ways to alleviate both the impacts and the costs of disaster by planning ahead. Insurance plays a critical role in effective disaster risk management helping communities get back on their feet faster. This report outlines tools and approaches proven to help governments, regions and cities, as well as the constituents they represent, to become more resilient.

We’re smarter together

Cover images
Above: Cars getting stuck on flooded streets in Fukuyama, 23 June 2016, after areas of western Japan were hit by heavy rain, causing landslides and caving in roads.
Below: Emergency workers supporting the recovery after an earthquake on 25 August 2016 in Amatrice, Italy
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A single house left standing after Hurricane Ike struck Gilchrist, Texas in 2008.
The economic cost of natural catastrophes has increased markedly. In the 1980s, the inflation-adjusted cost of natural catastrophes averaged about USD 30 billion per year. In the 1990s this increased to USD 104 billion per year. Over the last decade, economic damage grew to an annual inflation-adjusted average of USD 190 billion. In terms of percentage of the Gross Domestic Product (GDP), economic losses from natural catastrophes have also gone up.¹

2017 was one of the costliest year ever for natural disasters, an estimated USD 337 billion. The economic losses were almost twice the 2016 total (USD 180 billion), and well above the inflation-adjusted average of USD 190 billion of the previous 10 years. Insurance covered losses of close to USD 144 billion, with natural catastrophes generating claims of close to USD 138 billion.

¹ sigma 1/18, Natural catastrophes and man-made disasters in 2017: a year of record-breaking losses, Swiss Re
The human cost is equally staggering. Many millions of people are impacted by droughts, floods, storms, earthquakes, pandemic outbreaks and other natural catastrophes each year. Moreover, a growing share of the world’s population live in regions considered highly exposed to extreme weather and natural disasters.

The increased risk is mainly due to economic development and population growth, a higher concentration of assets in exposed areas and also, increasingly, climate change. For the first time in human history more people live in urban centres than in rural areas. Many cities are on the coast and threatened by floods and storms, while the vital agricultural sector remains exposed to weather-related events such as droughts or extreme cold spells.

But insurance has not kept pace, and the gap between uninsured and insured losses remains stubbornly large. The fact that the insurance industry paid out record claims of USD 144 billion in 2017, however, is good news, showing signs of progress.

It’s for this reason that Swiss Re has established a dedicated team to help public entities protect their budgets against the costs of natural disasters, and increasingly against other risks such as pandemic outbreaks, terrorism or cyber attacks.

In 2017 Swiss Re paid a total of USD 4.7 bn in claims for natural catastrophe losses

Source: Swiss Re Institute
On average, over the last 10 years, only about 30% of catastrophe losses were covered by insurance. That means that about 70% of catastrophe losses – or USD 1.3 trillion – have been borne by individuals, firms and governments.

### Countries, regions and cities can be hit in multiple ways

Governments – both on a national but also sub-national level - are uniquely exposed as they not only have to shoulder the cost of relief and recovery, but also have to pay for the reconstruction of public infrastructure. And when individuals and firms are underinsured, the government is often expected to support private rebuilding efforts by providing transfer payments as well. Closing the financial gap between insured and uninsured losses is thus in the public sector’s vital interest.

For example, it took the economy of Kauai, one of Hawaii’s islands, 7–8 years to return to pre-disaster levels after Hurricane Iniki devastated the island in 1992 and about 18 years for the population and labour-force to recover. And after Hurricane Katrina struck in 2005, the population of New Orleans dropped dramatically and ten years later, had only returned to 90% of pre-2005 levels. This means that not only is there a hiatus in the overall economic activity, but taxation income suffers too. Some places never recover.

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What can governments and public administrations do?

The best way for governments and public administrations to spread the risks, shoulder the costs of natural disaster and ensure a swift recovery is to support the development of healthy insurance markets. However, many countries lack formal insurance programmes for catastrophic losses and seek the funds to pay for recovery only after a disaster has taken place.

Measures typically include reallocating budget positions, increasing taxes, accessing domestic and international credit markets, borrowing from multilateral financial institutions or soliciting international aid. All have drawbacks and take time to arrange (see table below). Budget reallocation is a fast remedy, but available funds are usually small. Raising taxes comes with a time lag and can hurt an already fragile economy and the people battered by a natural disaster. Borrowing can come at high cost or even be unavailable, particularly for countries with an already high debt burden and with a poor credit rating. Moreover aid is often slow and unreliable. Based on 40 years of historical data for Latin America, the Inter-American Development Bank concluded that on average a country can expect international assistance, for example donor aid, to cover only about 8% of direct disaster losses.  

Financial preparedness through insurance, by contrast, helps to reduce the burden on the government after a disaster. It lowers the volatility of the state budget and improves planning certainty for the public sector thereby avoiding long-term fiscal instability at a time when government budgets are stretched.

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Swiss Re, Natural Disasters Financial Risk Management, 2011

4 Only available to countries with good credit standing
During 2010 and 2011, both Haiti and New Zealand were struck by powerful earthquakes. While similar amounts of energy were released in a densely populated area, the consequences for the society and the economy were very different — both in terms of fatalities and economic losses. The contrast makes two points. The first point is that the level of preparedness largely determines the impact on society and economy.

The second point is less obvious and demonstrates the value of insurance: in New Zealand, 80% of the direct losses was covered by insurance, whereas insurance covered less than 1% of the losses in Haiti. By facilitating investment and reconstruction, insurance can minimise the negative impact of natural catastrophes on economic growth, as in New Zealand. While economic losses in New Zealand were huge, compared to its GDP, economic activity rebounded quickly due to fast rebuilding. In Haiti’s case, uninsured losses caused lower levels of productivity over several years.

This is consistent with the findings of a 2012 study by the Bank of International Settlements (BIS), which looked at nearly 2,500 major natural catastrophes that occurred between 1960 and 2011. In countries with high insurance penetration, the study concluded, the indirect costs of a natural catastrophe event are lower, the overall economic impact is lower, and these countries recover faster from catastrophic events than less-insured countries.

The rating agency Standard & Poor’s (S&P) also emphasises the positive role of disaster insurance arrangements on sovereign financial resilience. The economy with higher insurance coverage recovers more quickly and suffers from a lower cumulative GDP damage than in absence of insurance coverage. For a sample of 48 countries and a hypothetical natural disaster shock equivalent to 5% of a country’s capital stock, S&P estimates that credit ratings would on average decline between two and three notches if there was no insurance protection at all. This compares to a decline of only about one notch if 50% of the damage was insured. Active disaster preparedness through insurance, will therefore allow disaster areas continued access to affordable credit when they need it most.

5 Bank for International Settlements working papers, no 394, von Peter et al. (2012)
6 Standard & Poors, Storm Alert: Natural Disasters can damage Sovereign Creditworthiness, 2015
Similar quakes, contrasting consequences

The earthquakes in Haiti and New Zealand released energy equivalent to a moment magnitude of up to 7.0. In all cases the epicentre was located near a densely populated area. While the economic loss of the events in New Zealand of around USD 36.6 billion* were equal to 18% of GDP, the economic loss of USD 8.8 billion* in Haiti was equal to 120% of its GDP.

The experiences diverged sharply in other areas as well. Haiti suffered more than 200,000 fatalities compared to only around 185 casualties in New Zealand. The damage in Haiti was tantamount to roughly 120% of its GDP, a colossal blow even for a prosperous country, let alone a highly vulnerable nation such as Haiti. Economic growth in Haiti plunged from 3.5% to minus 5.1% in 2010 alone. And exports contracted sharply in the wake of severe damage to the country’s airport, harbour, other infrastructure and manufacturing base. With insurance covering less than 1% of the losses, Haiti was almost completely dependent on foreign aid.

In New Zealand on the other hand, the earthquakes’ impact was equivalent to about 18% of its GDP. The quakes caused disruptions to a major airport, seaports and trunk roads. Facilities for food processing and the manufacture of textiles, machinery and transportation equipment were also hit. Many service providers were adversely affected as well. While its wealth suffered as resources were used to rebuild the capital stock, economic activity rebounded quickly as a result of the rebuilding efforts. Reconstruction, inventory adjustment and a large increase in local government spending helped compensate for the disruption to economic growth. Most notably, 80% of the resulting direct losses in New Zealand were covered and reimbursed by insurance. Without insurance, economic activity would not have rebounded as quickly due to more limited rebuilding efforts.

Haiti
Date: 12 January 2010
Magnitude*: 7.0
Casualties: ~200,000

New Zealand
Date: 4 September 2010, 22 February 2011, 13 June 2011
Magnitude*: 7.0 6.1 6.0
Casualties: ~185

6.6 bn 164.7 bn
Total GDP of country USD

8.8 bn 36.6 bn
Economic loss of earthquake USD*

<1 80
Insurance coverage %

8.7 bn 7.3 bn
Protection gap USD*

(Economic loss minus insured loss)

*Inflated to 2017 prices
Swiss Re’s CatNet® helps you to close the protection gap

CatNet® is Swiss Re’s online Natural Hazard Atlas. The CatNet® functions and data provide an overview and assessment of natural hazard exposure for any location worldwide. This makes CatNet® a valuable tool in preparing local, regional and cross-regional risk profiles.

Swiss Re’s special focus is on continuously enhancing the quality and resolution of our global hazard datasets. Swiss Re was the first provider of flood zones globally based on a proprietary, US patented geostatistical methodology. Now, Swiss Re again makes an effort to bring higher granularity for better risk assessment to clients. Based on Intermap’s NEXTMap World 30 digital surface model (DSM), we re-calculated the Global Flood Zones on 30m resolution. DSM base resolution in Europe and the US is 5m. While GFZv3 is still the unprotected risk view, the significantly higher spatial resolution makes the zones more reliable. With the global coverage we offer, we have one source for all flood assessments. Globally consistent elevation data and flood zone calculation methodology allows unbiased risk assessment.

See an example of the GFZv3 for Paris: CatNet® helps to close the protection gap: the visualisation of hazard and portfolio information in maps allows you to identify issues you would never have been able to detect using a standard NatCat model.

For more information or access to CatNet®, visit www.swissre.com/catnet or contact your client manager.

Flood – ways to insure against the growing threat to lives, homes and the economy

An estimated 500 million people are affected by flood every year across all parts of the globe, and no other natural catastrophe impacts as many people as flooding. This creates tremendous interruption to public infrastructure, business and the economy, and flood losses are increasing at an alarming rate. Annual claims in the 1970s were at USD 1–2 billion, whereas in 2011 insured flood losses amounted to USD 15 billion. Floods now rival earthquakes and hurricanes in terms of economic losses.

Population growth, a concentration of assets in exposed areas and climate change all contribute to the increasing costs of flood damage and which is also creating a challenge for insurability.

Many governments are going to great lengths to review their flood preparedness and find new ways to cover those costs and lower the impacts. The UK recently launched Flood Re, a government sponsored risk pool, offering homeowners more affordable flood insurance and mitigation guidelines to improve preparedness. The United States National Flood Insurance Programme, established in 1968, insuring more than 5 million homes, turned to reinsurance for the first time in 2016 to enhance its claims paying capacity.

Situations and regulations differ tremendously from nation to nation. While recognizing that there is no “one size fits all” solution, innovative risk-management and risk-financing solutions are being designed in both developed and developing markets. These solutions could serve as models for other countries.

7 World Bank, Cities and Flooding Guidebook, 2012
New Orleans flooded after Hurricane Katrina in 2005. The social and economic impact on the city was tremendous, and even now, more than 10 years later, it has not reclaimed its former economic strength.
The wildfires in 2017 caused tremendous damage to lives, property and business in many parts of the world, the most significant being California and Portugal. With climate change the threat of wildfires is becoming a major concern for regions and city governments in exposed areas.
More than one way to close the protection gap

Risk prevention and mitigation must be the first priority in managing natural disasters. Hazard mapping, physical protection measures such as flood gates and comprehensive building codes, for example, serve this purpose. Such measures also save lives and protect infrastructure.

But no organisation or country – whether developing or industrialised – can fully insulate itself against extreme events. Transferring catastrophic risk to enable and sustain growth must therefore be a key element in the financial strategy of every disaster-prone country or region – and should ideally be part of an integrated risk management approach.

The G20 and OECD have recognised that “financial resilience is a critical component of disaster management”8 because the immediate availability of funds to finance the necessary disaster response and recovery is critical to take appropriate action, not only for individuals and businesses, but also for governments. To the latter point, the OECD has adopted a Recommendation on Disaster Risk Financing Strategy that provides guidance on the development of strategies for the financial management of disaster risks.9

Life going back to normal – survivors of the 2010 earthquake in Haiti.

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8 G20/OECD, Disaster Risk Assessment and Risk Financing, 2012
9 OECD, Recommendation on Disaster Risk Financing Strategies, 2017
In addition, the G7 Climate Risk Insurance Initiative (G7 CRII) acknowledges the role insurance can play in effective climate risk management. As a risk transfer instrument, climate risk insurance can contribute to building resilience to adverse consequences of extreme weather events.

**Integrated risk management – Questions for decision-makers**

Financial risk transfer is part of a comprehensive risk management approach. Integrated risk management follows four stages: from risk identification and assessment to risk mitigation and adaptation, as outlined in the diagram below.

**Financing is a pillar of integrated disaster risk management**

1. **Identification**
   - What risks do we face?
     - Systematic
     - Cross-sectoral

2. **Assessment**
   - Can we quantify the risks?
     - Frequency
     - Severity

3. **Prevention & mitigation**
   - How can we minimise the risks?
     - Improve quality
     - Develop new protection measures

4. **Adaptation**
   - How can we manage residual risk?
     - Change risk awareness and behaviours
     - Pre-finance
     - Risk transfer

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10 G7 Summit 2015, Annex to the Summit Declaration
An integrated risk management process should include a thorough analysis of the risk landscape, including environmental, political, social and health aspects. It enables political and public sector decision-makers to determine their priorities in advance and protect communities from the financial costs of peak risks.

These large risks originate not only from natural catastrophes but also from pandemics, the unanticipated financial impact of people living longer lives, as well as from man-made disasters such as terrorism and cyber risk. A comprehensive approach allows governments in both developed and developing countries to minimise risks wherever possible and transfer the costs where necessary.

Decision-makers in governments and sub-sovereigns face a number of important issues on managing disaster risks. Key questions include:

1. In which areas can disaster risk prevention be improved to reduce the potential loss (e.g. zone planning rules, building codes)?
2. How will these be affected by climate change and future development?
3. What portion of the loss would be absorbed by the insurance sector and which by governments (at the municipal, state and national level)?
4. What are the (financial) resources that can be made available in case of an event? How quickly can they be deployed? What would be the impact of a catastrophe on a state’s fiscal budget and GDP growth?
5. How can the public sector benefit from partnerships with the private insurance sector to transfer financial risks and help absorb their own increasing burden of natural disaster costs?
Today there are a variety of innovative partnerships that can act as models for other countries to embark on risk financing strategies. These range from macro-level solutions for individual countries, sub-national solutions for provinces or cities; pool schemes that bring together regional entities facing a similar risk, as well as micro-level schemes to make insurance directly available to individuals.

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<th>Which risk?</th>
<th>Who carries the risk?</th>
<th>Risk transfer solution</th>
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<td>Public physical assets</td>
<td>Governments</td>
<td>MACRO: Risk transfer solutions for (sub)sovereigns to cover their direct or indirect costs</td>
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<tr>
<td>Emergency response costs</td>
<td></td>
<td>NATIONAL SCHEMES: Insurance schemes and pools to increase insurance penetration</td>
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<tr>
<td>Foregone revenue</td>
<td>Businesses, homeowners, farmers</td>
<td></td>
</tr>
<tr>
<td>Uninsured private assets</td>
<td>Individuals</td>
<td>MICRO: Simplified products distributed through aggregators such as MFIs, NGOs, and corporates</td>
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<tr>
<td>Livelihood assistance</td>
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Ways and means to close the gap, solutions that Swiss Re has been involved in

Governments pioneering sovereign risk transfer
Mexico is a pioneer of macro solutions to transfer risk. Faced with natural perils from earthquakes to storms (not to mention man-made risks such as sudden changes in the oil price), Mexico now has a world-class integrated risk management strategy. At the centre is FONDEN, its federally-supported fund for natural disasters. FONDEN works with the private sector to secure standard reinsurance cover for damage to infrastructure, as well as catastrophe bonds to transfer earthquake and hurricane risks to capital markets. Under this structure the government anticipates paying for recovery from its “ordinary” disaster experience through FONDEN, and leveraging the private sector to bolster protection against remote but costly (“fat tail”) risks.

In China, provincial governments are increasingly using insurance instruments to finance disaster relief programmes or to re-build public infrastructure. The provinces of Heilongjiang and Guangdong, for example, have pioneered macro insurance solutions.

In three different parts of the world – Africa, the Caribbean and the Pacific Islands – groups of countries have collaborated to jointly transfer part of their weather and disaster risks to the international re/insurance and capital markets. Each solution is based on so-called parametric or index insurance, with the ultimate result that payouts are quicker and ‘premiums’ are less expensive than they would be if each country approached international markets individually.

In early 2018, the four highly earthquake exposed Latin American countries Chile, Colombia, Mexico and Peru, united in the Pacific Alliance, jointly approached the insurance and capital markets through the intermediation of the World Bank and secured parametric earthquake protection worth USD 1.36 billion.

Creating national insurance schemes
Another approach to relieve governments’ budgets of the contingent liabilities related to natural disasters is to promote insurance solutions for homeowners, farmers, and other under-insured groups.

There is no single ideal or universally applicable solution for such insurance schemes. Each country must find and adapt a model that best fits its exposures, risk carrying capacity, existing insurance market, institutional set-up and political acceptability. The solutions range from comprehensive compulsory natural disaster covers offered by government-sponsored insurance entities (like in France or Spain), to privately organised voluntary disaster insurance products (like in Germany). The Turkish Catastrophe Insurance Pool provides risk-based disaster insurance for around 7 million homeowners and has become one of the largest catastrophe insurance pools in the world. It also serves as a model for many countries in terms of how the public and private sectors can cooperate to finance disaster risks. Flood Re in the United Kingdom is a good example of a successful flood scheme. It is set up as a Private Public Partnership between the UK insurance industry and the UK government and provides affordable flood insurance to homes potentially affected by flooding.

Insurance for the most vulnerable
Insurance is increasingly being tailored to those who could never access or afford it in the past. Kenya’s index-based Livestock Insurance Program (KLIP) is a good example. More than three-quarters of Kenya’s population depends on agriculture and livestock keeping as their main form of economic activity. The government launched KLIP to help herders keep their cattle alive through periods of drought. Interestingly, the scheme is not intended as compensation for the death of livestock, but rather a way of to help the herders keep their animals alive. KLIP is wholly funded by the Kenyan government under the Hunger Safety Net Programme. Each of the chosen households is covered for five tropical livestock. There is also the option of purchasing top-up covers. Swiss Re has played a key supporting role in getting this innovative and scalable insurance scheme off the ground.
Keeping their animals alive through the drought: novel insurance scheme supporting the lives and livelihoods of herders in Kenya.
As a first priority, governments should enable a functioning insurance market. This will help absorb a major part of disaster losses suffered by individuals and businesses. Sovereign and subsovereign insurance solutions can alleviate the remaining financial burden on governments. Post-disaster financing (such as debt financing or donor aid) should only come into play to cover residual losses once all other risk transfer solutions have been exhausted.

Public and private sectors can cooperate to finance disaster risks. Such partnerships do not just exist in theory. Real, innovative solutions have been developed and tested over the past few years which can be replicated and adapted to other countries and regions (see the appendix for successful case studies).

Because no nation or region can fully safeguard itself against natural disasters, insurance coverage for catastrophe risks should be a backbone of the financial strategy of any country exposed to such events. Country risk coverage of this kind, known as sovereign risk transfer, is preferable to post-disaster financing for numerous reasons. The benefits for the insured governments include:

1. Guaranteed access to funds for recovery, up to agreed cover limits
2. Budget planning certainty (pre-determined premiums vs highly volatile disaster expenses)
3. Speedy delivery, for example through parametric solutions
4. No payback obligation (in contrast to debt financing)
5. Diversified funding to cope with the impact of natural catastrophes
6. Reduction of a country’s contingent liabilities to acceptable levels (positive implications for sovereign rating and currency)
7. Reduced need to divert own funds from other projects to affected areas
8. Price tag on risks allowing for comparison of different risk management measures
Indemnity insurance is an insurance policy which pays out based on the actual economic losses incurred, up to a specified limit.

Parametric or index insurance uses measured or modelled parametric data to determine payouts. The payout model aims to closely mirror the actual damage on the ground and is usually based on physical parameters such as wind speed, geographic location of a hurricane or earthquake magnitude. Parametric/index insurance enables a more rapid payment than indemnity insurance because it requires no loss adjustments to assess the actual damage after an event.

In respect to flood solutions, the basis risk, i.e. that the payout could be larger or smaller than the actual loss incurred, can be addressed through the use of flood footprints that outline those areas that are actually inundated.

Weather insurance is an example of a parametric insurance cover that protects buyers against the impact of adverse weather conditions on their business or property. The underlying index for such a product could be, for instance, meteorological data. The market for weather products is split into standardised products and customised products. Standardised products are traded at the Chicago Mercantile Exchange, for example. They are based on daily temperature changes, frost or precipitation. Since they are standardised and do not cover a specifically defined risk, they leave the client with a substantial amount of basis risk. This is why, in parallel, an over-the-counter market for tailor-made products has developed seeking to minimise basis risk.

Derivative instruments and insurance-linked securities (such as catastrophe bonds) are a means of ceding insurance-related risks to the capital markets. These tools also usually rely on index-based payout mechanisms. Since the first cat bond in 1997, insurance-linked securities (ILS) have been used to transfer a wide range of risks from natural catastrophes to life insurance risks.
And it works – proven concepts to build on:

The case studies complementing this publication describe a broad range of risk-transfer partnerships already in operation.

Although these are highly customised to the risks and needs of their clients, they can offer guidance for public entities who are still undecided about how best to address their own natural disaster risks.

The case studies highlight schemes for individual countries, insurance pools for those facing similar risks, solutions for regions and urban centres, as well as mechanisms that make insurance directly accessible for individuals.