

Swiss Re



Closing the financial gap

New partnerships between the public
and private sectors to finance disaster risks

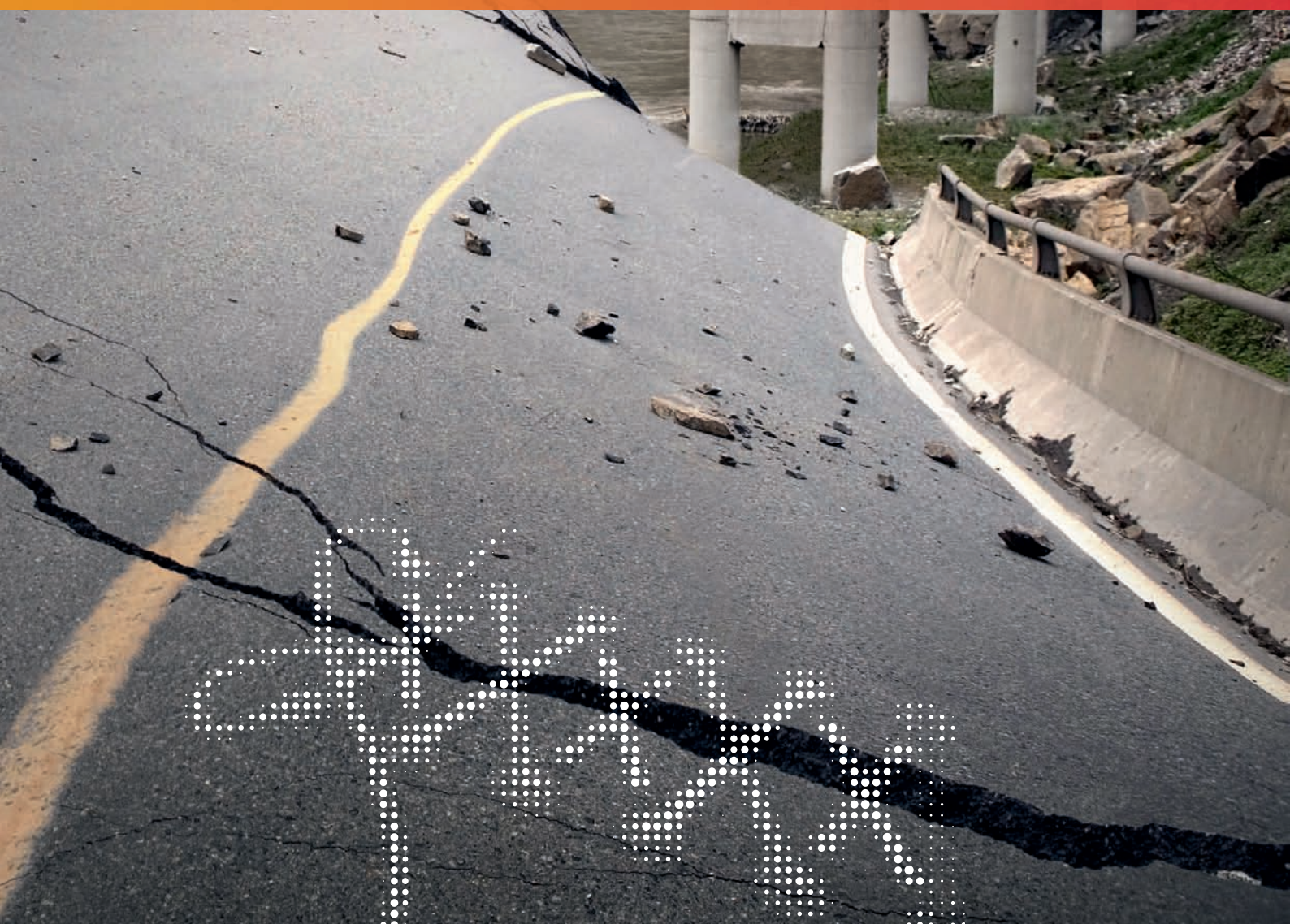


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The increasing severity and frequency of natural catastrophes are driving up the cost of disaster relief and reconstruction. The gap between the actual economic loss and the insured loss is large, especially in developing and emerging markets which are those most hurt and the least prepared.

New forms of public-private partnerships can help countries absorb the financial consequences of catastrophic events and can make them more resilient. The reinsurance sector contributes to innovative solutions that close part of the gap between economic and insured losses. This publication explains the mechanisms and advantages of such solutions using real-life case studies.

Financing disaster risks

Each year features new headlines about deadly and devastating catastrophes in different parts of the world. 2010 was a particularly devastating year, with earthquakes in Chile, Haiti and New Zealand, flooding in Pakistan and China, drought and wildfires in Russia and Australia and winter storms across Europe.

The economic cost of natural catastrophes has clearly increased. In the 1980s, inflation-adjusted costs were on average about USD 25 billion, in the 1990s this increased to USD 95 billion per year. In the last ten years, economic damage reached an annual average of USD 130 billion.

This 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 now live in urban centres than in rural areas. Many of these cities are located on the coast and are threatened by floods and storms. In rural areas it is primarily the agricultural sector which is exposed to weather-related events.

Economic development and population growth, a higher concentration of assets in exposed areas and a changing climate are increasing the economic cost of natural disasters. Both developed and developing countries are affected.

The growing economic cost of disasters

Overall vulnerability to natural disaster risks depends on exposure, preparedness and the ability to absorb losses. More developed countries are generally better prepared than less developed countries, although in absolute terms the damage in developed countries is costlier.

For example, estimated direct losses from Hurricane Katrina in 2005 reached a staggering USD 140 billion. When Hurricane Ivan hit the Caribbean island of Grenada a year earlier, it caused direct losses of up to USD 889 million. Although only a fraction of Katrina's economic fallout, this amount constituted more than 200% of Grenada's considerably smaller GDP.

Comparing data sets from countries in the Latin American and Caribbean region, the Inter-American Development Bank (IDB) concluded in its most recent report: "The losses associated with earthquakes, hurricanes, droughts, and flooding are growing at four times the rate of GDP growth."

Economic losses vary substantially by country and disaster event. A large part of these costs are not insured. On average, over the last twenty years only 20 to 40% were covered by insurance. Particularly in developing and emerging markets, insurance coverage is not widespread. Measured in premiums as a percentage of GDP, average insurance penetration rates in the non-life sector reach only 2.9% in developing countries, far below the 8.6% seen in industrialised countries. This means that developing countries face the largest gap between insured and economic losses. As a result, the majority of these losses falls back on individuals and the government.

Major disasters in the last 40 years

Year	Event	Country	Economic losses ¹ in USD millions	% of GDP ²	Insured losses ¹ in USD millions	Victims
2005	Hurricane Katrina	US, Gulf of Mexico, Bahamas, North Atlantic	140 000	1.1%	64 754	1 836
2008	Earthquake	China	124 578	2.8%	366	87 449
1995	Great Hanshin earthquake	Japan	82 399	1.6%	2 472	6 425
2010	Floods, mudslides	China	53 113	0.9%	n.a.	2 480
2008	Hurricane Ike	US, Gulf of Mexico, Turks and Caicos Islands, Haiti, Cuba, Bahamas, Dominica Republic	40 000	0.3%	20 221	136
2010	Earthquake	Chile	30 000	15.1%	8 000	521
1998	Flooding along Yangtze River	China	30 000	3.0%	301	3 656
1994	Northridge earthquake	United States	30 000	0.4%	14 000	61
2004	Chuetsu earthquake	Japan	29 276	0.6%	598	39
1992	Hurricane Andrew	United States	26 500	0.4%	16 000	43
2004	Hurricane Ivan	United States	22 000	0.2%	12 885	124
1999	Earthquake	Turkey	20 000	8.0%	1 000	19 118
2008	Snow storms	China	20 000	0.4%	1 270	130
2005	Hurricane Wilma	United States	20 000	0.2%	12 563	35
1995	Drought in Northeastern China China		19 669	2.7%	n.a.	0
2008	Hurricane Gustav	United States	17 500	0.1%	2 619	135
2004	Hurricane Charley	United States	16 000	0.1%	8 051	24
2010	Wild fires	Russia	15 000	1.0%	n.a.	50
2005	Hurricane Rita	United States	15 000	0.1%	10 090	34
2010	Earthquake	Haiti	8 000	114%	n.a.	220 000
1988	Hurricane Gilbert	St Lucia	1 000	386%	n.a.	341*
2004	Hurricane Ivan	Grenada	889	203%	n.a.	124*
1991	Cyclones Val and Wasa	Samoa	278	248%	n.a.	14*
1990	Cyclone Ofa	Samoa	200	178%	n.a.	8
1985	Cyclones Eric and Nigel	Vanuatu	173	143%	n.a.	25*
2009	Tsunami	Samoa	120	22%	n.a.	149*

¹ All figures are nominal values

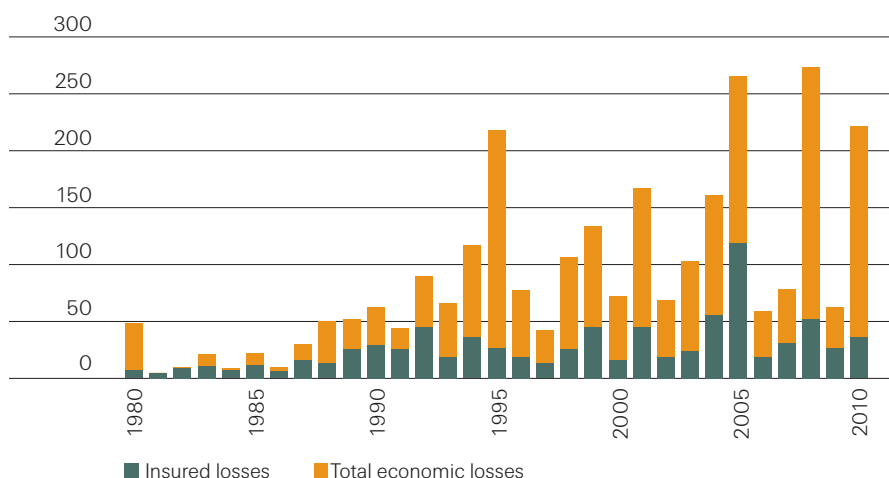
² Based on GDP recorded in the year of event

* Death toll in all countries

Source: World Bank and Swiss Re Economic Research & Consulting

The gap between economic losses and insured losses from natural disasters is large. New approaches to financing disaster risks are therefore key to making countries more resilient.

The gap between insured losses and total economic losses of catastrophic events globally in USD billions (indexed to 2010)



Source: Swiss Re Economic Research & Consulting

A major financial strain on governments

The public sector not only shoulders the cost of relief and recovery efforts, such as administering first aid, providing emergency supplies and clearing roads. The government also pays for the reconstruction of public infrastructure. And since individuals and firms are generally underinsured in many developing or emerging market economies, the government is often expected to support private rebuilding efforts by providing transfer payments as well.

The consequences are wide-ranging. Broken-down infrastructure and slow repairs can have costly secondary effects, such as lower economic growth and shortfalls

in (future) tax revenues. This in turn can further slow down rebuilding efforts, creating a vicious cycle. The faster a country can return to its normal state of affairs, the smaller the long-term impact of a disaster. The resilience of a nation – or its ability to rebound from devastation – not only depends on the severity of the catastrophic event, but also on available funding for relief, recovery and reconstruction.

In many developing and emerging economies, however, total available funds are simply not enough to cover all the potential costs. The World Bank has looked at the record of the 73 countries most exposed to weather-related risks over the last 30 years. It identified those that are highly vulnerable financially and experience a resource gap, which means that net disaster losses exceed all available financing sources. Many of these disaster-prone countries already run into a financing problem for events which are expected to happen once every 50 years but could happen tomorrow.

Highly vulnerable countries need to step up efforts to reduce risk, so that they can save human lives and alleviate the financial burden on the government and the general public. Prevention, mitigation and risk avoidance with measures such as hazard mapping or comprehensive building codes are the most important steps to dealing with catastrophes. But not all risks can be avoided, so preparing for the financial aspects of risks is a key element of any disaster-prone country or region.

The resilience of a nation not only depends on the severity of the catastrophic event but also on available funding for relief, recovery and reconstruction.

Instruments that build up financial reserves as well as insurance solutions can reduce the financial burden on governments after a disaster occurs, lower the volatility of the government budget and improve planning certainty for the public sector.

Preparing for the financial impact of disasters

Historically most governments have financed disaster expenses only after a catastrophic event has taken place. Measures include reallocating funds, increasing taxes, accessing domestic and international credit markets, borrowing from multilateral financial institutions or applying for international aid. Yet these initiatives clearly have drawbacks. Budget reallocation is a fast remedy, but available funds are usually small. Raising taxes can hurt an already fragile economy battered by a natural disaster. And the cost of borrowing money from national or international financial markets can be very high, particularly after a devastating event.

Countries with a low debt burden have more financial flexibility than others. Raising debt for them is cheaper and does not compromise their longer-term ability to borrow from international financial markets. Chile is a case in point: Its

8.8-magnitude earthquake in 2010 hit a country whose general government debt had been a mere 3.2% of GDP the year before. "That was an important component of the fiscal flexibility that allowed the country to absorb losses and spend on reconstruction without impairing creditworthiness", writes Standard & Poor's. Grenada by contrast, with debt at 91% of GDP in 2003, found itself in a very different position. When Hurricane Ivan struck in 2004, the country defaulted just a year later.

Donor assistance, another important post-event tool, can help during the early relief and recovery phase in the first weeks. But there is no guarantee that the aid will arrive promptly, and the amount is uncertain. 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 to cover only about 8% of direct disaster losses.

Pre-event vs post-event financing instruments

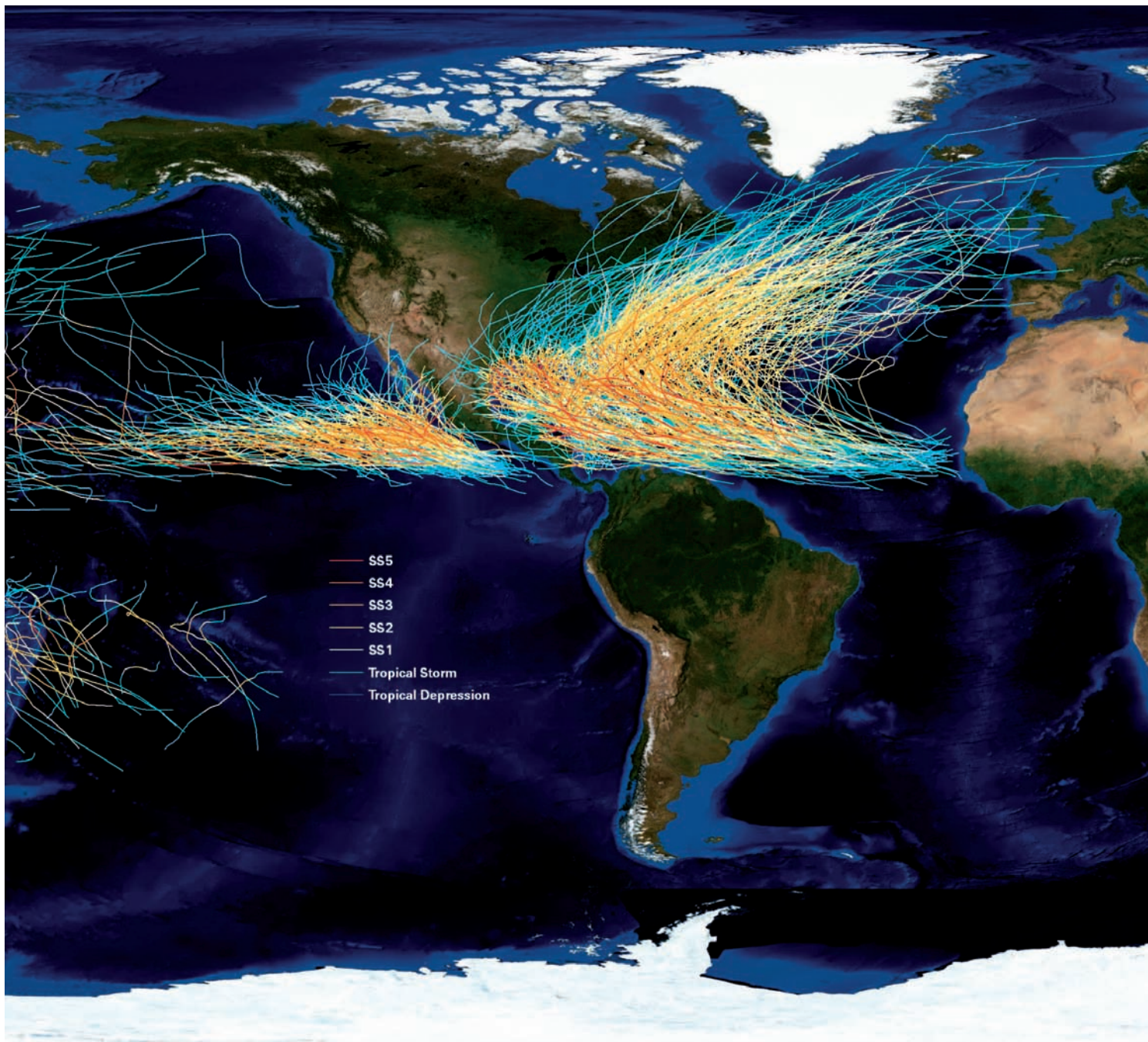
Pre-event measures	Advantages	Disadvantages
Indemnity insurance	Low basis risk for insured	Needs loss assessment
Parameteric insurance	Quick disbursement, low administrative cost	Basis risk of insured
Contingent financing	Small payment upfront, guaranteed access and pre-defined pricing	Repayable and costs interest
Reserve funds	National measure, does not impact financial strength	Costly, may divert resources

Post-event instruments

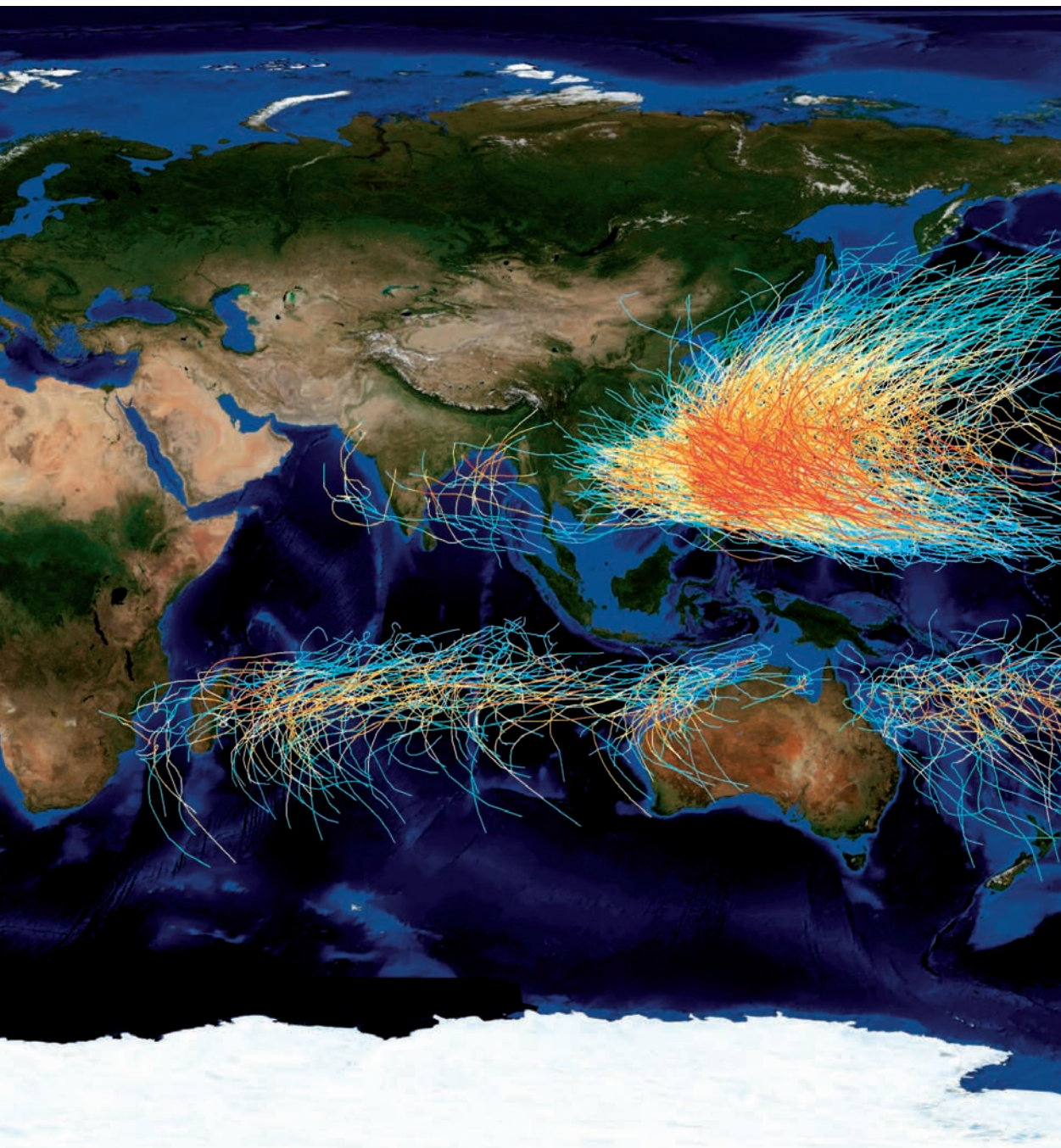
Budget	National source of funding	Limited, diverts resources
Raising taxes	National measure	Limited, politically sensitive, may dampen economic recovery
Debt	Standard instrument, proven	Potentially slow and costly
Donor aid	Inexpensive	Can be slow, and amounts are uncertain

Source: Swiss Re

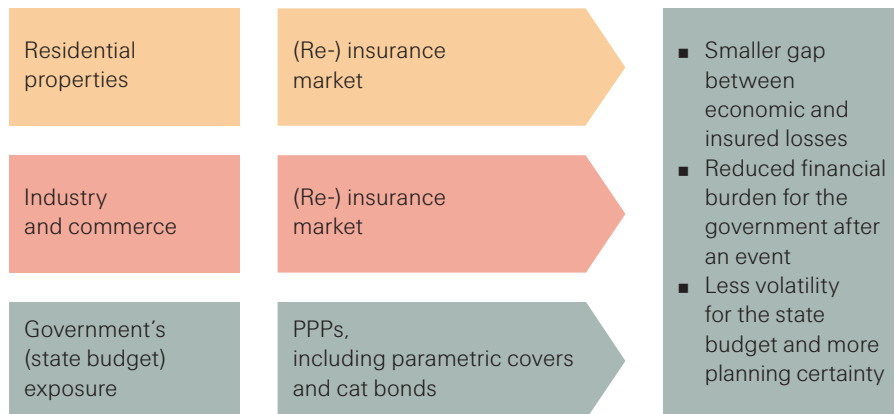
Most Atlantic ocean hurricanes form near the Cape Verde Islands off Africa's west coast, where trade winds of the northern and southern hemispheres meet and cause tropical disturbances. Such disturbances take their energy from warm waters and grow into tropical depressions. As the depression moves across the ocean they become more powerful and, as they reach more than 119 km/h, turn into hurricanes, cyclones or typhoons.



World risk map – Tropical cyclones
Source: Swiss Re GEOservices; Unisys



Benefits of comprehensive disaster risk transfer



Source: Swiss Re

Spreading the risk on many shoulders

The mounting exposure to catastrophes calls for a broader distribution of risk and a more diversified financing mix.

As a first priority, a functioning insurance market can absorb a large part of the risks faced by individuals and businesses. This also takes some burden off the government which as the lender of last resort is expected to pay for all losses.

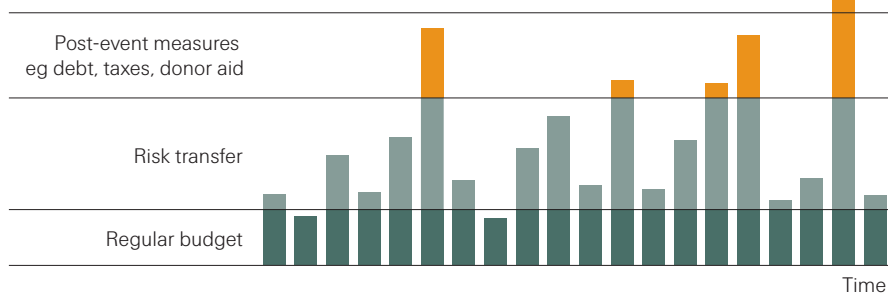
To enable a well-functioning insurance market that makes insurance more widely available to individuals and businesses alike, the public sector plays a key role in setting the necessary framework. Such a framework not only grants access to international reinsurance markets; it also sets the stage for international insurers to offer a variety of risk transfer instruments. These include traditional insurance, mi-

cro-insurance and insurance contracts for sovereign entities, as some risks are so complex and destructive that they need to be addressed through public-private partnerships and innovative solutions. Such pre-event financing tools can be a second step for governments to cover the financial aspects of disasters.

Post-event disaster financing should only come into play to cover residual losses once all other risk-transfer solutions have been exhausted. An effective risk management portfolio should consist of both post-disaster and pre-disaster financing tools. It is also a way to better spread risk over many shoulders and tap into international financial markets.

Pre-event financing tools have a distinct advantage over post-financing measures. Instruments that build up financial reserves or provide contingent funds as well as insurance or reinsurance solutions can reduce the financial burden on the government after a disaster, lower the volatility of the state budget and improve planning certainty for the public sector. Such an approach not only increases the government's financial flexibility; different instruments also cover different needs in the wake of a disaster.

Expected total economic losses covered by different disaster financing tools



Source: Swiss Re

New forms of public-private partnerships and risk transfer solutions

Public-private risk transfer solutions can help governments manage risks in at least two ways. They either complement the existing insurance market or help bridge a financing gap in countries that lack a functioning insurance market altogether.

Innovative solutions can open access to international financial markets. Since disaster relief requires quick availability of financial resources, parametric insurance solutions can be a particularly effective tool. The MultiCat transaction in Mexico is an example of how a government uses a cat bond to cover earthquake and hurricane risks to rapidly access funds. The Caribbean states use another solution. They combine the benefits of pooled reserves with the financial capacity of international reinsurance markets. This instrument uses a modelled loss approach to quickly assess the damage on the ground.

Agricultural insurance and weather insurance solutions play an important role in countries that depend heavily on food production. Without insurance against drought, not only are farmers exposed to crop failures and income losses, they also remain less productive because they are hesitant to buy seeds and fertilisers for fear of losing their investment. Agricultural insurance or weather insurance solutions help protect farmers and other stakeholders in the agricultural sector from the consequences of severe weather conditions, including those who were previously uninsured.

These risks would best be absorbed by a well-functioning and efficient local insurance market, but in its absence innovative public-private partnerships can help. Solutions can be structured to cover risks both at a macro-level (governments) and at a micro-level (subsistence farmers). The municipality of Beijing and the state of Malawi, for example, have successfully adopted such measures to protect farmers and boost agricultural output.

Glossary of products

Indemnity insurance is an insurance policy which pays out based on the actual economic losses incurred, up to the limit and duration specified in the terms of the insurance contract.

Parametric 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 the physical parameters of a catastrophic event or an index of such parameters, such as wind speed, geographic location of a hurricane or earthquake magnitude. Parametric insurance enables a more rapid payment than indemnity insurance because it requires no loss adjustments to assess the actual damage after an event.

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 that seeks to minimise basis risk.

Derivative instruments and insurance-linked securities can also cover insurable risks. These tools usually rely on index-based payout mechanisms. Insurance-linked securities (ILS), such as catastrophe bonds, are a means of ceding insurance-related risks to the capital markets. Since the first cat bond in 1997, ILS has been used to transfer a wide range of risks from natural catastrophes to life insurance risks.

Financial risk transfer should be part of a comprehensive country risk management strategy. This integrated approach enables governments to set priorities and determine the most appropriate course of action to protect society from the financial costs of catastrophic events.

Disaster financing in the wider country risk management context

Financial risk transfer should not be looked at in an isolated way. It is part of a comprehensive risk management approach. Integrated risk management follows four stages: from risk identification and assessment to risk mitigation and adaptation.

An integrated risk management process should include a thorough analysis of the risk landscape, including environmental, political, social and health aspects. Integrated risk management 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 not only emanate from natural catastrophes but also from man-made disasters such as terrorism as well as pandemics and unanticipated longevity, the phenomenon of people living longer than originally projected and therefore creating pension-cost liabilities. A comprehensive approach allows governments to minimise risks wherever possible and transfer the costs where necessary.

Once the risk assessment is done, the government must decide on different measures. There is a natural trade-off between risk mitigation and risk transfer. Investing in better building codes may cost some initial investments in the immediate term, but they pay off in the long run with lower levels of physical destruction in the event of disaster and lower insurance prices.

A comprehensive country risk management approach is essential to increase risk transparency and make informed decisions about the most appropriate risk transfer solutions. As the case studies in this publication show, different risk exposures call for different risk transfer mechanisms.

Decision-makers in government face a number of important issues on managing disaster risks. They must ask themselves a set of key questions:

1. Which potential catastrophic events is the country or region exposed to? How will these be affected by climate change and future development?
2. In which areas can disaster risk prevention be improved to reduce the potential loss (eg zone planning rules, building codes)?
3. What portion of the loss would be absorbed by the insurance sector, why by the government (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 the increasing burden of natural disaster relief?

This publication features a selection of case studies where governments act as buyers of innovative insurance or reinsurance products to protect themselves against the financial impact of natural catastrophes. It also shows that the applicability of such insurance schemes is not limited to emerging economies alone. They are equally valuable to communities in exposed regions of the developed world.

Public-private partnerships: the role of government in enabling risk transfer

Effectively reducing and financing catastrophic risks requires a combined response by both private and public sector players. While the public sector plays a key role in setting a legal framework that enables the development of a private insurance sector, it's the primary role of private insurers and reinsurers to develop appropriate risk transfer solutions and to absorb and manage those risks most effectively. In developed countries with a functioning insurance market, there is no need for the government to actively absorb natural catastrophe risks. In countries where the insurance market is not yet sufficiently developed, however, the government may need to play a more active role as an enabler of risk transfer. In addition, governments themselves may choose to buy private insurance coverage in order to pre-finance public disaster expenses.

Governments as rule setters: The public sector has the political and legal power to set rules and regulations that enable the insurance market to absorb large losses. These include setting capital and licensing requirements, providing access to international markets, defining the terms of liability, supporting preventive measures, etc. In some situations, governments can help expand the availability of risk transfer solutions to individuals and corporations by introducing compulsory insurance schemes to create a sufficiently large "risk community".

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 fire brigades exist. Enforcing prevention measures is an important role for a government in order to reduce vulnerability to disasters. This concerns building codes to enhance the resilience of structures, as much as appropriate zoning to reduce exposures in hazard-prone areas. Insurance provides an incentive for prevention and mitigation efforts by putting a price tag on risks.

Government intervention in a functioning insurance market should be limited since it can trigger unintended consequences. For example, regulations that keep rates artificially low may encourage homeowners to stay in highly exposed areas or to neglect maintenance as a means of risk prevention, thus further increasing the burden of natural disasters for society and the public sector.

Governments and NGOs as sponsors and facilitators of an insurance market: Where an insurance market does not yet exist – as is often the case in developing and emerging markets – governments and non-governmental organisations can play an important role in facilitating the development of risk transfer solutions. This may involve collecting exposure data and supporting risk research and modelling to enable new insurance solutions.

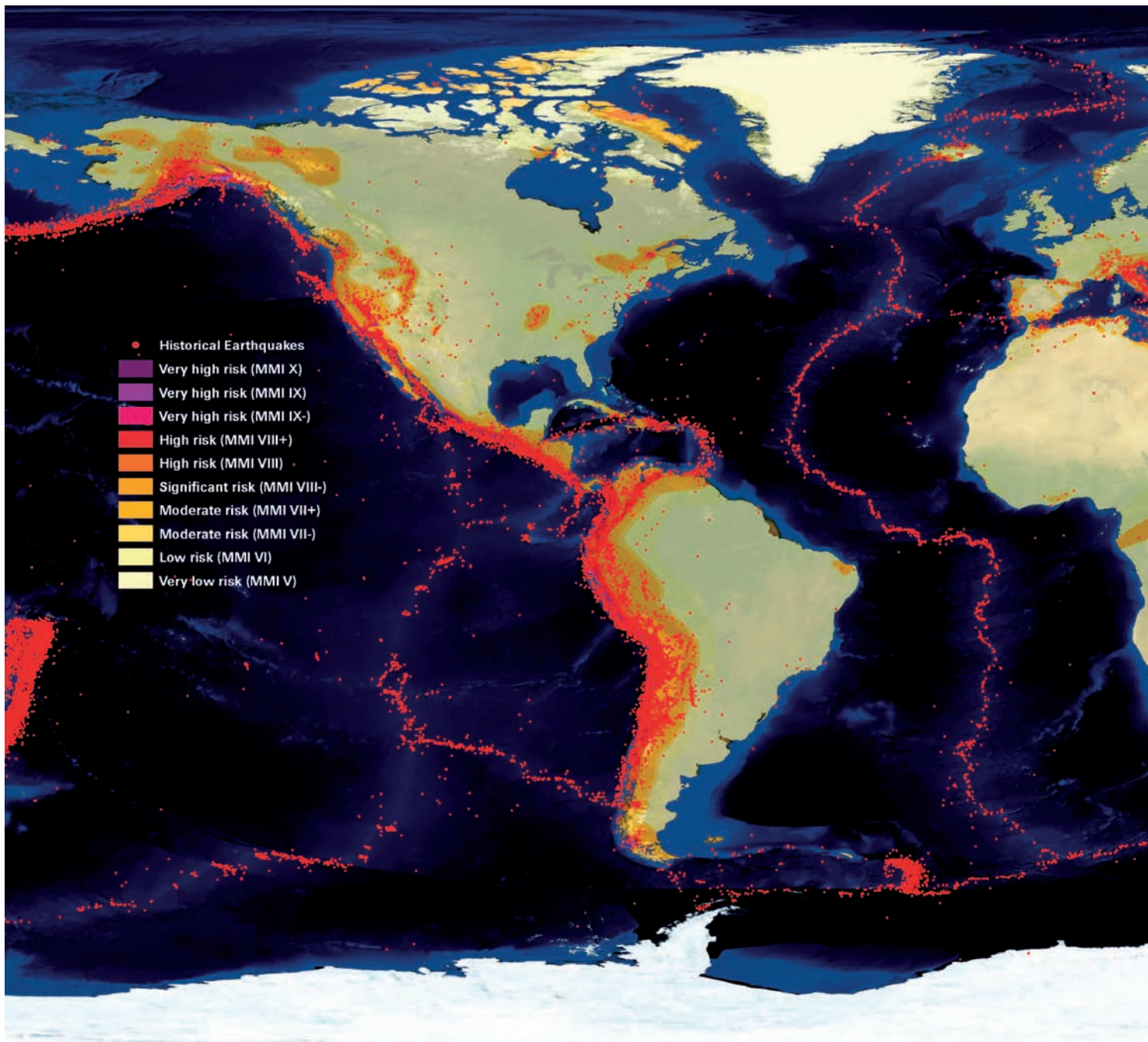
In addition, governments can encourage the development of an insurance market by initially subsidising insurance premiums. However, this should be limited to the build-up phase of an insurance market and particularly to developing and emerging markets, where affordability of insurance premiums is an issue. Otherwise, subsidies may provide the wrong incentives.

Governments as (re)insurers: In many countries, governments also act as insurers or reinsurers for certain risks in order to supplement private insurance schemes. Government backstop programmes can effectively facilitate a limited private-sector insurance solution wherever risk assessment is a particular challenge and where the magnitude of a potential loss exceeds the capacities of the private sector, such as in scenarios involving terrorism.

For weather-related and other natural catastrophe risks, however, the private sector has the capacity and expertise to provide sufficient coverage. Here, the public sector should limit its direct involvement and focus its intervention on expanding the availability of insurance schemes – with the ultimate aim of establishing an efficient private-sector market.

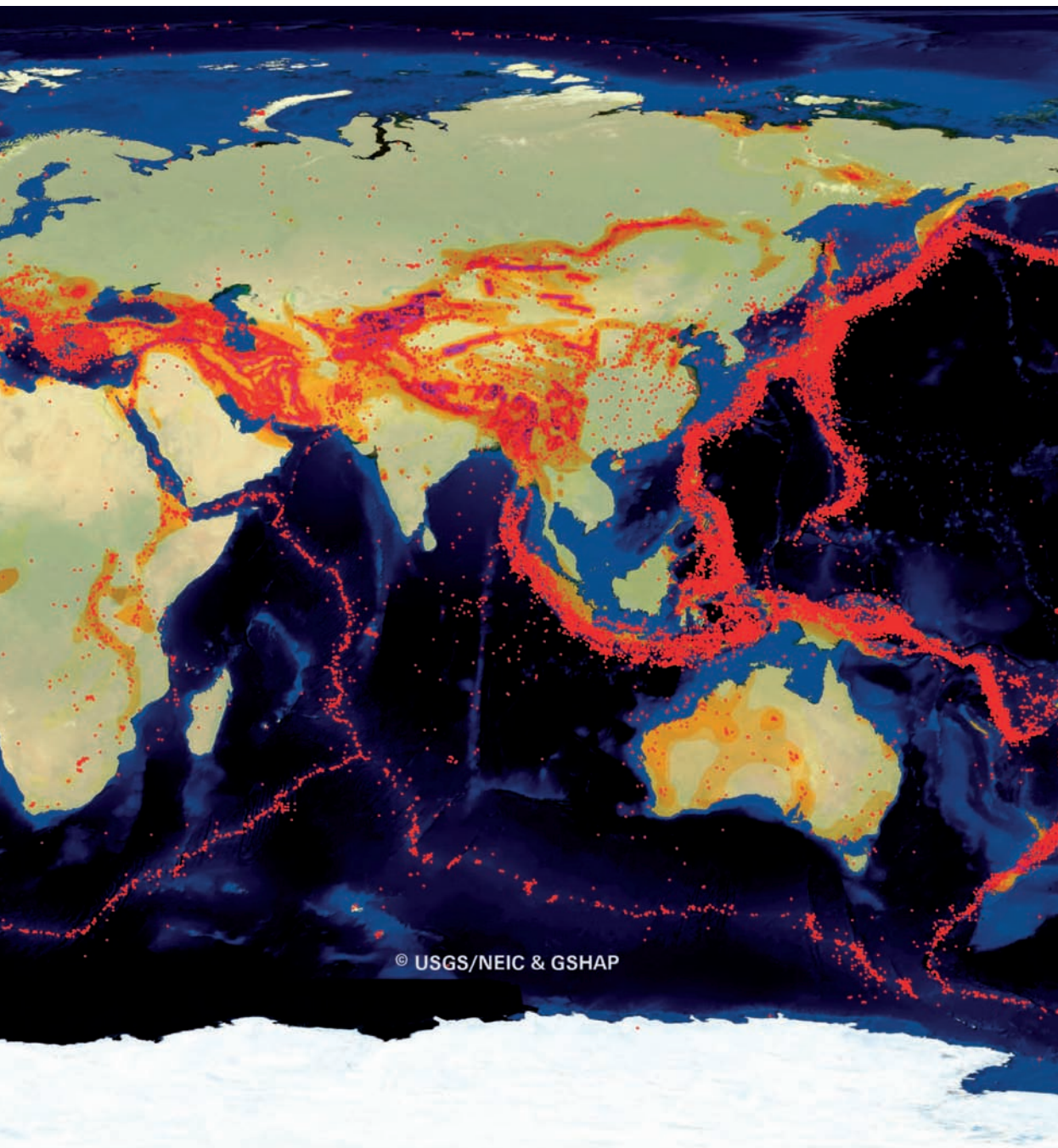
Governments as (re)insurance buyers: As the private sector has the expertise and capacity to insure disaster risks, governments can also buy private insurance coverage themselves. This enables the public sector to fund disaster expenses before a catastrophe occurs. As a result, governments will be able to deliver immediate relief to the victims of catastrophes without creating a significant sudden burden for public finances. The resulting public-private risk transfer mechanisms can involve insurance, reinsurance and capital market instruments.

Around the world there are about 500 000 earthquakes every year. A fifth of these can actually be felt and a handful are devastating enough to take lives, destroy houses and infrastructure or cause major flooding. Almost 80% of all earthquakes occur in the so-called Pacific Ring of Fire which passes through Alaska and Central America down to South America and across Southeast Asia.



World risk map – Seismic activity

Source: Swiss Re GEOservices; US Geological Survey; ETH Zurich



Case studies

Among the challenges facing the governments of small island states in the aftermath of a natural disaster is the need for short-term liquidity to start recovery efforts while maintaining essential government services. This challenge is particularly acute for countries in the Caribbean region, which are exposed to the recurring threat of hurricanes and earthquakes.

Caribbean Catastrophe Risk Insurance Facility

Climate-proofing development in the Caribbean

Faced with limited economic capacity and high levels of indebtedness, Caribbean governments found their resilience tested to the breaking point when Hurricane Ivan swept across the region in early September 2004. Ivan was the tenth most intense Atlantic hurricane ever recorded, killing over 100 people and causing billions of dollars in losses.¹

In addition to the tragic loss of life, extensive damage occurred to homes, buildings and other essential structures across the region.² In both Grenada and the Cayman Islands, losses reached close to 200% of annual national GDP. In the case of Cayman, 95% of homes and other buildings – which generally follow southern Florida’s building codes – were damaged or destroyed. Thousands of local residents were left homeless.

By putting contingent funding in place before a catastrophe occurs, the CCRIF represents a real shift in the way governments have traditionally managed disaster risks.

Besides the devastation it caused, Hurricane Ivan also laid bare the obvious limitations of post-disaster financing. Although funding from bilateral and multi-lateral agencies eventually poured into the region, donor assistance was slow to materialise and could only support a limited number of infrastructure projects.

A new approach to financing disaster risk

In the wake of Ivan, heads of government from the Caribbean Community (CARICOM) held an emergency meeting to discuss the need for catastrophe risk insurance as a priority issue in the region. CARICOM subsequently approached the World Bank for assistance in designing and implementing a cost-effective risk transfer programme that would help mitigate the cash flow problems faced by its

members after major natural disasters. This marked the beginning of what would become the Caribbean Catastrophe Risk Insurance Facility (CCRIF).

At the start of the 2007 Atlantic hurricane season, the Caribbean community formally launched the new facility with 16 participating governments. It was the world’s first regional fund utilising parametric insurance, giving Caribbean governments the unique opportunity to purchase earthquake and hurricane catastrophe coverage at the most attractive pricing.

Caribbean governments could now purchase coverage which would be triggered by a hurricane or earthquake with a probability of occurring once in 15 or 20 years, respectively. The maximum coverage available was set at USD 100 million for each peril. The cost of coverage is a direct function of the amount of risk being transferred, preventing cross-subsidisation of premiums and ensuring a level playing-field for all participants. The CCRIF has since moved to a modelled-loss approach, which calculates losses using historic and real-time data.

Securing future growth and development

The findings of a CCRIF-sponsored study on the economics of climate adaptation (ECA) in the Caribbean reinforced the importance of building a balanced portfolio of risk prevention and risk transfer measures to cost-effectively address the expected impact of climate change on the region.³

By putting contingent funding in place before catastrophes occur, the CCRIF represents a real shift in the way that governments have traditionally treated risks and the economic costs associated with them. It is a cost-effective way for an individual government to pre-finance liquidity needs and start with recovery efforts immediately after a catastrophic event, thereby filling the gap between immediate response aid and long-term redevelopment.

¹ US National Hurricane Centre, Tropical Cyclone Report

² The Caribbean Development Bank (CDB) estimated the damage in the Caribbean Sea region at more than USD 3 billion – USD 1.85 billion in the Cayman Islands, USD 815 million in Grenada, USD 360 million in Jamaica, USD 40 million in St. Vincent and the Grenadines, and USD 2.6 million in St Lucia.

³ Caribbean Catastrophe Risk Insurance Facility 2010. Enhancing the climate risk and adaptation fact base for the Caribbean. www.swissre.com/climatechange.

Tropical storms sweep across the island states of the Caribbean every year. With wind speeds of 119 kilometres an hour or more, hurricanes put lives and properties at risk from wind damage, torrential rains, storm surge and flooding.



The mechanisms of the new risk facility

CCRIF works in a similar manner as a mutual insurance company, combining the benefits of pooled reserves from participating countries with the financial capacity of the international financial markets. It retains some of the risk transferred by the participating countries and transfers the remainder of the risk to reinsurance markets when it is cost-effective to do so. This structure results in a particularly efficient risk financing instrument that provides participating countries with insurance policies at approximately half the price they could obtain if they approached the reinsurance industry on their own.

The CCRIF's cost-effectiveness is reinforced by low administrative costs and fast payout times. In addition, the CCRIF's insurance mechanism ensures that each country receives funds from the pool in direct proportion to the amount it has paid in over the long term. United States Geological Survey (USGS) earthquake location data is used as input for the models which estimate earthquake losses. For hurricanes, National Oceanic and Atmospheric Administration (NOAA) storm data is used as the input for the hurricane model in order to estimate the damage. It is the estimated loss, calculated objectively, which dictates whether or not a policy triggers and how much the payout will be.

Payouts made so far

In its first year of operation, the CCRIF made two payouts after a magnitude 7.4 earthquake shook the eastern Caribbean in November 2007. The St Lucian government received USD 0.4 million, while the Dominican government received USD 0.5 million. CCRIF made a further payout of over USD 6 million to the Turks & Caicos Islands after that island nation was severely impacted by Hurricane Ike in 2008. The sums of money went towards post-disaster recovery efforts. For 2010–2011, CCRIF's aggregate exposure for policies written was just over USD 600 million. Some USD 20 million was retained by the CCRIF, while an additional USD 110 million was purchased from the international reinsurance and capital markets – including Swiss Re – to increase the claims-paying capacity of the facility.

When a massive 7.0-magnitude earthquake hit Haiti in January 2010, the CCRIF's parametric earthquake insurance policy paid its full limit of just under USD 8 million, providing the nation rapid access to insurance proceeds after the quake. Measured against the loss of life and devastation on the island, the CCRIF's payout was not a major sum of money. It did however provide much-needed liquidity to get the wheels of government turning again. In addition, the Haitian catastrophe has highlighted the potential of parametric insurance to help countries plan for and pre-finance natural disasters as part of a comprehensive disaster risk management strategy.

At a glance – Caribbean Catastrophe Risk Insurance Facility

Established	2007
Insured peril	Earthquake, hurricane
Insurance instrument	Insurance/reinsurance
Policy coverage	Country-specific, up to an aggregate USD 100 million limit per peril
Index	Modelled loss for earthquake and hurricane
Trigger	Pre-defined level of government loss equating to a self-selected event return period barometric pressure (hurricane)
Beneficiaries	Participating Caribbean countries affected by events with a probability of 1 in 15 years or over
Insured party	16 CARICOM governments
Sponsor	World Bank
Reinsurer	Swiss Re (lead reinsurer) and other overseas reinsurers

Central America and the Dominican Republic comprise a region regularly affected by natural disasters such as earthquakes, hurricanes and floods. Compared to other parts of the world, this geographic area is therefore exposed to an unusually high risk of multiple hazards. When two or more perils occur at once, they can spell disaster.

Central America Natural Disaster Insurance Facility

Strengthening multi-hazard defences on two fronts

Straddling the Pacific Rim of Fire and the Caribbean Plate, Central America sits on a hotbed of seismic activity, and waves from both the Pacific Ocean and the Caribbean Sea wash its shores. Earthquakes, hurricanes and floods are all recurring threats. The devastating effect that a confluence of such events can have was evidenced by the active hurricane season of 2005. The impact of Hurricane Stan, a relatively weak storm, was so severe because it coincided with torrential rains brought on by a non-tropical weather system.

allows them to plan more effectively and reduces the need for costly post-disaster debt financing.

The facility establishes captive insurance companies, which are owned by each government and supported by the international reinsurance and capital markets. Under the terms of the agreement, each captive will initially issue a single parametric natural catastrophe cover to its national government. The government will in turn pay a premium for this coverage, but the risk transfer scheme will provide twenty to thirty times the amount if a major natural disaster occurs.

Quick access to insurance proceeds allows governments to be better prepared and reduces the need for costly debt financing.

Stan caused flash floods and mudslides that killed over 1 500 people and led to USD 4 billion in damage. Coffee growers in Guatemala, El Salvador, Nicaragua, Honduras and Costa Rica were particularly hard hit, losing a substantial part of their crop.

A concerted response to multiple-hazard risk

To strengthen disaster preparedness in the region, the Inter-American Development Bank (IDB) partnered with Swiss Re in 2010 to develop an insurance mechanism for countries in Central America and the Dominican Republic. The new Central America Natural Disaster Insurance Facility provides participating governments with quick access to insurance proceeds following a disaster. This approach

Innovative and flexible coverage

A key innovation of the facility is its use of an index that approximates the population nominally affected by a disaster. This proxy provides a transparent and effective way to manage the government's fiscal exposure to natural catastrophes. It also ensures that real-time funding for emergency relief and subsequent reconstruction is made available in the event of a disaster.

The Central America Natural Disaster Insurance Facility works in a similar way as the CCRIF, the catastrophe risk insurance facility that was established for governments in the Caribbean. But it offers additional coverage for hurricane-induced landslides and reflects a more customised approach suited for nations of all sizes. This is why it can be easily expanded to include additional countries, large and small, and could be broadened beyond natural catastrophes to cover other insurable risks. Among them are weather-related risks that impact the agricultural sector or pandemic and epidemic risks that destabilise health care budgets.

For Central American countries and the Dominican Republic, the new facility provides a supplemental instrument to cope with the challenge of managing the economic volatility and uncertainty posed by a changing climate. To be sure, construction standards, risk management and scientific research are indispensable to tackle the effects of adverse weather and natural disasters. But transferring catastrophe risk to the private sector will allow participating governments to implement contingency plans after a disaster strikes, maintain political and economic stability and begin with reconstruction efforts.

At a glance – Central America Natural Disaster Insurance Facility

Established	2010
Insured peril	Earthquake, hurricane-induced risks (eg landslides)
Insurance instrument	Insurance/reinsurance
Policy coverage	Country-specific
Index	Parametric index for earthquake and hurricane risk
Trigger	Defined size of population nominally affected by a disaster
Beneficiaries	Participating governments and their constituents in the event of a major earthquake or hurricane
Insured party	Country-specific captive insurance companies
Sponsor	Inter-American Development Bank
Reinsurer	Swiss Re, acting as structurer and placement agent

Mexico is considered a pioneer in transferring risk through public-private partnerships. Faced with natural perils from storms over the Atlantic and the Pacific to the risk of earthquakes, Mexico has been hit by no less than six major catastrophes since 1985. But the government has found an innovative way to strengthen its defences.

MultiCat Mexico

Making a measurable difference in disaster readiness

In terms of lives lost, the Mexico City earthquake of 1986, which measured 8.1 on the Richter scale, was the worst disaster to hit Mexico in recent decades, resulting in over 9 500 fatalities. But in economic terms, Hurricane Wilma, which hit in October 2005, was the most devastating. Wilma caused total damages of over USD 22 billion. But only USD 13.8 billion of that was insured.

As early as the 1990s, the Mexican government identified disaster risk reduction as a national priority, creating the Fund for Natural Disasters (FONDEN) in 1999 to improve its financial preparedness for natural disasters. Managed by several government agencies, including the ministry of finance and the ministry of the interior, the fund helps the general population in the event of natural catastrophes.

Boosting disaster preparedness

With the intention of helping smooth the impact of payouts on the national budget, the Mexican government wanted to arrange a risk transfer transaction that would cover USD 290 million of earthquake and hurricane risk. The Mexican government, through FONDEN, appointed the federal government's insurance company AGROASEMEX to act as the insurer for the transaction.

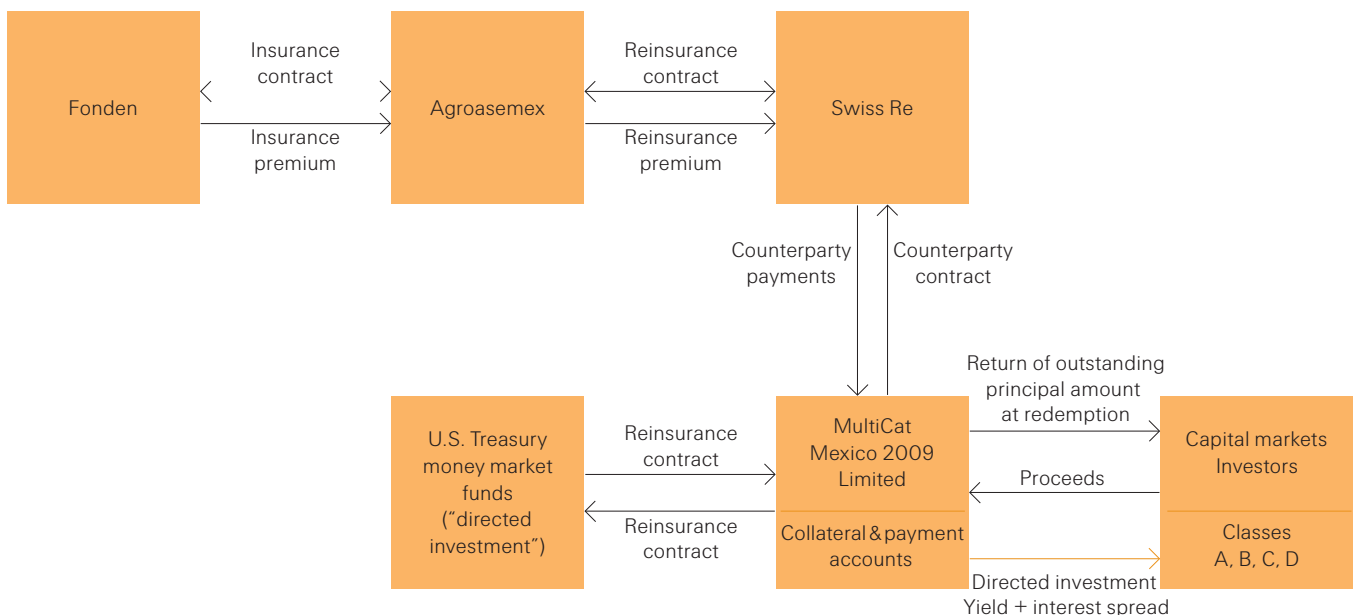
The result of these efforts was MultiCat Mexico 2009, the first transaction in the MultiCat Programme, a shelf programme arranged by the World Bank in collaboration with Swiss Re. It followed an earlier transaction in 2006 that was designed to cover earthquake risk only. MultiCat uses risk-linked securities, so-called catastrophe bonds, to transfer earthquake and hurricane risks to capital markets.

These instruments provide the Mexican government with rapid access to natural disaster protection from the capital markets in the event of a major disaster. Swiss Re acted as co-lead manager and joint bookrunner for this particular transaction, drawing on its experience in expanding capacity for public sector entities in emerging economies. The graphic below demonstrates the relationships between the various parties in the transaction.

A parametric insurance solution

The 2009 MultiCat cat bond runs for three years and is based on a parametric approach linked to pre-defined triggers: Unlike traditional insurance, parametric instruments use a model to calculate the payout of the insurance policy. This payout model aims to closely mirror the actual damage on the ground and

Figure 1: MultiCat Mexico 2009 – Illustrative transaction structure



MultiCat Mexico demonstrates how governments can use insurance and capital markets to reduce the pressure on public budgets when a disaster strikes while ensuring that timely and adequate funds are in place for relief and reconstruction efforts.

enables a much more rapid payment, since no assessment of the actual damage is required after the event. In the case of parametric insurance, the payout is triggered by a measure such as the strength of an earthquake on the Richter scale or the air pressure experienced during a hurricane.

Parametric insurance does not require loss adjusters to tally damage after a catastrophe occurs, a process that can take months or even years and which can delay a payout. The speed of payout is one of the significant advantages of this type of transaction: a parametric trigger is transparent, both for the insured and for investors, and it means that loss events can be handled faster and more efficiently than with other kinds of insurance-based solutions.

Insurance coverage

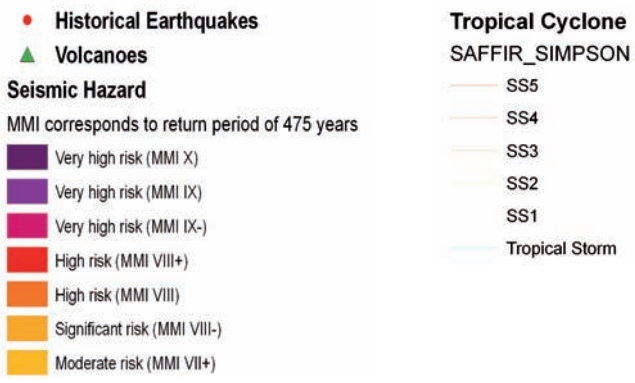
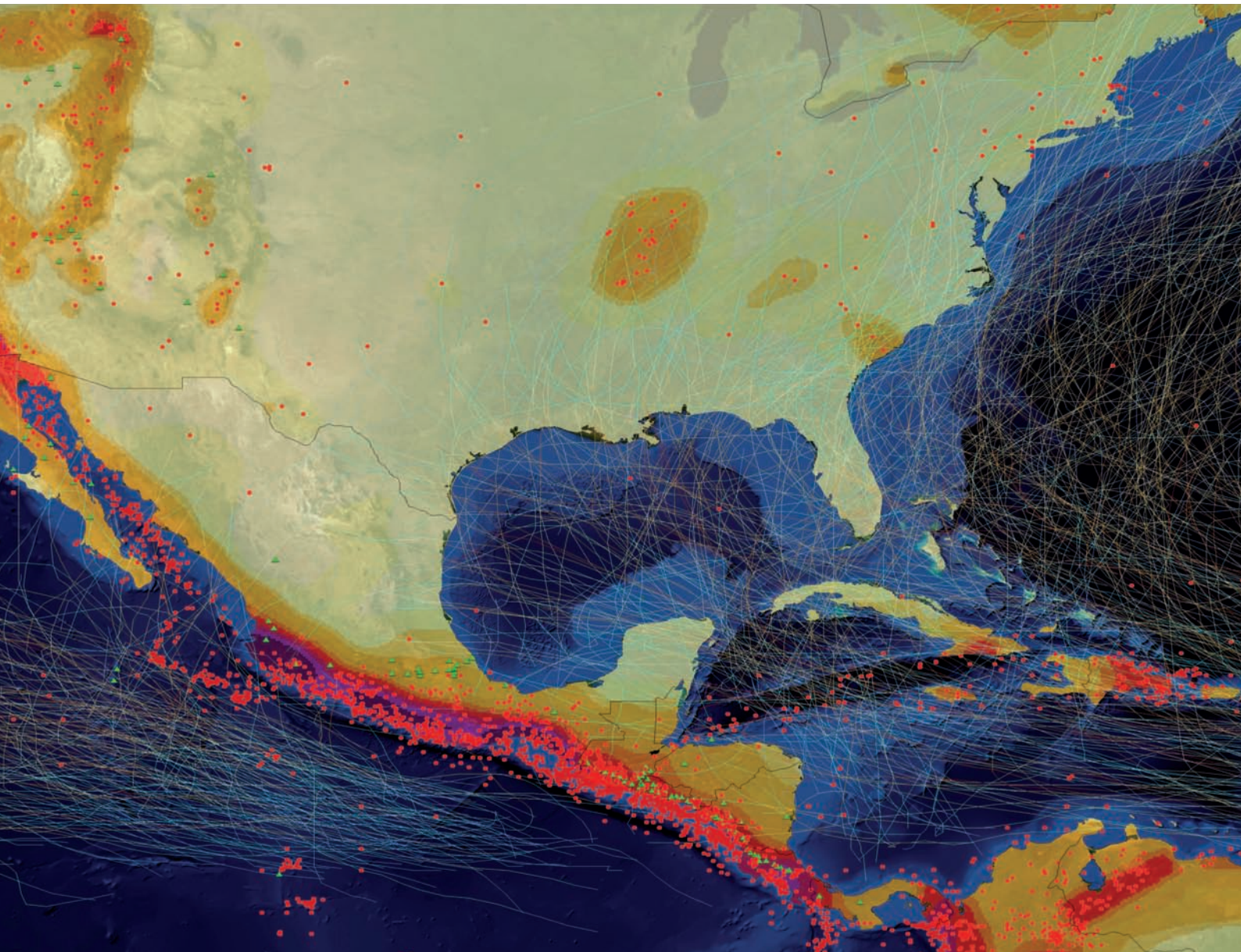
The MultiCat Mexico transaction comprises four tranches, each relating to a different peril or geographic area, with potential payouts of USD 140 million to cover earthquakes and USD 50 million each to cover hurricanes in two Pacific coastal regions and one Atlantic region. Each tranche therefore has a different trigger: for the earthquake cover, for instance, three seismic zones were identified covering the Northwest Cocos, Central Cocos and Mexico City regions, with magnitude and depth measures determined for each. For the hurricane covers, the payout is triggered if a storm passes through one of the coastal zones and the pressure at the centre of the storm is at or below a set level (944 mb or lower for the Pacific coastal regions and 920 mb or lower for the Atlantic coastal regions).

This MultiCat transaction demonstrates how governments can use reinsurance and capital markets to reduce the pressure on public budgets in the event of a natural disaster while ensuring that adequate and timely funds are in place for relief and reconstruction activities.

At a glance – MultiCat Mexico

Established	2009 (period covered October 2009 to October 2012)
Insured peril	Earthquake, hurricane
Insurance instrument	Insurance-linked security (cat bond)
Policy coverage	USD 290 million
Index	Parametric index for earthquake and hurricane risk
Trigger	Quake magnitude (earthquake), barometric pressure (hurricane)
Beneficiaries	Mexican communities affected by a major disaster
Insured party	Fund for Natural Disasters (FONDEN) of Mexico
Sponsor	World Bank
Reinsurer	Swiss Re, co-lead manager and joint bookrunner

The area comprising the Gulf of Mexico, the Caribbean Sea, the Northern Atlantic and Eastern Pacific is one of the most disaster-prone in the world. Hurricanes, earthquakes and volcanic activity threaten communities across the region.



Source: Swiss Re GEOservices; Unisys; US Geological Survey; ETH Zurich

Historically, communities along the southeastern seaboard of the United States have been heavily impacted by hurricanes. And Alabama's coastal counties have been among the hardest hit. This explains why as far back as 1923 Alabama established its own State Insurance Fund to protect public institutions against catastrophic losses.

Alabama State Insurance Fund

Weathering hurricanes along America's Gulf coast

The city of Mobile and its surrounding districts have one of the highest values of insured coastal properties in the nation today, worth a total of USD 92.5 billion. Public institutions in the district are protected through Alabama's State Insurance Fund (SIF), which provides insurance for state properties, colleges, universities and public schools. By 2008, the SIF covered potential damages of more than USD 41 billion across the State.

Alabama's reinsurance cover shows how public-private collaboration can be a powerful and cost-effective way to minimise the financial impact of natural disasters.

But hurricane risks are continuing to rise along the entire US Gulf Coast. Severe wind and storm surge damage from hurricanes already costs the region an average of USD 14 billion per year. Climate change, combined with economic growth and subsiding coastal land, could increase losses along the Gulf Coast by another 65 percent over the next twenty years. Although much of the potential damage is covered by insurance, municipal and state governments – and ultimately taxpayers – are left shouldering the burden of paying for emergency relief and uninsured losses.

Enhancing statewide insurance cover

Faced with the dilemma of having to prepare for growing costs associated with hurricanes while keeping its public finances in check, Alabama decided to opt for a new approach. In 2010, it became the first state nationwide to purchase parametric insurance cover, which transfers natural catastrophe risk to the private sector using an index-based trigger.

Such insurance solutions differ from conventional insurance policies in that they compensate the policyholder based on the physical characteristics of a disaster rather than on actual losses on the ground. This form of arrangement ensures quick payouts whenever a disaster exceeds a measurable threshold, such as wind speed in the case of hurricanes.

Keeping hurricane costs in check

The public-private partnership behind the Alabama deal provides three years of cover for the SIF's primary catastrophic hurricane exposure. Under the terms of the agreement, the SIF will receive financial compensation from reinsurer Swiss Re in the event that a Category 3 hurricane passes through a designated area of exposed coast. The payments can be used by Alabama's authorities for any purpose, including emergency response costs, replacing lost tax revenue and funding of increased insurance expenses. Considering that Alabama experiences a Category 3 storm every ten years, the state budget is subjected to a large degree of volatility, partly due to the effect on insurance prices.

With the closing of the State Insurance Fund transaction, the government of Alabama has demonstrated that collaboration between public institutions and the private insurance industry is a powerful and cost-effective way to reduce the financial impact of natural disasters. These partnerships not only help governments and their citizens offload some of the reconstruction costs from taxpayers to the private markets; they can also help protect societies against a wide range of perils, from earthquakes and hurricanes to droughts and floods. Similar solutions may be redeployed to cover risks in other regions of the United States and elsewhere in the world.

At a glance – Alabama State Insurance Fund

Established	2010 (for three years)
Insured peril	Hurricane
Insurance instrument	Reinsurance
Index	Parametric index for hurricane risk
Trigger	"Cat-in-the Box": Category 3 hurricane passes through a predefined geographic area
Beneficiaries	Alabama coastal communities
Insured party	Alabama State Insurance Fund (SIF)
Reinsurer	Swiss Re

Maize is the lifeline of Malawi. It feeds the nation's 13 million people and provides them with a vital source of income. No less than 85% of Malawians rely on the land for their livelihoods. But almost all crop production is rain-fed, taking place during a single season lasting from December to April. Since rainfall during this period is highly erratic, drought is a recurring problem.

Malawi weather insurance

Saving the staple crop of a nation

Without enough rain, Malawi faces disaster. Over the last two decades, severe drought crippled the country no less than four times, most recently in 2005. The devastation it caused reached catastrophic dimensions for Malawian farmers and for society at large. But drought not only causes widespread crop failure, threatening food supplies and

Malawi government if the country's farmers suffer from a drought-related shortfall in maize production.

Linking rainfall with maize production

The transaction's key innovation lies in its use of an index linking rainfall with maize production. The Malawi Maize Index (MMI) applies a model to calculate the value of projected losses if precipitation falls below a certain level, mirroring the high correlation between maize yields and rainfall. To arrive at a realistic estimate, the MMI model integrates daily rainfall data from 23 weather stations across the country. Payouts are triggered whenever the index crosses the specified contract threshold. Under the terms of the contract, if maize production drops 10% below the historical average, Malawi will receive a payout up to USD 5 million. This approach guarantees timely disbursements of funds and keeps administrative costs to a minimum, as there is no need for a case-by-case damage assessment.

Malawi's weather insurance solution is a prime example of a pre-emptive approach to disaster risk management.

incomes. The risk of drought is also a major factor in keeping productivity low because even in good years farmers are leery of using inputs such as improved seeds and fertilizers for fear of losing their investment.

Hedging against drought risk

To help maize producers overcome the hurdle of uncertainty and boost agricultural output, the government of Malawi decided to promote index-based weather insurance as a way to tackle drought risk. Its resolve translated into action in 2008 when it became the first sovereign entity in Africa to introduce such an instrument. Together with the World Bank, the government created a weather derivative that offers maize farmers a means to better cope with the financial impact of drought. Swiss Re entered into this transaction as counterparty to the World Bank. Under the provisions of this arrangement, Swiss Re commits to pay out up to USD 5 million to the World Bank which in turn pays the money to the Mala-

Timely and predictable financing

Malawi's weather risk transfer solution is a prime example of how a pre-emptive approach to disaster risk management can help governments and individuals prepare for devastating events by providing them with an affordable way of hedging against weather risks. As a timely and predictable source of funding in a time of crisis, the proceeds of weather-indexed risk transfer instruments give the government much more flexibility in its drought preparedness and contingency planning, allowing an earlier response to shocks and saving overall costs. Should Malawi experience another severe drought in the years to come, Malawi is set to reap significant rewards from what is an exemplary risk management strategy.

At a glance – Malawi drought risk

Established	2008
Insured peril	Drought
Insurance instrument	Weather derivative
Policy coverage	USD 5 million
Index	Malawi Maize Index: calculation of drought-related crop losses based on correlation between maize yields and rainfall
Trigger	Maize production drops 10% below the historical average due to lack of rainfall
Beneficiaries	Maize farmers affected by severe drought
Insured party	Government of Malawi
Sponsor	World Bank
Reinsurer	Swiss Re

“While the people are the primary foundation of a nation, food is the first necessity of the people.” This ancient proverb has been a guiding principle throughout China’s 4 000-year history. Today, it underpins the Chinese government’s growing concern over food security.

Chinese agriculture risk insurance

Boosting grain production in Beijing

As demand for food in China continues to increase due to population growth and shifts from rice and cereal to a more enriched diet, the risk of a looming food shortage is increasingly challenging the country's age-old maxim of agricultural self-sufficiency.

This risk is further compounded by limited arable land, the impact of natural disasters and climate change. Over the past decade alone, droughts, floods, typhoons, pests and diseases destroyed about 10 percent of annual crops, with some regions recording losses of over 80%.

A challenge worth taking

The Chinese government is well aware of the agricultural sector's importance to China's economy and the stability of the country. According to its estimates, grain production must increase by around 30% over the next 25 years to satisfy domestic demand. But after production actually dropped in the years between 1999 and

2003, the government decided to take action to boost agricultural output. In 2004 it launched the Three-Dimensional Rural Issues policy to give greater prominence to agriculture, rural development and farmers. As part of this plan, it identified agricultural insurance as a key financial instrument to stabilise farmers' incomes and improve their resilience to financial hardship from poor harvests.

In a country where the insurance market represents less than 1% of agricultural GDP, establishing an agricultural insurance industry is a daunting challenge. But since 2007, the China Insurance Regulatory Commission (CIRC) has taken bold first steps to make this happen, working with the central and provincial governments to extend insurance to farmers across the land.

A solution at hand

With the CIRC's support in 2008, the Beijing Municipal Government entered into a ground-breaking partnership with Swiss Re to purchase reinsurance cover for its agricultural insurance scheme. This agreement provides tailor-made reinsurance protection for livestock, crops and fruits against perils such as livestock diseases, flood, hail, wind and rainstorms. It covers about 400 000 farming households.

The immediate beneficiaries of the transaction are the insurance companies under the government-subsidised agricultural insurance scheme in Beijing. It specifies that the Beijing Municipal Government will pool all the agricultural insurance business within Beijing.

By transferring a substantial part of agricultural risk to the reinsurance market, the Beijing government has set a milestone in strengthening a public insurance scheme and promoting rural development.

Under the terms of the contract, the insurance companies will be responsible for any losses below 160% of the annual premium. Swiss Re and the state-owned reinsurer China Re will take up any losses between 160 and 300%, while those losses over 300% will be covered by the Beijing Municipal Government's Agricultural Catastrophe Risks Reserve. In the event of catastrophe loss, Swiss Re as the lead reinsurer will settle with the individual insurance companies.

Risk management and economic growth

This public-private partnership is the first of its kind in China. It marks a departure from post-disaster financing and a shift towards a pre-emptive risk management strategy. By transferring a substantial part of the agriculture risk to the reinsurance market, the Beijing Municipal Government has set a milestone in strengthening its own insurance scheme and helping promote agricultural development in the region. As more and more farmers buy insurance covers, not only will they benefit from protection against catastrophe losses, but they will also gain easier access to loans that are badly needed for investments in high quality inputs and improved farming equipment. The Beijing administration's use of agricultural insurance to stimulate productivity and its efforts to develop a viable insurance industry are a good example to other regions and countries with underinsured agriculture markets.

At a glance – Beijing Municipal Government

Established	2009
Insured peril	All (flood, hail, wind, rainstorm, livestock diseases)
Insurance instrument	Insurance/reinsurance
Policy coverage	Reinsurers will take up the losses between 160% and 300% of the annual premium. Losses below 160% will be borne by the insurance companies and losses exceeding 300% will be covered by the Beijing Municipal Government's Agricultural Catastrophe Risks Reserve
Index	Indemnity-based crop and livestock losses due to natural disasters
Trigger	Actual loss
Beneficiaries	400 000 farmers in the municipality of Beijing
Insured party	Local insurance companies
Sponsor	Beijing Municipal Government, China Insurance Regulatory Commission
Reinsurer	Swiss Re, China Re

Agriculture is the main source of livelihood for millions of people across China and Southeast Asia. But drought poses a constant threat to the region, causing widespread damage to crops and losses to farming incomes.



Agriculture is a key sector in Vietnam. It secures the livelihoods of more than half of the country's 86 million people. Rice is by far the most important crop. But frequent natural disasters such as droughts, floods and typhoons threaten rice production, and climate change could make rice harvests even more volatile in the future.

Vietnam agriculture insurance

Securing the livelihoods of Vietnamese rice farmers

With an annual production of 39 million tonnes on over 7 million hectares of land, Vietnam supplies a fifth of global trade in rice and is the world's second largest exporter. When crops fail, rice farmers across Vietnam lose an essential source of income. As a consequence, they are often unable to repay their loans or make much needed investments for the next growing season.

Securitising agriculture loans

To actively manage loan default ratios and exhibit more confidence offering loans to rice farmers in the future, Agribank and its insurance company Agribank Insurance Joint Stock Company (ABIC) decided to enter into an innovative insurance scheme that mitigates the impact of poor harvests.

Under the deal established in November 2010, ABIC will insure Agribank against the inability of its rice-farming clients to make loan repayments due to low crop yields. ABIC will transfer the risk via reinsurance to Swiss Re and Vina Re, Vietnam's national reinsurer.

Protecting against crop failures

The transaction is the first of its kind in Southeast Asia. It defines payouts according to an independent area-yield index that draws on data from Vietnam's Bureau of Statistics. The insurance product disburses funds if, after a natural catastrophe or disease, the rice yield in a certain geographic area falls below the expected output of an average yield.

To date, the new insurance programme will cover loans to rice farmers in up to ten provinces of Vietnam, with the potential to extend the scheme to the entire country. The advantages of this type of index-based product over conventional forms of insurance are its transparency, lower administration costs and faster payouts.

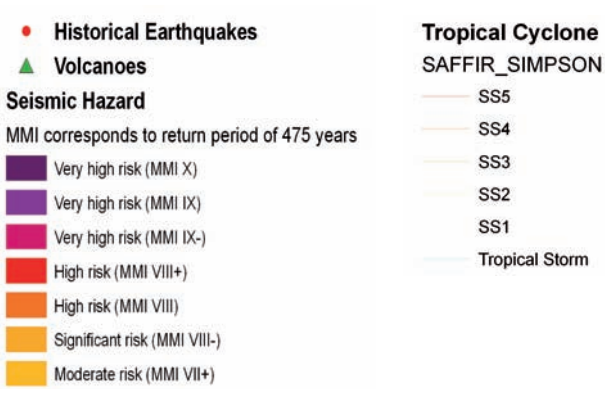
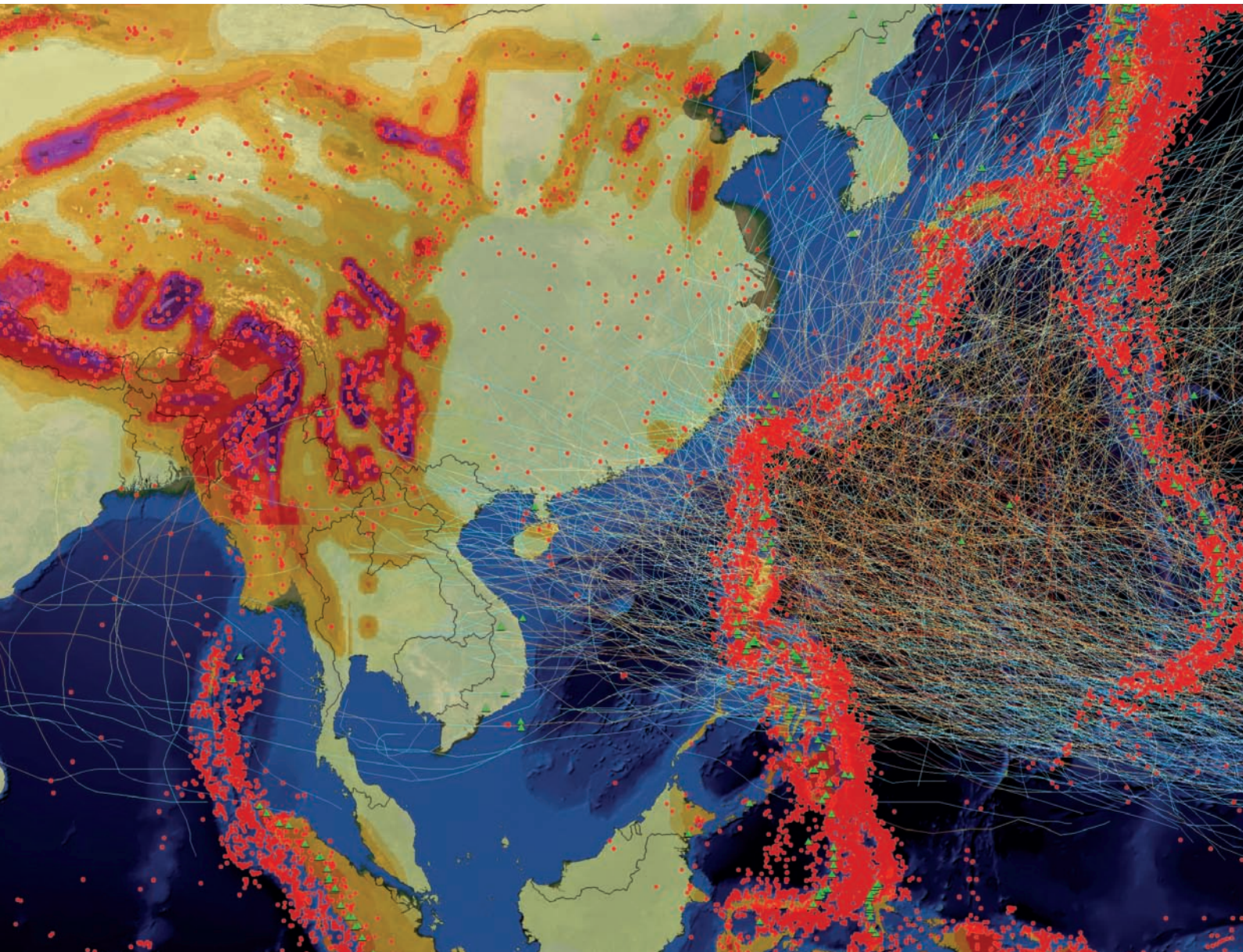
With the area yield index solution, Agribank has taken a key step towards strengthening a sector of vital importance to its economy. Other agriculture-producing countries in Southeast Asia could benefit from similar approaches, as population growth, limited arable land, stagnating yields and climate change continue to widen the gap between food demand and supply.

At a glance – Vietnam agriculture risk

Established	2010
Insured peril	Drought, flood, typhoon, pest and disease
Insurance instrument	Insurance/reinsurance
Index	Parametric area-yield index
Trigger	Rice yields drop below the historical average due to a natural peril, pest or disease
Beneficiaries	Rice farmers
Insured party	Agribank
Reinsurer	Swiss Re, Vina Re

With its new agricultural insurance scheme, Vietnam's Agribank has taken a key step towards mitigating the fiscal impact of poor rice harvests and strengthening a sector of vital importance to the country's economy.

Southeast Asia is one of the world's disaster hot spots. According to UN figures from 2009, the region accounts for some 60% of natural disasters worldwide.



Source: Swiss Re GEOservices; Unisys; US Geological Survey; ETH Zurich

Conclusion

Each year features new headlines about devastating natural catastrophes in different parts of the world. The resilience of a country not only depends on the severity of the catastrophic event but also on available funding for relief, recovery and reconstruction. Currently, a large part of the economic costs are not insured. New approaches to financing disaster risks are therefore key to making societies more resilient.

As a first priority, governments should ensure a functioning insurance market. This will help to absorb a big part of disaster losses suffered by individuals and businesses. Then, pre-event financing solutions that build up reserves, contingent finance as well as sovereign insurance solutions can alleviate the remaining financial burden on governments. Post-disaster financing through budgetary means, debt financing or donor aid should only come into play to cover residual losses once all other risk transfer solutions have been exhausted.

Risk prevention and mitigation strategies must be the first priority in managing natural disasters. But no organisation or country can fully insulate itself against extreme events. Transferring catastrophic risk must therefore be a key element in the financial strategy of every disaster-prone country or region to enable and sustain growth.

The various case studies included in this publication illustrate how new forms of cooperation between the public and private sectors can help countries finance disaster risks. They also show that such partnerships do not just exist in theory, but that real solutions are already available which can be replicated and adapted to the risk exposure in other countries and regions of the world.

By building up financial reserves or using insurance solutions, governments can reduce their financial burden after a disaster occurs. These measures also lower the volatility on the government budget and help improve planning certainty for the public sector. But disaster financing instruments should never be seen in isolation. Rather, they must be viewed in a country's wider risk management context.

Integrated risk management

An integrated risk management process should include a thorough analysis of the risk landscape, from environmental and political to social and health aspects. Such a comprehensive strategy enables political and public sector decision-makers to determine their priorities in advance and take appropriate action to protect communities from the impact of peak risks. This approach allows governments to minimise risks wherever possible and transfer the costs where necessary.

Risk mitigation and risk transfer must go hand in hand. Building physical defences such as dams or sea walls may be expensive in the short term, but they deliver important economic benefits over the long run. Not only do such investments save human lives and keep the physical damage to a minimum, but they also make insurance affordable for a wider community.

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