

Global reinsurance: strengthening disaster risk resilience

Global Reinsurance Forum

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The Global Reinsurance Forum

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Cover page: Floodwaters cover large parts of New Orleans on August 30, 2005, the day after Hurricane Katrina passed across the city. Source: Swiss Re.

Executive summary

People, companies, cities and entire nations are under threat from natural disasters, disruptive technologies, political turmoil, terrorist attacks, and environmental degradation – to name only some major risks. On the other side, the last decades have brought unprecedented improvements in human wellbeing, growth and mobility. In a world where physical, financial, and information systems are ever more interconnected, risks are becoming more complex in their form and more widespread in their impact. The broadest geopolitical forces (population, economic progress, trade, governance, health, environment, and climate change) themselves shape the risk landscape, with a general trend over time of increasing overall value and the number of people at risk.

Large, unpredictable, and costly disasters are inevitable – but global reinsurance provides a mechanism to compensate insured parties for their losses, using the premiums they and others have paid beforehand under an agreed contract. Global reinsurers are able to offer this service to insurers because they pool their risks and capital globally and thus gain the benefits of diversification.

Reinsurance and insurance (collectively, “re/insurance”) and other pre-paid risk-financing mechanisms are widely recognised as a critical part of any comprehensive disaster risk management strategy. The re/insurance industry has expertise in risk prevention and absorbs disaster shocks by providing predictable financial relief. Timely payouts enable rebuilding and recovery, which helps to reduce indirect losses.

Re/insurance can also play an important role in reducing disaster risk: in its bi-yearly Global Assessment Report for Disaster Risk Reduction¹, the United Nations Office for Disaster Risk Reduction (UNISDR) points out that insurance is one of the main financial tools for households and companies to strengthen their disaster resilience.

The members of the Global Reinsurance Forum (GRF), comprising twelve global reinsurance companies, have extensive experience in assessing current and future risks, in managing risks, and in creating tailor-made risk transfer solutions. Looking beyond the perils we face today, reinsurers scan the horizon for indications of emerging and future risks, which include climate change, infectious diseases, technological and cyber risks. But reinsurers do not only operate on the risk side: the pooled nature of their capital commitments also makes them important global investors, whose long-term view adds stability to financial markets.

Regulation and supervision play a critical role in ensuring that both sides of the reinsurance market – risk sharing/pooling and long-term investing – work effectively. Governments, legislators, regulators and supervisors shape the rules, which makes it essential that they have a clear understanding of the business model through which the reinsurance industry delivers its essential risk management and risk reduction benefits. At a time when financial regulation is evolving at its most

¹ The United Nations Office for Disaster Risk Reduction, 2013: [Global Assessment Report on Disaster Risk Reduction 2013](#).

rapid pace in decades, the reinsurance industry relies on the regulators to maintain certain key conditions: to allow international risk transfer, free trade and free capital flow, to ensure legal certainty and regulatory harmonisation, to incentivise long-term investments and appropriately regulated capital market solutions, and to foster collaboration between the industry and the public sector.

We live in a turbulent and interconnected world, which will only become more so. We need to make our socioeconomic systems more resilient to large events – by managing

risks with foresight and flexibility and, most of all, by being willing to collaborate. The private sector has already set a high standard for risk management, in particular within large companies. But the public sector is also increasingly interested in comprehensive country and regional risk management, with new financial structures to meet disaster expenses; these are solutions that require the resources and expertise of a global reinsurance industry. Only together can we extend the boundaries of insurability and develop innovative solutions to further close the gap between economic and insured losses.

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Catastrophes threaten people, companies, cities, and entire nations

Natural disasters, disruptive technologies, political turmoil, terrorist attacks, environmental degradation – these are just a few of the inherently unpredictable risks that can inflict heavy blows on individuals and businesses, cities, regions, and whole societies. In an interconnected world, such shocks can become more complex in their form, more sudden in their impact, and more costly in their consequences.² Although decades of growth in the global economy have greatly improved conditions in many regions and brought greater wealth to millions of people, the broadest geopolitical forces – growing population, changing economies, international trade, governance issues, health impacts, and climate change – continue to shape the risk landscape, so that **more growth and wealth also means more value and more people at risk from disaster**.

Hazards arise from a wide variety of sources – geological, meteorological, hydrological, climatological, oceanic, biological, political and technological – sometimes acting in combination. The most common major **natural hazards** include earthquake, floods, storms, tsunamis, droughts and freezes. Technological or **man-made hazards** include industrial pollution, nuclear radiation, toxic waste, dam failures, transport accidents, factory explosions, fires, and chemical spills. Among the best-known examples of man-made disasters are the Exxon Valdez and Deepwater Horizon oil spills, the 9/11 terror attacks, and the Chernobyl nuclear disaster. Technological hazards may also arise directly

as a result of the impacts of a natural hazard event, as happened at the Fukushima Daiichi nuclear power plant.

Natural catastrophes are often both severe and extensive, with the capacity to threaten cities, regions, and entire countries; it is therefore these natural hazards that most people think of when they consider disaster risk. **Losses from natural catastrophes have risen significantly over the last three decades**, due to economic development, population growth, urbanization, and a higher concentration of assets in exposed areas (Figure 2).³ The proportion of insured losses to total economic loss remains low. Two examples of recent natural catastrophes show the severe impact such events can have – Hurricane Sandy in 2012 (Box 1 and Figure 8) and Typhoon Haiyan in 2013 (Box 2). Climate change presents an additional aggravating factor to natural catastrophes (Box 6). If unmitigated, climate change could lead to significant losses for the world economy.⁴

In addition to natural catastrophes, **this publication covers the broader spectrum of hazards with potential for large-scale impact**, including technological risks such as power blackouts (Box 3 and Box 7), mortality risks such as pandemics, and political risks such as terrorism (Figure 7).

² R. Kupers (ed), 2014: *Turbulence – A Corporate Perspective on Collaborating for Resilience*.

³ Swiss Re, 2014: sigma 1/2014 – [Natural catastrophes and man-made disasters in 2013](#).

⁴ Intergovernmental Panel on Climate Change, 2014: *Fifth Assessment Report, Climate Change 2014: Impacts, Adaptation, and Vulnerability, Summary for policymakers*.

The United Nations Office for Disaster Risk Reduction (UNISDR)⁵ defines a disaster as “a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.” **Disaster risk for a given hazard is often defined as the combination of three factors** (Figure 1): the inherent probability of the *hazard* (“how likely is it?”); the *exposure* of the business, city, or country to the hazard (“how many people and assets are located in this area?”); and a business’ or country’s *vulnerability* in the event of a disaster (“how well could we cope?”). This definition recognizes that the impacts of a disaster can go well beyond the immediate loss of life or damage to property. They include the potential for disease and other negative effects on human physical, mental, and social well-being, loss of services, social and economic disruption, and damage to the environment.

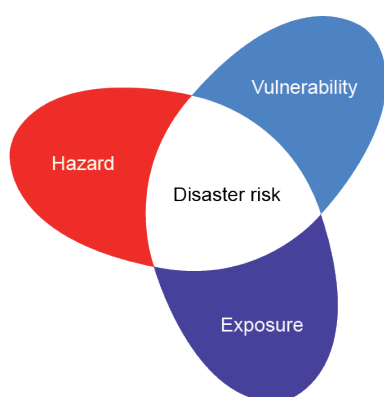


Figure 1: Disaster risk arises from hazard, exposure, and vulnerability. Source: IPCC, SREX, modified from Figure SPM.1

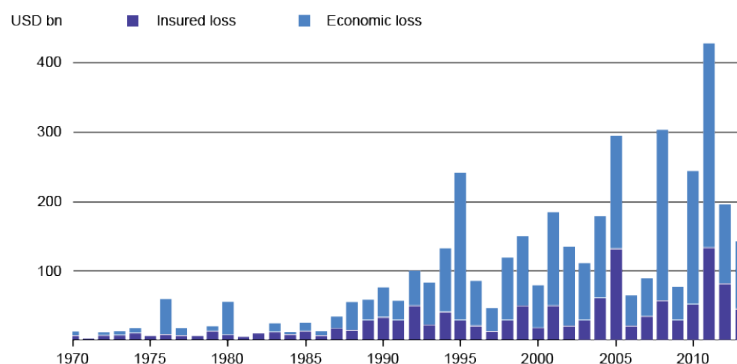


Figure 2: Natural catastrophes losses from 1970 to 2013 in USD bn at 2013 prices. Economic losses are only partly covered by insurance. Source: Swiss Re, Munich Re.

Disaster risk management and reduction

must concentrate on all three elements of risk: hazard, exposure and vulnerability. The reinsurance and insurance industries offer significant contributions in the latter two areas, providing expertise in reducing exposure and financial resources to boost resilience.

Therefore re/insurance and other pre-paid risk-financing mechanisms form a critical part of a comprehensive disaster risk management strategy.⁶ **Re/insurance absorbs disaster shocks** by providing predictable financial relief. Timely payouts enable rebuilding and recovery, which helps to reduce indirect losses. Re/insurance can also play an important role in reducing disaster risk⁷: in its bi-yearly Global Assessment Report for Disaster Risk Reduction¹, the UNISDR pointed out that “insurance is one of the main financial tools for households and companies to strengthen their disaster resilience.”

⁵ The United Nations Office for Disaster Risk Reduction, 2009: [Terminology](#).

⁶ The Commission on Climate Change and Development, 2008: [The Role of Risk Transfer and Insurance in Disaster Risk Reduction and Climate Change Adaptation](#).

⁷ Munich Re, 2013: [TOPICS Magazine 2/2013: First aid for traffic arteries cut by natural catastrophes](#).

Box 1: Hurricane Sandy: concentrated coastal assets mean huge losses

On 29 October 2012, Hurricane Sandy⁸ reached New York City and neighbouring New Jersey. After gradually travelling up from the Caribbean, Sandy made its final landfall at 8 pm local time with sustained winds of 130 km/h. Its near-record diameter led to its being dubbed a “Frankenstorm” by the US media. Over the next couple of days, one of the world’s most densely developed urban areas was shaken by the storm’s sheer size and force. Although Sandy’s winds were not particularly strong, its exceptional size caused losses in 15 US states, spanning over 1,600 km. The combination of a large wind field, persistent easterly winds, and a high tide at landfall produced a record storm surge in parts of New York, Connecticut, and the New Jersey shore. Surge heights reached 3.5 metres above mean sea level at Battery Park in Lower Manhattan, exceeding the previous high water mark set by Hurricane Donna in 1960 by almost 1.3 metres. Over 650,000 homes were destroyed or damaged; more than eight million people lost power during the storm, of whom 2.7 million were in New Jersey and 2.2 million in New York. Three nuclear power stations were shut down, more than 20,000 flights cancelled and the New York Stock Exchange was closed for two days. Parts of the city’s power grid were also damaged as flood waters shorted out substations and underground wiring.^{9,10} And despite all the precautions taken, 44 people were killed in New York City, 147 people in the US⁸, and more than 200 along Sandy’s path from Jamaica to Canada.

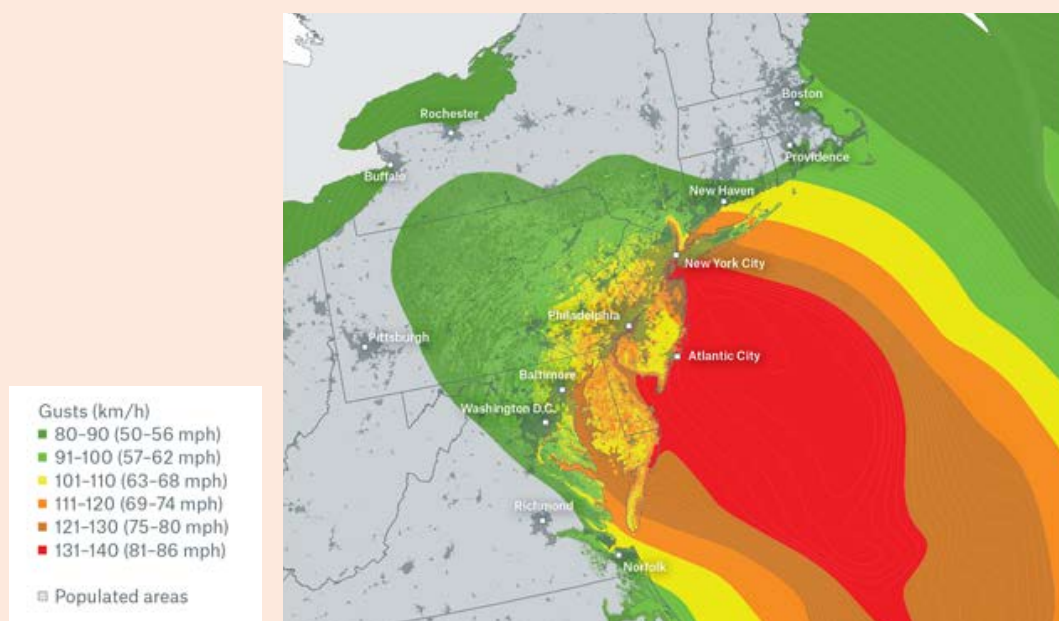


Figure 3: On 29 October 2012, Sandy’s huge wind field struck the US East Coast. It reached Atlantic City, New Jersey, at 8 pm local time, with winds of 130 km/h. Source: Munich Re, based on National Hurricane Center, Hurricane Research Division, National Weather Service.

The total economic damage caused by Hurricane Sandy is estimated to be approximately USD 70 billion. The re/insurance industry covered more than USD 30 billion of this (see also Figure 8). Insured residential losses were split roughly equally between wind and flood damage. On the commercial side, roughly 65-70% of insured losses were caused by flood.¹¹

8 Two-and-a-half hours before it had made landfall, the National Hurricane Center had reclassified Sandy as a “post-tropical cyclone”. Source: National Oceanic and Atmospheric Administration (NOAA), 2013: [Service Assessment, Hurricane/Post-Tropical Cyclone Sandy, October 22–29, 2012](#).

9 Munich Re, 2014: [TOPICS GEO – Natural catastrophes 2013: A quiet year for hurricanes and tornadoes](#).

10 Munich Re, 2013: [TOPICS GEO – Natural catastrophes 2012: Hurricane Sandy impacts US East Coast](#).

11 Swiss Re, 2013: [sigma 2/2013 – Natural catastrophes and man-made disasters in 2012: Hurricane Sandy](#).

Box 2: Typhoon Haiyan: the deadliest natural catastrophes occur in developing countries

In November 2013, Super Typhoon Haiyan caused enormous loss of life and property damage in Southeast Asia, particularly in the Philippines. The tropical cyclone generated wind speeds of well over 300 km/h, with gusts of up to 380 km/h. The record wind speeds and central pressure values at landfall made Haiyan the most intense tropical cyclone ever observed to hit land. Haiyan made six landfalls in the Philippines, bringing a storm surge of up to six metres extending one kilometre inland on Samar island and the island of Leyte. In spite of the typhoon's extreme wind speeds, the worst part of the destruction was caused by the storm surge. Furthermore, Typhoon Haiyan brought rainfall of up to 100 mm to the region, triggering mudslides.



Figure 4: In November 2013, Super Typhoon Haiyan caused enormous loss of life and property damage in Southeast Asia, particularly in the Philippines.

According to the National Disaster Risk Reduction and Management Council, the typhoon caused more than 6,000 fatalities. Roughly 600,000 houses were destroyed, with an additional 600,000 partially damaged. More than four million people were forced to leave their homes. In total, about 17 million people were affected by the disaster. People suffered not only from power outages and breakdown of communications infrastructure, but crucially from shortages of food, water, and medical supplies. Serious damage to roads, railways, and transport systems greatly hindered access to affected areas by disaster relief organisations. Overall, direct losses in the Philippines are estimated to have reached USD 9.7 billion. The insured portion is estimated to be around 7% of this sum, or USD 700 million, as the Philippine private insurance market is not strongly developed.¹²

Even though the material losses from Typhoon Haiyan appear comparatively low (Hurricane Katrina alone caused over USD 125 billion of direct losses¹³), they made a deep dent in the Philippine economy: Haiyan destroyed property worth about 4% the Philippines' GDP. Some 93% of the losses were uninsured and could not be compensated without placing a huge additional burden on the country's national budget. This will weigh heavily on the Philippine economy for years to come.¹⁴

The impact of a natural catastrophe differs greatly between poor and rich countries. Studies^{15, 16} reveal that countries with lower per-capita income suffer larger economic losses relative to GDP from natural catastrophes than countries with higher per-capita income; natural catastrophes therefore pose a particularly severe threat to the well-being of emerging economies.¹⁷ In less developed regions, the ability to cope with disasters is weaker and therefore their vulnerability is greater. This starts with lack of financial resources for preventive action and emergency procedures, leading to a heavy reliance on external disaster relief. As an example, the storm surge caused by Typhoon Haiyan was particularly devastating not just because there were no preventive measures such as dykes, but because in the absence of other sources of income large areas of naturally protective coastal mangrove forests had been uprooted to make way for shrimp farms.

12 Munich Re, 2014: [TOPICS GEO – Natural catastrophes 2013: Super typhoon wreaks havoc on the Philippines](#).

13 Swiss Re, 2006: [sigma 2/2006 – Natural catastrophes and man-made disasters 2005: Hurricane Katrina](#).

14 Munich Re, 2014: [TOPICS GEO – Natural catastrophes 2013: Poor countries again bear the brunt of the damage](#).

15 Bank for International Settlements, 2012: [Unmitigated disasters? New evidence on the macroeconomic cost of natural catastrophes](#).

16 Englmaier and Stowasser, 2013: The effects of insurance markets on countries' resilience to disasters, unpublished working paper.

17 Munich Re, 2013: [Position Paper: Economic consequences of natural catastrophes](#).

Box 3: Technological hazards can result in supra-regional events with large economic losses

On August 14, 2003, large portions of the Midwest and Northeast United States and part of Canada experienced an electric power blackout. The outage affected an area with an estimated 50 million people and 62 GW of electric load in the states of Ohio, Michigan, Pennsylvania, New York, Vermont, Massachusetts, Connecticut, New Jersey, and the Canadian province of Ontario. Power was not restored for four days in some parts of the United States and parts of Ontario suffered rolling blackouts for more than a week before full power was restored. How could that happen? A combination of lack of maintenance, human error, and equipment failures.

A failure to cut back vegetation near power transmission lines caused contact between the plants and the lines, effectively creating a short circuit. A software failure then suppressed the alarm in the original operator's system, leaving neighbouring operators unable to react; relays were therefore inadequately coordinated, preventing backup capacity from being made available in the system. The result was a cascading system collapse.

Canadian GDP dropped 0.7% in August. There was a net loss of 18.9 million work hours and manufacturing shipments in Ontario were down by USD 2.3 billion.¹⁸ The losses were mainly related to perishable goods spoilage, production and computer equipment shut-down, and business income losses. According to the US Department of Energy the total cost was about USD 6 billion.

The event shows how, in a tightly interconnected system, a seemingly minor cause like untrimmed plants can lead to a very big effect. It also reveals the instability and insufficient robustness of the systems and procedures implemented in the North American power grid: this event will not be unique.

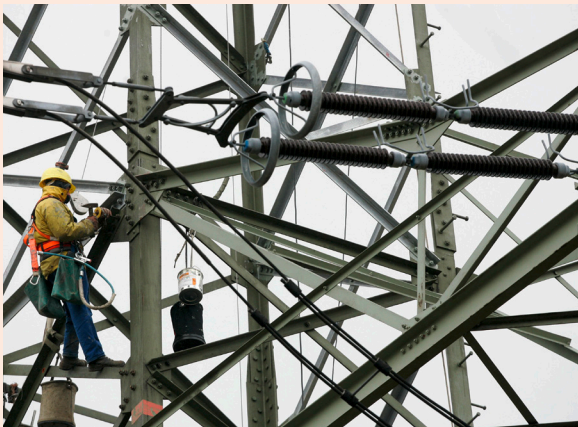


Figure 5: A lineman carries out maintenance on a power line. Source: Swiss Re.

Local or regional short-term power failures occur frequently around the world, often caused by natural hazards such as earthquakes, storms, floods, or heat waves. Large scale and long-lasting power blackouts, however, could produce unprecedented impacts on today's electricity-dependent societies. Traditional modelling scenarios assume blackouts that only last for a few days; losses from these appear to be moderate. If, however, we consider longer-lasting blackouts, such as would result from very severe solar storm events or coordinated cyber or terrorist attacks, the impacts on economies and societies would be significant (see Box 7).

¹⁸ Chief Risk Officer Forum, 2011: [Power Blackout Risks](#).

Reinsurance absorbs economic shocks and sustains long-term investment

Managing risks today

Disaster losses, especially from natural catastrophes, are large and unpredictable, which means that they can present severe shocks to economies and societies. **The re/insurance industry plays an essential role in absorbing such shocks.**^{19, 17} As mentioned above, insurance helps to provide immediate financial help through payouts, enabling emergency relief efforts and reconstruction; this, in turn, helps to limit indirect losses such as business interruption.

Reinsurers can bear 40-65% of insured losses from a large disaster, depending on insurance penetration and reinsurance buying behaviour in the affected region. After the 9/11 terror attacks, international re/insurers covered more than 60% of the losses (Figure 7). Global reinsurers can absorb such major losses because of their **global diversification of risk and investment**, which is secured by payment of premiums before the loss event occurs. Worldwide aggregate insurance premium payments in 2013 by public and private policyholders and insured entities totalled USD 4,641 billion. Of this global premium volume, 43% (USD 2,033 billion) relates to non-life insurance and the remainder to life insurance products. The primary insurers paid about USD 243 billion of their premium income to buy financial protection from reinsurers.²⁰

This is the fundamental concept of re/insurance: **insured risks are pre-funded**. Premiums paid beforehand buy protection from the consequences of an event that may or may not materialise over the course of the contract.¹⁹ For such prefunding to work, **the risk must itself be insurable**: that is, it must meet a set of basic financial and probabilistic criteria that make a clear, good-faith insurance contract feasible (see Box 4 for details).

The security offered by re/insurance **enables the risk-taking which is essential to economic growth** and entrepreneurship. Having bought protection, public and private entities can productively invest funds that would otherwise be required to cover disaster losses. Reinsurers can make protection broadly available at lower cost – thus releasing these funds – because they diversify their risks on a global basis (Figure 6); this is how reinsurance creates value.

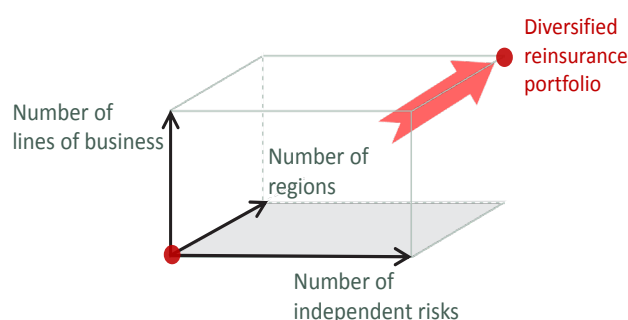


Figure 6: Diversification through geographical distribution, lines of business and number of independent risks. Reinsurers provide coverage against all kinds of risks, all over the world: They range from earthquake risks in Chile to hurricane risks in the Gulf of Mexico; from the effects of drought for Brazilian farmers to mortality risks for a European life insurer; and from an auto insurance portfolio in the US to aviation liabilities in Asia.²¹

19 Bank for International Settlements, 2012: [Natural catastrophes and global reinsurance – exploring the linkages](#).

20 Swiss Re, 2014: [sigma 3/2014 – World insurance in 2013](#).

21 Swiss Re, 2013: [The essential guide to reinsurance](#).

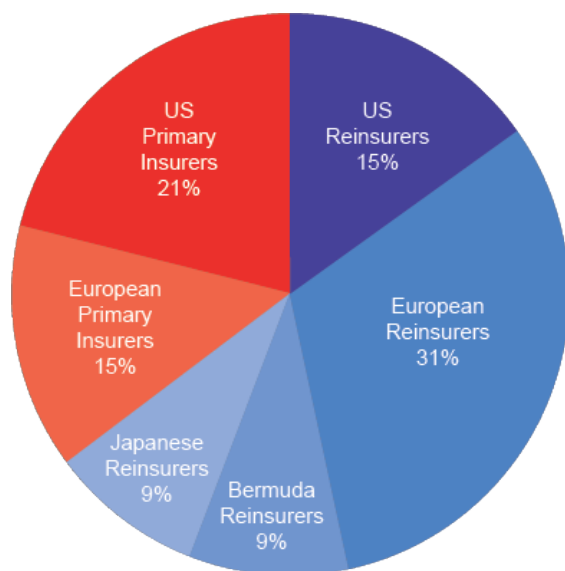


Figure 7: Claims payments resulting from US 9/11 terror attacks. Reinsurers paid 64% of the total claims of USD 26,799 million. Source: Dowling & Partners Securities, LLC.

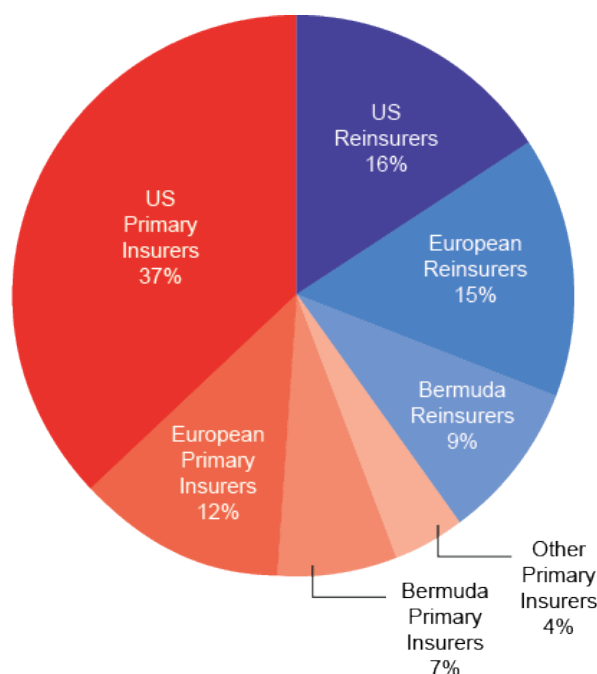


Figure 8: Claims payments resulting from Hurricane Sandy. Reinsurers paid 40% of the total claims of USD 18,750 million, excluding USD 8,000 million under the National Flood Insurance Program. The reinsurance share includes primary insurance companies that are owned by reinsurance companies. Source: Property Claim Services, Insurance Insider and Swiss Re.

Physical events do not correlate in the way that financial risks do, so that it is possible for reinsurers to **gain diversification by taking on a mix of insurable risks**. This lack of connection can arise from reinsuring different geographical locations, but also from writing different lines of business (Figure 6). Reinsurers achieve optimal geographical diversification by offering peak risk protection not just for one country, but (ideally) on a worldwide basis.¹⁹ Primary insurers in each country benefit from this diversification when they buy reinsurance and thereby reduce their exposure to peak losses and risk concentration. Thanks to this unique business model, reinsurance has evolved over the past 150 years into a highly effective means of coping with the growing number and increasingly complex nature of risks.

Re/insurance is therefore a key tool that all risk managers, in the public as well as the private sector, need for reducing financial exposure to extreme events. It helps to **speed up the recovery of societies affected by catastrophic events, to maintain business continuity, and to reduce individual suffering**. This highlights the importance of re/insurance in the efforts of countries and the world community to achieve the goals they set themselves in the UNISDR's Hyogo Framework for Action (HFA)²². Given the expected renewal of the HFA commitments in Sendai in 2015 (HFA2), it will be important for lawmakers and regulators to recognize and sustain the essential role of the international re/insurance industry by helping to **ensure consistent and equitable conditions** governing insurance product coverage and pricing.

²² The United Nations Office for Disaster Risk Reduction, 2005: [Hyogo Framework for Action](#). The HFA is the first plan to describe the work that is required to reduce disaster losses.

All re/insurance is contractual: a voluntary arrangement between two parties. One party agrees to pay a specified premium and the other to cover losses from a specified risk according to the term of the contract. This is not the way governments and public bodies traditionally deal with disasters: they generally assign funds, whether derived from taxation or international transfer, after the event to repay losses or rebuild infrastructure. This is a much slower process than the payout from insurance – and there are further reasons that **public sector bodies are turning increasingly to working with the re/insurance industry** in planning for disasters (Figure 14, Box 10 and 11).

The first reason is **efficiency**: by shifting from post-funded to pre-funded disaster financing through re/insurance, governments can move from attempting to coordinate external loans, tax increases, and budget reallocations – often under extreme time pressure – towards budget and planning security, which helps minimize the economic impacts of catastrophes and accelerate reconstruction and recovery when it is most urgently needed.

Box 4: What is insurability?²³

When assessing a risk, any insurer or reinsurer must consider the **fundamental principles and limitations of insurability**. Insurability is not a strict formula, but rather a set of basic criteria which must be fulfilled in order for a risk to be insurable. Disregarding these constraints could jeopardise a re/insurer's solvency and its ability to honour its obligations under the policy. The strict insurability criteria do, however, mean that certain exposures may remain uninsurable. These criteria are:

Randomness: The time and location of an insured event must be unpredictable and its occurrence must be independent of the will of the insured entity. Insurers must also keep in mind the theory of 'moral hazard,' in which the existence of insurance may lead to a change in the behaviour of the insured (such as taking fewer risk avoidance or risk management measures). This change in behaviour can affect the probable occurrence of a risk.

Quantifiability: The frequency and severity of claimable events must be quantifiable within reasonable confidence limits. Re/insurers and insured entities need to share the same information on the risk so that they can agree on its likelihood: exchange of data and common data formats between the re/insurer and the insured entity is therefore essential.

Mutuality: Both the insurer and reinsurer must have the freedom to build a risk pool in which the risk is shared and diversified at economically fair terms.

Economic viability: From the reinsurer's perspective, the price charged for taking on a risk needs to cover the expected cost of acquiring and administering the business as well as claims costs. The price must also allow for an appropriate investment return on the capital allocated to the risk. With these in place, along with sound risk management practices, re/insurers can ensure that they have adequate capitalisation to absorb severe losses.

Insurability varies according to markets and lines of business; it is also not only assessed from the insurer's point of view. One key question for insurability is whether consumers can **afford the justified risk-based premium** for their insurance, either at its current level or at an increased level that accurately reflects the risk. This can be an issue when, for instance, unrestricted home-building has been allowed in areas regularly prone to flooding. Where this problem arises, re/insurers and public sector bodies need to look at how the risk itself might be mitigated to make protection more affordable.

23 Insurance Europe, 2012: [Insurance Europe key points for insurers regarding natural catastrophes in Europe](#).

The second reason for public sector participation in the re/insurance market is the **continuing high level of underinsurance**. Both economic losses and insured losses from weather events have increased significantly over recent decades: the 10-year average of insured losses from weather-related events as a proportion of global GDP has more than quadrupled in the last thirty years, yet the gap between insured and economic losses, especially in emerging countries, remains worryingly large (Figure 2).^{3, 24, 25} Natural disasters continue to place a significant burden on uninsured individuals and businesses and, through them, on the public sector. Efficient, affordable risk transfer can protect livelihoods of individuals from catastrophic events and therefore increase the ability of decision-makers to invest in economic development.

It is therefore especially for the economies of developing and emerging countries that insurance provides such an effective protection for the nations' economic development. Recent macroeconomic analysis^{15,16} has shown that emerging countries with only very small private insurance markets suffer from stagnant output and increased government deficits in the aftermath of disasters. This contrasts strongly with countries that have developed insurance markets: because such insured countries can shoulder part of the disaster costs and facilitate accelerated recovery, **the economy faces smaller consequences and the government does not expand its deficits** following a natural catastrophe. Judged after the event, the availability of insurance offers the best mitigation

of economic and fiscal consequences of disasters.²⁶ These consequences can be economically crippling: the World Bank calculates that indirect losses from typhoons reduce the Philippines' GDP growth by 0.8% every year. A major natural catastrophe such as Typhoon Haiyan can reduce a country's GDP by almost 4% cumulatively over five years¹⁷, when compared against catastrophe-free GDP development.

By putting a price tag on risk, **re/insurance also boosts investment in preventive measures**. Insurance cover usually encourages risk prevention – both through the way in which policy terms and conditions are formulated and by providing risk information and expertise. The signals given by varying insurance premiums create incentives to lower the price of insurance protection by taking measures to minimise the risk. Efficient financial and insurance markets therefore play an important part in strengthening a society's resilience in the face of risk, at every level from the individual to national governments.

Global reinsurers can get the best value from diversification because they maintain **detailed and wide-ranging expertise** in all forms of insurable risks. This particularly applies to natural catastrophes, the core business of reinsurance: some of the most advanced loss data collection and state-of-the-art modelling of major natural hazards such as earthquakes, floods, and storms take place in the research centres of the global reinsurers (see Box 5). Therefore reinsurers collaborate with universities and scientific institutions to stay abreast of the latest knowledge on the economic impact

24 Munich Re, 2013: [TOPICS Magazine 2/2013: How can emerging countries obtain the insurance protection they need?](#)

25 Lloyd's, 2012: [Lloyd's Global Underinsurance Report](#).

26 World Bank (Martin Melecky and Claudio Raddatz), 2011: [How Do Governments Respond after Catastrophes? Natural-Disaster Shocks and the Fiscal Stance](#), World Bank Policy Research Working Paper 5564.

Box 5: Good underwriting needs good quality data

Government and re/insurers have a shared interest in continuously improving the mapping of hazards and the quality and availability of data. The insurance industry continues to work to improve data collection, hazard mapping, and other tools to manage the underwriting process for increasing natural catastrophe risks. More accurate quantification of the probability and impact of future climate change will require further advancement of detailed scientific understanding and refinement of climate model forecasts. These needs overlap to a large extent with what local and regional public sector planners require to define government-mandated risk mitigation and adaptation measures. Additional data collection, tools and research are vital for identifying future trends and catastrophe risks.²⁷



Figure 9: Earthquake epicentres, seismic hazard and historical tropical cyclone tracks in Asia.²⁷

of natural disasters, including the effects of climate change (Box 6). This expertise is put at the disposal of the reinsurers' clients from the public and private sector, offering both the information needed to support meaningful risk reduction and the financial sophistication required for innovative and efficient risk transfer.

Global reinsurers offer further advantages to local insurance companies, national governments and public-sector bodies when planning for future financial commitments, whether related to disaster relief or not.

Capital provided under a reinsurance payout is an external source to the local economy: it is not a redistribution but an injection, helping to stabilise the financial situation in the wake of an economic shock (Figure 7 and Figure 8).

Additionally **reinsurance contracts smooth earnings volatility** for local insurance companies, protecting their balance sheets and enabling them to make better use of their capital; in turn this allows them to offer more insurance at lower prices than would otherwise be possible. Reinsurers are able to cover particularly large one-off risks, such as a major construction or civil engineering projects, aviation risks such as satellites, thus enabling public bodies to invest for innovation and growth. Reinsurers can also transfer risks to capital markets through insurance-linked securities.

²⁷ Swiss Re, CatNet®.

Planning for future risks

Beyond managing the risks they face today, reinsurers are also constantly scanning the horizon for indications of **emerging and future hazards**. The risk landscape is changing faster than ever before: new economic, technological, biological, socio-political, regulatory, and environmental developments all have **the potential to change the dynamics of current risks or to create new ones**. Moreover, growing interdependencies between these developments can create significant knock-on effects, potentially allowing risk to accumulate. The general business environment is also changing significantly, as **liability and regulatory regimes evolve**, stakeholder expectations rise, and people's risk perceptions shift. As part of their comprehensive approach to risk management, reinsurers must detect and explore such emerging risks as early as possible. The aims are to reduce uncertainty, prevent unforeseen losses, identify new business opportunities, and raise general risk awareness. Due to the extensive efforts that reinsurers put into understanding and assessing a large range of different risks, reinsurers hold a lot of know-how which they can use to determine the possible impact of risks.

Given its role as an ultimate destination of risk, the reinsurance industry is particularly exposed to the impact of climate change. The industry **identified climate change as an emerging risk** more than twenty years ago; it has since become a key component of every company's long-term risk management strategy. As the Special Report on Extremes (SREX)²⁸ published by the

Intergovernmental Panel on Climate Change (IPCC) points out, extreme weather events have become more numerous and severe. These include storms, floods, droughts, heat waves, and other natural disasters, as well as rising sea level, crop failures, and water shortages. As mentioned above, **unmitigated climate change could reduce global welfare**.²⁹ It is in the interest, not just of the industry, but of society as a whole to tackle this issue. Reinsurers can make an important contribution by developing **protection and mitigation-finance solutions** to address the specific challenges that climate change presents. They are also advancing understanding of climate change-related risk through proprietary, **state-of-the-art natural catastrophe models** and collaborations with universities and scientific institutions, and monitoring relevant such phenomena as urbanisation and the concentration of population, property, and commercial activity in high-risk areas like coasts and flood plains.

Through all its activities, the industry seeks to **extend the boundaries of insurability** (Figure 14), that address the changing risk landscape while strengthening the resilience of local and national economies and humanity at large.

²⁸ Intergovernmental Panel on Climate Change, 2012: [Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation \(SREX\)](#).

²⁹ Intergovernmental Panel on Climate Change, 2014: [Fifth Assessment Report, Climate Change 2014: Impacts, Adaptation, and Vulnerability, Summary for policymakers](#).

Box 6: What if Hurricane Sandy hit New York in 2050?

In the aftermath of Hurricane Sandy, Mayor Michael Bloomberg called for “A Stronger, More Resilient New York,” an ideal embodied in the city’s Special Initiative for Rebuilding and Resiliency. As part of this initiative, Swiss Re conducted an Economics of Climate Adaptation study³⁰, which came to some stark conclusions: Hurricane Sandy caused around USD 19 billion worth of damage to New York City’s five boroughs. While a storm generating this kind of loss would previously have been expected to occur on average once every 70 years, climate change is expected to make them noticeably more frequent: once every 50 years by the 2050s, under the climate change scenario used in the project. Since 1900, sea levels around New York City have risen more than 33 centimetres, more than half of which is thought to be due to climate change.

The study further concluded that, if no action were taken, damage from a hurricane like Sandy would likely increase more than fourfold, to USD 90 billion, and that the average loss per year from windstorms and storm surges would rise from around USD 1.7 billion today to USD 4.4 billion by the 2050s.

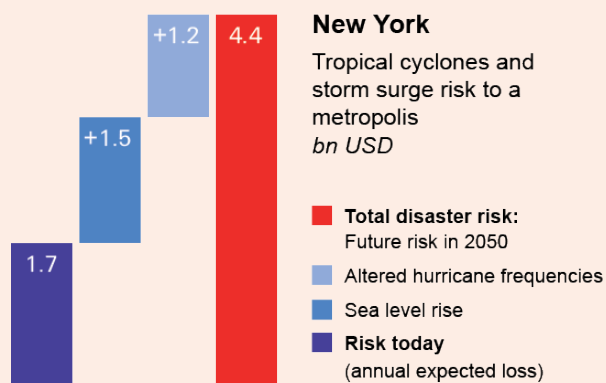


Figure 10: Annual expected weather-related loss for New York City is estimated at USD 1.7 billion, increasing to USD 4.4 billion by 2050 due to sea level rise and altered hurricane frequencies.³⁰

30 Swiss Re, 2014: [Economics of Climate Adaptation: A global overview of case studies with a focus on infrastructure](#).

Box 7: Space weather and disruptive power blackouts

Short term, local power blackouts are a familiar fact of life, causing only moderate losses even when they last for several days; but there are reasons to fear the significant economic effects of longer-term power failures. Traditionally thought to be caused by coordinated cyber or terrorist attacks, power blackouts can also result from space weather.

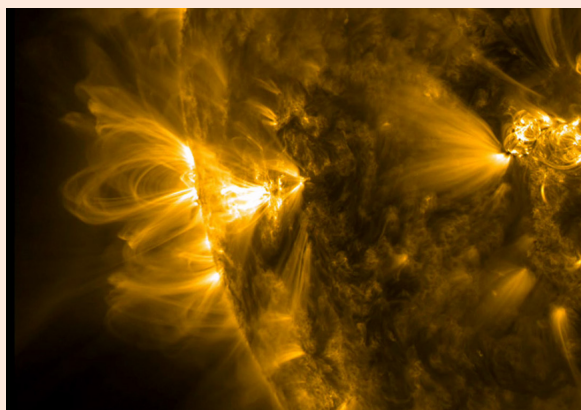


Figure 11: Coronal loops in an active region of the sun. Solar storms could lead to large scale, long-lasting, disruptive power blackouts. Source: Nasa/Solar Dynamics Observatory.

Space weather comprises phenomena such as solar flares and coronal mass

ejections (CME), in which large amounts of energy in the form of radiation and plasma are released explosively from the sun's corona into space, forming solar storms. These particles can reach earth in less than two days and distort its magnetic field, as well as damaging vital components of satellites and other spacecraft. There are about 700 operational satellites that could be disrupted; damage to them could have significant effects on communication and transportation infrastructure.

Damage to terrestrial infrastructure is also possible when the solar storm produces a geomagnetic storm by distorting the Earth's magnetic field: this can trigger disturbing or even damaging induction currents in transmission power grid equipment such as high-voltage transformers (through the grounding cables) and cause power failures (as in Canada in 1989 and in Sweden in 2003). The duration of such a failure would depend largely on the number of transformers damaged and the availability of replacements. If new transformers need to be ordered, the down-time could last from several months to a year.

Several geomagnetic storms are recorded in history; the most extreme, the Carrington event, took place from 28 August to 2 September 1859. If the Carrington event were to reoccur today, between 20 and 40 million people in the US would be at risk of extended power outage, with durations ranging from weeks to months or even years until full functionality was restored. In such a scenario, multiple transformers could fail with cascading effects, which might lead to a widespread and long-lasting power outage. Water, food, and fuel supply could be disrupted, financial transactions stopped, communication channels interrupted, and transportation of goods hampered for a long time. ^{31, 32, 33}

31 Chief Risk Officer Forum, 2011: [Power Blackout Risks](#).

32 Lloyd's, 2013: [Solar storm risk to the North American electric grid](#).

33 Swiss Re, 2013: [Solar storms, and what they mean for us](#).

In planning for future risks, the re/insurance industry does not only consider large-scale, physical hazards such as natural and man-made catastrophes – it also needs to evaluate the fast-evolving dangers that originate at the microscopic scale: **pandemics and other biological risks.**

After the comparatively minor impacts of the last global influenza outbreaks, H5N1 in 2007 and H1N1 in 2009, it is tempting to regard pandemics as a dead issue. This is far from the case. A serious pandemic, with its widespread loss of life, would not only bring the global economy to a halt, it would also pose a significant risk to global life and health re/insurers. The 1918 Influenza pandemic event just after the end of World War I stands out by far as the worst influenza pandemic on record. It infected around 30% of the world's population and death estimates range from 20 to 100 million: the pandemic killed more people than the war itself. **A repeat of such an event would likely cause a global recession** with estimated impacts ranging from 1% to 10% of global GDP. In particular, industries with significant face to face contact would be profoundly affected. Not everything in a pandemics model is certain: one key

variable is that past pandemics occurred at a time when global trade was very different from now; it is not at all clear how the shock of a pandemic would affect today's supply chains. Many businesses operate a "just in time" model; disruption could lead to shortages in some areas and backlogs in others – including, most significantly, in hospitals.

It is vital for the industry and for society to continue to be vigilant about peak mortality risk and to keep refining predictive models, **because pandemics are relatively rare and the pool of historical data is limited.** Medical developments, in particular vaccines and antivirals, make the situation very different from 1918, as do changes in the ways that individuals and authorities respond to a pandemic threat. Life re/insurers will find it difficult to quantify the potential loss value arising from the risk and therefore difficult to manage their capital efficiently for the benefit of both policyholders and shareholders. All stakeholders, whether in industry or government, therefore need to ensure that their plans are flexible and robust to a variety of scenarios.³⁴

Increasing bacterial resistance to antibiotics

is another emerging risk that poses major problems in human medicine, as are new pandemic diseases that have recently emerged. The Middle East respiratory syndrome coronavirus (MERS-Cov) is part of the large family of coronaviruses that cause a range of illnesses in humans, from the common cold to Severe Acute Respiratory Syndrome (SARS). MERS-Cov was first identified 2012 in Saudi Arabia; human infections have since reached a global scale



Figure 12: Laboratory analysis of serum samples.
Source: Swiss Re.

³⁴ Lloyd's, 2010: [Pandemic: Potential insurance impacts](#).

with affected countries in Middle East, Africa, Europe, Asia and North America. As of June 2014, 699 cases have been reported to WHO, including at least 209 deaths.³⁵

Ebola virus disease (EVD), formerly known as Ebola haemorrhagic fever, is a severe, often fatal illness in humans, which first appeared in 1976. Since 2012, the Ebola virus has re-emerged in several African countries, predominantly in West Africa. In 2014, **the latest Ebola epidemic continues to spread** in Sierra Leone, Liberia, and Guinea and has caused more than 1100 deaths (August 2014). Although the outbreak is expected to subside, it has been exacerbated by local suspicion of aid agencies, along with the travel of infected people to other countries and to large cities.³⁶

Another emerging risk, which should not be underestimated, is represented by **endocrine disruptors**: artificial substances that interfere with the sensitive hormonal system of humans and animals. Strong evidence indicates negative effects on animal organisms, and there is mounting evidence for impacts on human health.³⁷ Monitoring this evidence is essential for risk management in the context of liability insurance, since these substances are man-made and therefore the responsibility of human institutions.

Re/insurance capital stabilises financial markets

Re/insurance is, of course, not only a risk-mitigation industry; it is also **an investment industry, with a uniquely long-term view**. This stems from the specific business model embodied in an insurance contract: premiums are collected at the beginning of each coverage period, which **makes new capital continuously available for investment**. Unlike banks and other investment vehicles, re/insurers do not depend on short-term funding nor suffer from withdrawal of capital at times of financial uncertainty; this allows them to invest prudently for the long term, helping to stabilise financial markets.

Collectively, re/insurers rank among the **world's largest institutional investors**, holding (as of 2012) some USD 27,000 billion, or 12% of global assets.²⁰ This puts the industry's total assets in line with those of the world's pension and mutual funds and more than six times those of all its sovereign wealth funds.

Although their unique business model allows re/insurers to invest in a fundamentally different way from other financial institutions, their **guiding principle of investment is the same: Asset-Liability Management**. Each re/insurance contract commits the insurer to a specific expected payout over a specific period; the financial assets held to meet these liabilities therefore need to correspond in their projected yield and maturity with the aggregate future commitments of the re/insurer. As an industry, therefore, re/insurers manage their assets conservatively and prudently, with a large proportion of their holdings in government and highly-rated corporate bonds.

35 World Health Organization, 2014: [Middle East respiratory syndrome coronavirus \(MERS-CoV\) summary and literature update](#) – as of 11 June 2014.

36 World Health Organization, 2014: [Ebola virus disease Fact sheet N°103](#).

37 Chief Risk Officer Forum, 2012: [Endocrine Disruptors](#).

The re/insurance industry's unique position as a provider of risk capital with a long-term investment horizon creates opportunities for **productive collaboration with governments** and other public sector institutions, for whom large, long-term capital projects are a vital but challenging imperative. Properly designed infrastructure projects, whether involving maintenance and upgrades (as is mostly the case in developed countries) or entirely new construction (as is more common in emerging markets) is essential for sustaining economic growth. High levels of government indebtedness, however, make financing these projects increasingly difficult. Clear rules for public/private collaboration and innovative financial instruments (such as fixed-rate investment products and investable indices) can open the way for private institutional investment in these areas.^{38,39} This could be particularly fruitful in the energy sector, particularly in renewable energy. **The social and environmental benefits of transition to a low-carbon economy are clear**, but the extended time-frame for economic return discourages short-term investors. As active investors with a long-term view, re/insurance companies are capable of playing a pivotal role in bringing this transition about.

Re/insurers' participation in long-term investments naturally depends on whether the **regulatory and prudential regimes** under which they operate allow them to hold such assets until maturity. This is not the case if capital charges link asset valuations too closely to short-term market volatility, which may trigger the risk that re/insurers de-risk their balance-sheets in

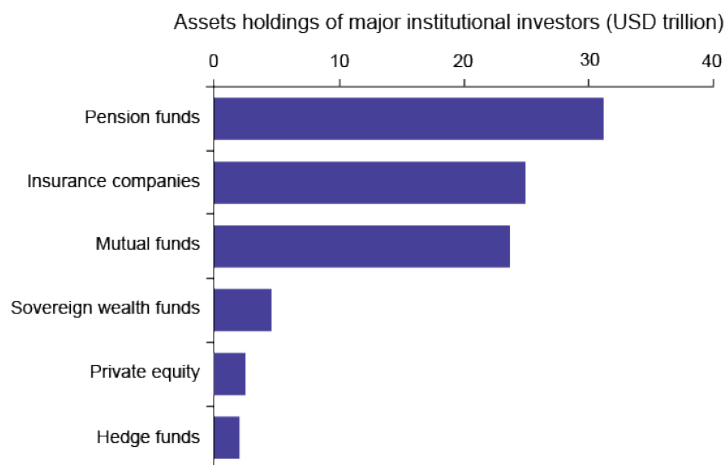


Figure 13: Asset holdings of major institutional investors, year-end 2011, USD trillion. Source: Pension funds – CityUK; Insurers – Swiss Re Economic Research & Consulting; Mutual funds – Investment Company Institute; Sovereign wealth funds – Sovereign Wealth Funds Institute; Private equity – Deutsche Bank; Hedge funds – Hedge Fund Research, Inc.

times of market stress and shorten the time-horizon of both their liabilities and their investments. Such **inadvertently pro-cyclical regulation** undermines the stabilising value of the re/insurance industry for financial markets.⁴⁰

³⁸ Institute of International Finance and Swiss Re, 2014: [Infrastructure investing. It matters.](#)

³⁹ Institute of International Finance and Swiss Re, 2013: [Strengthening the role of long-term investors.](#)

⁴⁰ European Financial Services Round Table, 2013: [EFR Response to the EU Green Paper: Long-Term Financing of the European Economy.](#)

Effective regulation and supervision: the key to risk sharing and long-term investment

Appropriate, comprehensive regulation and supervision are essential for protecting policy holders, ensuring financial market stability, and creating the basis for efficient functioning of global re/insurance. In the aftermath of the 2008 crisis, we are witnessing **unprecedented changes in financial sector regulation**. It is essential, in such a dynamic regulatory and economic environment, that society and its lawmakers understand clearly the business model of reinsurance and proper role of re/insurance in the economy. The most pressing challenge to the industry is the tendency among some regulators to incorporate re/insurers into the discussion on the future of banking, bundling two distinct industries together under the discussion on “systemic risk.” Regulating re/insurance in a similar fashion to the banking industry risks blurring the **essential differences in business model between reinsurance and banks**, which ought to require a differentiated regulatory approach (see Box 9). In simple terms, because the core business of reinsurance is funded in advance by contractual premium payments, re/insurers have much lower liquidity risks than banks and they are not involved in maturity transformation. Indeed, since they continuously invest the money collected from their clients, they are providers of capital to the economy. Their liabilities stem largely from natural and man-made hazards that are very weakly correlated with financial market volatility, and are further smoothed by aggregation, diversification, and efficient risk pooling. Moreover, because their liabilities can be run off over an extended period of time, re/insurers can fail without threatening the

stability of the financial system. A reinsurer at risk would not require emergency bail-out measures to protect the financial system or the insurance industry.

What the re/insurance industry therefore needs from regulators – beyond such fundamental necessities as freedom of contract and legal certainty – are **risk and capital requirements that acknowledge the specific characteristics of the re/insurance business model** and regulatory standards that facilitate cross-border reinsurance to support effective risk pooling. Sound risk and capital management is best encouraged through the implementation of a risk-based regulatory framework. Global regulatory standards will help achieve greater transparency and mutual recognition among national supervisory regimes. Equivalent accounting standards will allow greater clarity in long-term capital management and help to mitigate pro-cyclical effects.

Because reinsurance requires international risk pooling to achieve the diversification necessary for absorbing large risks, it is vital to **maintain open access to national markets**, with global mobility of premiums and capital. Market distorting protectionist regulation obviously impedes reinsurers’ ability to cover large risks efficiently and to invest in the real economy.

Box 8: Insured parties, re/insurers, governments: the GRF's perspective for risk sharing

The GRF's perspective is of shared risk and mitigation measures that integrate the roles of insured parties, the re/insurance industry, and the government, as risk bearer of last resort.

Under this integrated framework, the **insured party is responsible for**

- buying insurance cover,
- being informed,
- implementing protection measures and maintenance,
- integrated risk management,
- and reacting to warnings.

The **re/insurance industry is responsible for**

- offering insurance solutions that balance insured needs while managing risks prudently such that all valid claims can be paid in a timely manner,
- maintaining efficient organizations,
- integrated risk management,
- and building awareness, learning from disasters, and exchanging detailed loss information to improve risk assessment.

The **state is responsible for**

- integrated risk management,
- governmental guidelines,
- constructing and maintaining protection measures,
- appropriate land use planning,
- defining interventions, activities, and emergency forces,
- improving awareness,
- and defining the legal framework for insurance.

Box 9: Reinsurance does not pose a systemic risk

Because of their role in absorbing risk in the financial sector and supporting growth in the broader economy, global reinsurers have been included in the debate on systemic risk regulation for the financial sector. During the 2008 financial crisis no diversified reinsurer failed. The reinsurance sector weathered the crisis well and indeed acted as a source of stability. There have been no examples of the failure of a reinsurer producing a cascading impact on primary insurers. Even the total failure of a large reinsurer would represent a relatively low loss in terms of global insurance premiums, total insurance market capitalisation, or total industry investments. This assumption has been confirmed in studies by the International Association of Insurance Supervisors (IAIS, 2011, *Insurance and Financial Stability*⁴¹ and 2012, *Reinsurance and Financial Stability*⁴²) after a G30 report on the topic initiated by the Financial Stability Board (G30, 2006, *Reinsurance and international financial markets*⁴³). As the IAIS puts it, “the evidence for global systemic risk to arise from reinsurance failures has been small or non-existent so far” and “traditional reinsurance – including the reinsurance of peak risks – is unlikely to contribute, or amplify, systemic risk.” The G30 adds, “the hierarchical structure of the insurance market dampens the propagation of shocks through the insurance market. Although reinsurers can fail, in the past, primary insurers have typically absorbed the loss of reinsurance recoverables without a significant detrimental financial impact.”

One source for the misconception that the failure of a reinsurer would threaten financial stability is the confusion between disaster risk and systemic risk. Reinsurers do indeed take on extreme natural and man-made risks with the potential for large losses, but they do so subject to their own risk management and risk modelling expertise. Reinsurers are experts in extending the boundaries of insurability through risk pooling, securitisation, and public-private partnerships. Reinsurers are subject to close micro-supervisory oversight of their solvency and capital adequacy. They are also subject to an annual macro-prudential report from the IAIS. Finally, since reinsurers' liabilities are prefunded, in the event of a failure, they can do so in an orderly fashion. Due to these essential elements, there is no systemic risk in the traditional reinsurance business model.

41 International Association of Insurance Supervisors, 2011: [Insurance and Financial Stability](#).

42 International Association of Insurance Supervisors, 2012: [Reinsurance and Financial Stability](#).

43 G30, 2006: [Reinsurance and international financial markets](#).

The reinsurance sector plays an important shock-absorbing role in the global economy. Global reinsurers follow long-term investment strategies, providing essential risk capital to the manufacturing and services companies that they insure. It is therefore critically important that governments work to retain the benefits that their economies gain from such large, cross-border institutions by **adopting a tailored approach to regulation**, especially to potential macro-prudential surveillance. Given that the reinsurance sector weathered the global financial turmoil very well and that no diversified reinsurer failed during the crisis, it is worth avoiding a supervisory over-reaction. Excessive capital requirements or restrictions to reinsurers' activities would ultimately distort the market and reduce the availability of insurance capacity and increase costs for insurers and insured alike.

Regulatory and supervisory intervention should rather focus on **encouraging sound enterprise risk management and on strengthening the role of long-term investors**. Regulatory reforms should enable reinsurers to freely exercise their intermediation function, providing risk capital reliably and stabilising markets by remaining invested. Policymakers can also provide capital incentives for such institutions to increase their provision of long-term funding to the economy. ^{38, 39}

Public-private partnerships: extending the boundaries of insurability

In today's turbulent world, natural and man-made risks continue to grow. As societies, we need to make our socioeconomic systems more resilient to large events. This requires both foresight and flexibility: **risk management is most effective when it adapts to changing circumstances and when it is shared by all related private and public parties** (Box 8). Resilience is itself an adaptive quality, allowing economic and social structures to survive and grow in the face of uncertainty. Achieving resilience depends on willingness to collaborate, shared vision, and a conceptual framework to integrate appropriate actions. ²

As mentioned above, underinsurance of disaster risks remains an obstacle to societies' resilience. **Uninsured losses put an extra burden on individuals, on governments, and ultimately on taxpayers**. At a time when government budgets are already stretched, it makes sense to explore new ways to manage risk and finance disaster losses. To choose one of many examples, governments in several developing countries have turned to crop insurance to cover agricultural losses from flood, storm, or drought. Paying a pre-funded risk-based premium rather than scrambling to assemble disaster-relief funding helps to promote both effective country-wide risk management and fiscal stability.

Such initiatives are part of a broader trend in which some governments establish **processes for systematic integrated disaster risk management**. Societies are becoming increasingly aware of their vulnerability to

a spectrum of risks, often interconnected: integrated risk management with dedicated national risk officers helps countries identify and prepare for a range of hazards. The reinsurance sector can contribute to public-private partnerships and other innovative solutions that narrow the gap between economic and insured losses and thus absorb the financial consequences of catastrophic events. Partnerships with governments are essential to extending the boundaries of insurable loss, in particular for extreme risks (nuclear accidents, terrorism...), and when insurance is provided for the poorest “bottom of the pyramid” members of society, who need cover most but would not otherwise be able to afford it – and when insurance is needed for large public assets and infrastructure, where the risk is too complex or concentrated to be covered simply by a traditional re/insurance contract (see Figure 14 and Boxes 10 and 11).

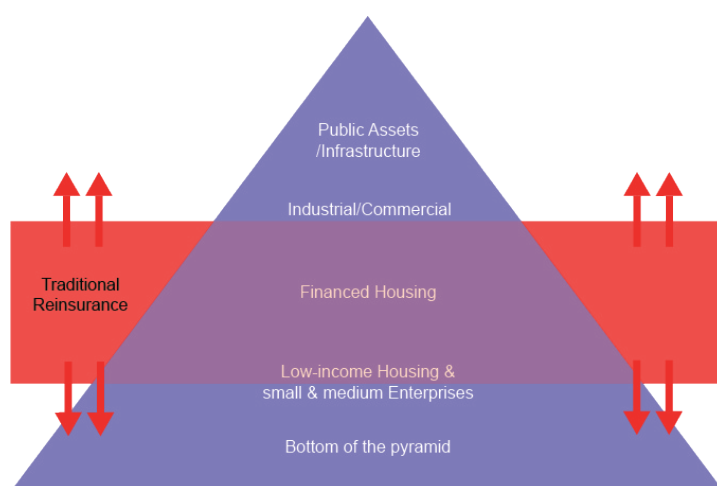


Figure 14: Expansion of traditional re/insurance. Source: Munich Re (internal study).

As mentioned above, the Intergovernmental Panel on Climate Change reports increasing frequency and severity of extreme weather events for all emission scenarios. Such extreme weather events comprise storms and floods, along with climate-related disasters such as crop failure and heat waves. The risks from climate change are exacerbated by socio-demographic factors such as population growth and the rise of mega-cities, creating an **urgent need for governments to strengthen their societies' disaster risk resilience**.

Clearly, the only way to solve the global problem of climate change in the long term is mitigation by reducing emissions of greenhouse gases – but this does not address short and medium-term risks. Within 25 years' time, more than half of the world's population is expected to live within 100 km of the coast – and sea levels are rising fast. **Governments need to adapt to unavoidable risks²⁹**, deciding on measures to manage them and assessing the costs and benefits of these measures.

Such an adaptation strategy combines **risk prevention, risk mitigation, and risk transfer measures** to make cities, regions and entire nations more resilient to impacts of climate change. These measures include infrastructure development, technology advancements, shifts in systems and behaviours (such as improved building codes and land use management), and financial measures.⁴⁴ Well-targeted, early investments in adaptation measures are likely to be cheaper and more effective for the individual country and the world community than complex disaster relief efforts after the event. It has been shown that up to 65% of climate risks can be

⁴⁴ Swiss Re, 2014: [sigma 1/2014 – Fostering climate change resilience](#).

averted by such measures⁴⁵, and **the global re/insurance industry plays a vital role in their planning and implementation**. Future insurability will depend on well-planned adaptation: without it, property insurance will become less affordable and less accessible.⁴⁶ The world cannot simply insure its way out of the effects of climate change, but adaptation allows the global burden of potential loss to be reduced and shared, helping to keep the most vulnerable from being overwhelmed.

The value of collaboration between governments and the re/insurance industry has been demonstrated in many partnerships at the city, regional, and national level – and is now recognised by international institutions. In 2012, the UN Conference on Sustainable Development saw the launch of the **UNEP FI Principles for Sustainable Insurance (PSI)**⁴⁷: a global framework for the insurance industry to address environmental, social and governance risks and opportunities. The flagship project is the PSI Global Resilience Project, which plans to use education on disaster mitigation to help reduce the massive economic and social losses, and more importantly the number of victims, from natural catastrophes such as cyclones, floods and earthquakes. The combined expertise of the PSI insurers should help ensure targeted use of public and private investment.

45 Economics of Climate Adaptation Working Group, 2009: [Shaping climate-resilient development – a framework for decision-making](#).

46 Lloyd's, 2008: [Coastal communities and climate change](#).

47 United Nations Environment Programme Finance Initiative, 2012: [Principles for Sustainable Insurance](#).

Box 10: The Caribbean Catastrophe Risk Insurance Facility (CCRIF)

The CCRIF risk-pooling facility is owned and operated by 16 Caribbean governments and is structured to pay out quickly in case of serious disaster. CCRIF has been designed as a parametric solution: It uses physical parameters such as strength of earthquakes, wind speeds, or rainfall to estimate losses and to determine payout levels. CCRIF represents a paradigm shift in the way governments treat risk: by putting contingent funding in place before catastrophes occur and streamlining the loss assessment process, it shows how proactive treatment of risks can reduce their economic impact.



Figure 15: Hurricane Felix destroyed thousands of homes in Nicaragua's low-lying Caribbean coast, leaving dozens dead and dozens more missing. Source: Swiss Re.

Sixteen governments are currently members of CCRIF: Anguilla, Antigua & Barbuda, Bahamas, Barbados, Belize, Bermuda, Cayman Islands, Dominica, Grenada, Haiti, Jamaica, St. Kitts & Nevis, St. Lucia, St. Vincent & the Grenadines, Trinidad & Tobago and the Turks & Caicos Islands. CCRIF was developed under the technical leadership of the World Bank and with a grant from the Government of Japan. It was capitalised through contributions to a multi-donor Trust Fund by the Government of Canada, the European Union, the World Bank and others. Since the inception of CCRIF in 2007, the Facility has made eight payouts totalling more than USD 32 million to seven member governments. All payouts after each event were transferred to the respective governments immediately after the stipulated 14-day waiting period.⁴⁸

⁴⁸ The Caribbean Catastrophe Risk Insurance Facility, 2013: [About us](#).

Box 11: The Global Earthquake Model (GEM): working together to understand earthquake behaviour

World-wide vulnerability to earthquakes is increasing as societies develop and concentrate value in danger zones – yet reliable risk assessment tools and data are unavailable in many areas; there are as yet no global standards for risk analysis. The Global Earthquake Model (GEM) was created to bridge this critical gap, increasing risk awareness and supporting measures to strengthen resilience.

A collaborative effort bringing together governments and public bodies in several countries with private sector companies and scientific researchers, GEM is based on the OpenQuake software platform, which enables open-source sharing of data, models, and expertise. Its tools support practical decision-making for risk mitigation and management while expanding scientific understanding of earthquakes. Since its inception in 2009, GEM has made significant contributions toward establishing a unified framework for seismic hazard and risk modelling, data collection, and risk assessment at local to global scales.⁴⁹ It also provides a successful template for how other natural catastrophe risks, such as flooding, could be studied and managed. Together with other private organizations, the GEM initiative is actively supported by the GRF member companies Hannover Re, Munich Re, and Renaissance Re.

⁴⁹ Global Earthquake Model, 2014: [About GEM](#).

Recommendations

Reinsurance has evolved over the last century and a half to become an essential tool for coping with the growing number and increasingly complex nature of risks faced by the world. With their global financial resources and expertise, reinsurers play a key continuing role in strengthening the disaster resilience of companies, regions and entire nations – but only if certain basic conditions are met. These are:

Allowing international risk transfer, free trade and capital flow

- Reinsurers are, by necessity globally active: to provide their clients with the full benefits of risk pooling and diversification, they need to be able to balance their business portfolios on a worldwide basis, taking on risk and allocating capital across borders. Protectionist legislation that restricts **access to national reinsurance markets**, therefore inevitably increases insurance costs and limits the local availability of world-class risk-management expertise.
- Reinsurers also need to be able to rely on their worldwide premium income to pay local claims – this is essential to diversification. National restrictions on the **free flow of capital** for reinsurers (such as discriminatory requirements imposed on foreign reinsurers as they relate to collateralisation and location of asset) similarly reduce efficiency and increase cost of insurance in all markets.

Assuring legal certainty and regulatory harmonisation

- Reinsurance is based on contracts that define which risks are covered and under which conditions future claims are paid. **Freedom of contract** is therefore essential for an efficient reinsurance market. As claims manifest themselves in the future, it is important that originally agreed contracts remain legally valid and changes in law are not applied retroactively.
- Reinsurers envision a regulatory framework that preserves the confidence in the financial robustness of the industry while taking into account its unique characteristics. It is important for regulation, especially regarding capital requirements, to account for **credit for reinsurance** to appropriately recognize the credit worthiness of global reinsurers, their supervisory regimes and their risk mitigation techniques.
- In order to enable efficient global reinsurance, market regulators should continue efforts for **harmonisation of supervision** to avoid regulatory fragmentation with its associated potential for regulatory arbitrage and moral hazard. The recent proliferation of authorities in the US and EU risks confusion between the roles of macro-surveillance and micro-supervision, and could disrupt the growing consensus that supervision of a global reinsurer is best exercised by a single group supervisor.

Providing long-term investment incentives

- Reinsurers actively participate in financial markets as institutional long-term investors, providing vital risk capital and absorbing the shock of catastrophes and contribute to financial stability. It is essential to **strengthen the role of long-term investors** through appropriate regulatory incentives. These have largely to do with the valuation of capital assets: it is important that the capital adequacy regimes established in the wake of the 2008 financial crisis should not take valuation rules appropriate to banks' short-term vulnerability and apply them to re/insurers' long-term asset-liability management.

Collaborating to extend the boundaries of insurability

- The gap between economic and insured losses continues to be vast; the burden of uninsured disaster losses continues to weigh on individuals and government. New forms of **public-private partnerships** can help countries absorb the financial consequences of catastrophic events and make them more resilient.
- To offer sustainable insurance solutions also in the future, essential measures to **adapt to the impacts of climate change** need to be implemented. Public and private decision-makers should develop adaptation strategies collaboratively, while at the same time pursuing the goal of substantially reducing greenhouse gas emissions.

- Structuring sound risk-transfer solutions relies on comprehensive understanding of catastrophe risks and the impact of novel threats. Re/insurers and governments alike need **free access to scientific data** and joint contributions to state-of-the-art catastrophe models.

*These conditions are essential to ensuring a robust reinsurance industry that can help build worldwide disaster resilience. Their realisation depends on active, constructive discussion among all stakeholders with the aim of finding joint solutions. **The GRF is committed to maintain active dialogue** with policy-makers, regulators, insurers and other stakeholders with an interest in anticipating, mitigating, and adapting to today's and future risks, and enabling society to advance further.*

The Global Reinsurance Forum

The Global Reinsurance Forum (GRF) is composed of twelve leading global reinsurers; its main objective is to promote a stable, innovative, and competitive worldwide reinsurance market. The members of the GRF, all private companies, are Gen Re, Hannover Re, Lloyd's, Munich Re, Partner Re, Renaissance Re, RGA, SCOR, Swiss Re, Toa Re, Transatlantic Re, and XL Capital. The GRF secretariat is managed by The Geneva Association.

In support of its main objective, the GRF helps to define industry positions on regulatory, legal, tax, and accounting developments. It represents these positions in discussions with relevant regulatory and supervisory bodies (especially international ones). It works to advance understanding of the value of reinsurance to the economy, and encourages an open and fair international framework for the development of reinsurance markets.

Members

Michel Liès, GRF Chairman and Group CEO, Swiss Re
Inga Beale, CEO, Lloyd's
Nikolaus von Bomhard, Chairman of the Board of Management, Munich Re
Denis Kessler, Chairman and CEO, SCOR
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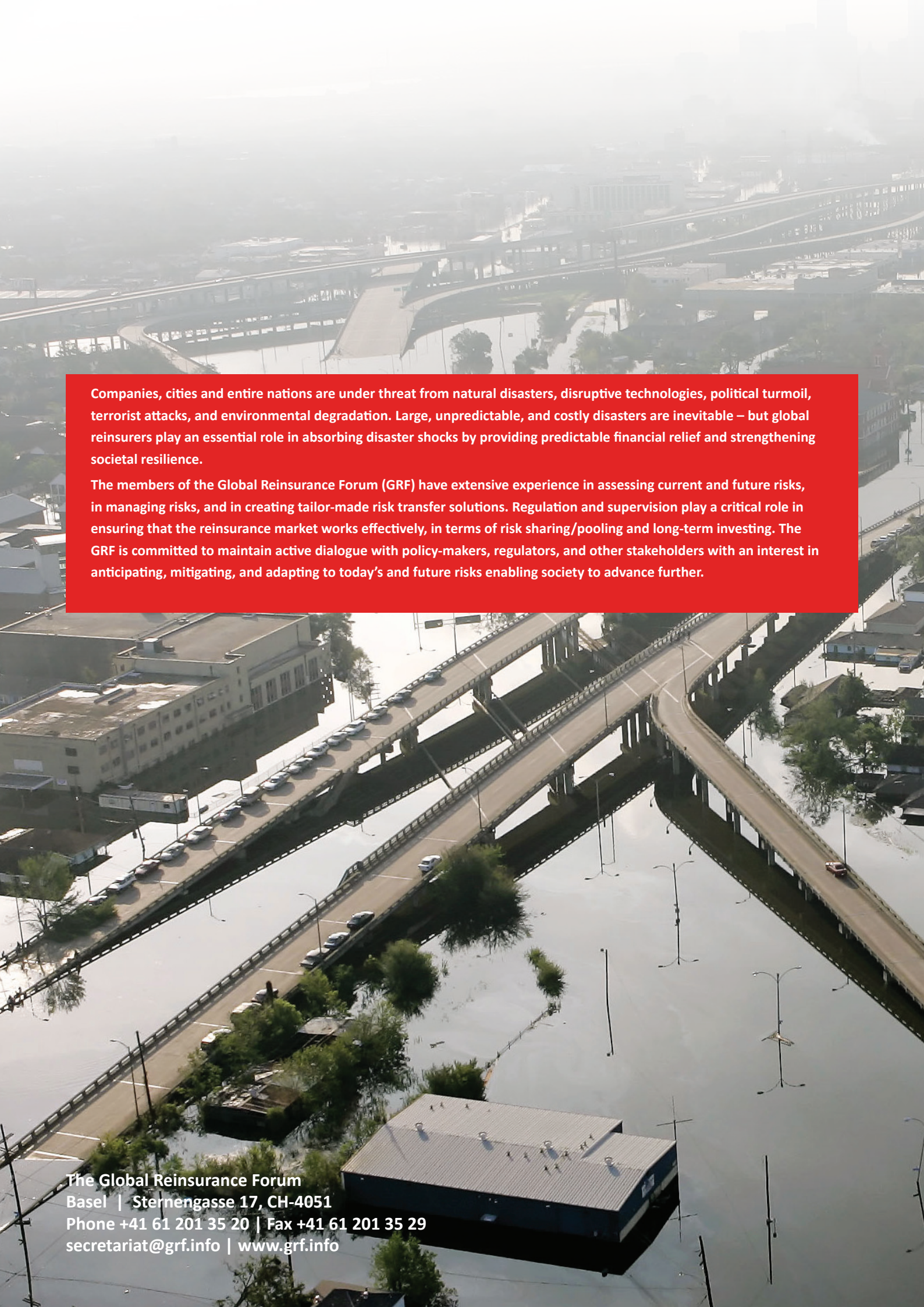
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An aerial photograph of a city heavily inundated with floodwater. A large, multi-lane bridge spans across the flooded area, with several cars visible on its surface. The surrounding urban landscape, including buildings and streets, is submerged in water, illustrating the impact of natural disasters.

Companies, cities and entire nations are under threat from natural disasters, disruptive technologies, political turmoil, terrorist attacks, and environmental degradation. Large, unpredictable, and costly disasters are inevitable – but global reinsurers play an essential role in absorbing disaster shocks by providing predictable financial relief and strengthening societal resilience.

The members of the Global Reinsurance Forum (GRF) have extensive experience in assessing current and future risks, in managing risks, and in creating tailor-made risk transfer solutions. Regulation and supervision play a critical role in ensuring that the reinsurance market works effectively, in terms of risk sharing/pooling and long-term investing. The GRF is committed to maintain active dialogue with policy-makers, regulators, and other stakeholders with an interest in anticipating, mitigating, and adapting to today's and future risks enabling society to advance further.