

Global protection gaps and recommendations for bridging them

March 2023

**Report extract:
Natcat protection gap**



II. Executive summary

“The pace of change has never been this fast — yet it will never be this slow again.” This statement by Canadian prime minister Justin Trudeau in 2018 describes the pace at which megatrends disrupt the world we live in, implying high levels of change and uncertainty for both individuals and organisations.

Four megatrends are particularly relevant given their global economic relevance and their impact on human lives:

- **Climate change**, which impacts lives and livelihoods around the globe. The World Economic Forum estimates it will create costs equivalent to between 4% and 18% of global GDP by 2050 if no adequate preventive actions are taken.
- **Technological acceleration** and the use of data, which has increased exponentially over recent years, with the amount of data stored globally expected to reach an unprecedented 180 zettabytes² by 2025.
- Changing **demographics** leading to ageing populations (in the USA, for example, 21% of the population is expected to be above 65 by 2030, up from 17% in 2020). At the same time, GDP productivity will shift towards emerging countries, which will account for 35% of global GDP in 2040, up from 25% in 2020.
- Disruptive developments in **macroeconomics and politics**, which will increase the level of uncertainty and volatility across the globe as supply-chain disruptions, inflation and other developments hit economies worldwide (eg, inflation in Europe was at almost 10% in July 2022 compared to 2.5% in the previous year).

These megatrends also change today’s risk landscape by reinforcing existing risks and creating new ones, increasing the vulnerability of both individuals and organisations. Among the newly emerging risk areas are cyber risk, supply-chain disruptions and environmental liabilities.

The risk landscape impacts:

- individuals (such as pensions, health, mobility and homes, as well as disability, morbidity and death);
- businesses (such as business continuity); or,
- both individuals and businesses (namely personal and business liability, property, financial markets, natural catastrophes (natcat) and war and terrorism).

The risks vary in terms of economic relevance, speed of growth, direct impact on human lives (whether they cause major hardship or death) and insurability (whether private insurers or public systems can at least partially cover them).

Of these risks, **pensions, cyber, health** and **natcat** stand out due to their growing economic importance, impact on human lives and insurability. Exploring the current protection landscape and analysing the protection gaps related to these risks is particularly relevant due to their substantial economic and human impact.

While the insurance industry can contribute to reducing these protection gaps when the underlying risks are insurable, a single stakeholder group alone cannot narrow the gaps. Close collaboration between private and public stakeholders is necessary, as governments and other public entities can help build the appropriate regulatory environment, create fiscal incentives or conduct public awareness and prevention campaigns, among other actions.

Below we describe these four protection gaps in more detail and summarise the possible levers that private and public stakeholders can use to reduce them. We end this Executive summary with GFIA’s own recommendations to policymakers for reducing the protection gaps in cyber, pensions and natcat.

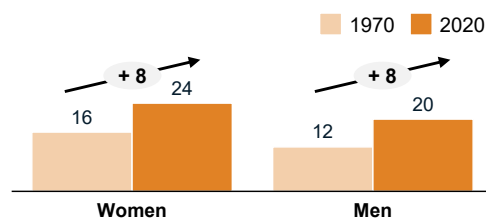
² 10²¹ bytes or a trillion gigabytes

Four major protection gaps

Accelerated by current trends

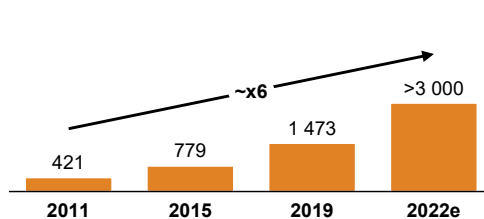
Pension

Expected life years after labour market exit (OECD countries)



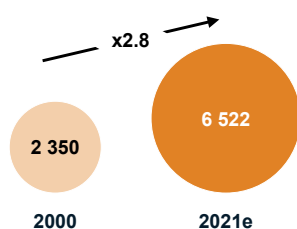
Cyber

Number of breaches with >50 000 files lost



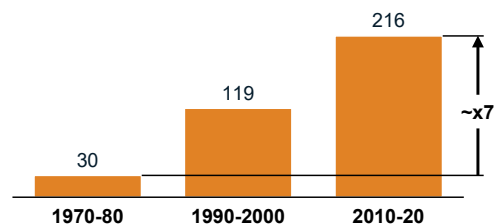
Health

Health spending¹ in OECD countries (US\$ per capita)

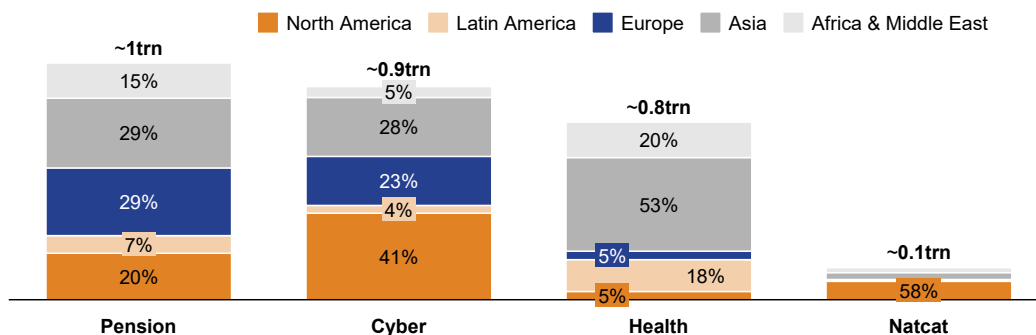


Natcat

Average annual natcat losses per decade² (US\$bn)



Annual protection gaps (US\$trn) and geographic split



<p>Cumulative gap of US\$51trn after deducting pay-as-you-go, converted into an annuity of US\$1trn p.a. with a 1% interest rate over 40 years</p>	<p>First-order cyber losses (US\$0.95trn) minus paid cyber claims (US\$0.06trn)</p>	<p>Stressful out-of-pocket spending³ only. Gap could reach up to US\$4.0trn if spending avoided due to financial constraints is included</p>	<p>~60% of natcat losses not insured between 2011 and 2020</p>
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e = estimate

- Including personal healthcare (curative care, rehabilitative care, long-term care, ancillary services and medical goods) and collective services (prevention and public health services and health administration), excluding investments
- Events caused by natural forces triggering insurance policies, eg, floods, storms, earthquakes, droughts, forest fires, frost, hail and tsunamis
- Spending by individuals that puts pressure on their finances

Natcat protection gap — accelerated by climate change

The last decade of natcat events has been the costliest in recorded history, with substantial losses that inhibit economic growth and severely impact individuals' well-being.

Natcat events are catastrophes caused by natural phenomena (eg, floods, earthquakes, tsunamis). Accelerated by climate change and global development patterns (people living in high-risk areas), natcat events and related losses are expected to increase, thereby creating significant risks to the health and financial viability of individuals and organisations. Against this background, insurers are likely to play an increasing role in natcat protection in the coming years. However, individuals and organisations often struggle to access adequate natcat protection (eg, insurance coverage), primarily due to challenges related to affordability, availability or the ability to appreciate the risk. Levels of awareness and engagement in prevention also remain insufficient, thus causing the protection gap to increase.

The current natcat protection gap is estimated based on the economic losses from natcats currently not covered by insurance. The number of natcat losses has increased by an average of 5% a year over the last 50 years and is a focus for governments and the private sector, especially due to the link to climate change as well as to limited adaptation and mitigation. In absolute numbers, average annual natcat losses increased from US\$126bn between 1990 and 1999 to US\$219bn between 2010 and 2020.

Natcat losses have remained stable as a share of inflation-adjusted GDP over recent decades, despite an increase in the frequency and severity of events and the higher economic value of assets in high-risk areas. Among other reasons, this relatively stable share is caused by the increasing GDP of intangibles (eg, data-driven business models), which are less affected by natcat events.

While the average share of insured losses has increased (between 1990 and 2000, the average share of insured losses was approximately 22%, compared with 33% between 2010 and 2020), this has not been sufficient to decrease the natcat protection gap in absolute numbers. The current natcat protection gap stands at roughly US\$139bn per annum.

A driver contributing to the acceleration of the protection gap is the movement of populations and their valuable assets to high-risk areas. The share of insured losses (and therefore the natcat protection gap) differs significantly by region, which can be partly explained by each region's risk situation and economic exposure. While the gap stands at 30-40% of losses in some regions and countries (Europe and North America), it has been consistently large — indeed close to 100% — in some low- and middle-income markets, making them particularly vulnerable to long-term economic hardship and reliant on international aid in the case of major natcat events.

Although a joint effort by private and public stakeholders is needed to address the natcat protection gap, insurers can play a crucial role in addressing it due to their specialist capabilities (eg, dedicated natcat risk modelling).

There are various potential levers for private and public stakeholders to use to address the protection gap. These include: setting up parametric insurances or other innovative forms of risk transfer; revisiting distribution models; prevention and adaptation; government-backed programmes; and facilitated access to global reinsurance.

- As a first lever for reducing the protection gap, new distribution models for natcat insurance coverage are evolving. Technology is key to creating new distribution methods, such as embedded insurance products. These distribution methods may allow private insurers to increase the accessibility of coverage, increasing the share of insured losses in the case of a natcat event.
- Another important lever to use to address the gap is to decrease the losses (both insured and uninsured) by implementing prevention and adaptation measures in various contexts, such as land-use or building codes and not incentivising rebuilding in high-risk areas.

- Further levers, depending on the jurisdiction and local insurance industry framework, could include government-backed programmes, public-private partnerships, mandatory contributions to natcat funds or pooling solutions to alleviate the financial burden on governments and speed up economic recovery from natcat events by, for instance, increasing insurance market penetration.
- Access to global reinsurance markets to reduce the geographic concentration of natcat risks can also be facilitated. International risk diversification may help build (re)insurance risk portfolios that are more resilient and less affected by losses in single countries or regions.

The suitability of these levers needs to be assessed individually for each country, as countries have exposures to different geographical risks.

GFIA recommendations for policymakers


Introduction


This report has been produced by GFIA to promote greater understanding of the largest protection gaps faced by individuals, businesses and societies globally. Later chapters look into these gaps in more detail, examine the drivers and provide an overview of the wide range of potential levers that could be considered as ways to help reduce each of the gaps. The range of potential levers covered in later chapters include both actions that insurers can take and actions the public sector can take. The potential levers identified for policymakers have pros and cons — some can have unintended consequences and others may work in some jurisdictions but not in others. Nevertheless, all the levers have been included in the report to give as complete an overview as possible.


In this section of the report, GFIA focuses on its own recommendations for policymakers because insurers' ability to help reduce protection gaps is dependent on appropriate actions being taken by regional, national and supranational policymakers. It is they who can design and create the environments in which risks can be best managed and mitigated and so allow insurers to play their key role.

The following sets of recommendations represent “dos” and “don'ts” with which the global insurance industry considers policymakers can have the largest potential impact across the world in helping to address protection gaps.


Recommendations to policymakers for narrowing the natcat protection gap

-  **Support and make efforts to educate and inform the general public, businesses, communities and policyholders about the benefits of insurance.**
 - Protection gaps can arise because people and businesses do not understand the level or potential impact of the natural hazards to which they are exposed.
 - Education and information campaigns and programmes can help ensure that there is a better understanding of the risks faced and the importance of having financial protection. For example, improving the information available about the natcat risks linked to a property would help informed decision-making.


-  **Ensure that strong and enforced land-use controls and building codes are in place to promote the resilient construction of buildings and infrastructure and, where appropriate, the use of green or reconditioned materials.**
 - Restricting construction in high-risk areas (eg, those exposed to major floods), enforcing appropriate building codes and implementing “build back better” programmes will limit and reduce exposure to extreme natcat events. This will reduce the damage and costs of recovery and thus keep more risks insurable, limit the need to increase premiums and help keep insurance affordable.
 - Encourage the use of green or reconditioned materials, as well as building levees and natural infrastructure, etc., which — in appropriate circumstances — will help limit the impact of new building and repairs on the climate and environment.
 - Involve the local insurance industry, which is already using its expertise to help jurisdictions around the world to develop effective land-use planning, flood-control planning and building codes.

-  **Promote close cooperation between public and private sectors to close the protection gap.**
 - Work together with the private sector to take many measures to address the protection gap, including reducing risk and improving resilience.
 - In addition to those efforts, in certain jurisdictions the implementation of insurers' measures to close natcat protection gaps may require combined risk-sharing efforts with governments and society, and it should be with due regard to the underwriting capacities of insurers.


- Where steps are taken to address affordability, allow private insurers to price policies on a sustainable basis and accompany them with measures to reduce risk and avoid moral hazard.

 **Promote insurance products tailored to local needs, in particular by fostering microinsurance when appropriate.**


- The heterogeneity of markets requires solutions adapted to each territory. Consider and promote solutions such as parametric insurance or cat bonds where appropriate.
- Microinsurance can be an effective mechanism for expanding protection to a large target population, especially in emerging economies.

 **Support open markets for (re)insurance. This will ensure the maximum amount of capital is available to close natcat protection gaps and support competitiveness and innovation.**

- Open markets allow (re)insurers to diversify risks globally, leading to lower costs and more capacity in the long term, which is needed to close the protection gap.
- Global diversification allows (re)insurers to provide more substantial and affordable coverage, particularly as it increases the capital support available to both cedants and reinsurers to provide natcat cover.
- Restricting market access not only makes (re)insurance more expensive but also makes it less secure because there may not be enough capacity to cope with major disasters.

 **Do not create a regulatory environment that erects barriers to (re)insurers' ability to provide natcat coverage and to innovate.**

- Support competition and innovation and avoid excessive costs and solvency capital to allow (re)insurers to better provide affordable cover for the widest range of risks.
- Permit risk-based pricing and underwriting where possible.
- Take care to ensure that regulation does not create unnecessary barriers or costs for innovations such as parametric insurance, microinsurance and digitalisation.
- Do not create moral hazard through post-disaster financial assistance that deters people from insuring their properties. Make people and businesses aware of the specific and limited post-disaster financial assistance that would be made available to them and do not go above what is foreseen in terms of the intervention of public authorities after an event.

 **Do not apply excessive taxes and levies to insurance premiums that affect the affordability of cover.**

- Taxes and levies on insurance products and services add to the cost of buying insurance. These can make insurance less affordable and can therefore contribute to widening the protection gap.
- This can especially impact those on low incomes living in higher risk areas, where insurance premiums are already signalling the elevated risk and need for adaptation measures.
- Helping individuals to afford insurance cover can have a positive impact on public finances.

VI. Natcat protection gap

Accelerated by climate change

For a summary of this chapter, see the Executive Summary, “Natcat protection gap”, p12. And for GFIA’s recommendations for closing the natcat protection gap, see the Executive Summary, “GFIA recommendations”, p18.

Swiss Re defines natural catastrophes as events caused by natural forces, generally resulting in a large number of individual losses involving many insurance policies. The extent of losses depends on the severity of the event, but also on human factors, such as building design²⁵³. Natcats include floods, storms, earthquakes, tsunamis, droughts/forest fires/heatwaves and cold waves/frost/hail.

**Last decade’s
natcats were
most costly in
modern history**

Over the last three decades, 2010 was the year in which natural catastrophes caused the most deaths: nearly 300 000 people died, mostly as a result of the earthquake that struck Haiti²⁵⁴. In terms of financial losses, the last decade was the costliest in modern history for global natural catastrophes on a nominal and inflation-adjusted basis²⁵⁵, as climate change continues to raise the threats from natcat events²⁵⁶. In addition, exposure is increasing in certain high-risk areas due to economic development and population growth (eg, as a result of migration towards coastal Florida in the USA)²⁵⁷. Despite significant progress being made around the world in terms of covering losses (including in emerging markets), over 60% of today’s global losses remain uninsured.

We define the natcat gap as the difference between total economic losses from natcats and the insured part of these losses (not including government relief efforts). According to Swiss Re, “economic losses are all the financial losses directly attributable to a major event, ie, damage to buildings, infrastructure, vehicles, etc. The term also includes losses due to business interruption as a direct consequence of the property damage. Total loss figures do not include indirect financial losses, ie, loss of earnings by suppliers due to disabled businesses, estimated shortfalls in GDP and non-economic losses, such as loss of reputation or impaired quality of life”²⁵⁸. Insured losses are gross of any reinsurance, be it provided by commercial or government schemes. Life insurance losses are not included. The gap also does not reflect the (often severe) human suffering, which cannot be measured in financial terms.

Total natcat losses averaged US\$210bn/year in last decade

Natcat losses increased at 5% per annum from 1970 to 2021. The last decade (2011 to 2020) was the costliest, also on an inflation-adjusted basis, with approximately US\$210bn in losses per year on average (Figure 17)²⁵⁹.

253 In this report, “natural catastrophe” or “natcat” are used to describe events in which natural hazards cause both human and financial losses. Human actions (eg, settlement in earthquake-prone areas), rather than the natural hazard itself, result in disasters and therefore the terms “natural catastrophe” or “natural disaster” do not accurately describe the event. However, we have chosen to use “natural catastrophe” or “natcat”, as they are established terms in the industry.

254 sigma explorer, Swiss Re Institute, 2022

255 Ibid

256 Lucia Bevere and Michael Gloor, “Natural catastrophes in times of economic accumulation and climate change”, sigma 2/2020, Swiss Re Institute, 8 April 2020

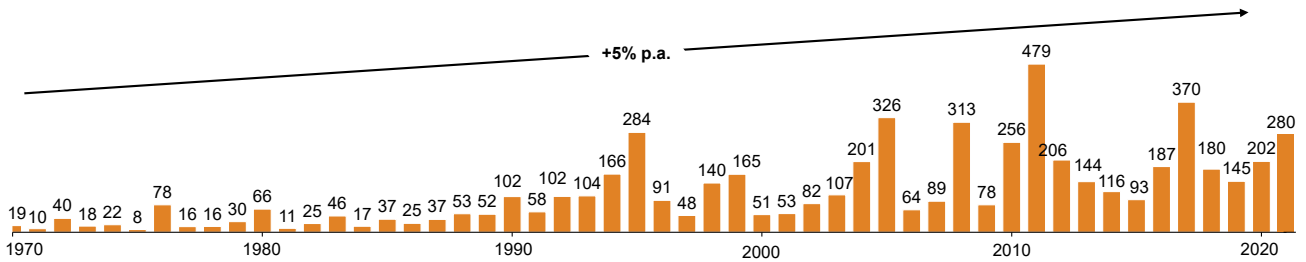
257 Florida Population 2022, World Population Review

258 Lucia Bevere and Andreas Weigel, “Natural catastrophes in 2020: secondary perils in the spotlight, but don’t forget about primary peril risks”, sigma 1/2021, Swiss Re Institute, 30 March 2021

259 sigma explorer, Swiss Re Institute, 2022

Figure 17: Total natcat losses increased ~5% annually from 1970 to 2021

Global natcat losses — 1970–2021 (\$bn)



Source: Swiss Re

Economic losses from natcats have not developed in the same way across all regions (Figure 18). While global growth amounts to approximately 75% between 1991 and 2020, the USA, for example, has experienced an even stronger expansion of its losses (+90%), while Europe’s losses have decreased (-38%)²⁶⁰.

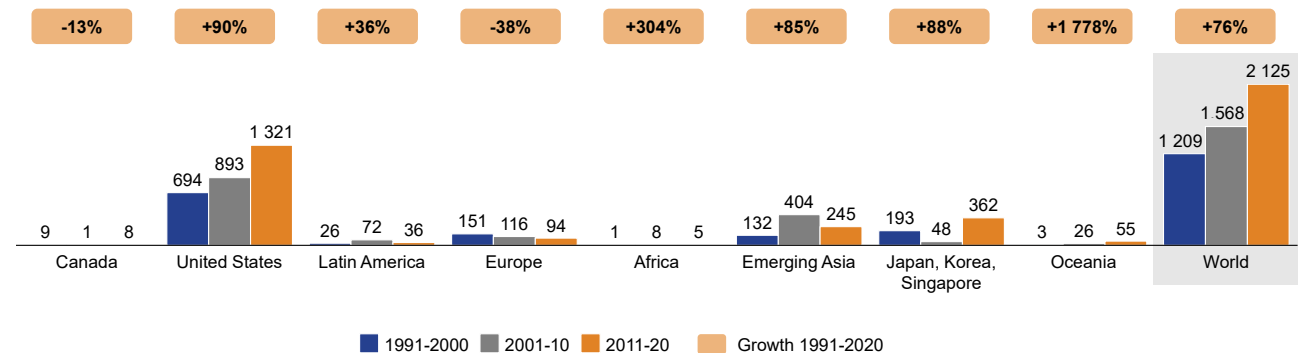
Natcat losses are determined by the frequency and severity of natcat events for various hazards, the vulnerability and exposure of the region, and the value of assets in that region. Whereas climate change may increase both the frequency and severity of events, the vulnerability and exposure of regions is driven by socioeconomic factors, such as increasingly valuable assets, population growth and urbanisation (including decisions to build in particular areas). As these factors might gain importance over the next few decades, losses as a result of natcat events can be expected to continue to increase²⁶¹.

Socioeconomic factors increase vulnerability and exposure

The frequency of natcat events has been increasing by about 3% per annum over the last five decades (Figure 19), from an average of 48 events in the decade from 1971 to 1980 to more than 180 in the decade from 2011 to 2020²⁶².

Figure 18: Natcat losses vary significantly by region

Losses by region — 1991–2020 (sum per decade, \$bn)



Source: Swiss Re

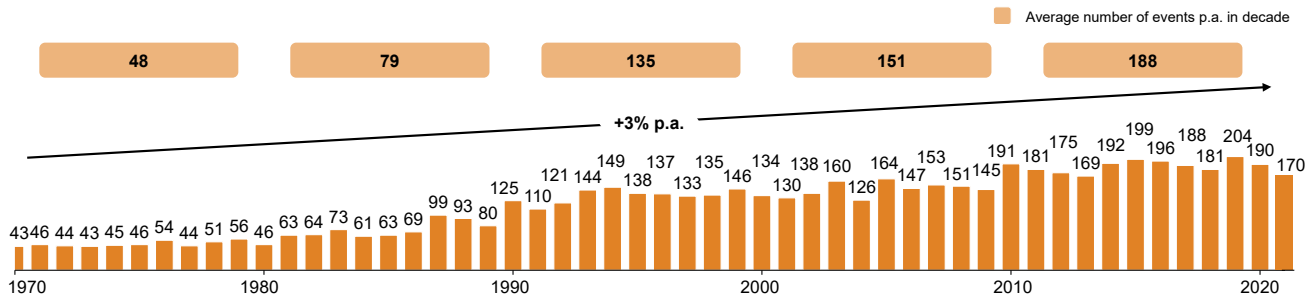
260 sigma explorer, 2022

261 “Natural catastrophes in times of economic accumulation and climate change”, sigma 2/2020, Swiss Re Institute, 8 April 2020

262 sigma explorer, 2022

Figure 19: Average natcat events per year increased from 48 to 188 over five decades

Global number of natcat events — 1970–2021



Source: Swiss Re

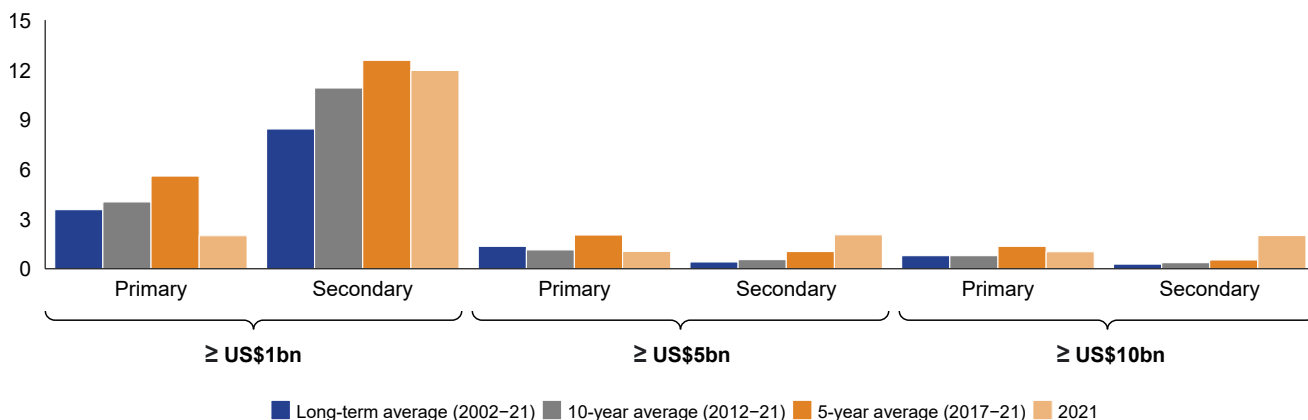
Natcat events result from both primary and secondary perils. Primary perils (eg, tropical cyclones, earthquakes and winter storms in Europe) are typically less frequent events associated with high losses. Secondary perils are more frequent, largely weather-related events (eg, convective storms, tornadoes and floods) with typically small or medium losses per event²⁶³. Due to climate change and the corresponding rising temperature levels, secondary perils have been increasing in frequency and severity²⁶⁴, as demonstrated by the rising prominence of secondary perils in the natcat event mix (Figure 20).

Regional focus makes clear causal link between climate change and natcats

While the impact of climate change on disaster losses can be identified by considering a specific region or peril, it is more complicated on a global scale, as opposing influences partially cancel each other out. Focusing on specific regions or events, the causal link between natcat and climate change is clearer to follow²⁶⁵. For example, rising temperatures have led to an increase in losses from severe thunderstorms with gusts or tornadoes in North America and an increase in the number of severe thunderstorms with hail in Europe²⁶⁶.

Figure 20: Growing prominence of secondary perils

Average number of natcat events with losses exceeding US\$1bn



Source: Swiss Re

²⁶³ “Natural catastrophes in 2020”, sigma 1/2021, Swiss Re Institute, 30 March 2021

²⁶⁴ “Enhancing financial protection against catastrophe risks: The role of catastrophe risk insurance programs”, OECD, 2021

²⁶⁵ Ibid

²⁶⁶ “Natural catastrophes in 2020”, sigma 1/2021, Swiss Re Institute, 30 March 2021

Canada, adjacent regions of the USA and many parts of the Mediterranean experienced record temperatures in 2021, including a new all-time Canadian temperature record of nearly 50°C in a village in British Columbia. The extreme heat was often accompanied by devastating wildfires²⁶⁷. Scientists assessing to what extent each event can be attributed to climate change (as part of a new field of research called attribution science) state that extreme heat in north-west America in recent years would not have happened without the effects of human-generated climate change²⁶⁸.

All-time temperature record of 50°C in Canada

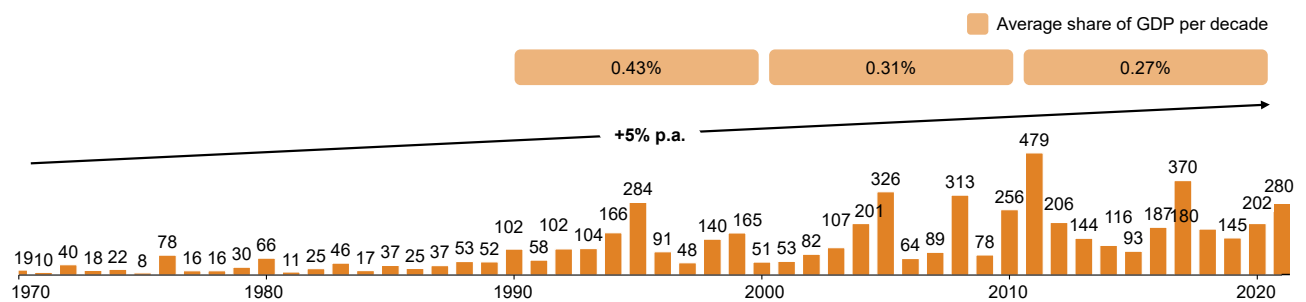
According to Swiss Re estimates, rising losses are also driven by socioeconomic factors. Economic development and urbanisation (population density) have generated higher losses for hazards of the same size and scale²⁶⁹. Asset values have also increased; for example, private property prices tripled between 2000 and 2020, based on a 10-country sample²⁷⁰. The global population grew from approximately 4 billion to 7.8 billion with a CAGR of 1.43% from 1975 to 2020, and population density increased from 32 to 60 people per square kilometre over the last five decades. Therefore, a hazard of the same size, scale and geography occurring in 2020 would generate higher economic losses than in the 1970s, in absolute terms.

Despite this, as a share of inflation-adjusted GDP, the share of losses has stayed relatively stable over the last two decades (Figure 21) despite an increase in the frequency and severity of events. This is partially due to the rising share of intangibles in GDP (eg, intellectual property and computerised information) that is not as strongly affected by natcat events as tangible goods. The share of investments in intangible assets in overall investments increased by about 30% in both the USA and a sample of European countries over the last 25 years. During the pandemic, when social distancing necessitated a shift to remote working and large-scale, rapid digitalisation, investment in intangible assets accelerated even further²⁷¹.

Nevertheless, in addition to the reported direct losses, significant indirect losses and immeasurable human suffering results from natcat events.

Figure 21: Natcat losses increasing in absolute terms, but flat as share of GDP

Natcat losses — 1970–2021 (US\$bn)



Source: Swiss Re

267 “June ends with exceptional heat”, World Meteorological Organisation, 30 June 2021

268 “Western North American extreme heat virtually impossible without human-caused climate change”, World Weather Attribution, 7 July 2021

269 “Natural catastrophes in times of economic accumulation and climate change”, sigma 2/2020, Swiss Re Institute, 8 April 2020

270 Australia, Canada, China, France, Germany, Mexico, Japan, Sweden, UK and USA

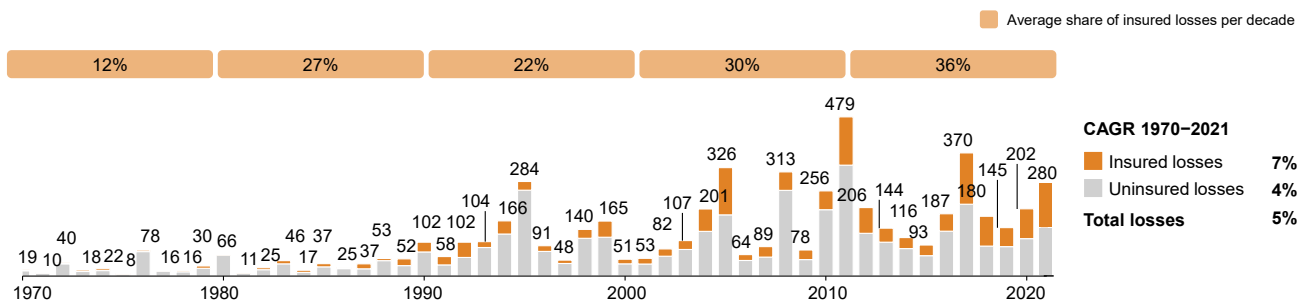
271 “Getting tangible about intangibles: The future of growth and productivity?”, McKinsey Global Institute, 16 June 2021

Protection gap is US\$139bn/year, with significant variation between regions

In 2021, the global natcat protection gap was US\$159bn, with a 10-year average of US\$139bn from 2011 to 2021²⁷². The share of insured losses globally has increased from 22% in the decade 1991-2000 to about 36% in the decade 2011-2020, or a protection gap of 64% of total losses (Figure 22). The gap would be significantly larger if indirect losses were also included.

Figure 22: Insured natcat losses have increased as share of total losses, but gap remains ~64%

Global natcat losses — 1970–2021 (US\$bn)



Source: Swiss Re

Insurers in North America cover 40% of natcat losses, in China just 10%

The protection gap and its development over time differ greatly between regions (Figure 23), as the share of insured losses depends on the level of insurance penetration (and therefore the country income group) and the types of events occurring in the region. For example, while in North America insurers cover approximately 40% of natcat losses, in China this figure is only 10%, although this has increased rapidly over the last 10 years²⁷³. Overall, the share of insured losses has increased in the last few decades, largely driven by increases in the USA, Latin America and emerging Asian economies.

There are several reasons for the low level of natcat insurance. These include:

- Limited public awareness of coverage
- Gap between the perception of potential losses and actual economic losses
- Expected post-disaster aid from governments
- Differences in the way natcat insurance products are offered to homeowners and businesses
- Lower probability of tail-risk events
- Lack of education about risks and likelihood of occurrence

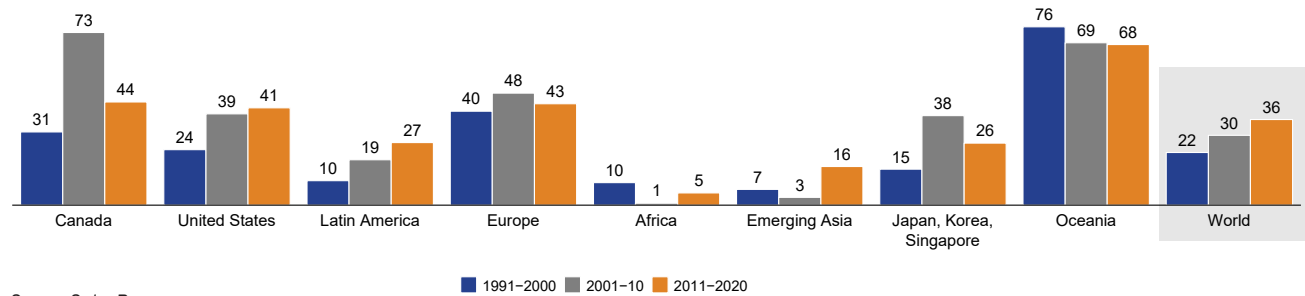
In some countries and regions, insurability challenges are emerging for some perils, as insurers may increase prices or withdraw coverage for high-risk policyholders. In emerging markets, another factor that could influence the level of natcat insurance coverage is the amount of uncertainty in estimating losses. The low frequency of natcat events limits the availability of data on historical experience and therefore results in higher levels of uncertainty in estimates of expected losses and, usually, higher premiums, as insurers are likely to address uncertainty by charging higher prices for coverage.

²⁷² www.swissre.com/risk-knowledge/mitigating-climate-risk/natcat-country-profiles-infographic.html#/

²⁷³ "Natural catastrophes in 2020", sigma 1/2021, Swiss Re Institute, 30 March 2021

Figure 23: Insured share of natcat losses varied significantly by region

Insured share of natcat losses by region — 1991–2020 (% per decade)



Source: Swiss Re

From a demand perspective, this implies that insurance may not be affordable for low-income households and vulnerable groups. Other demand factors that may provide an explanation for a lower insurance penetration in emerging markets include limited financial literacy and trust in the products and reliance on alternative compensation (eg, government aid or help from family structures and local communities). The chances of being insured increase for people with a higher income and formal employment²⁷⁴. Hence, those who are often already disadvantaged within a society (eg, due to poverty) may also be the ones who are the least protected from natural hazards. In low-income countries, the protection gap is close to 100% of losses and has not improved in the last three decades²⁷⁵, which is alarming, given that the effects of climate change will often be felt acutely in those countries.

Natcat losses expected to grow but share of uninsured losses to decrease in next decade

The absolute increase in losses is believed to be on a 5% growth trajectory²⁷⁶. The uninsured gap has been growing at 4%, ie, slower than the total losses. In the future, the relative increases will be driven by multidirectional forces. On the one hand, there is the expected increased frequency and severity of both primary and secondary perils, driven by climate change. In addition, increasing asset values and urbanisation could accelerate the growth of uninsured losses beyond the last decade's growth²⁷⁷. On the other hand, an increasing proportion of incurred losses are covered due to developments in the USA and significant advances in Latin America and emerging Asian markets²⁷⁸. Overall, it is likely that the trend of increasing absolute losses will persist, while the uninsured gap within total losses might continue to decrease, assuming continuing efforts by public authorities and the insurance industry, as well as by households and companies.

Absolute losses forecast to grow 5% p.a.

Levers for public and private stakeholders

To address the natcat protection gap, we have identified a toolbox of potential levers (Figure 24) for private and public stakeholders. It is worth noting that the portfolio of levers chosen by each country is likely to be different, depending on its specific exposures, the position of the insurance

²⁷⁴ "Insuring Sustainable Development: What drives uptake of insurance in developing countries?", UN Capital Development Fund, 2020

²⁷⁵ "Understanding and Addressing Global Insurance Protection Gaps", The Geneva Association, 2018

²⁷⁶ "Natural catastrophes in 2020", sigma 1/2021, Swiss Re Institute, 30 March 2021

²⁷⁷ "Natural catastrophes in times of economic accumulation and climate change", sigma 2/2020, Swiss Re Institute, 8 April 2020

²⁷⁸ sigma explorer, Swiss Re Institute, 2022

industry, past initiatives and policy choices. This toolbox of potential levers should not be thought of as a list of recommendations but as a “menu” of possible actions.








Figure 24: Natcat protection gap — toolbox of potential levers



(For GFIA's natcat protection gap reduction recommendations, see the Executive Summary, p18.)

We have looked at several case studies (Figure 25) that illustrate how some of these levers have been put into practice in some parts of the world by private or public stakeholders gap.

Figure 25: Overview of case studies

	Levers	Case studies	Outcomes
Private	Make coverage more accessible through revisited distribution	 Access to crop insurance for Indian farmers via a central crop insurance portal	20m newly insured farmers
	Strengthen prevention & adaptation measures	 "Build Back Better" scheme in New Orleans after Hurricane Katrina	>50% of policies with rate reduction
		 Building codes to limit loss of life & damage from earthquakes	92% of compliant buildings withstood strong earthquakes
Public	Introduce government-backed programmes, PPPs, mandatory contributions to natcat funds or pooling solutions	 Mandatory P&C premium add-on for natcat leading to high coverage	>95% natcat insurance penetration
		 Multi-country parametric insurance scheme to build resilience by pooling risk	3.5m affected people benefited
Public	Build a regulatory environment that fosters access to global reinsurance markets & the participation of foreign players	 Earthquake Commission's reinsurance programme	US\$4.5bn reinsured on international markets
		 Reinsurance incentivised via the Solvency II regulation	Lowered capital requirements

Case studies

Make coverage more accessible through revisited distribution

One potential lever for private insurance companies to use to increase the share of insured losses in the case of a natcat event is to increase the accessibility of insurance schemes by revisiting distribution. New distribution concepts and partnerships might represent a measure for widening reach, particularly in areas with low insurance penetration rates such as emerging markets. Revisiting distribution through, for example, partnerships (including partnerships between established insurers and insurtechs) and embedded insurance could complement today's agent- and broker-dominated distribution channels in both developed and emerging markets to increase the cost effectiveness of distribution and enhance access to insurance coverage in general. In addition, the increasing use of smartphones across the world may facilitate access to population groups in more remote regions.

New distribution methods can widen insurance reach in emerging markets

- An example of the revisited distribution of natcat insurance is the Pradhan Mantri Fasal Bima Yojana (PMFBY) crop insurance scheme, which was introduced in India in 2016 and rolled out in combination with other measures, such as mandatory insurance for seasonal crop loans. In India, which has a significant agricultural sector that contributes 16% of GDP and employs 49% of the labour force, both the government and the private insurance sector have an interest in increasing crop insurance coverage for natcat events²⁷⁹. It usually covers events such as droughts, cyclones, storms, unseasonal rains, flooding, landslide and fire caused by lightning²⁸⁰. Having such cover increases the chances and speed of economic recovery for India's farmers and increases the overall resilience of its economy.

²⁷⁹ "Climate change is a growing concern for insurers of agriculture and property in India", Munich Re, 26 February 2021

²⁸⁰ "Pradhan Mantri Fasal Bima Yojana (PMFBY)", National Insurance Company, India

Voluntary participation in India's crop insurance scheme rose from 5% to 42%

In collaboration with 18 mostly private insurance companies and the Ministry of Agriculture & Farmers Welfare, the PMFBY crop insurance scheme is the most prominent example in India of how insurance coverage can be fostered via innovative, digital distribution. The Agriculture Insurance Company of India and the General Insurance Corporation of India set up the initial infrastructure for a centralised portal, including a corresponding app, which PMFBY uses to provide crop insurance to farmers across the country²⁸¹. Through the portal, farmers can check their coverage options and calculate their premiums with the connected insurers. It also allows them to file claims, manage contracts and contact insurers.

The goal of the portal is to increase the effectiveness and accessibility of insurance, particularly for farmers from remote regions and economically weaker backgrounds²⁸². The insurance premiums are subsidised through state and federal funds to keep them low and, before 2020, participation was further accelerated by making insurance mandatory for seasonal crop loans. Within its first year, coverage reached approximately 22% of Indian farmers and 30% of gross cropped area (GCA) — the highest coverage in the history of Indian crop insurance. In absolute numbers, insurance coverage rose from under 40 million insured farmers in 2014-2015 to nearly 60 million in 2016-2017²⁸³. Even without considering the mandatory requirement for loan-receiving farmers before the 2020 policy change, voluntary participation increased from 5% before 2015 to 42% in 2020²⁸⁴. In 2019-2020, 22.3 million farmers benefitted from insurance claims, resulting in a total of over US\$3.2bn in paid claims²⁸⁵.

Despite these initial successes, the scheme has faced some criticism, mostly due to delays in state governments paying their share of the premium subsidy²⁸⁶. Furthermore, farmers may lose trust in the scheme and view it as a programme that benefits insurers rather than farmers, potentially resulting in lower voluntary participation, which could prevent the government from reaching its goal of 50% GCA insured²⁸⁷.

The Indian PMFBY case demonstrates that revisited distribution methods can play a role in increasing the percentage of insured losses in the case of a natcat event. Despite criticism of the delays in rollout and claims payments, it provides an interesting case study for increased natcat resilience in the agricultural sector. It remains to be seen if similar models of distribution could be successful in other sectors that may benefit from increased insurance coverage for natcat events, such as home and commercial insurance.

Strengthen prevention and adaptation measures

In terms of loss prevention and risk adaptation measures, there are numerous examples from developed, emerging and developing markets that show how public stakeholders are trying to reduce exposure to areas of high natcat risk. For example, some public authorities ensure that future construction and urban expansion take place on safer sites and that highly exposed

281 "Implementation of PMFBY", Press Information Bureau, Government of India, Ministry of Agriculture & Farmers Welfare, 3 August 2018

282 "Pradhan Mantri Fasal Bima Yojana. An Evaluation — 29th Report", Government of India, Ministry of Agriculture & Farmers Welfare, 2021

283 "Crop insurance: Improving business value using technology interventions", Tata Consultancy Services, 2021

284 Harikishan Sharma, "Govt makes crop insurance schemes voluntary", The Indian Express, 20 February 2020

285 State Wise Business Statistics 2019-2020, Government of India, Ministry of Agriculture & Farmers Welfare, PMFBY

286 Vidya Mahambare and Sowmya Dhanaraj, "Has crop insurance helped Indian farmers? Many don't get payments on time", The Print, 28 October 2021

287 Ashwini Kulkarni, "Crop insurance scheme 2.0: Implementation issues and weaknesses," Ideas For India, 26 November 2020

areas remain free of construction. Since prevention and adaptation are approached differently by public authorities, we detail below three case studies illustrating regional initiatives aiming to prevent (or reduce) losses from natcat events.

- One example of how prevention and adaptation measures are adopted *ex-post* in response to severe individual disasters in specific areas is that of the New Orleans region of the USA in the aftermath of Hurricane Katrina. “Building Back Better” establishes a flood-risk management system to adapt to the risk of heavy rainfall and cyclones.

The lives of more than 1 000 people were lost and record damages of more than US\$160bn were caused by Hurricane Katrina in 2005²⁸⁸. The area of New Orleans was affected especially strongly, as the levee and floodwall system failed. Modelling by the US Army Corps of Engineers suggests that approximately 50% of the direct damage in the area and two-thirds of all deaths could have been prevented if the system had been reinforced in time²⁸⁹.

Hurricane Katrina killed 1 000 and caused US\$160bn of damage ...

To ensure that the city will be protected from a one-in-100-year storm in the future, the government commissioned a project to establish a flood-risk management system for the city. The newly built Hurricane & Storm Damage Risk Reduction System (HSDRRS) protects the Greater New Orleans area from flooding and includes, among other infrastructure components, permanent canal closures and pumps, floodwalls and floodgates. The total construction cost amounted to US\$14.5bn²⁹⁰. This led the Federal Emergency Management Agency (FEMA) to adjust its Flood Insurance Rate Maps (FIRMs) for the region in 2016, reclassifying more than half of all properties in New Orleans from Special Flood Hazard Areas (A Zones) to more moderate zones. Owners of approximately 85 000 policies now benefit from lower rates under the National Flood Insurance Program²⁹¹.

A first indication of the effectiveness of the flood-risk management system was provided during Hurricane Ida in 2021, which caused damages totalling US\$65bn. A report by Munich Re found that these losses would have been much higher without the protective system²⁹². And while Hurricane Katrina was responsible for the loss of close to 1 000 lives in Louisiana alone²⁹³, 26 people fell victim to Hurricane Ida in the state²⁹⁴. Nevertheless, the storms are not fully comparable, as Ida differed from Katrina in its path, strength and speed, and may not have hit New Orleans in the worst possible way. Therefore, it is difficult to predict whether the system will withstand a stronger cyclone²⁹⁵, particularly as climate change will intensify hurricanes, resulting in heavier rains and an even greater risk of flooding²⁹⁶. As a result, experts question whether the HSDRRS will be able to protect the area from the next storm, as only legacy data on storms was used to model the protective strength. To address this, additional funding has been raised to improve the system²⁹⁷.

... following action, Hurricane Ida killed 26 and caused US\$65bn of damage

288 “Costliest US tropical cyclones tables updated”, US National Hurricane Center, 2018

289 “Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System — Final Report of the Interagency Performance Evaluation Task Force”, US Army Corps of Engineers, 2009

290 “The System”, Flood Protection Authority East, State of Louisiana, 2022

291 “FEMA To Hold Flood Insurance Workshop At New Orleans City Hall Friday”, Biz New Orleans, 22 August 2016

292 “Hurricanes, cold waves, tornadoes: Weather disasters in USA dominate natural disaster losses in 2021”, Munich Re, 2022

293 Joan Brunkard, Gonza Namulanda and Raoult Ratard, “Hurricane Katrina Deaths, Louisiana, 2005”, Disaster Medicine and Public Health Preparedness, 8 April 2008, volume 2, number 4

294 “Hurricane Ida storm-related death toll rises to 26”, Louisiana Department of Health, USA, 8 September 2021

295 Marlene Lenthang, “How New Orleans handled Hurricane Ida after post-Katrina changes”, ABC News, 2 September 2021

296 Angela Colbert, “A Force of Nature: Hurricanes in a Changing Climate”, NASA, 2022

297 Jake Bittle, “The levees worked in New Orleans — this time”, Curbed Magazine, 2 September 2021

Japan has long had earthquake-resistant building regulations

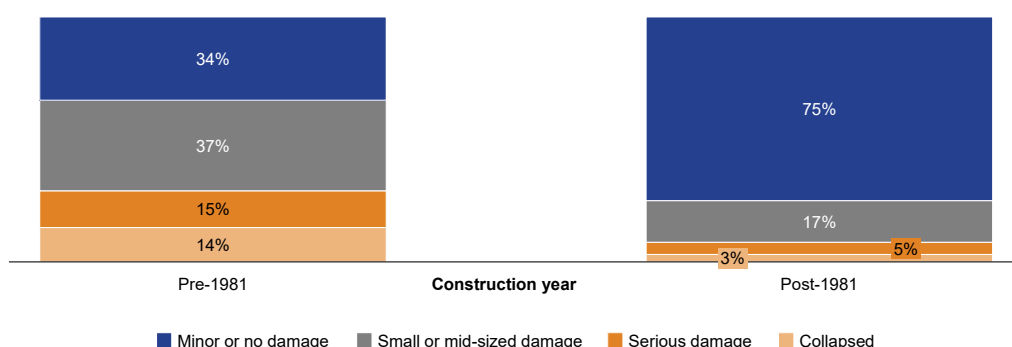
- Whereas the "Building Back Better" programme in New Orleans is an example of a city reacting to a past event by introducing a regional adaptation measure, the following Japanese example shows how the government structurally defined building codes to save lives and reduce the losses from earthquakes.

Japan is a country with a high risk of severe earthquakes²⁹⁸. After the Great Kanto Earthquake of 1923, the first earthquake-resistant construction regulation was introduced by the government as early as 1924. The Building Standard Law providing rules to enforce earthquake-resistant construction methods was passed in 1950 and is regularly updated, for example to take account of regional specifics by applying additional standards or to reflect the effects of technical advances or improved building materials.

The law was extensively amended in 1981, when strict earthquake-resistant building standards (Shin-taishin building codes) were introduced, which are still in force today. Buildings must be able to withstand without damage medium to severe earthquakes of 5.0 to 7.0 on the Richter scale (which occur frequently in the region) and they must remain usable without restriction. In the case of less frequent but more severe earthquakes with a magnitude of over 7.0, the buildings must be designed in such a way that they do not collapse. This is achieved via technical criteria for building materials or construction methods (structural codes), defining, for instance, the size of posts, the thickness of walls or the structure of foundations, depending on the type of building (eg, high-rise or small buildings)²⁹⁹.

Japan's efforts seem effective: only 8% of buildings that complied with the Shin-taishin building codes were severely damaged in the 1995 Great Hanshin-Awaji (Kobe) earthquake, whereas 29% of buildings that were built before 1981 were severely damaged (Figure 26)³⁰⁰. As collapsing buildings are responsible for approximately 75% of all earthquake-related deaths, it can be concluded that the building codes saved numerous lives³⁰¹.

Figure 26: Damage caused by 1995 Great Hanshin-Awaji earthquake, Japan
Buildings by construction period (%)



Source: Japan Ministry of Construction

298 "Your Community's Earthquake Risk 2018", Government of Japan, Tokyo Metropolitan Government, Bureau of Urban Development, 2018

299 "Introduction to the Building Standard Law — Building Regulation in Japan", Government of Japan, Ministry of Land, Infrastructure, Transport & Tourism, 2013

300 "Report on the damage due to Hyogoken-nambu earthquake", Government of Japan, Ministry of Construction, Committee for Building Damage Investigation of Hanshin-Awaji Earthquake Disaster, 1996

301 A.W. Cobum, R.J.S. Spence and A. Pomonis, "Factors determining human casualty levels in earthquakes: Mortality prediction in building collapse", Proceedings of the 10th World Conference on Earthquake Engineering, 1992, volume 10

In addition to tax deductions on earthquake insurance premiums for private homeowners, insurance companies offer a discount of 10-50% on premiums for buildings that comply with the new earthquake-resistant regulations, which incentivises risk-adjusted housing construction and voluntary insurance uptake³⁰². Thus, for example, by building thicker walls or using building materials that conform to standards, higher earthquake resistance is achieved³⁰³.

In contrast to *ex-post* adaptation (eg, in New Orleans after Hurricane Katrina), there are more structural approaches to addressing high natcat risks. Japanese regulations illustrate that such approaches seem to be effective, as they are constantly being further developed and improved. This is supported by continuous target-setting, for instance to increase the share of buildings that meet current earthquake-resilience regulations³⁰⁴. A complement to such approaches could be cooperation between insurers and public institutions, whereby potential high-risk areas for natcat events are jointly identified and *ex-ante* adaptation measures are implemented.

In addition to New Orleans and Japan, there are numerous countries or regions that actively strengthen prevention and adaption efforts. Other case studies include:

- Cambodia — Greater Mekong Subregion Flood and Drought Risk Management and Mitigation Project
- Spain — Project Guardian, creating the largest fire-fighting infrastructure in Europe
- Netherlands — Delta Program and Port of Rotterdam Flood Risk Management Program
- Italy — floodwalls of Venice

It is not only public players, but also private insurers that foster prevention and adaptation, eg, via differentiated pricing, communication (such as on mitigation requirements) and reinforcement measures such as increasing the resilience of buildings against landslides. These may also be levers for private players to increase insurance penetration. Many insurance companies are involved in developing loss-prevention tools and solutions, using advanced analytics or cutting-edge technologies (eg, real-time monitoring of natcat risk or calculating exposure using geocoding). In the event of an impending disaster, messaging services can be used to prepare policyholders and provide loss-mitigation advice. In addition, insurers can actively incentivise individual investment in risk reduction by using frameworks that offer lower premiums for such efforts.

To summarise, although *ex-ante* measures seems effective in protecting regions against certain types of natcat risks, there is a large set of factors (eg, initial costs, expected frequency and level of damage and potential fatalities) that need to be taken into account. In addition, the implementation of adaptation and prevention measures may come with unintended consequences that need to be considered. For example, they may create an incentive to rebuild in high-risk areas rather than to relocate to low-risk regions.

Introduce government-backed programmes, public-private partnerships (PPPs), mandatory contributions to natcat funds or pooling solutions

Public entities might introduce natcat insurance to increase market penetration and create a culture of insurance protection, rather than relying on public aid programmes. Government cooperation with private (re)insurers (eg, through government guarantees) can be a further way to increase coverage for natcat losses.

302 “Outline of Japan’s Earthquake Insurance System”, Government of Japan, Ministry of Finance, 2022

303 “Introduction to the Building Standard Law – Building Regulation in Japan”, Government of Japan, Ministry of Land, Infrastructure, Transport & Tourism, 2013

304 “Report on the damage due to Hyogoken-nambu earthquake”, Government of Japan, Ministry of Construction, Committee for Building Damage Investigation of Hanshin-Awaji Earthquake Disaster, 1996

Insurers are involved in cutting-edge loss prevention

- One frequently cited disaster compensation scheme was set up in France. The scheme combines elements of a government-backed pooling solution (including quasi-mandatory natcat insurance) with elements of a PPP.

The French natcat compensation scheme (“Cat Nat” regime) was introduced in 1982 in response to a December 1981 storm, which caused severe flooding with substantial damage that was, to a large degree, not covered by insurance³⁰⁵. The goal of the legislation was to increase coverage for losses due to extreme weather events that had been considered uninsurable at the time. The scheme was designed as an add-on to existing P&C insurance for residential buildings, vehicles, industrial assets and goods, and business interruption to provide coverage for natcat losses and hence help secure the livelihoods of affected citizens.

France’s “Cat Nat” regime has led to near-universal insurance coverage

The legislator set an additional fee of 12%³⁰⁶ as a natcat premium on top of the premium for all P&C home insurance contracts (6% for motor vehicles)³⁰⁷, which is collected by private insurers³⁰⁸. The additional premium can thus be considered as similar to a tax that all policyholders are required to pay, which led to natcat insurance penetration of, for example, approximately 98% for homeowners and close to 100% on motor insurance, as well as 98% for businesses. The individual risk of being affected by a natcat event is thus indirectly reflected in the initial P&C premium (ie, generally higher P&C premiums in more exposed areas), but is not directly reflected in the predefined percentage share for the add-on natcat premium (ie, 12% regardless of the area)³⁰⁹.

Once the national natcat commission declares a state of catastrophe, the policyholder receives compensation for the losses from their primary insurance provider within three months³¹⁰. The state-owned Caisse Centrale de Réassurance (CCR) acts as reinsurer, with the French state as guarantor of the CCR’s financial solvency (Figure 27)³¹¹. In parallel to the scheme, additional government funds provide immediate food, shelter and clothing to those affected³¹².

The system is perceived as fair by many people, as risks for all hazards are pooled, with every policyholder paying the same share and, in the event of a disaster, the principle of solidarity applies; everyone contributes, while those who suffer from the disaster are eligible for compensation³¹³. In addition, the countrywide risk pooling ensures that all regions benefit, even though they are exposed to different hazards. For example, a property is protected not only against flood hazards, but also against rockfall or subsidence risks³¹⁴. The scheme also seems effective in closing the protection gap: researchers summarised evidence on flood insurance coverage for various countries worldwide and found that for France — as well as

305 Geneviève Decrop and Claude Gilbert, “L’usage des politiques de transition: le cas des risques majeurs”, *Politiques et Management Public*, June 1993, volume 11, number 2

306 Nicolas Boccard, “Natural disasters over France a 35 years assessment”, *Weather and Climate Extremes*, December 2018, volume 22

307 “Fiscal resilience to natural disasters: Lessons from country experiences”, OECD, 20 May 2019

308 Serge Magnan, “Catastrophe insurance system in France”, *The Geneva Papers on Risk and Insurance*, 1995, volume 20, number 77

309 Nathalie de Marcellis-Warin and Erwann Michel-Kerjan, “The public-private sector risk-sharing in the French insurance ‘Cat. Nat. system’”, *Scientific Series*, December 2001

310 Serge Magnan, “Catastrophe insurance system in France”, *The Geneva Papers on Risk and Insurance*, 1995, volume 20, number 77

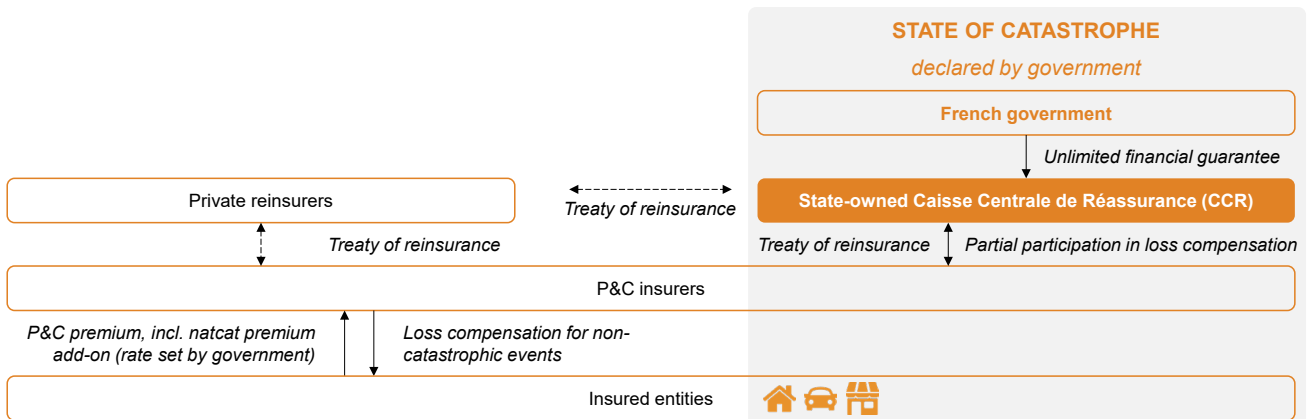
311 *Ibid*

312 “Fiscal resilience to natural disasters: Lessons from country experiences”, OECD, 20 May 2019

313 Nathalie de Marcellis-Warin and Erwann Michel-Kerjan, “The public-private sector risk-sharing in the French insurance ‘Cat. Nat. system’”, *Scientific Series*, December 2001

314 Jessica Lamond and Edmund Penning-Rowsell, “The robustness of flood insurance regimes given changing risk resulting from climate change”, *Climate Risk Management*, 2014, Volume 2

Figure 27: France's "Cat Nat" regime



for Spain, which follows a similar approach — there is almost full coverage of losses³¹⁵. In 2016, which was a year of severe flood hazards in France, US\$1.2bn was paid out to affected people by direct insurers, half of which was provided by the CCR³¹⁶. Over the past five years, the annual average amounted to US\$1.8bn. And the CCR highlights additional advantages of the system, such as the reasonable costs for the insured and the operational efficiency. The CCR also suggests that adverse selection can be avoided through the solidarity concept³¹⁷.

Nevertheless, due to the combination of full coverage and not fully risk-adjusted prices, the incentive for individuals to engage in prevention may be reduced. Similarly, the effect of signalling high-risk areas through price may be partly reduced. This could result in prices being perceived as unfair by those living in low-risk areas, as they are subsidising other groups. However, while the prevention incentive is rather low for the individual citizen, it is higher for the government because it is directly impacted financially by the effects of too little prevention and the resulting higher losses through the public CCR and the state guarantee³¹⁸.

Prevention incentive is low for citizens but high for government

As a result, the government established the Plan for the Prevention of Natural Hazards (PPRN) as part of the Barnier Law of 1995. The PPRN defines building regulations for specific regions according to their exposure to natural hazards, but also mandates preventive measures to limit exposure in hazardous areas³¹⁹. In addition, public authorities invest in various *ex-ante* prevention programmes and establish funds based on the scheme, such as the Fund for the Prevention of Major Natural Hazards (FPRNM, also known as the Barnier Fund) with an average annual spend of US\$220m and more than US\$2bn invested in the last 10 years³²⁰. Other initiatives are also underway to enhance national resilience against natcat events. For example, the Association for the Prevention of Natural and Technological Disasters (AFPCNT) was appointed in 2021 by the Ministry of Ecological and Inclusive Transition to implement a state action plan called "Tous résilients face aux risques" (Risk resilience for all).

315 Ibid

316 Clotilde Saint-Martin, "Floods of May-June 2016 in France — modeling the risks and damages", CCR, 2017

317 "Response of Caisse Centrale de Réassurance (CCR) to the European Commission's Green Paper on natural and man-made disasters", CCR, 2013

318 Jessica Lamond and Edmund Penning-Rowsell, "The robustness of flood insurance regimes given changing risk resulting from climate change", Climate Risk Management, 2014, Volume 2

319 "Plans de Prévention des Risques naturels et inondations (PPRN - PPRI)", Préfet de L'Isère, 30 September 2022

320 "Fiscal Resilience to Natural Disasters: Lessons from Country Experiences", OECD, May 2019; "Les Catastrophe Naturelles en France", CCR, 2016

While the Cat Nat regime in France is one example of how an individual country is addressing its natcat protection gap by bundling public and private resources to increase penetration, natcat bonds may be another useful tool to support governments' initial relief efforts. Even though private rebuilding efforts are not necessarily supported, the bond return may save lives as it is invested in immediate relief, such as medical aid.

World Bank and others make use of cat bonds

The World Bank, in particular, has been making wider use of catastrophe bonds for developing and emerging markets³²¹. For example, in 2019, the World Bank's International Bank for Reconstruction and Development issued a US\$225m bond to cover the Philippines for losses from earthquakes and tropical cyclones for three years³²².

- With a similar goal to that of natcat bonds, governments from the Caribbean and Central America have established a risk pool to finance government relief efforts to better respond to natcat events.

When Hurricane Ivan hit in 2004, it left the Caribbean region with extensive damage, especially on Grenada and the Cayman Islands; on Grenada, almost all houses were destroyed³²³ and on the Cayman Islands, the storm caused losses equivalent to twice the region's GDP. At the time, the governments of both countries struggled to help those affected quickly due to insufficient liquidity. To overcome this in future disasters, the Caribbean Community (CARICOM) countries³²⁴ founded the Caribbean Catastrophe Risk Insurance Facility (CCRIF) in 2007.

According to the CCRIF's annual report, it is "the world's first multi-country risk pool based on parametric insurance"³²⁵. The mechanism of the CCRIF is similar to that of a mutual insurance company, with CARICOM states as its members. Premiums are paid by members to the CCRIF and are based on members' risk profiles per peril. These profiles are generated using models that predict potential losses based on country-specific exposure (in terms of potential replacement costs), long-term hazards (for earthquakes, cyclones or excessive rainfall), and vulnerability depending on the severity of the natcat event (using scenarios)³²⁶. The risks are then partly borne by the CCRIF itself and partly reinsured on international markets³²⁷. The development of the CCRIF was supported technically by the World Bank and sponsored by the Government of Japan. It was capitalised through fees from CCRIF members and contributions from various international states and institutions, including the World Bank, the European Union and the Caribbean Development Bank.

The instrument provides an effective solution to states' short-term liquidity problems after natcat events by providing parametric insurance against hurricanes, earthquakes and excess rain. Parametric insurance has the advantage that large sums can flow quickly and without delay to the affected states, since a predetermined amount is paid if the insured event occurs. This contrasts with traditional insurance, where compensation is only granted

321 "Catastrophe Bonds", Wharton Risk Center, July 2021

322 "World Bank catastrophe bond transaction insures the Republic of Philippines against natural disaster-related losses up to US\$225 million", The World Bank, 24 November 2019

323 "Twenty-seventh Session (RA IV/Hurricane Committee) — Final Report", World Meteorological Organization, 2005

324 Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, St Lucia, St Kitts and Nevis, St Vincent and the Grenadines, Suriname, Trinidad and Tobago

325 Annual report 2020-2021, CCRIF, 2021

326 "CCRIF's country risk profiles", CCRIF, 2022

327 Liz Henderson, "The role of insurance in building resilience: Closing the protection gap", Aon, September 2018

after the loss assessment is completed. As a result, the CCRIF is able to provide affected states with liquidity within two weeks of the event³²⁸. To date, the risk pool has paid out a total of US\$245m for 54 natcat events and approximately 3.5 million people in the Caribbean and Central America have directly or indirectly benefitted from it³²⁹. 63% of the payout has gone into immediate post-event activities to provide affected people with essentials such as food, shelter and medical care, thereby bringing substantial relief to the region. Since it is the governments that receive payouts, and not individual households or businesses, the government only supports individual rebuilding efforts indirectly by providing building materials³³⁰.

Despite all the advantages, there may be events where parametric protection is not triggered, as was the case in flooding in Jamaica in 2017. Such events may be perceived as a failure of the system and may weaken the trust of the population and governments in it³³¹. Therefore, triggers should be constantly reviewed, refined and updated if necessary to ensure that the risk pool can withstand a changing risk environment (eg, due to climate change). It should also be noted that the total coverage of the parametric insurance may not be sufficient to cover all losses incurred, as the main objective of the risk pool is rather to ensure sufficient liquidity for the first few months after the disaster³³². CCRIF members plan to significantly scale up the facility, such as by attracting new members, expanding product offerings (eg, providing microinsurance) and services, and covering additional hazards³³³.

Governments of various other countries or regions, eg, the UK (Flood Re), Australia (Cyclone Reinsurance Pool), the USA (Insure Louisiana Incentive Program), and Turkey (Turkish Catastrophe Insurance Pool), also engage in increasing insurance penetration and/or increasing coverage for natcat losses through risk pooling, natcat funds or other governmental programmes. In addition, there are several recently established PPPs to address the natcat protection gap in emerging markets, such as sovereign risk transfer and building a resilience scheme for urban flooding in Ghana, parametric risk transfer to provide insurance coverage to Mexican smallholders or the development of parametric insurance against hurricanes for Jamaican farmers.

Countries and regions engage in risk pooling, natcat funds and PPPs

In conclusion, these examples show how governments can be active players in a natcat insurance scheme and that these measures seem to have a positive effect on reducing the natcat protection gap. Due to differences between developed and emerging markets, there are different design options that governments can choose according to their needs. For example, while liquidity needs following natcat events were a pressing issue for CARICOM, for France the concern was the high volume of uninsured losses due to the exclusion of natcat from insurance contracts. So, CARICOM implemented an insurance solution that provides reinsurance to the state in a simplified way for short-term liabilities after a natcat event, while the French scheme provides reinsurance capacity and a state guarantee for large natcat claims.

While individual countries, such as Belgium, have implemented a scheme similar to the French one, the establishment of a CCRIF-type risk pool requires a critical mass of countries to achieve a certain level of risk pooling and risk diversification, as well as to reduce the administrative costs per member. And, when designing their options, public authorities should consider the potential

328 Annual report 2020-2021, CCRIF, 2021

329 "Who we are", CCRIF, 2022

330 Annual report 2020-2021, CCRIF, 2021

331 "Jamaica questions CCRIF model after floods fail to trigger policy", Artemis, 29 June 2017

332 "Caribbean Catastrophe Risk Insurance Facility (CCRIF)", The World Bank, 2012

333 Annual report 2020-2021, CCRIF, 2021

unintended consequences of their measures and endeavour to prevent them with appropriate mechanisms (eg, avoiding adverse selection as a result of mutualised pricing by mandating insurance).

Build a regulatory environment that fosters access to global reinsurance markets and the participation of foreign players

**Open reinsurance
markets
reduce natcat
concentration risk**

Geographic diversification of natcat risks can be achieved through cross-border reinsurance and the presence of global insurance groups in markets. Access to global reinsurance markets helps to address protection gaps by enabling an increase in insurance capacity, capital, cross-country sharing of best practices/technology and, most importantly, by keeping geographically correlated risks from being concentrated within a market. Governments that seek to close protection gaps might therefore want to review laws and regulations that restrict cross-border reinsurance (eg, domestic placement requirements, mandatory domestic offerings and restrictions on global data modelling), foreign ownership of insurance companies and other measures that may reduce risk diversification benefits and exacerbate concentration risks³³⁴.

- One example that illustrates how access to global reinsurance markets affects resilience in the case of a natcat event is New Zealand's Earthquake Commission (Toka Tū Ake EQC) and the country's ease of access to global (re)insurance markets.

Due to its geographic location where two tectonic plates meet, New Zealand faces the risk of earthquakes and volcanic activity, with — on average — one earthquake of 7.0 to 7.9 on the Richter scale every four years and one earthquake with a magnitude higher than 8.0 every century³³⁵. In terms of economic losses, these earthquakes can cause significant destruction, such as the Canterbury earthquake sequence (four major earthquakes from September 2010 to December 2011) that resulted in overall economic costs estimated to be more than NZ\$40bn (US\$25bn)³³⁶.

Without proper insurance coverage, recovery from such major events would be a significant challenge to the economic viability of the country. However, aware of its high-risk location, New Zealand founded the EQC in 1945, tasked with the management of a Natural Disaster Fund, as well as with research, education and the supplementing of private natcat insurance for residential properties³³⁷. The EQC collects levies as a mandatory part of home insurance premiums and deposits them in the Natural Disaster Fund. Levies are calculated proportionally to coverage rather than depending on risk levels. As of 1 October 2022, the maximum coverage is NZ\$300 000 and the levies are calculated at 16 cents per NZ\$100. As a result, the maximum annual premium payable is NZ\$480³³⁸.

A key advantage for New Zealand in the aftermath of the Canterbury earthquakes was its significant investment in reinsurance — both in the EQC's reinsurance of the Natural Disaster Fund and in the reinsurance of private insurers. The Reserve Bank of New Zealand (RBNZ) acts as the prudential regulatory agency for both insurers and reinsurers (including international ones). The RBNZ licenses insurers before they can operate in the country; insurers must prove they have appropriate governance, financial capacity and risk management programmes, as outlined in the Insurance (Prudential Supervision) Act

334 "The Contribution of Reinsurance Markets to Managing Catastrophe Risk", OECD, 2018

335 GeoNet Geological Hazard Information for New Zealand: Earthquake statistics, Toka Tū Ake EQC, 2022

336 "Canterbury earthquakes", Insurance Council of New Zealand

337 "What we do", Toka Tū Ake EQC, 2022

338 "EQCover Insurers' Guide", Toka Tū Ake EQC, October 2022

of 2010³³⁹. Licensing standards are set at a level that leaves the New Zealand insurance market open to international insurers while ensuring the financial soundness of participants.

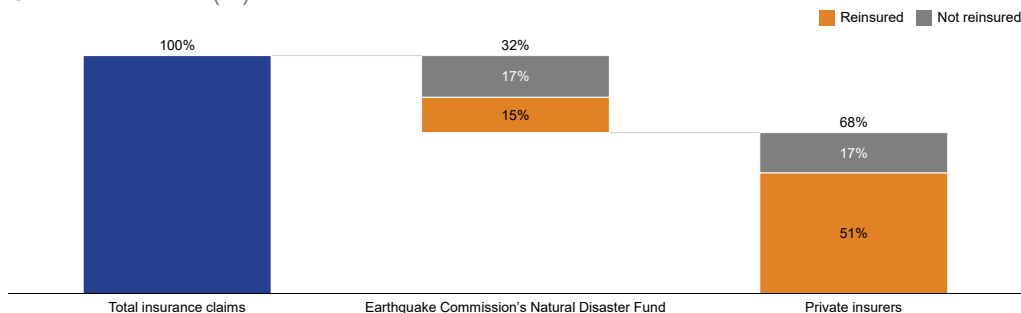
Reinsurance for private insurers is further actively encouraged through additional policies and the example that the EQC sets in reinsuring the Natural Disaster Fund. For example, New Zealand solvency standards require property insurance providers to have reinsurance and capital sufficient for a 1-in-1000-year earthquake³⁴⁰. The EQC negotiates and buys international reinsurance for the Natural Disaster Fund on an annual basis, thereby preventing geographic risk correlation within the New Zealand market. The EQC has continuously increased its level of reinsurance, reaching a record level of NZ\$7.2bn in the international market in 2022³⁴¹. The EQC's public liabilities are met through the Natural Disaster Fund or reinsurance, or through a government guarantee should the first two sources be exhausted.

The impact of these measures can be observed in the example of the Canterbury earthquakes of 2010 to 2011, where reinsurance payments helped the New Zealand economy to recover (Figure 28). Prior to the first earthquake in 2010, the Natural Disaster Fund consisted of NZ\$6.0bn in funds accumulated from levies. In the case of a major event, the EQC covers damages up to a specified cap (NZ\$100 000 per property in 2010-2011)³⁴², while any additional insured damages are covered by private insurers.

**New Zealand's
Natural Disaster
Fund helps
post-earthquake
economic recovery**

Figure 28: Claims from Canterbury earthquake, New Zealand

Claims distribution (%)



Source: Reserve Bank of New Zealand

Total insured losses from the Canterbury earthquakes amounted to about NZ\$34bn, of which 65% was reinsured. Toka Tū Ake EQC incurred losses of about NZ\$11bn, 46% of which (NZ\$5bn) was covered by reinsurance³⁴³. Private insurers incurred losses of about NZ\$23bn, of which NZ\$12bn was related to houses and contents and NZ\$11bn to commercial losses. Of private insurers' losses, 75% (NZ\$17.25bn) were reinsured³⁴⁴.

Today, as a result of the Canterbury earthquakes and the 2016 Kaikoūra earthquake, the Natural Disaster Fund has been depleted and stands at about NZ\$250m. It is currently rebuilding its capital through levies. Although the immediate losses put a strain on the

339 Nick Laing and Jonathan Scragg, "Insurance and reinsurance in New Zealand: overview", Duncan Cotterill, 1 March 2021

340 Robert Cole, "Funding and reserving Canterbury earthquake insurance claims", Analytical Notes, Reserve Bank of New Zealand, 2021

341 "EQC continues to grow its reinsurance programme", Toka Tū Ake EQC, 10 June 2022

342 The EQC announced that the cap would be raised to NZ\$190 000 per property in 2022

343 "Insurance Liability Valuation as of 30 June 2021", Toka Tū Ake EQC, 11 August 2021

344 Insurance Council of New Zealand

economy, as businesses and infrastructure were damaged, the economic development since then has been highly successful and some claim the reconstruction efforts even boosted the economy in New Zealand in the medium to long term³⁴⁵.

Employment in the construction sector in the Canterbury region rose to double the national level by 2015 and nominal GDP growth in Canterbury increased from 3% in 2010 to 10.5% in 2014 during the construction efforts³⁴⁶. Most businesses and private property owners immediately started reconstruction efforts after the 2010 earthquake, indicating a high level of financial capacity as well as trust that they would receive insurance payouts in due course. The good reputation of insurers in terms of solvency can be attributed to the high degree of reinsurance from global reinsurers for both private insurers and the EQC Natural Disaster Fund, and the use of government guarantees should both options fall short³⁴⁷.

While the non-risk-dependent premiums are effective in minimising natcat protection gaps, one critical consideration remains. Non-risk-dependent levies may pose a moral hazard as people may still build in high-risk areas without incurring higher insurance premiums. Although the levies themselves are not risk dependent, conditions regarding where rebuilding efforts take place have been influenced by the government through the establishment of residential red zones. After the Canterbury earthquakes, for example, approximately 8 000 properties in and around the city of Christchurch were deemed uninhabitable and torn down instead of rebuilt³⁴⁸. Furthermore, private insurers are likely to reflect the level of risk of a certain area in their portion of the insurance premium (not passed on as levies) or even limit services to lower-risk areas. Another criticism during the Canterbury reconstruction was the slow pace of reimbursements, as the EQC needed to process a high number of claims. After the Kaikōura earthquake of 2016, private insurers encouraged the Toka Tū Ake EQC to involve them more in claims processing to speed up reimbursements.

Countries are opening their reinsurance markets

Several countries appear to be amending their regulations to facilitate access to global reinsurance markets. Brazil opened up to international reinsurance markets in 2007 but requires 40% of premiums to be offered to domestic reinsurers first³⁴⁹. India has significantly reduced its mandatory placement requirements for the domestic market since 2013 from 20% to 5%, and Indonesia eliminated domestic mandatory placements in 2020 (effective from 2023)³⁵⁰. The effectiveness of such policy changes in fostering natcat reinsurance has yet to be evaluated. Other factors, such as the confidence of international reinsurers in domestic underwriting capabilities must be considered in this context. For example, as reinsurers participate directly in the profits and losses of the primary insurer through proportional reinsurance, they are more likely to become active in the market if they have confidence in the pricing adequacy of the primary insurer.

- While the New Zealand example illustrates the effects of permitting ceding insurers voluntary, unrestricted access to reinsurance, solvency regulation is a potential lever to increase risk transfer through reinsurance. The example of the EU's Solvency II regulatory regime shows

345 Amy Wood et al., "The Canterbury rebuild five years on from the Christchurch earthquake", Reserve Bank of New Zealand Bulletin, February 2016, volume 79, number 3

346 Ibid

347 Goetz von Peter et al., "Unmitigated Disasters? New evidence on the macroeconomic cost of natural catastrophes", Bank for International Settlements working paper, number 394, December 2012

348 "Christchurch residential red zone areas", Toitū Te Whenua — Land Information New Zealand

349 "Decreto-LEI complementar N° 126, de 15 de janeiro de 2007", Presidência da República Casa Civil Subchefia para Assuntos Jurídicos, January 2007

350 "Leveraging the role of property catastrophe reinsurance markets: The case of India, Indonesia, Myanmar and the Philippines", OECD, 2020

that there are supervisory approaches beyond the voluntary, open-market purchase concept that could potentially be adapted and leveraged to further incentivise natcat reinsurance to help spread and diversify natcat risk globally.

Solvency II legislation became effective in 2016 with the objective of harmonising insurance supervisory regulation in the EU and creating a framework that reduces the probability of insolvency for insurance companies. The regulatory framework consists of three pillars: risk capital requirements; a qualitative assessment of own risks; and reporting requirements to the supervisory authority and the public³⁵¹. Insurers are obliged to calculate their solvency capital requirement (SCR) to withstand a 1-in-200-year event for their main risks, covering non-life (including natcat), life and health underwriting, as well as market and counterparty default risk³⁵². They report the sum of their eligible own funds against this, valued on a market-consistent basis. The resulting solvency ratio is a signal to stakeholders of the financial strength of the insurer.

A key feature of the Solvency II framework is the recognition of risk-mitigation techniques, including reinsurance. When an insurer calculates its SCR, the economic effect of reinsurance contracts is taken into account. This results in lower capital requirements for natcat events that are reinsured. Ensuring insurers are given credit for the risk-mitigating effect of reinsurance helps to optimise the capacity available for natcat and the diversification of natcat risks within the European market by facilitating the use of reinsurance.

EU's Solvency II gives credit for risk-mitigating effects of reinsurance

In addition, due to the recognition of diversification, reinsurers subject to the regime may also be incentivised to accept business that further diversifies their natcat portfolio risks in terms of geographic exposure or peril type in order to improve their own solvency ratios. Solvency II may, therefore, create a potentially positive impact on natcat protection gaps by incentivising global reinsurance activities. Nevertheless, there has been some industry criticism of the regulation. Scepticism about the regulation notes that the long-term orientation of the insurance business model should be reflected; that the regulation may create a high operational burden in some circumstances; and that the capital charge under its standard formula should reflect the actual risks.

To summarise, the investment of New Zealand's government in global reinsurance purchases and the country's unrestricted access to reinsurance markets enable New Zealand to transfer risk into a diversified global market. This allowed the country to demonstrate economic resilience and speed in reconstruction following the Canterbury earthquakes. Voluntary reinsurance purchases are not the only lever for achieving risk transfer and diversified risk pooling; the example of the EU's Solvency II shows that beyond avoiding restrictive reinsurance regulation, regulators may have options to actively incentivise reinsurance uptake. Whether the introduction of Solvency II had an effect on the natcat gap is rather difficult to judge, since, for example, any causality between its date of introduction and a potential increase in natcat reinsurance capacity is distorted by the transition period of several years before the law came into force. An investigation of whether Solvency II's introduction has actually contributed to an increase in ceded natcat risk could be conducted to better understand the potential effect on the natcat protection gap.

In addition to the four levers detailed above, there are additional levers that private and public stakeholders can use to address the natcat protection gap.

³⁵¹ "Solvency II", EIOPA, 28 April 2022

³⁵² Directive 2009/138/EC, Article 103, 25 November 2009; Commission Delegated Regulation (EU) 2015/35, Article 119, 10 October 2014

Additional levers for private players

Scale up alternative forms of risk capacity

Since the mid-1990s, when catastrophe bonds emerged, bonds have expanded and broadened in their design and use, and there has been a continuous focus on helping to bring risk-transfer solutions to underserved populations. In countries with poorly developed insurance markets, insurance-linked securities, catastrophe bonds and (green) resilience bonds can be a part of the solution. For example, multilateral development bank bonds can be issued by several sovereign governments on the capital markets. Thus, the capital markets can be used to finance social projects (eg, the construction of natcat prevention systems in emerging markets).

Scale up parametric insurance or other innovative forms of risk transfer

The advantages of parametric insurance are the speed of payout and low dispute risk. One potential advantage of insurance-based risk transfer solutions is the high level of cost transparency, as insurance products are usually characterised by constant premium payments throughout the product's lifetime. Parametric insurance or other innovative approaches, eg, microinsurance, could be an instrument to scale up penetration in emerging markets and may be adapted to the needs and circumstances of individual countries.

Make the product value proposition more attractive to a wider audience

This can be done by improving product design, creating easy-to-purchase bundles and communicating more transparently with customers. Especially for emerging markets, where insurance penetration has historically been lower and insurance is not mandatory, easy-to-use products can help to increase take-up rates. In this context, it is also important to provide information about available products and to educate people about them to generate trust in their effectiveness.

Enhance reporting on secondary perils (eg, to advance modelling)

Given that losses are increasingly caused by secondary perils and that this trend is expected to continue, more robust reporting and data collection may be required. Though the monitoring of primary hazards and corresponding modelling capacities are advanced in the insurance industry, modelling for secondary risks is not yet as well developed, at least in some regions, as it is based on data from a period when these risks were less prominent³⁵³.

Build up risk-assessment capabilities including actuarial talent

Adequate actuarial training is required to assess natcat risks sufficiently, but there is a lack of people with these skills, especially in less developed parts of the world. In Latin America, for example, only Mexico, Brazil, Argentina and Colombia have significant numbers of actuaries, despite the insurance industry's urgent need for them³⁵⁴. Insurers may wish to consider investing in actuarial training, data collection and modelling in areas at high risk of natcat events to better understand their risks and make them more insurable.

Additional levers for public and private players

Increase awareness among households and business owners

There are several examples from emerging and developing markets where private players and the public sector are fostering disaster awareness among households and business owners

³⁵³ "Natural catastrophes in 2020", sigma 1/2021, Swiss Re Institute, 30 March 2021

³⁵⁴ Carlos Arocha, "Narrowing the natcat protection gap in Latin America", Society of Actuaries, May 2019, Issue 78

Innovative risk-transfer solutions can increase penetration

Lack of actuaries hampers risk assessment

both in developed and in emerging markets. These initiatives include, for example, establishing educational campaigns in schools, providing information material in high-risk areas, and sharing protection tips via podcasts³⁵⁵.

Promote the net-zero agenda

As both primary and secondary perils have been shown to increase in frequency due to climate change and rising temperature levels, governments and insurance companies could mitigate this trend by committing to zero emissions by 2050 (as many countries, including Canada, Japan, Korea and New Zealand, have already done) and adopting appropriate measures for moving in that direction as quickly as possible³⁵⁶. The insurance industry founded the Net-Zero Asset Owner Alliance to promote a net-zero target in investment and underwriting activities. However, these measures aim for long-term changes and are unlikely to have an impact on the gap in the next five to 10 years. This makes the need for risk mitigation all the more acute.

Additional levers for public players

Review pricing regulations

This could help manage the trade-off between an unconstrained market and the mutualisation of risks. In areas where the market sets an unaffordable premium, public bodies could encourage natcat insurance take-up by subsidising insurance for low-income households. Depending on the target group, such as low-income households or micro, small and medium-sized enterprises, premium subsidies or tax reductions could be used at various scales. The Brazilian government, for example, launched the Rural Insurance Premium Subsidy Program (PSR), which provides financial support to farmers who are willing to insure their crops and livestock against the disasters caused by natural hazards³⁵⁷.

Public subsidies could encourage natcat insurance take-up

In the case of microinsurance schemes, such as agricultural insurance, low-income consumers in many low- and middle-income developing countries are often unable to make (annual) up-front payments, resulting in microinsurance providers not being able to collect enough liquidity to pay claims, particularly for catastrophic events where losses may impact most of the policyholders. In such cases, the subsidising of microinsurance can have a huge impact on the attractiveness of insurance policies for low-income consumers³⁵⁸.

In Ethiopia, studies show that the quantity of insurance purchased falls by 0.58% when the price of insurance increases by 1%. And as a result of pricing regulation, affected areas may become economically unviable from an underwriting perspective and supply may decrease. Pricing regulation might also reduce the risk signals sent out by risk-based pricing, whereas risk-based pricing can potentially create incentives to move to a lower-risk area. For example, already higher-than-average premiums for homeowners' insurance in Florida continued to rise as a result of Hurricanes Irma (2017) and Michael (2018)³⁵⁹.

355 "Disaster resources", US Centers for Disease Control and Prevention, 2019; "How developing countries are addressing hazards, focusing on relevant lessons learned and good practices", United Nations Climate Change, 2020

356 "Net zero by 2050", International Energy Agency, October 2021

357 "Property catastrophe insurance — national examples", GFIA, 2020

358 "Premium support — background paper", MCII Climate Insurance, 26 May 2021

359 Ed Leefeldt, "Why is homeowners insurance in Florida such a disaster?", Forbes, 26 March 2021

Clarify expectations of post-disaster government assistance for certain types of insurable risks

In disaster-prone areas, this may incentivise citizens and businesses to take out more insurance, as there is a clear expectation about the extent of government support. However, the incentive for politicians to communicate clearly on the (lack of) potential government assistance is rather low, as such measures tend to resonate negatively with voters, which may translate into poorer performance in elections.

The levers that have been detailed and illustrated by case examples from several countries represent different ways of addressing the natcat protection gap. Whereas an effect was observed in all the case studies, some measures also create unintended consequences.

For some levers, such as facilitating access to coverage through revised distribution or free access to global reinsurance, unintended consequences were barely evident from the case studies. However, indications were found suggesting that shortcomings in implementation (eg, delayed claims payments) could reduce confidence in a measure and thus potentially reduce its effect.

Potentially negative impacts of some levers must be evaluated

For the two case studies of government efforts to strengthen prevention and adaptation and of active government engagement in insurance schemes, it was evident that these measures address the natcat protection gap. Nonetheless, both levers potentially prevent the reallocation of building efforts to lower-risk areas. People may either fully rely on preventive government measures without acting substantially independently, thus losing an incentive to move away from the affected region, or they may systematically underestimate the risk, since the signalling effect of risk-based pricing is reduced. This assumption is supported by the observation that, in some cases, people are increasingly relocating to certain high-risk areas (eg, to coastal Florida), which may be driven by the partly lower costs of property in high-risk areas. In addition, stakeholders can draw on a whole toolbox of additional levers to reduce the natcat protection gap in their regions. However, the costs and potentially positive and negative impacts of levers should be carefully evaluated, taking into account the needs and characteristics of the different regions.

Concluding remarks

From a purely financial point of view, the natcat protection gap is the smallest of the gaps considered in this report, at US\$139bn per annum over the last decade for direct losses. Despite some efforts by the insurance industry and public players, the gap has been growing at an average of 4% a year over the past 50 years (1970-2020) and is expected to continue growing due to accelerating climate change.

While particularly prominent in the USA and Europe in absolute terms, the gap is also significant in emerging markets, where 85-90% of losses are uninsured in some markets, and where the direct human impact tends to be much higher. Thus, in order to address the gap effectively, it is crucial for both public and private stakeholders to choose levers that are suitable and effective for their region. In addition to preventing financial losses, the effective implementation of levers may save lives and reduce human suffering in high-risk regions.

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