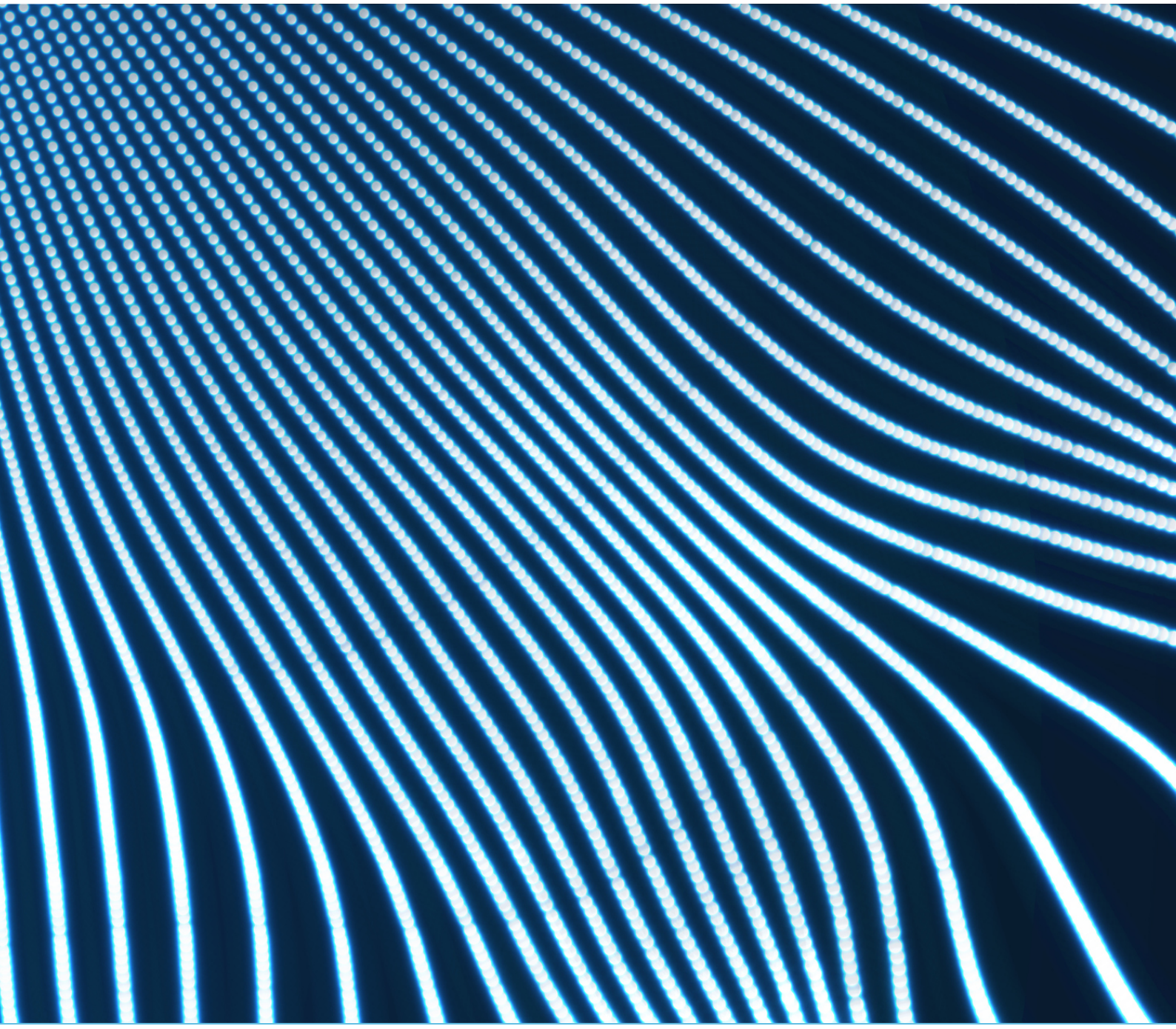
Financial Management of Catastrophe Risks

Approaches to Building Financial Resilience



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Please cite this publication as:

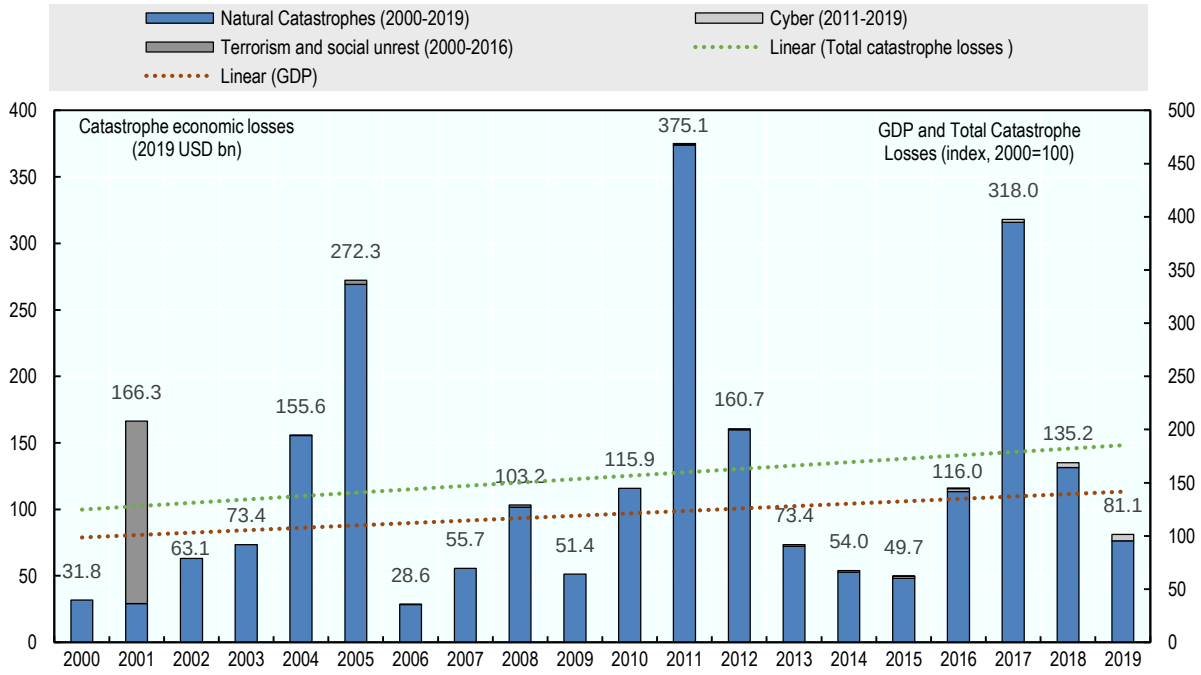
OECD (2021), *Financial Management of Catastrophe Risks: Approaches to Building Financial Resilience* *www.oecd.org/daf/fin/insurance/financial-management-of-catastrophe-risks-approaches-to-building-financial-resilience.htm*

1 Introduction

The financial management of disaster risks, such as floods, earthquakes, cyclones, terrorist attacks, cyber-attacks and pandemics, remains a key public policy challenge for governments around the world, particularly those faced with significant exposures to such risks and/or limited capacity to manage the financial impacts. The ongoing COVID-19 health crisis has provided a stark reminder of the enormous economic (and social) hardship and financial strains that can result from a large-scale catastrophe.

In addition to loss of life and bodily injury, disasters often result in significant damage to property and loss of income and livelihoods ("economic losses"). Economic losses from catastrophes, while highly volatile from year-to-year, have been increasing in OECD countries since the year 2000 at a slightly faster rate than GDP (see Figure 1.1).

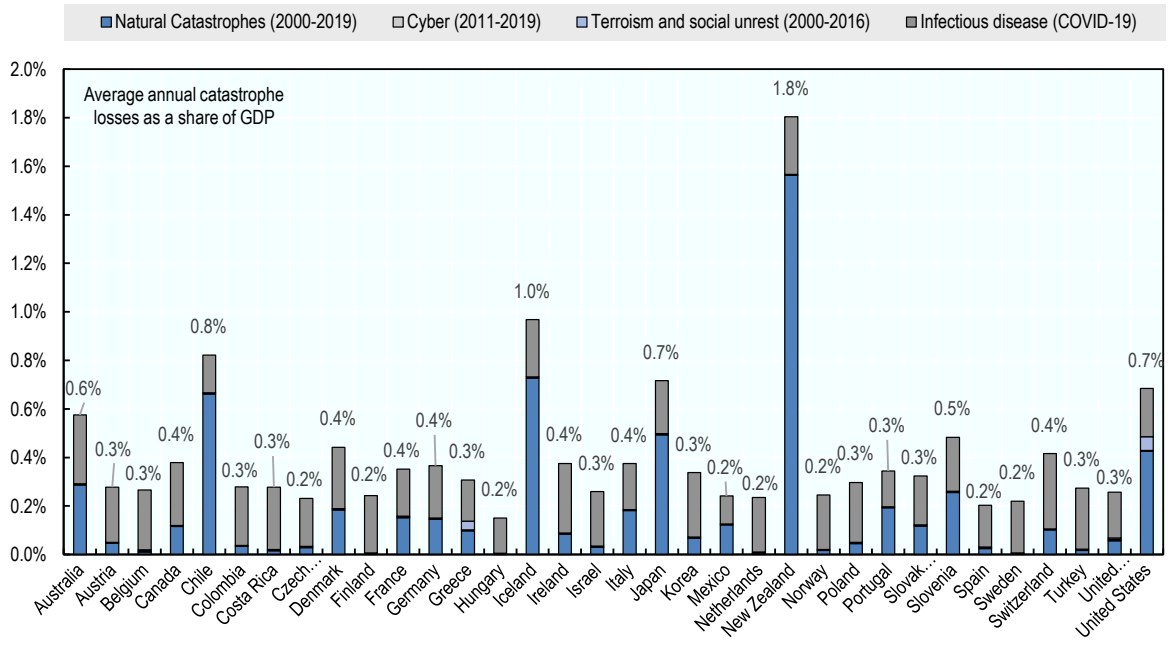
Figure 1.1. Economic losses from catastrophes



Source: OECD calculations based on data on: (i) natural catastrophe and terrorism and social unrest losses provided by Swiss Re and PCS; and (ii) OECD estimates on cyber-related economic losses (from (OECD, 2021[1])). Data on OECD country GDP is from (OECD, 2021[2]).

For a number of OECD countries, economic losses incurred as a result of catastrophe events approach (or even exceed) 1% of GDP on annual basis (see Figure 1.2) with important implications for economic growth, particularly in the regions directly affected.

Figure 1.2. Estimated economic losses from catastrophes as a share of GDP



Source: OECD calculations based on data on: (i) natural catastrophe and terrorism and social unrest losses provided by Swiss Re and PCS; and (ii) OECD estimates on cyber-related economic losses and revenue losses resulting from COVID-19 public health measures (OECD, 2021[1]). Data on OECD country GDP is from (OECD, 2021[2]).

The frequency and severity of many types of natural and human-made catastrophes could increase in the future as a consequence of a number of economic, social and environmental trends – including a changing climate, digitalisation, globalisation and urbanisation[1] - which could lead to greater economic impacts and create new challenges to insurability.

In 2017, the OECD Council adopted the Recommendation on Disaster Risk Financing Strategies[2], which provides a set of high-level recommendations for designing a strategy for addressing the financial impacts of disasters on individuals, businesses and sub-national levels of governments, as well as the implication for public finances (OECD, 2017[3]). The aim of the Recommendation is to support efforts by governments to better manage the financial impacts of disasters when they occur. The aim of this document is to provide

[1] For example, a changing climate is expected to lead to an increase in the severity of cyclones in some regions, more days of conducive conditions for wildfire ignition and changing precipitation patterns (particularly more extreme precipitation and dry spells) that could lead to more flooding and more frequent droughts. Increasing reliance on connected technologies is likely to increase cyber risk as increasing volumes of processes and transactions are managed online. Globalisation, population, urbanisation and a changing climate all create conditions that may be more conducive to more frequent infectious disease outbreaks with increased probability of global transmission.

[2] The Recommendation replaced a previous set of guidance contained in the 2010 Recommendation on Good Practices for Mitigating and Financing Catastrophic Risks. The Recommendation provides a set of high-level recommendations for designing a strategy for addressing the financial impacts of disasters on individuals, businesses and sub-national levels of governments, as well as the implication for public finances. It specifically targets issues related to the financial management of disaster risks, while recognising the importance of an integrated approach to disaster risk management and the contribution of risk assessment, risk awareness and risk prevention to the financial management of disaster risks.

a brief overview of the key findings and lessons from the last five years of OECD work[3] on the financial management of disaster risks (see Box 1.1). The objective of this document is to raise awareness of the key elements of a disaster risk financing strategy while also identifying some areas of potential focus for the Report to Council on the Recommendation that must be submitted by the Insurance and Private Pensions Committee to the OECD Council in 2022 (as instructed by Council in the Recommendation).

Box 1.1. OECD work on the financial management of catastrophe risks

The analysis and content in this document is based on the following analyses and findings:

- Financial Management of Flood Risk (2016)
- Enhancing the Role of Insurance in Cyber Risk Management (2017)
- Financial Management of Earthquake Risk (2018)
- The Contribution of Reinsurance Markets to Managing Catastrophe Risk (2018)
- Fiscal Resilience to Natural Disasters: Lessons from Country Experiences (2019) (OECD Public Governance Directorate, developed jointly with the World Bank)
- Encouraging Clarity in Cyber Insurance Coverage: The Role of Public Policy and Regulation (2020)
- Enhancing the Availability of Data for Cyber Insurance Underwriting: The Role of Public Policy and Regulation (2020)
- Insurance Coverage for Cyber Terrorism in Australia (2020)
- Leveraging the Role of Property Catastrophe Reinsurance Markets: The Case of India, Indonesia, Myanmar, and the Philippines (2020)
- Leveraging Technology and Innovation for Disaster Risk Management and Financing (2020) (developed jointly with the Asian Development Bank)
- Responding to the COVID-19 and pandemic protection gap in insurance (2021)
- Enhancing financial protection against catastrophe risks: the role of catastrophe risk insurance programmes (2021)

[3] The OECD's work under the financial management of catastrophic risks is developed under the guidance of the OECD's Insurance and Private Pensions Committee and with support from the High-Level Advisory Board on the financial management of catastrophic risks.

2 Risk assessment

Key takeaways

Commercial catastrophe models are available for the **natural catastrophe perils** and countries that account for the vast majority of economic losses in OECD countries. .

Probabilistic catastrophe models for **terrorism and cyber risks** and for some of the (non-life) economic losses that result from **infectious disease outbreaks** are also increasingly available.

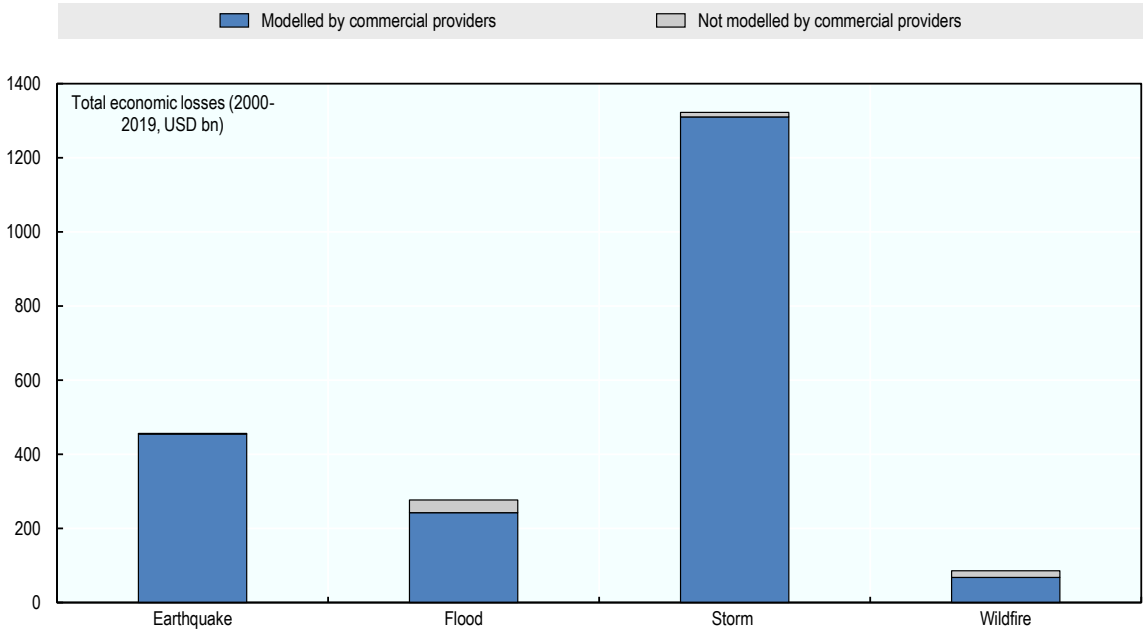
A significant private insurance sector role in **assuming risk** creates demand for commercial models which could contribute to better risk quantification by policyholders and (re)insurance companies.

Governments can **make greater use of models** in land-use planning, building code development and decisions on risk mitigation investments.

Effective financial management of catastrophe risks must be grounded in a comprehensive understanding of exposure to all potential catastrophe perils and the financial vulnerabilities that may emerge in the event of a catastrophe.

In developed insurance markets, catastrophe models that provide a range of estimates of average annual losses and probable maximum losses based on large catalogues of potential event parameters and information on exposed assets and vulnerabilities play a critical role in helping insurers set pricing for coverage and manage the risks that they assume. Commercial catastrophe models now cover the natural catastrophe perils and countries that accounted for approximately 96% of all storm, flood, earthquake and wildfire economic losses in OECD countries since 2000 (see Figure 2.1). Probabilistic catastrophe models for terrorism and cyber risks are also available (if more recent, in the case of cyber) while specialised providers have also developed models for some of the (non-life) economic losses that result from infectious disease outbreaks such as COVID-19.

Figure 2.1. Commercial catastrophe model coverage of natural catastrophe economic losses: OECD countries



Note: Information on commercial model coverage is taken from (OECD, 2021[1]).
Source: OECD calculations based on data on natural catastrophe losses provided by Swiss Re and PCS.

Despite broad commercial model coverage of the major economic loss drivers in OECD countries, many countries and perils remain uncovered, making it challenging for policyholders and (re)insurance companies to quantify (and effectively manage) catastrophe risks. Emerging technologies and innovations can provide new (or improved) data sources and analytical and processing capacities that can expand the quality and coverage of catastrophe models and other risk assessment and quantification tools (see Box 2.1). These technological developments along with efforts to improve access to – and inter-operability of – catastrophe models should support a broadening of coverage to new countries and perils over time. There is also an increasing investment in understanding risk over longer-time horizons that include the potential impacts of a changing climate.[4] Significant participation of private (re)insurance markets in assuming catastrophe risks has been a key driver for the development of commercial catastrophe models.

[4] For example, RMS released a set of models in June 2021 for North Atlantic Hurricane, Europe Inland Flood and Europe Windstorm that will allow users to adjust time horizons using the different future climate scenarios (RCPs) (RMS, 2021[22]). AIR Worldwide is examining the potential impacts of different climate scenarios on typhoon, wildfire, hailstorm, and coastal flood losses and has developed future event sets for key exposed regions such as Miami (Florida, United States) (AIR Worldwide, 2021[23]), (Churney, 2021[24]).

Box 2.1. The application of emerging technologies and innovations to natural catastrophe risk assessment

The increasing inventory of higher resolution earth observation, street-level imagery and volunteered geographic information for more parts of the world and the ability to integrate these different data sources through the use of artificial intelligence and other analytical tools has greatly expanded the availability of data on hazard, exposure and vulnerability for potential use in modelling and quantifying potential financial exposures to natural hazards as well as the accuracy of model outcomes:

- Higher-resolution space-based imagery and the capacity to combine that imagery with crowdsourced street-level imagery has filled important gaps in the availability of data on the built and natural environment, including structural characteristics and potential vulnerabilities.
- The expanding time-series of high-quality imagery for past disaster and climate events creates a catalogue of potential events based on the physical parameters and footprints of past events and provides the data necessary to create probabilistic models for various perils.
- Artificial intelligence and machine learning techniques allow modellers to integrate complex factors such as the performance of drainage networks during extreme rainfall events and complex multi-hazard scenarios (such as a flood caused by an earthquake-generated landslide) as well as the potential impacts of a changing climate.

Source: (OECD and ADB, 2020[4])

The new data sources and analytical tools can also make an important contribution to risk reduction and mitigation. One opportunity that has likely not been fully leveraged by governments is the use of the analytic tools developed by the insurance sector and commercial modelling firms for broader risk management purposes (such as land-use planning or building codes, decisions on risk mitigation investments) and the measurement of potential public sector exposures to catastrophe risk (see below).

3 Insurance regulation and supervision

Key takeaways

In many countries, a significant share of economic losses from natural catastrophe, cyber attacks and infectious disease outbreaks are uninsured.

Insurance regulators and supervisors can support broader take-up by requiring insurance companies to **make coverage available** for all relevant catastrophe perils.

New technologies and innovation offer opportunities to reduce the cost of insurance underwriting, claims settlement and distribution and design new products (e.g. parametric insurance).

Access to reinsurance and capital markets can provide an additional layer of absorptive capacity and diversify risks away from the domestic financial system.

Catastrophe risk insurance programmes may offer a potential solution for supporting the availability of affordable of coverage for risks that are difficult to insure or for high-risk policyholders and ultimately reduce public financial exposure.

Insurance markets can play an important role in protecting households, businesses and governments from the financial impacts of catastrophe risks. Households and businesses with an applicable insurance coverage will have access to the funding they need to rebuild damaged property and restore livelihoods when affected by a covered peril. There is growing evidence that, in the case of natural catastrophes at least, countries with higher levels of insurance (and international reinsurance) coverage for catastrophe perils recover more quickly in the aftermath of a catastrophic event.[5]

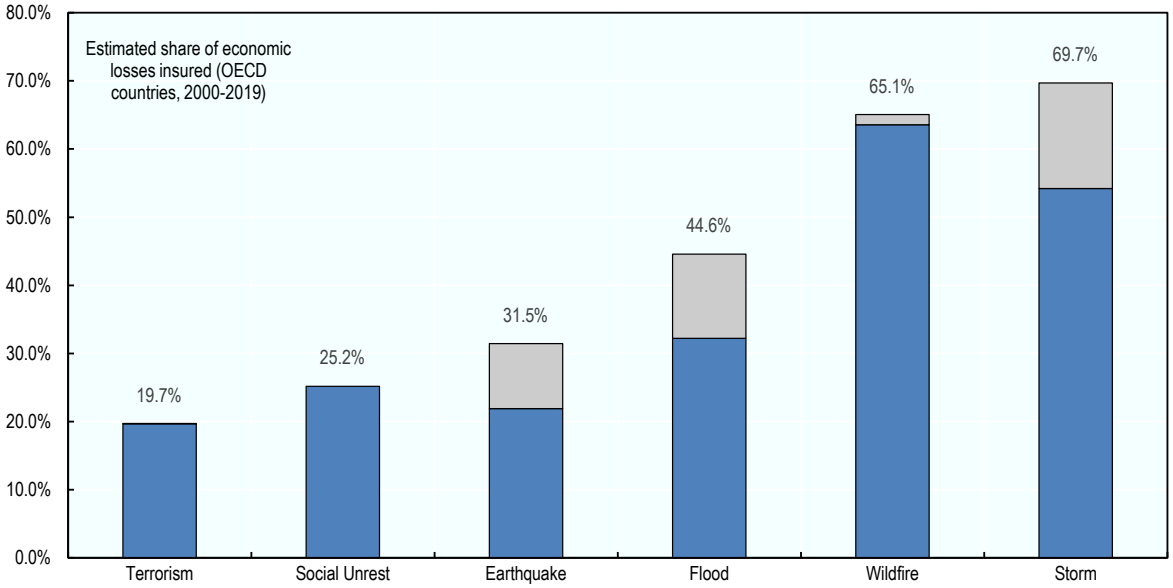
However, levels of insurance protection remain low for many catastrophe risks in many OECD countries. Between 2000 and 2019, approximately 45%-58% of total economic losses from natural catastrophe events (earthquakes, floods, storms and wildfires) and 20% of total economic losses from catastrophic terrorist attacks and social unrest in OECD countries were insured[6] (see Figure 3.1). The share of losses

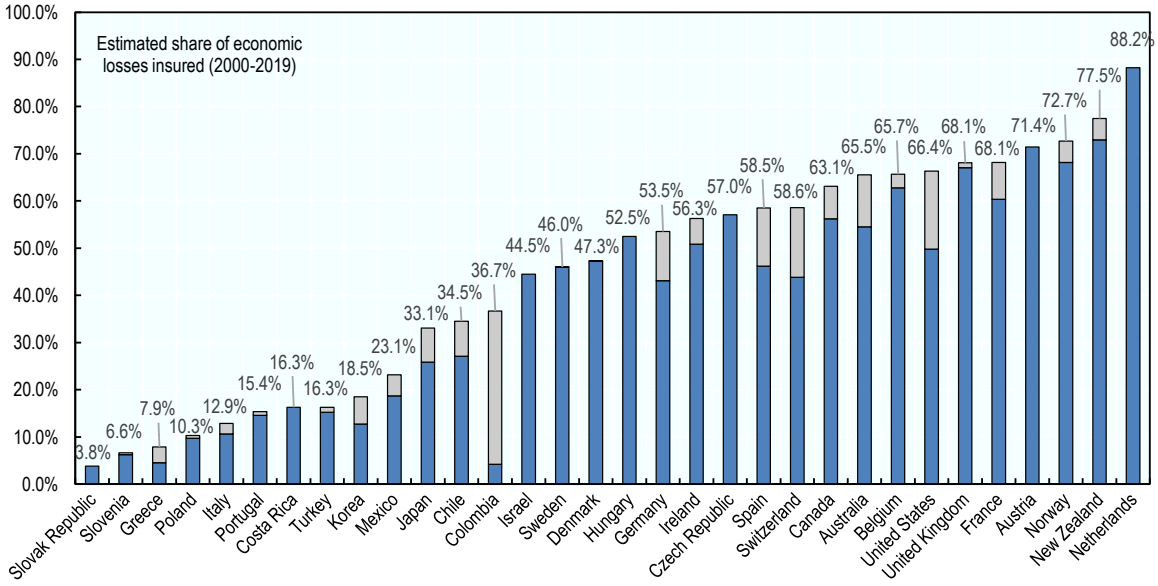
[5] A variety of studies and analyses have demonstrated the benefits of insurance coverage in terms of reducing the economic impacts of catastrophe events (specifically for natural catastrophes). Higher levels of insurance penetration or coverage have been found to reduce (Melecky and Raddatz, 2011[17]) or eliminate (in the case of full insurance) (Von Peter, Von Dahlen and Saxena, 2012[18]) contractions in economic activity after disaster events. A recent study that examined the economic implications of over 100 past disaster events found that countries with higher insurance penetration recover (on average) within 12 months whereas those with lower penetration face average recovery periods of four years (Cambridge Centre for Risk Studies and AXA XL, 2020[19]).

[6] These estimates are based on data provided by Swiss Re's sigma service and Verisk's PCS. Swiss Re's economic loss data includes "all financial losses directly attributable to a major event", including damage to buildings, infrastructure, motor vehicles and other physical assets as well as "business interruption as a direct consequence of the property damage" (Swiss Re Institute, 2021[20]). Insured losses includes non-life insurance losses borne by both private and public insurers gross of any reinsurance, excluding liability. This data is collected from various sources

from cyber attacks and infectious disease outbreaks (business interruption losses) that were insured was likely much lower (see Box 3.2).

Figure 3.1. Estimated share of catastrophe economic losses insured by peril and country





including newspapers, direct insurance and reinsurance periodicals, specialist publications and reports from insurers and reinsurers (Swiss Re Institute, 2021[20]). PCS insured loss data is collected from insurance companies for designated catastrophe events in the markets where it is active and includes losses under personal property, vehicle, and commercial property lines of business (PCS, 2020[21]). The data from Swiss Re includes any event that resulted in insured losses of more than USD 52.7 million, economic losses of more than USD 105.4 million, 20 or more deaths, 50 or more injuries or 2 000 or more people made homeless. The data from PCS includes all events designated as a catastrophe by PCS which is defined as an event with insured losses of more than USD 25 million (United States), CAD 25 million (Canada), TRY 30 million (Turkey), USD 2 billion (Japan) and MXN 300 million (Mexico).

Note: The chart shows two estimates: (i) the share of all economic losses insured (2000-2019 in the case of natural catastrophes and 2000-2016 in the case of terrorism and social unrest); and (ii) the average of the insured share of losses for each individual event. The data label refers to the higher of the two estimates. The data for Japan includes both Japanese private and mutual insurers although data from mutual insurers for individual events (particularly smaller events) is not always available. As a result, some underestimation of insured losses in Japan is possible.
Source: OECD calculations based on data on natural catastrophe and terrorism and social unrest losses provided by Swiss Re and PCS.

Box 3.1. Insurance coverage for cyber and infectious disease outbreak losses

Insurance coverage for cyber risks

The digital transformation of the economy has led to new risks and new insurance coverages to protect against those risks. Cyber risk refers to the broad range of incidents - whether intentional or unintentional, malicious or accidental - that could lead to a compromise of the confidentiality, integrity and/or availability of information and information systems and result in losses to those dependent on that information and those information systems. While most cyber incidents are idiosyncratic, the interconnectedness of digital infrastructure and the potential scalability of cyber-attacks create the potential for cyber catastrophes.

Cyber insurance coverage has been developed to address (some) of these losses, either in stand-alone cyber insurance policies or through expansions to the scope of coverage in other types of property/business interruption or liability policies (sometimes unintentional). While the market has grown rapidly, there remains a significant level of uninsured losses resulting from: (i) low levels of take-up and coverage; and (ii) potentially significant gaps in coverage. Data on insured losses resulting from cyber incidents is not systematically collected. Based on available estimates of insured losses[1] and economic losses[2], the share of cyber losses insured may be as low as 14% (although estimates of the share of losses insured from selected significant events reached 30% to 35%[3]).

Insurance coverage for infectious disease outbreaks

Pandemic, epidemics and other infectious disease outbreaks have long been considered potential catastrophe risks although with much of the focus dedicated to the potential losses in life, health and certain liability lines, such as workers' compensation/employer's liability. However, the experience of the COVID-19 health crisis – and particularly the measures taken by governments around the world to constrain the spread of the virus – has clearly demonstrated the potential for significant economic losses to be incurred for loss types that are normally covered in other lines of business (specifically, business interruption coverage in property insurance policies). The measures put in place to slow the spread of the virus in most countries led to a significant decline in business revenues and important changes in consumer behaviour as potential customers were unwilling or unable to make purchases and many businesses were forced to close altogether in order to be compliant with government requirements.

While subject to ongoing disputes and litigation – many (if not most) property and business interruption insurance policies do not appear to provide coverage for business interruption losses in the context of a pandemic or other infectious disease outbreak. While subject to change based on the outcomes of ongoing claims disputes, estimates of total COVID-19 industry losses related to business interruption claims range from USD 10 billion – USD 20 billion.[4] Based on a one-month revenue loss estimate of USD 1.7 trillion for OECD countries[5], this would suggest a protection gap for pandemic-related business interruption losses related to the COVID-19 crisis of at least 99%.

Note [1] : The US National Association of Insurance Commissioners collects annual data on cyber insurance premiums and claims which can allow for an estimate of insured cyber losses. [2] In the United States, the Federal Bureau of Investigation publishes data on complaints to the Internet Crime Complaint Center (IC3), including the number of reported incidents and estimated losses. [3] For example, the WannaCry and NotPetya attacks of 2017 are estimated to have resulted in more than USD 10 billion in economic losses, of which approximately 30% - 35% were insured (Brew, 2020[5]) . Equifax was covered for approximately USD 125 million of the more than USD 1 billion in losses that it faced as a result of a major data breach. [4] The Geneva Association (Schanz, 2020[6]), based on figures from Willis Towers Watson, estimates total insured business interruption losses of approximately USD 20 billion to USD 40 billion, including event cancellation. Informal discussions with another market participant provided estimates of approximately USD 7 billion to USD 10 billion in business interruption losses worldwide (and USD 7 billion to USD 10 billion in event cancellation losses). [5] OECD estimates as outlined in (OECD, 2021[1]).
Source: (OECD, 2017[7]), (OECD, 2020[8]), (OECD, 2020[9]), (OECD, 2021[10])

The relatively limited insurance coverage of catastrophe losses is likely due to a number of factors that lead to a gap between the cost of insurance coverage and the amount that policyholders are willing to pay for such coverage, including:

- The lower frequency and higher severity of catastrophe events as well as higher levels of correlation of losses across policyholders can make these perils more difficult and costly to insure than other perils (and therefore impact the supply of insurance coverage). There is more limited historical experience on which to base underwriting assessments, leading to more pricing uncertainty. The higher severity of catastrophe events requires insurance companies to hold large reserves and/or capital to cover these losses. The potential for catastrophes to impact many policyholders simultaneously (particularly where catastrophes can affect policyholders across different regions and sectors) reduces the benefits of risk diversification on which the insurance business model is based. This can be particularly challenging in the context of large-scale cyber attacks and global infectious disease outbreaks given the inability to diversify risk geographically.
- The lower frequency of catastrophe events may also limit the willingness of policyholders to pay for insurance coverage of catastrophe perils (i.e. the demand for insurance coverage) as the likelihood of facing losses may seem remote and/or there may be an expectation of government compensation for losses in the event of a low-likelihood catastrophic event.

Insurance regulation and supervision can support the availability, affordability and take-up of insurance for catastrophe risks in a number of ways. The following sections provide some examples of where a conducive insurance regulatory and supervisory framework can support insurance availability, affordability and/or take-up.

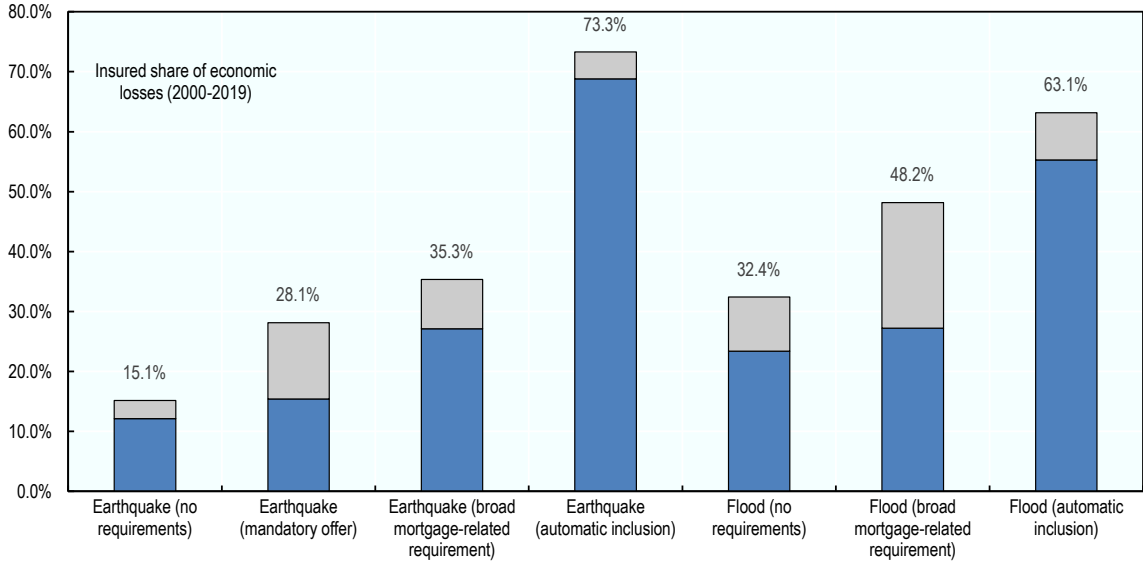
Ensuring availability and encouraging take-up

Given both the demand and supply challenges related to achieving broad insurance coverage for catastrophe perils, efforts should be made to both ensure that insurance companies make coverage for catastrophe perils available (to the extent that private insurance markets have the capacity to provide such coverage)[7] and encourage take-up by policyholders at risk. Insurance regulators or supervisors can ensure availability by requiring insurance companies to make a coverage available for all relevant catastrophe perils (i.e. mandatory offer) and/or encourage take-up by requiring that coverage for relevant catastrophe perils be included with standard property insurance coverage (i.e. automatic inclusion). In some countries, banking regulators require banks to ensure that their borrowers have insurance coverage for relevant catastrophe perils for properties with outstanding mortgages. All of these approaches tend to lead to higher take-up of insurance coverage for catastrophe perils and lower levels of uninsured losses (see Figure 3.2 in the case of flood and earthquake coverage). However, requiring insurance companies to make coverage available for risks that are beyond their capacity to absorb could lead to disruptions in coverage for other perils[8] and have implications for insurer solvency.

[7] Some catastrophe perils, whether due to the magnitude of potential losses or the level of correlation of losses, may not be insurable by private insurance markets or by private insurance markets without public support (as outlined below).

[8] For example, requirements to offer earthquake coverage as part of residential property insurance coverage in California (United States) after the Northridge earthquake in 1994 led some insurers to withdraw from the property insurance market altogether.

Figure 3.2. Insured share of natural catastrophe losses by form of coverage offer



Note: The chart shows two estimates: (i) the share of all economic losses insured (2000-2019); and (ii) the average of the insured share of losses for each individual event. The data label refers to the higher of the two estimates. Information on the form of coverage offer for earthquake and flood insurance is from (OECD, 2016[11]), (OECD, 2018[12]). In the case earthquake: *no requirements* includes Greece, Italy, Mexico and the United States (outside California); *mandatory offer* includes California (United States) and Japan; *broad-mortgage related requirements* includes Chile and Costa Rica; automatic inclusion includes France, New Zealand, Spain and Turkey. In the case flood: *no requirements* includes Australia (storm surge), Canada, Chile, Colombia, Czech Republic, Germany, Greece, Italy, Japan, Mexico, New Zealand, Portugal and Turkey; *broad-mortgage related requirements* includes Ireland and the United States; automatic inclusion includes Australia (rainfall flooding), Belgium, Denmark, France, Poland, Spain, Switzerland and the United Kingdom. The data for Japan includes both Japanese private and mutual insurers although data from mutual insurers for individual events (particularly smaller events) is not always available. As a result, some underestimation of insured losses in Japan is possible.
Source: OECD calculations based on data on natural catastrophe losses provided by Swiss Re and PCS.

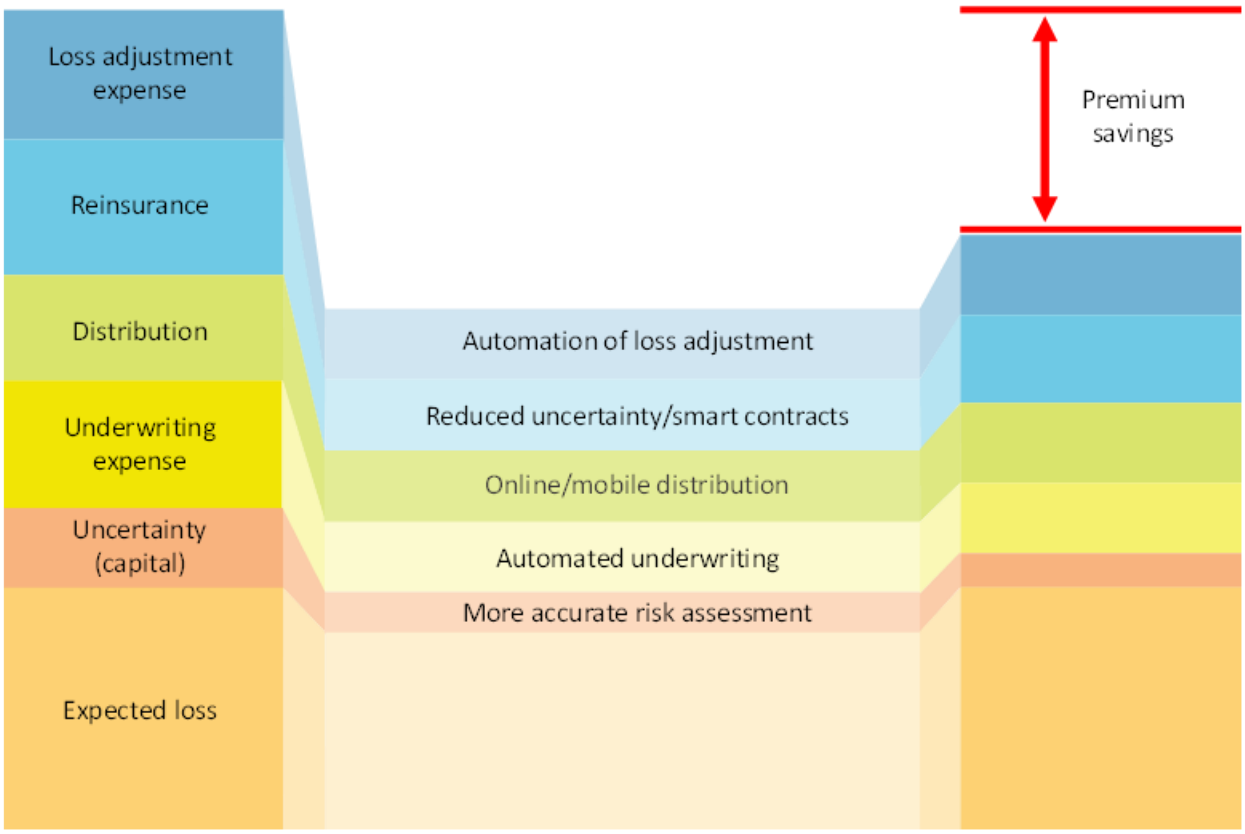
Requiring insurance companies to offer coverage or policyholders to acquire coverage may create challenges for specific perils or properties facing high-levels of risk exposure. For example, the risk-based premium for a home or business located in a high-risk flood zone may be unaffordable for some policyholders. Similarly, insurance companies may not make any property insurance coverage available to policyholders facing high-levels of exposure to a specific peril if required to offer coverage for that peril alongside standard property insurance coverage. In such cases, catastrophe risk insurance programmes may offer a potential solution for supporting the availability of coverage for high-risk policyholders (see below).

Creating an enabling environment for leveraging emerging technologies and innovations

Emerging technologies and innovations may offer opportunities to reduce the cost of providing insurance coverage and therefore expand the availability of coverage offered at a cost that policyholders are willing to pay. The availability of new data sources and analytical tools for risk assessment outlined in Box 2.1 above can also be applied to improve the accuracy and reduce the cost of underwriting insurance coverage (underwriting expenses can account for as much as 20%-25% of gross premium cost). These same

technologies can also be applied to claims settlement and contribute to lowering loss adjustment expenses. Online insurance distribution and innovations such as smart contracts could potentially provide further efficiency gains (see Figure 3.3).

Figure 3.3. Improving the affordability of catastrophe insurance coverage: illustrative example



Source: (OECD and ADB, 2020[4])

The increasing availability of data on hazards, exposure, and vulnerability and the improved ability to analyse this data using big data analytical techniques can provide a basis for developing parametric insurance coverage for more types of risks and with greater accuracy (and therefore less potential for basis risk). Parametric insurance coverage is a type of coverage triggered by the occurrence of an event that meets specific thresholds - often a physical parameter such as water level, wind speed, precipitation amount, or earthquake magnitude - and makes claims payouts of a fixed amount regardless of the amount of damage incurred by the policyholder (unlike indemnity insurance which pays claims based on the amount of damage or loss incurred by each individual policyholder). The main advantage of parametric insurance is its simplicity as the coverage can be underwritten based solely on the probability of an event that meets the thresholds for a payout occurring at a given location and claims payments are made solely on the basis of the occurrence of the triggering event. As a result, underwriting and loss adjustment expenses should be much lower than in the case of indemnity insurance and payouts should be made much more quickly allowing households and businesses to recover much faster. The main disadvantage of parametric insurance is basis risk; i.e., the risk that the coverage is triggered when no loss is incurred or that the policy is not triggered when a loss has occurred (for example, if the specific threshold has not been met).

Harnessing the benefits of technological developments and innovations in insurance underwriting, distribution and claims settlement may require insurance regulators and supervisors to adapt existing regulatory and supervisory frameworks to allow the implementation of new approaches while continuing to ensure that policyholders are sufficiently protected from insurer insolvencies and unfair practices. Some existing practices - such as premium rating oversight, limits on outsourcing, specific requirements related to insurance distribution and regulatory frameworks that impede the offering of parametric coverage - may limit the ability of insurance companies to leverage some of the benefits of integrating emerging technologies and innovations.

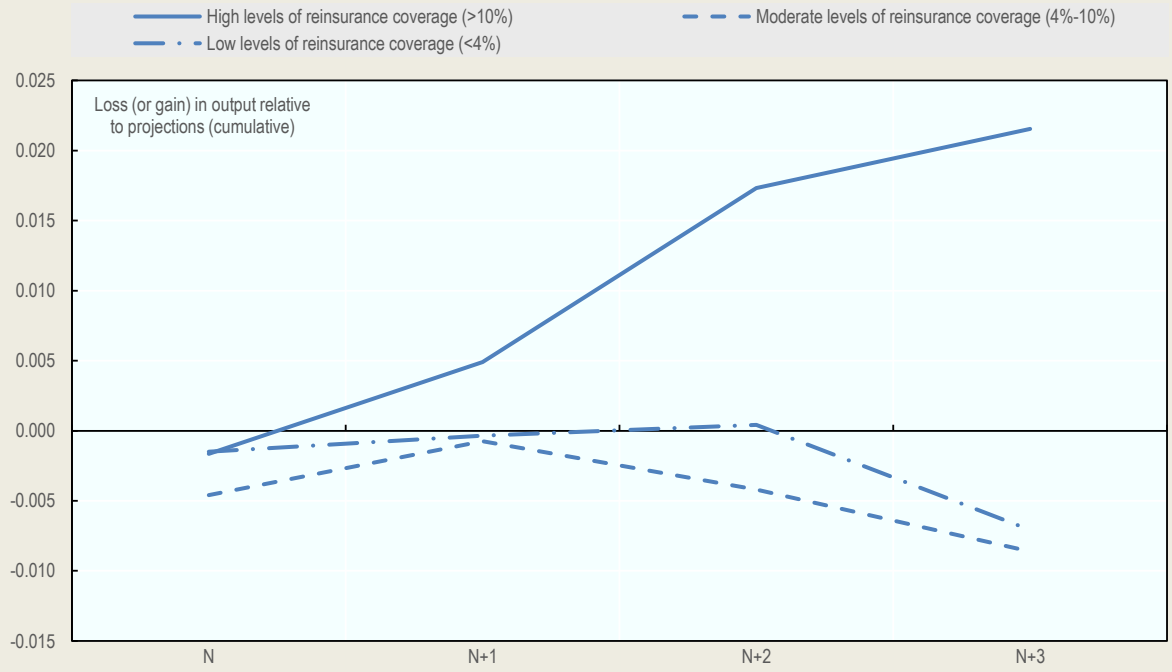
Enabling access to the capacity and expertise of international reinsurance markets

Global reinsurance and capital markets play a critical role in providing an additional layer of risk absorption capacity and diversifying catastrophe risks internationally, allowing for some portion of the losses from a catastrophic event to be absorbed by international markets (and investors) and diversifying the burden away from the domestic financial system. Providing insurance companies with the ability to leverage the capacity of international reinsurance and capital markets while addressing the potential counterparty, execution and liquidity risks that could arise requires the thoughtful development of a regulatory and supervisory framework.

Box 3.2. The contribution of global reinsurance markets to post-catastrophe economic recovery

In 2018, the OECD published an analysis of the role of international reinsurance markets in supporting post-disaster economic recovery. Using a unique set of data on property reinsurance premiums and claims provided by reinsurance companies, the OECD's report examined the impact of reinsurance on reducing the economic disruption in the aftermath of 26 major natural catastrophes (or series of natural catastrophes) that occurred between 2010 and 2016. The report found that, in countries where a relatively high share (10% or more) of economic losses related to the specific event(s) were reinsured, the post-event recovery occurred more quickly and these countries had higher than projected GDP growth in the following three years – while those countries with lower levels of reinsurance coverage struggled to recover and faced a cumulative loss in output relative to pre-event projections.

Figure 3.4. The contribution of reinsurance to post-catastrophe economic recovery



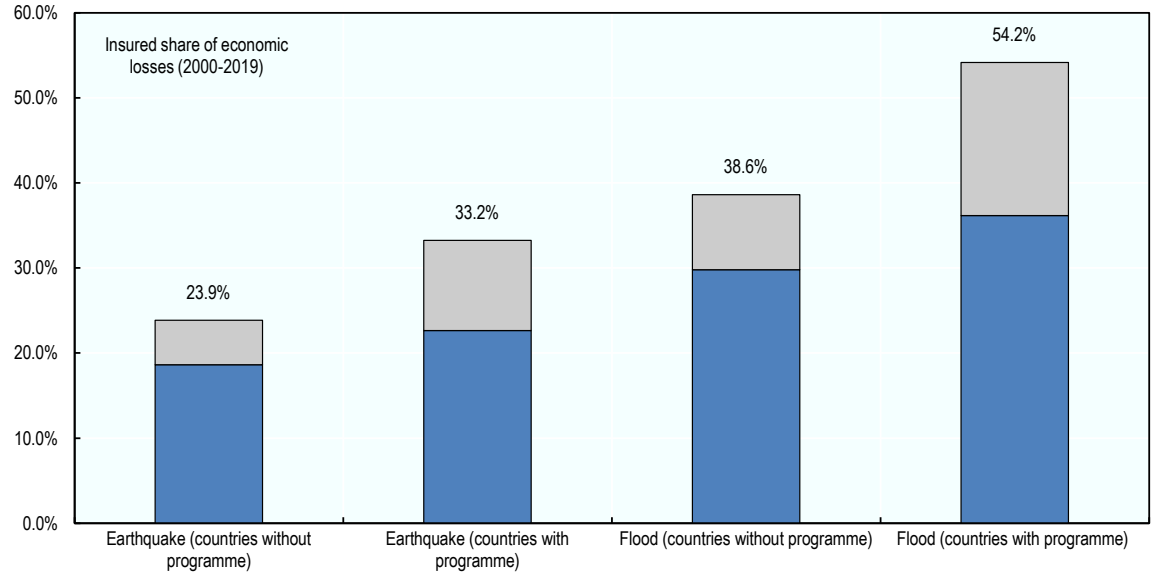
Source: (OECD, 2018[13])

A number of countries impose various restrictions on the transfer of risk to reinsurance markets (and, particularly, for cross-border risk transfer), normally (but not always) aimed at ensuring that counterparty and execution risks are appropriately managed. Some of these requirements may be creating other risks to cedants and the broader economy by concentrating risk domestically and limiting the ability of cedants to fully capitalise on the benefits of risk transfer to reinsurance and capital markets. Ultimately, greater access to international reinsurance and capital markets may be necessary to provide insurance companies with the reinsurance capacity that they need to properly manage growing exposure to catastrophe risks.

Establishing catastrophe risk insurance programmes to address insurability challenges

In many countries, catastrophe risk insurance programmes have been established to address some of the insurability challenges presented by catastrophe perils, particularly natural catastrophes and terrorism (the potential contribution of such programmes to addressing insurability challenges for perils such as cyber and infectious disease outbreaks remains uncertain). The design of these programmes differs in a number of ways, including in terms of the types of insurance coverage that is offered, the scope of perils and policyholders covered, the programme's role in the larger market and the pricing structures applied in premium-setting. They also involve different levels of loss sharing across the insurance and reinsurance sector, and with governments. Overall, these programmes appear to have supported broader levels of insurance coverage for catastrophe perils than in countries without such programmes (particularly for earthquakes and floods) (see Figure 3.5). They may make a particularly significant contribution in countries where property insurance penetration levels are relatively low and where catastrophe exposure is relatively high.

Figure 3.5. The role of catastrophe risk insurance programmes in broadening insurance coverage



Note: The chart shows two estimates: (i) the share of all economic losses insured (2000-2019); and (ii) the average of the insured share of losses for each individual event. The data label refers to the higher of the two estimates. The information on whether a relevant catastrophe risk insurance programme is in place is from (OECD, 2021[1]). In the case of earthquake: *countries without programme* includes Chile, Costa Rica, Greece, Italy, Korea, Mexico, United States (outside California); *countries with programme* includes France, Japan, New Zealand, Spain, Turkey, California (United States). In the case of flood: *countries without programme* includes Australia, Belgium, Canada, Chile, Czech Republic, Germany, Greece, Ireland, Italy, Japan, Korea, Mexico, New Zealand (as EQC does not cover flood damage to buildings), Poland, Portugal, Slovak Republic, Slovenia, Turkey and the United Kingdom (pre-Flood Re); *countries with programme* includes Denmark, France, Spain, Switzerland, United Kingdom, (post-Flood Re) and the United States. The data for Japan includes both Japanese private and mutual insurers although data from mutual insurers for individual events (particularly smaller events) is not always available. As a result, some underestimation of insured losses in Japan is possible.
Source: OECD calculations based on data on natural catastrophe losses provided by Swiss Re and PCS.

Box 3.3. Designing a catastrophe risk insurance programme

Different programme design features have different impacts on supporting the availability and affordability of coverage, limiting public exposure to catastrophe losses and encouraging risk reduction. Careful consideration needs to be given to the potential trade-offs inherent in different approaches to programme design:

- Approaches designed to ensure coverage availability do not always result in broad coverage as policyholders may underestimate the risk of losses or have an expectation of government financial support should a large catastrophe occur and therefore do not acquire the available insurance coverage.
- Efforts to support affordability through cross-subsidisation between policyholders can blunt incentives for risk reduction and can raise issues of fairness if cross-subsidies benefit wealthier policyholders that could afford to pay higher premiums, although some mutualisation may be necessary for some risks to become insurable.
- Subsidisation of the aggregate cost of programme coverage can put taxpayers at risk and might raise competition concerns if the coverage provided by catastrophe risk insurance programmes competes directly with coverage provided by private insurers or reinsurers.
- Limiting the scope or amount of coverage provided by a catastrophe risk insurance programme to specific perils or policyholders can reduce public sector exposure although may lead to gaps in coverage and can also reduce the ability of the programme to benefit from diversification.
- Catastrophe risk insurance programmes can play an important role in developing modelling and risk analytics tools – particularly for perils that have not traditionally created significant exposure for private insurers or reinsurers – although limiting private sector involvement in the assumption of risk could hamper the development of private sector models and analytics.
- Catastrophe risk insurance programmes can provide a source of expertise and funding to support risk reduction although their capacity to contribute will depend on the scope of the coverage that they provide (and the amount of premiums that they collect).

Source: (OECD, 2021[1])

4 Public financial management

Key takeaways

Governments face a number of **expenses and losses** in the aftermath of catastrophe events.

Very few governments systematically **quanitfy their exposure** to disaster-related contingent liabilities.

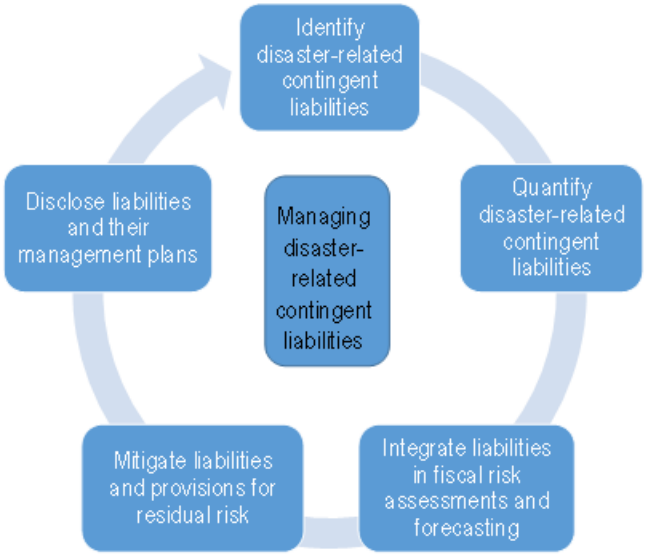
Governments should take an **integrated approach to the management of catastrophe risks** that assesses the most cost-effective way to manage their exposures, whether through investments in risk reduction or the transfer of risk to insurance markets.

Governments (and public finances) are equally exposed to expenses and losses from catastrophe risks, both as a result of damages to publicly-owned buildings and infrastructure as well as due to their role as safety net provider (or insurer of last resort) where catastrophes lead to high-levels of uninsured losses and financial stress on businesses and households unable to absorb those losses. The potential contingent liabilities of governments may be explicit (i.e. obligations that are based on government contracts, legislation or clear policy commitments) or implicit (i.e. expenditures in response to a disaster, whether due to political pressure or attempts to support economic recovery, that go beyond any *ex ante* government spending commitments). An OECD/World Bank analysis of fiscal resilience to natural catastrophes found that annual government spending in response to natural disasters ranged from 3%-4% of annual economic losses in Colombia to over 38% of annual economic losses in Japan (OECD and World Bank, 2019[14]).[9]

However, very few governments have put in place processes to quantify their potential exposures to disaster-related contingent liabilities, particularly in the case of the implicit liabilities that tend to arise in the aftermath of extreme events where limited insurance coverage had been acquired. A key challenge – particularly in countries with decentralised systems of governance - has been to identify potential needs for central government financial support for sub-national governments. As a result, catastrophes remain a potential risk to fiscal resilience. The OECD and World Bank have proposed a framework for managing disaster-related contingent liabilities within public finance frameworks involving the identification and quantification of potential public finance exposures and the implementation of measures to mitigate those risks and manage remaining residual risks (see Figure 4.1).

[9] Annual government spending in response to disasters was estimated to be 9% of economic losses in Australia and 11.7% in Mexico. Data was not available for the other countries covered in the study.

Figure 4.1. Managing disaster-related contingent liabilities within public finance frameworks



Source: (OECD and World Bank, 2019[14])

Ultimately, governments should ensure that all segments of society exposed to catastrophe risks (households, businesses and sub-national governments) have appropriate incentives to manage their own exposures, including through risk reduction and risk transfer to insurance markets. When central governments provide high levels of *ex post* financial support for losses incurred by households, businesses and/or sub-national governments that could have been insured or avoided through proper risk management, incentives to manage or protect against these risks in the future are likely to be reduced. Governments at all levels should take an integrated approach to the management of catastrophe risks that assesses the most cost-effective way to manage their exposures, whether through investments in risk reduction or the transfer of risk to insurance markets. Well-targeted investments in risk reduction will reduce damage and losses and support the availability of affordable insurance coverage which should reduce the financial pressure on governments to provide financial support for the uninsured losses of vulnerable segments of society.

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