Fiscal Resilience to Natural Disasters

LESSONS FROM COUNTRY EXPERIENCES

OECD

WORLD BANK GROUP

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Please cite this publication as:
OECD/The World Bank (2019), *Fiscal Resilience to Natural Disasters: Lessons from Country Experiences*, OECD Publishing, Paris, *https://doi.org/10.1787/27a4198a-en*.

ISBN 978-92-64-53700-2 (print)
ISBN 978-92-64-96944-5 (pdf)

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Foreword

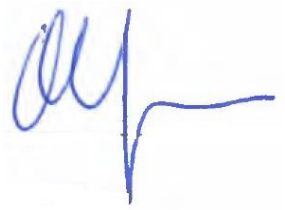
The international debate on strengthening the financial resilience to disasters is more front and center than ever before. Recurring hurricanes and floods, large-scale devastating wildfires and massive earthquakes are costing lives and create a significant negative impact on people's well-being and economic development.

This joint report by the OECD and the World Bank takes stock of how a sample of governments in OECD and non-OECD countries manage the implications of natural disasters for public finances. The findings of this joint work were presented to Finance Ministers as part of the Asia-Pacific Economic Cooperation (APEC) Finance Ministers' Meeting in Port Moresby, Papua New Guinea in October 2018. Yet many countries are still struggling with the challenge of developing more effective financial instruments to counter the economic impact and strengthen financial resilience to natural disasters. Disasters simultaneously affect the government balance sheet from two sides. In their efforts to contain negative impacts on social and economic welfare, governments have often assumed the lion's share of recovery and reconstruction costs. At the same time, disasters can also reduce government revenues due to disruption in economic activities. *Boosting Fiscal Resilience: Managing Disaster-Related Contingent Liabilities in Public Finance Frameworks* makes the case for how integrating disaster and climate risk in fiscal planning and budgeting frameworks in advance helps make countries more financially resilient.

This report - jointly prepared by teams in the OECD's Public Governance Directorate and by the World Bank Group's Disaster Risk Financing and Insurance Program under the Finance, Competitiveness, and Innovation Global Practice - draws on a set of nine in-depth case studies, completed through a survey gathering views directly from policy makes in all countries. At the OECD, this work was carried out in co-operation with the OECD High Level Risk Forum and the Working Party of Senior Budget Officials. The report also drew on the OECD's 2014 Recommendation on the Governance of Critical Risks and the 2017 Recommendation on Disaster Risk Financing Strategies. At the World Bank, this work is contributing to a growing institution-wide focus on better risk management, including a large and growing lending portfolio of supporting countries in improved risk management, the Global Crisis Risk Platform, the Climate Change Action Plan, and the newly established Global Risk Financing Facility.

Findings of the country cases confirm that for many countries, the rehabilitation of damaged public assets is one of the largest drivers of disaster-related contingent liabilities. Central government support to local governments, often ad hoc and unplanned, can create large implicit contingent liabilities. The research and analysis in this report will support government officials with practical lessons and insights in more proactively managing these liabilities. Despite efforts to set clear rules for assistance and compensation for losses, disaster-related liabilities tend to rise beyond what many governments have committed to pay, especially when extreme events occur. The capacity of governments to assess and quantify the expected expenditure, creating conditions that support resilience, sound fiscal planning, and pre-arranging financial mechanism to cost-efficiently meet losses that cannot be reduced, determines the experience of governments when faced with a shock.

This report will be of interest to public officials, financial planners, disaster risk specialists, business communities and a general public that consider the inclusion of disaster-related contingent liabilities in fiscal planning, strengthening public and private finance strategies and increasing the transparency, and reliability of the fiscal outlook.



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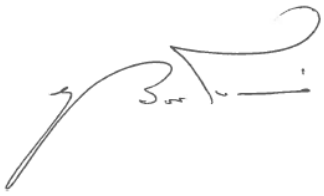

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Acknowledgements

This report was jointly prepared by the Organisation for Economic Co-operation and Development (OECD) and the World Bank under a project to assess the progress, achievements and existing challenges in understanding and managing contingent liabilities for governments stemming from disasters.

The project was carried out by the High Level Risk Forum Secretariat in the OECD Public Governance Directorate led by Marcos Bonturi in cooperation with the World Bank's Disaster Risk Financing and Insurance Program part of the Finance, Competitiveness, and Innovation Global Practice. The project was led by Cathérine Désirée Gamper (OECD) and Benedikt Signer (World Bank) under the guidance of Stéphane Jacobzone (OECD) and Oliver Mahul (World Bank). Contributions were received from Teresa Deubelli (OECD), Luis Alton (World Bank) and Juan Martinez (external consultant). Murray Petrie (external consultant) contributed to the development of the conceptual framework that led to the development of the case studies. Charlie Benson (Asian Development Bank) provided comments on the conceptual framework. Editorial support was provided Anne Himmelfarb, Randy Holden and Andrea Uhrhammer; Liv Gaunt and Raquel Paramo prepared the report for publication.

The team gratefully acknowledges input from Cigdem Aslan, Samantha Cook, Alfonso Garcia Mora, Hideaki Hamada, Samuel Munzele Maimbo and Abha Prasad from the World Bank, and Jon Blondal, Delphine Moretti, Masayuki Omote, Jack Radisch, Doug Sutherland and Leigh Wolfrom from the OECD.

The authors are grateful for contributions from the following colleagues: Anne Martin, Geoff Painton (Australia); Jennifer Arena, Angela Dong, Bill Matthews (Canada); Margarita Arías, Yenifer Alejandra Barragan Rojas, Andres Quevedo (Colombia); María del Pilar Garrido Gonzalo, Daniel Soto Castro, Adrián Moreira Muñóz (Costa Rica); Louis Boillot, Laurent Guérin (France); Shun Sakata, Setsuko Saya (Japan); Maya Camacho, Fernando Galindo Favela, Oscar Silva López (Mexico); Jessica Gonzales Vildoso, Jose Alfredo La Rosa Basurco (Peru) and Matthew Appleby and Sarah-Jayne McCurrach (New Zealand).

Findings and policy lessons from this report were presented at the Asia-Pacific Economic Cooperation (APEC) finance minister's meetings in 2017 and 2018.

The project was carried out from June 2016 to October 2018 and benefitted from financial support from Switzerland's State Secretariat for Economic Affairs (SECO) through the World Bank-SECO Single-Donor Trust Fund on Disaster Risk Financing and Insurance for Middle-Income Countries.

Acronyms and abbreviations

AF	Adaptation Fund (Colombia)
AGDRA	Australian Government Disaster Recovery Allowance
AGDRP	Australian Government Disaster Recovery Payment
APEC	Asia-Pacific Economic Cooperation
BEFU	Budget Economic and Fiscal Update (New Zealand)
CAT DDO	Catastrophe Deferred Drawdown Option
CATNAT	Catastrophes Naturelles (France)
CDD	Canadian Disaster Database
CDEM	Civil Defence Emergency Management (New Zealand)
CNE	National Commission for Risk Prevention and Emergency Response (Costa Rica)
CONAGUA	National Water Commission (Mexico)
CRA	Canada Revenue Agency
DFAA	Disaster Financial Assistance Arrangements (Canada)
EMAP	Emergency Management Assistance Program (Canada)
EQC	Earthquake Commission (New Zealand)
FNE	National Emergency Fund (Costa Rica)
FONDEN	Fund for Natural Disasters (Mexico)
FONDES	Fund for Interventions to Face Natural Disasters (Peru)
FONIPREL	Promotion Fund for Regional and Local Public Investment (Peru)
FOPREDEN	Fund for Disaster Prevention (Mexico)
FSF	Fiscal Stabilisation Fund (Peru)
FSOM	Relief Fund for Overseas Territories (France)
GDP	Gross Domestic Product

IBC	Insurance Bureau of Canada
IDB	Inter-American Development Bank
INDECI	National Civil Defence Institute (Peru)
INS	National Insurance Institute (Costa Rica)
JER	Japan Earthquake Reinsurance
MCDEM	Ministry of Civil Defence and Emergency Management (New Zealand)
MEF	Ministry of Economy and Finance (Peru)
METI	Ministry of Economy, Trade and Industry (Japan)
MHLW	Ministry of Health, Labour and Welfare (Japan)
MIDEPLAN	Ministry of Economic Policy and National Planning (Costa Rica)
MLIT	Ministry of Land, Infrastructure, Transport and Tourism (Japan)
MMF	Multiannual Macroeconomic Framework (Peru)
NDMP	National Disaster Mitigation Program (Canada)
NDRRA	Natural Disaster Relief and Recovery Arrangements (Australia)
OECD	Organisation for Economic Co-operation and Development
PCD	Public Credit Directorate (Costa Rica)
PLP	Prudential Liquidity Plan
PPP	Public-Private Partnership
SECO	Switzerland's State Secretariat for Economic Affairs
SEGOB	Ministry of Interior (Mexico)
SINAGERD	National Disaster Risk Management System (Peru)
SMEs	Small and Medium Enterprises
SNG	Subnational Government
UNGRD	National Unit for Disaster Risk Management (Colombia)
US	United States

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Executive Summary

Natural disasters cause widespread damage and losses and fast growing economies are particularly exposed. Rapid and unplanned economic development increase vulnerability and exposure to natural disasters, while climate change could exacerbate the intensity and frequency of major meteorological disasters.

Governments shoulder a significant share of the costs of disasters. This is true in OECD economies and even more so in developing economies, where private insurance markets are not as well developed.

The fiscal impact of disasters on a government's budget can be sizeable. Major disasters, or a number of smaller events in a short timeframe, can result in significant government expenditure with potentially negative impacts on revenues. This can cause deviations from previously forecast fiscal outcomes leading (for example) to an increase in public debt. Depending on the level of these impacts, this can create a fiscal risk to government finances.

Expenditures for governments arise from both explicit and implicit commitments to compensate for disaster losses. Explicit commitments (or explicit contingent liabilities) are payment obligations based on contracts, laws, or clear policyies. Implicit contingent liabilities, by contrast, are expenditures governments make in response to a disaster due to moral expectations, political pressure or in an attempt to speed up recovery. Implicit contingent liabilities are harder to identify and quantify, and hence harder to manage.

This report presents the results of a study that compares governments' practices in the management of the financial implications of disasters for a set of OECD member and partner economies.

Key findings

Explicit commitments by governments to provide post disaster financial assistance vary widely. In some economies legal frameworks and policies clearly stipulate what central governments finance in terms of post disaster costs, while in others governments make a more general commitment to provide financial assistance, but without being specific.

Damage to public assets, such as public buildings and infrastructure is the largest disaster-related liability for central governments. Publicly owned buildings and infrastructure make up the majority of disaster costs incurred by central governments. To better control the level of these costs several governments have implemented measures such as asset registries, which allow for better monitoring of asset exposure, and public asset insurance, which reduces their liabilities in the event of a disaster.

The liabilities most difficult to control for central governments are those that stem from damages to assets and infrastructure owned by subnational governments. These damages become a central government liability where rules about the responsibility for associated costs are unclear or where financial capacity constraints at subnational level lead central governments to assume responsibility for these costs. To limit these liabilities, a number of

governments have implemented clear rules for sharing costs between levels of government for disaster damages. To further minimise such costs some central governments have strengthened incentive mechanisms, for example through co-financing agreements, to encourage subnational governments to invest in reducing their assets' vulnerabilities.

Governments have actively implemented rules limiting financial support for disaster damages incurred by state-owned enterprises. Most, but not all, governments have established rules obliging state-owned enterprises to manage exposure to disasters on their own, by purchasing insurance or creating the necessary emergency reserves.

Various measures are financed by central governments to provide post-disaster assistance for individual households. All studied governments provide immediate relief assistance to households, such as temporary shelter or food, without reference to household income. Additional support for the rehabilitation or reconstruction of houses is provided by some governments, while many make such aid dependent on the household's income.

Governments have supported post disaster assistance for businesses to limit the prolonged negative economic impact of disasters. This includes safety-net programs, such as interest-free loans, to help balance temporary cash-flow problems and avoid potential business closures.

The share of implicit disaster-related contingent liabilities rises when extreme events occur. Implicit liabilities tend to be higher still for governments that have made limited or vague commitments about what they are going to pay for prior to a disaster. Such liabilities arise in the form of an ad-hoc expansion of rules for financial assistance defined prior to a disaster. They tend to increase when political pressure to assist is high or when there is a risk for prolonged economic suffering.

Systematic quantification of disaster-related contingent liabilities remains limited despite significant information available to estimate their overall size. The case studies show that governments have significant information on the sources and potential level of disaster-related contingent liabilities. This information, however, is often stored in a scattered way and rarely collated to support financial planning.

Governments acknowledge the value of incorporating disaster-related contingent liabilities in fiscal risk assessments, however, in practice governments do not often take this step. Most governments do not count disaster-related contingent liabilities as part of fiscal risks or government liabilities. Some governments report such liabilities in a qualitative reference in their budget statements, while others point to a specific number, such as is the case for government-backed disaster insurances.

Policy recommendations

- ***Design clear framework rules for a government's post-disaster financial assistance***. Rules that are too general or too ambiguous make it difficult to control, and will fail to limit, government expenditures in the event of a disaster. Compensation rules could be regularly assessed and revised especially when financial outlays for the government continuously rise.
- ***Establish clear cost sharing mechanisms across levels of government***. Make explicit the central government commitments for providing financial assistance to subnational levels. A ceiling for such assistance along with clear cost sharing formulas between the central and subnational governments could help to control and limit overall central government costs.

- ***Include the assessment of disaster-related contingent liabilities in fiscal risk management frameworks***. Even where the impact of disaster-related contingent liabilities on a government's fiscal risk position can be reasonably expected to be limited, including them in the assessment process raises visibility and thereby increases effectiveness in public financial planning. It also often spurs a more whole of government focus on building resilience to climate and disaster shocks, including to reduce risks in the first place.
- ***Make risk reduction part of the framework conditions for co-financing disaster risk management measures***. Governments can boost the resilience of businesses and households cost-effectively by raising awareness about the risks and the role they have in ensuring their own resilience. Governments can also help improve framework conditions to increase access to and take-up of risk transfer instruments, such as business continuity or household insurance. To avoid paying for preventable damage repeatedly over time, governments may consider incentive mechanisms to sectoral government agencies, subnational governments and private stakeholders that provide higher damage reimbursement rates where measures are included to reduce future risks.
- ***Manage remaining fiscal risk through multi-pronged financial protection strategies***. Financial protection strategies secure optimal access to post disaster financing. Such strategies ideally take a risk-layering approach combining different financial instruments from budgetary measures, contingent credit facilities to risk transfer instruments, making sure each instrument matches the funding needs during different phases of disaster response. Effective strategies lay out processes to mobilise resources effectively in the event of a disaster and ensure they reach beneficiaries rapidly and appropriately.

Introduction

Large-scale catastrophic and smaller recurrent disasters[1] generate considerable economic losses. Over the past 30 years, damages from major disasters have increased significantly. In the last ten years alone, both high-income and fast-growing middle-income economies have experienced an estimated USD 1.2 trillion in economic costs from disruptive shocks due to hazards such as storms or floods (OECD, 2014a). Single shocks, such as recent earthquakes in New Zealand and Chile, have caused damages in excess of 20% of gross domestic product (GDP), with local economies and populations disproportionately affected. Disasters also take a tragic toll on development and poverty reduction by forcing an estimated 26 million people into poverty every year (Hallegatte et al., 2017).

The costs of disasters are often largely shouldered by governments, particularly where insurance coverage for these costs is limited (OECD, 2012). Often governments are not only responsible for the costs related to restoring public assets and services, but are also asked to provide financing for other explicit and implicit commitments made prior to a disaster. The costs that disasters impose on governments, and ultimately on taxpayers should be considered contingent liabilities or, when disasters lead to reductions in public revenues, contingent revenue losses. These expenses and revenue losses arise only if an uncertain event, such as a disaster, actually happens.

Disaster-related contingent liabilities are one type of government contingent liability. Other government liabilities stem (for example) from state guarantees or are related to off-balance public private partnerships (PPPs). The key difference that marks disaster-related contingent liabilities is the uncertain intensity and frequency of disasters in any given fiscal year, and hence the difficulty of carrying out adequate financial planning.

Unclear rules on "who pays for what" following a disaster may not only lead to delays in disaster response; they may also create larger costs for the government that can cause major budget volatility when they materialise. In recent years, disasters have hit some middle- and high-income economies in times of increasing public debt, making a challenging situation worse.

Financial planning for disasters helps governments shift their role from emergency borrowers to effective risk managers, and helps match potential liabilities with appropriate financial resources. Nevertheless, ad hoc arrangements still characterise many official approaches to meeting the costs of disasters. Japan, for example, had to rely on ad hoc post-disaster borrowing after the 2011 Great East Japan Earthquake (Mahul, Benson and Boudreau, 2013). But a growing number of governments have started to develop and implement financial protection strategies that help smooth fiscal shocks and avoid disruption of longer-term economic growth and fiscal objectives.

This report presents the findings of a comparative study that assesses how effectively governments manage disaster-related contingent liabilities, and the potential fiscal risks arising from them, within public finance frameworks. The report documents and compares the policies and practices of a set of nine selected middle- and high-income economies

(Australia, Canada, Colombia, Costa Rica, France, Japan, Mexico, New Zealand and Peru), focusing on their response to and plans for disasters from a public financial perspective. Economies were selected on the basis of their exposure to and regular experience of natural disasters, and with the aim of including economies of different sizes and fiscal capacity. The nine detailed case studies are included as part 2 of the report.

Part 1 of the report first describes the economic impacts, and more specifically the fiscal impacts, arising from disasters in the selected economies (chapter 1). It then assesses and compares governments' approaches to identifying and managing disaster-related contingent liabilities in the context of public finance frameworks and related fiscal risk assessments (chapter 2). Finally, it compares their strategies for mitigating or reducing their financial exposure, such as through risk reduction policies and investments, and also highlights good practices and makes policy recommendations for effective public financial planning for disasters (chapter 3).

In addition to documenting good practices, this report seeks to inform the implementation of existing guidance issued by the World Bank and the Organisation for Economic Co-operation and Development (OECD):

- It provides lessons learned from middle- and high-income economies to inform the implementation of the World Bank operational framework for disaster risk finance (Mahul et al., 2014).
- It complements a study documenting the experience of G20 economies in risk assessment and risk financing (Government of Mexico and World Bank, 2012).
- It complements a World Bank study assessing evidence on the development impact of disaster risk finance (World Bank Group, 2016).
- It complements World Bank recommendations for increasing the effectiveness of sovereign climate and disaster risk pooling by providing examples of how governments integrate specific financial instruments in a broader public financial management framework (World Bank Group, 2017).
- It supports the implementation of the OECD Council Recommendation on the Governance of Critical Risks (OECD, 2014b), which includes the recommendation that governments "plan for contingent liabilities within clear public finance frameworks by enhancing efforts to minimise the impact that critical risks may have on public finances and the fiscal position of an economy".
- It supports the implementation of the OECD Council Recommendation on Disaster Risk Financing Strategies (OECD, 2017), which includes the recommendation that governments "manage the financial impacts of disasters on public finances" by evaluating exposures and developing plans for managing them.

Finally, the report also aims to support one of the key objectives of the Asia-Pacific Economic Cooperation (APEC) Cebu Action Plan, which is to enhance the region's financial resilience to disasters and improve its financial response to disasters through innovative disaster risk financing mechanisms that reduce the potential fiscal burden arising from disasters (APEC, 2015a; 2015b).

Notes

[1] In the remainder of this document, the term "disasters" refers to disasters resulting from natural hazards and excludes any other type of disaster.

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Part I: Synthesis

Chapter 1. Understanding the economic and fiscal impacts of disasters

This chapter provides an overview of the economic and fiscal impacts of large-scale catastrophic and smaller recurrent natural disasters, in particular in high- and higher-middle-income economies. It shows that the costs caused by disasters are often and to a significant extent shouldered by governments, which are asked to provide financing for both explicit and implicit commitments related to disaster response. This role for government can have important fiscal implications in governments' budgets and can also prolong negative economic impacts if not managed adequately ex ante.

The economic impacts of disasters: Disaster losses and damages on the rise

In high- and middle-income economies, the number of recorded disaster events has shown a tendency to increase over the last 30 years, although in the past few years it has decreased. It is expected that climate change will drive the intensity and frequency of meteorological disasters, including extreme temperatures, storms and floods, in the future (Banholzer, Kossin and Donner, 2014), whereas geophysical events are not subject to a specific trend. Disaster-related damages and losses (defined in box 2.1) have similarly been increasing, albeit with considerable year-to-year variation and largely as a result of increased vulnerability driven by economic development that has not taken risk into account. In the last decade, high- and higher-middle-income economies have experienced an estimated USD 1.2 trillion in damages from disasters stemming from natural hazards such as storms or earthquakes (OECD, 2014a). Figure 1.1 shows the increasing share of disaster losses from natural hazards suffered by fast-growing middle-income economies over the period 1990–2012. These economies are marked by a rapid growth of assets through urbanisation and construction of new infrastructure (Mahul et al., 2014a).

Box 1.1. The economic impact of disasters: Damages and losses defined

In the literature on disasters and their economic impact, the same terms are often used to denote different things, or conversely, the same thing is denoted by different terms. This report uses the following definitions of damages and losses when discussing the economic effects of disasters:

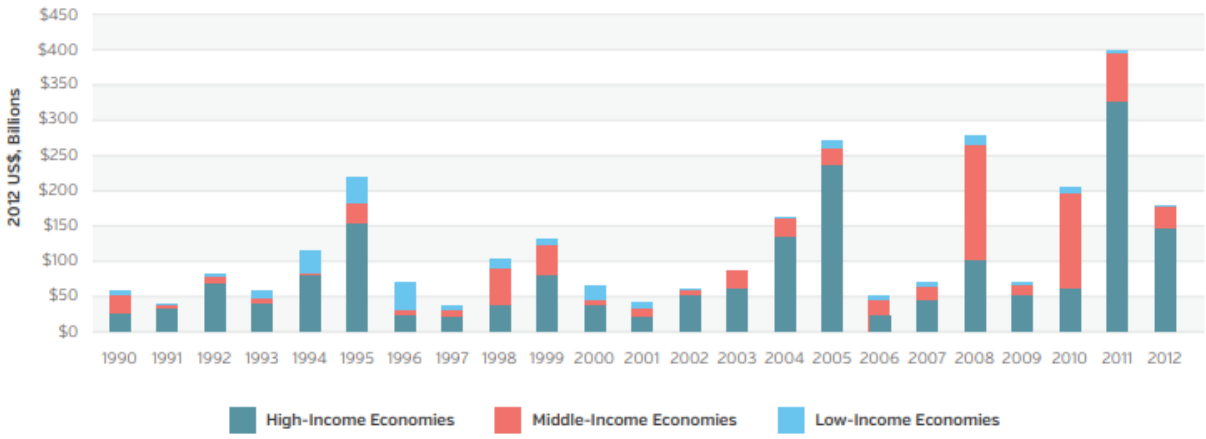
Damage is the replacement value of physical assets wholly or partly destroyed, built to the same standards that prevailed prior to the disaster.

Losses are the foregone economic flows resulting from the temporary absence of the damaged assets and/or due to any other disruption of economic activity caused by the disaster.

Source: GFDRR, 2017.

The impact of a disaster on human lives, livelihoods and infrastructure is the result of three parameters, namely the natural hazard, the vulnerability and the exposure of people and assets[1].

Figure 1.1. Direct disaster loss by income group, 1990–2012



Source: World Bank Group (2014). Financial Protection against Disasters. An Operational Framework for Disaster Risk Financing and Insurance. https://www.gfdrr.org/sites/gfdrr/files/publication/Financial%20Protection%20Against%20Natural%20Disasters.pdf

Inverse relation of disaster impacts to income

The aggregate impact of disasters on economic growth is complex to measure and depends on a number of factors. Concerning aggregate growth, most studies find a negative relationship between the occurrence of disasters and economic growth in the medium to long run. For example, von Peter, von Dahlen and Saxena (2012), using data from Munich Re's NatCat Service for 2,476 major natural catastrophes since 1960, found that the average disaster leads to a fall in growth of 1% of gross domestic product (GDP) upon impact and a cumulative loss to GDP of 2.6%. In another study, Felbermayr and Gröschl (2014) found that disasters can reduce per capita GDP by up to 6.8% on impact.

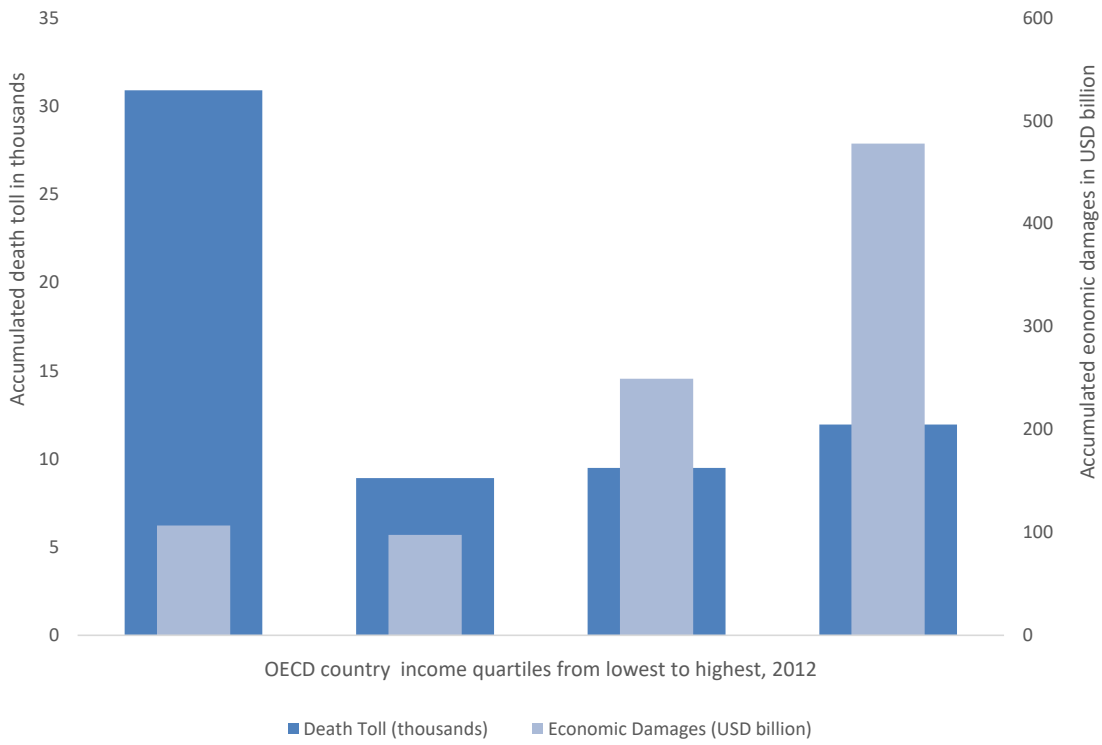
Disaster impacts are inversely related to income and an economy's size. Organisation for Economic Co-operation and Development (OECD) economies with lower GDP per capita suffer relatively more fatalities, while those with higher GDP per capita experience larger absolute costs but lower costs as a percentage of GDP, reducing their relative economic impact (Figure 1.2). Among OECD economies, the United States, Japan and Italy have been most affected by large-scale disasters over the past 40 years, while Iceland, New Zealand and Australia are among those most affected relative to population size (OECD, 2014). Recent disasters in smaller OECD economies have had a large economic impact: damages and losses from the Chile earthquake in 2010 were around 18% of GDP, and from the Canterbury earthquakes in 2010 and 2011 were approximately 20% of New Zealand GDP.

The regional economic impact can be large and long-lasting (OECD, 2014). Hurricane Katrina, for example, caused an estimated USD 96 billion to USD 108 billion in economic losses, which were felt disproportionately by the impacted geographic area, its population and related economic activities. The impact on the national level, however, was only 0.1% of GDP (OECD, 2014). Hurricanes Harvey and Irma, which hit the United States in 2017, exceed that level of losses. The Great East Japan Earthquake destroyed or damaged 190 000 buildings, left the surrounding areas of the Fukushima nuclear plant (around 800 km²) uninhabitable and ruined 23 600 hectares of farmland (Ranghieri and Ishiwatari, 2014).

The Pisco earthquake in 2007 resulted in USD 1.2 billion in economic losses, which equates to a slim 0.001% of Peru's GDP, but it left the affected area devastated (EM-DAT, 2017).

Costly disasters – ranging from earthquakes to floods, wild fires and severe storms – have occurred in all of the case study economies in the last six years (Table 1.1), with damages worth several billions of US dollars. Generally speaking, storms accounted for nearly 30% of all disaster events over the past 40 years; but average damages from earthquakes were more than four times higher than those from storms, and average damages from droughts were around twice as high. Floods are the second-most frequent source of disasters, and the damages caused by floods are growing particularly rapidly in fast-urbanising areas (OECD, 2014).

Figure 1.2. Death toll and damages in OECD countries by income quartile, 1995–2010



Note: Data on the European heat wave of 2003 are not included due to the difficulty of determining the actual causes of death during this disaster.
Source: OECD, 2014.

Table 1.1. Selected high-economic-impact disasters in case study economies

	Disaster event/location	Year	Fatalities	USD billion
Japan	Great East Japan Earthquake	2011	19,846	210
New Zealand	Canterbury earthquake sequence	2010/11	181	21.5
France	Storms Martin and Lothar & subsequent landslides	1999	92	8.5
Colombia	Floods	2010/11	1 374	6.3
Mexico	Hurricanes Manuel and Ingrid	2013	192	5.7
Canada	Fort McMurray wildfire	2016	2	4.6
Australia	Queensland floods	2010	36	4.5
Peru	Pisco earthquake	2007	596	1.2
Costa Rica	Hurricane Johan	1988	28	0.736

Source: Case study reports.

Past economic damage figures provide important information on disaster trends and (indirectly) on the potential need for governments' financial assistance. However, given the rapidly changing factors that are driving damage potential, estimates of future expected damages and their implications for government assistance are equally important; they help governments avoid underestimating and take worst-case scenarios into account. While there is a high degree of uncertainty concerning future trends in disaster exposure, several forces have been identified as drivers. Apart from socio-economic development (OECD, 2014), climate change is expected to affect the frequency and severity of extreme weather events (UNFCCC, 2012; World Bank Group, 2012; World Bank Group, 2014; Wolfrom and Yokoi-Arai, 2016). As a result, there is a need to refine deterministic analyses and interpretations of historical disaster events as well as available retrospective data, which tend to under-report low-frequency but high-impact events.

While this report is concerned with disasters caused by natural hazards, many of the approaches discussed could provide a basis for looking at contingent liabilities associated with man-made, technological or health hazards and their fiscal impact if these materialise.

Data on the estimates of past economic damage caused by (especially larger-scale) disasters can be found relatively easily, although the degree of comprehensiveness and accuracy varies (OECD, 2018). Significantly fewer sources and less systematic accounts can be found on disasters' fiscal impact, i.e. the impact on government revenues and spending and related fiscal indicators, which is crucial information for governments' identification of their contingent liabilities and adequate financial planning for disasters as part of public financial frameworks. The next section sheds light on this issue and provides evidence found through case studies.

The fiscal impacts of disasters: Understanding the key determinants

The determinants of fiscal impacts of disasters

The fiscal impact of a disaster is a function of the changes in government expenditures and revenues caused by the disaster. Future potential expenditures that governments are expected to or legally obliged to make in response to disasters – that is, disaster-related contingent liabilities of government, can cause potential disaster-related fiscal risks (Box 1.2). Once a disaster event occurs, contingent liabilities turn into actual expenditures. Particularly in case of a major disaster, the expenditures resulting from such liabilities may cause deviations from the forecast fiscal outcomes. As a consequence, such expenditures could lead to an increase in public debt and, depending on their size, create a fiscal risk to

government finances (Box 1.3), especially if a government has not made ex ante provisions to meet these possible costs (OECD, 2012; Mahul et al., 2014).

The size of the government's expenditure in the event of a disaster depends of course on the severity of the disaster itself, but also on the government's rate of compliance with meeting its liabilities – that is its ability and willingness to meet its ex ante commitments to shoulder specific disaster-related costs, or to go beyond them.

Box 1.2. Sources of disaster-related government contingent liabilities and changes in government revenues

Potential government expenditures following disasters can include payments for the following costs:

- relief payments to affected populations
- spending for the temporary recovery of public infrastructure/services – e.g. costs for renting temporary shelter premises or costs for restoring essential services such as water or electricity
- spending for the reconstruction of damaged public infrastructure and assets, particularly in case of damage to uninsured public corporation assets
- cash transfers to public health facilities and to publicly owned or guaranteed insurance companies to address claims obligations
- an increase in short-term social transfers (such as health and medical support, temporary debt or tax relief) due to an economic slowdown that follows a disaster
- expenditure to stimulate the economy following a disaster – e.g. support to key industries or businesses and providers of critical infrastructure, capital injections or loans to public or private corporations, or financial incentives for housing (re)construction
- expenditures due to guarantees issued to public or private entities suffering disaster losses -, for example financing to restore public services provided under a public-private partnership (PPP) contract where the PPP operator's assets were not covered by disaster insurance and the government faces pressure to step in
- payments to subnational levels of government faced with fiscal constraints in the aftermath of a disaster

Potential disaster-related changes to government revenues can be caused by the following:

- reductions in tax bases through e.g. the negative impact of disasters on personal and corporate income, natural resource extraction and consumption.
- deliberate tax cuts, e.g. in business taxes, which reduce government tax revenue at first but can speed up recovery in the long term, enabling a potential net gain for tax revenues.
- business interruption risks to revenue collection authorities.

- disrupted operations of public corporations (including natural resource extraction companies) that result in changes in income and production and risks to royalties and dividends to government.

Source: IMF (2016), "Analyzing and managing fiscal risks—Best practices", June, www.imf.org/external/np/pp/eng/2016/050416.pdf. OECD (2015), Disaster Risk Financing: A Global Survey of Practices and Challenges, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264234246-en. Mahul, O., C. Benson and L. Boudreau (2013), "Risk assessment and management of natural disasters from a fiscal perspective in developing economies", World Bank working paper (draft).

Box 1.3. Fiscal risks and contingent liabilities: Definitions

Fiscal risks describe changes in the expected fiscal outcomes as outlined in an economy's annual budget or forecasting documents. Fiscal risks may have positive or negative effects on the annual budget. While governments tend to foresee and arrange for positive fiscal risks with relative accuracy, the possible negative impact of fiscal risks is often underestimated.

Governments may face different types of fiscal risks, including various shocks to macroeconomic variables and the realization of contingent liabilities, such as in the event of disasters. Other fiscal risks can include government bailouts for troubled financial institutions, state-owned enterprises and private corporations; demands for government compensation; and financial support to subnational governments in need.

Contingent liabilities refer to (government) obligations that are triggered when a potential but uncertain future event occurs. Contingent liabilities can cause large unexpected increases in government debt.

Contingent liabilities may be **explicit or implicit**. Explicit contingent liabilities are expenditures that might arise from pre-arranged explicit commitments made (for example) in contracts or through laws, or from clear policy commitments that could fall due in the event of disaster. Implicit contingent liabilities are expenditures that might arise due to moral obligations without any prior commitments, or due to public expectations or political pressure on the government.

The impact of fiscal risks may be **direct**, e.g. in the case of foreign and domestic sovereign debt (explicit liability) or in the case of future recurrent costs of public investments (implicit liability). They may also be **indirect**, as in the case of state insurance schemes (explicit liability) or bank failures (implicit liability).

Sources: IMF (2016), "Analyzing and managing fiscal risks—Best practices", June, www.imf.org/external/np/pp/eng/2016/050416.pdf. OECD (2015), Disaster Risk Financing: A Global Survey of Practices and Challenges, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264234246-en. Brixi, H. Polackova and A. Schick (2002), Government at Risk: Contingent Liabilities and Fiscal Risk, World Bank and Oxford University Press, Washington, DC.

Disaster impacts on government spending: Explicit contingent liabilities

Explicit disaster-related contingent liabilities are payment obligations based on government contracts, laws or clear policy commitments that could fall due in the event of disaster. Expenditures triggered by the destruction of public assets and infrastructure, along with spending due to pre-arranged commitments, fall under this category. The exact level of explicit contingent liabilities depends on the legal and contractual payment obligations that could be triggered by a disaster. The role of governments as providers and owners of public infrastructure, as set out in various government policies, also influences the level of explicit contingent liabilities. Moreover, where the government has a role in providing insurance for public or private assets, such as in New Zealand (Earthquake Commission, EQC), France (CATNAT scheme) and Japan (Japan Earthquake Reinsurance, JER) (Box 1.4), this role creates an explicit contingent liability for a portion of the claims payments due under the insurance coverage provided (OECD, 2015)[2].

Governments may find alternative ways to meet their pre-disaster commitments in nominal terms, such as through inflationary money creation, thereby not meeting them in real terms.

Box 1.4. Explicit contingent liabilities: The case of government-backed insurance schemes in New Zealand, France and Japan

In some economies, disaster-related contingent liabilities arise for governments through publicly backed insurance schemes against disasters, such as the New Zealand Earthquake Commission (EQC), France's Natural Catastrophes (CATNAT) insurance scheme or the Japan Earthquake Reinsurance (JER).

The EQC is a New Zealand government entity providing insurance to residential property owners for damages to houses and contents stemming from an earthquake, landslide, volcanic eruption, hydrothermal activity or tsunami. It also provides storm and flood coverage for those areas of residential land that allow property access or that include building platforms. The EQC transfers the financial risk posed by New Zealand's natural hazards through financial arrangements, including 1) the Natural Disaster Fund; 2) an international reinsurance programme renewed every year; and 3) a backstop government guarantee in the event that EQC's reserves and reinsurance lines are exhausted (under Section 16 of the Earthquake Commission Act 1993). The Treasury may meet the deficiency of funds by providing either a grant or a loan.

The CATNAT insurance scheme, a public-private partnership based on the constitutional principle of solidarity, has been the backbone of disaster recovery financing in France since its establishment in 1982. The scheme has been put in place to provide insurance for hazards otherwise considered "uninsurable", i.e. hazards affecting a limited area, such as flooding, avalanches, volcanic activity or earthquakes. Both private and public assets can be covered by hazard insurance via the CATNAT scheme. Funding for CATNAT comes from an additional premium, fixed by the state at a mandatory uniform rate, for all property and motor vehicle insurance policies. To prevent illiquidity in case a major disaster triggers insurance payouts beyond available reserves, CATNAT is backed by a state guarantee. If claims exceed 90% of the special reserve and annually defined equalisation reserves, the government is required to step in.

Through the JER, which offers insurance through the private insurance market, the government of Japan has a key role in retaining a portion of the liability. Under this scheme, the private and public sectors share the aggregate limit of indemnity for a single seismic event (up to JPY 11.3 trillion; ~ USD 103 billion) as follows:

- For earthquake insurance liabilities up to JPY 88 billion (~USD 804 million), the JER is liable for 100% of insurance claims.
- For amounts over JPY 88 billion and up to JPY 224 billion (~ USD 2.06 billion), the central government is liable for 50% and the JER and private insurers (i.e. those to which the JER has retroceded risk) are liable for 50%.
- For amounts from JPY 224 billion to JPY 11.3 trillion (~USD 103 billion), the central government is liable for approximately 99.8% and private insurers (including the JER) are liable for approximately 0.2%.

If earthquake insurance liabilities for one event exceed the indemnity cap of JPY 11.3 trillion, the government can decide to provide additional resources on a needs basis. In response to reductions in the private sector's reserve balance following recent large-scale disasters, the Ministry of Finance has increased the government's share of indemnity.

Sources: OECD, 2015, Case study reports.

Disaster impacts on government spending: Implicit contingent liabilities

Implicit disaster-related contingent liabilities are expenditures the government makes in response to a disaster without any previous formal commitment to make them. The expectation for such payments might arise from political or moral pressure, or could reflect the government's attempt to speed up recovery in order to stimulate growth. The size of a government's implicit contingent liability may be influenced by a government's past spending on disaster recovery and compensation beyond its legal obligation, or by the relative political power of key affected population groups.

Unlike explicit contingent liabilities, implicit contingent liabilities tend to be challenging to identify and quantify[3]. Although recovery and compensation expenditure in response to previous disasters should serve as a point of reference for estimating expected post-disaster government assistance, it can be difficult for governments to accurately predict the contingent liabilities arising from moral expectations and political pressure (Brixi and Schick, 2002; OECD, 2015). When statutory levels of compensation or cost-sharing arrangements between levels of government are exceeded in response to a disaster, explicit commitments can generate additional implicit commitments. In other words, due to the implicit assumption that the government will serve as insurer or guarantor of last resort, implicit contingent liabilities may arise even from explicit contingent liabilities. Still, high levels of insurance coverage for exposed assets may help limit the size of a government's implicit contingent liabilities: if economic costs to households and businesses are covered by insurance, the political pressure on governments to provide economic relief may be smaller, hence reducing the government's implicit contingent liability.

Disaster impacts on government revenues

Disasters can also have impacts on government revenues, especially through their negative impact on economic activity. This is usually the consequence of a decline in various tax as well as non-tax revenues, but it could also be caused by disruptions to tax collection efforts.

In principle, disasters could also lead to revenue gains, either through increased revenues following a strong post-disaster economic rebound fuelled by reconstruction activities, or through increased receipts in international aid. Changes to the value of assets and liabilities of governments are often directly linked to changes in expenditure and revenue flows. For example, a reduction in the value of public infrastructure assets due to a disaster might be responsible for a corresponding increase in expenditure on the affected assets. While the latter clearly constitutes a fiscal impact caused by a disaster, a change in government asset values by itself might be overlooked in accounting for the fiscal impacts of disasters, not least because many governments do not publish comprehensive balance sheets that include non-financial assets. To properly assess fiscal impacts, the effect of disasters on an economy's balance sheet should be comprehensively taken into account.

Indirect fiscal impacts of disasters

In addition to government expenditures and risks to revenues arising from disasters, there are a number of potential indirect disaster-related fiscal impacts, which are more difficult to observe, but no less important to consider. These include the possible deterioration in the terms at which the government can refinance public debt or raise additional debt in the short term. For example, Standard & Poor's Rating Services (2015a, 2015b) estimate that a 1-in-250-year cyclone could downgrade ratings by four or more notches in many economies. A four-notch credit rating downgrade is likely to lead to an increase in borrowing costs of 20–40 basis points or more (Hanusch et al., 2016). Disasters might also weaken public finances through the impact on domestic equity markets, where public financial asset portfolios (e.g. sovereign wealth funds) could lose value, and through a reduction in the net worth of government-owned insurance companies or banks exposed to the disaster.

When assessing fiscal risks posed by disasters, it is important to keep in mind that disasters can also raise additional revenues. Additional revenues, albeit earmarked, may be obtained through inflow of financial assistance (e.g. financial support from other governments or organisations for recovery interventions), which may reduce the government's reconstruction liabilities. Insurance payments may also reduce the government's liability, as they cover at least part of the spending demands arising from disaster recovery needs.

Past fiscal impacts of disasters

Despite the considerable interest in and research on disasters and their social and economic impact, data on the fiscal costs of past disasters are comparatively very limited. A number of factors contribute to this:

- Accounting systems do not directly record spending related to disasters. Such spending may be undertaken by a wide range of entities, across different functions, programmes, projects and outputs. While some data may be available on spending by a particular ministry or by a disaster fund for a particular disaster response, recording total disaster-related expenditures requires ad hoc exercises, since standard budget classification and accounting systems do not include this process.
- Some expenditures, such as emergency relief and early recovery activities, are financed by transferring funds from other budget heads that are unspent; or by deferring maintenance spending or new capital spending in favour of disaster response; or, in economies receiving development assistance, by diverting funds from existing projects to disaster relief. Often, these transfers from other budget

lines are poorly captured in reporting systems, particularly when funds are rededicated within the same budget line (e.g. in operation and maintenance budgets).

- Expenditures are often undertaken by all levels of government (central, regional and local), and there is typically a lack of consolidated data on the total (general government) fiscal impact.

Partial estimates of the fiscal costs of a disaster are often made using information and data from the following sources:

- expenditures reported from a general annual budget contingency appropriation, where such spending is reported against the specific disaster-related programme or activity, or is tagged to disaster response;
- expenditures reported from a dedicated disaster contingency appropriation or a dedicated disaster fund
- supplementary budget or budgets;
- expenditures financed from emergency spending authority;
- an earmarked disaster recovery line in a capital or development budget;
- identifiable projects for the reconstruction of public infrastructure[4];
- transfers to subnational governments to meet the costs of disaster recovery and rehabilitation that are identifiable in separate budget lines.

A recent report on contingent liability realisations in 80 advanced and emerging economies identified 65 disasters that occurred during the period 1990–2014 and estimated the fiscal costs of 29 of these (IMF, 2016)[5]. On average, the fiscal cost of these events was 1.6% of GDP. The maximum fiscal cost identified was 6% of GDP. Compared to the fiscal shocks emanating from the realisation of other contingent liabilities, such as those associated with the financial sector, disaster-related fiscal shocks appear to be modest, though relatively frequent. Given the particular sample on which these figures are based, they likely understate the fiscal risk posed by disasters to economies that are strongly exposed to disaster risks across a large share of their territory. Such economies include not only Small Island Developing States, but also certain OECD economies such as Chile, where the 2010 earthquake off the central coast cost an estimated 12–15% of GDP (Government of Chile, 2013). On the other hand, the quoted figures likely overstate the size of the average fiscal shock from disasters faced by larger developed economies, not least because the study includes only events with fiscal impacts larger than 1% of GDP.

The case studies conducted for this report sought to obtain estimates on government expenditures both for disaster response (ex post) and for disaster risk reduction (ex ante). The figures in Table 1.2 do not reflect a complete picture of governments' spending, but rather an estimated average based on some identifiable and dedicated funds or specific observations over a number of past events. By and large, reporting on post-disaster government expenditure is more complete than reporting on expenditure for disaster risk management ex ante. This difference might be due to the difficulty of identifying the different sources that contribute to reducing disasters and the considerable embedded contributions governments make to reduce disaster risks (OECD, 2018). Nevertheless, the discernible pattern suggests that spending in response to disasters is (significantly) higher across the studied economies than ex ante spending on disaster risk reduction. Especially

in those economies where good spending records are available, the balance in favour of response spending is striking, such as the 97% in Mexico or 96% in Australia (Table 1.2).

This pattern highlights a reactive approach to financing disasters across economies and underlines the importance of managing disaster-related contingent liabilities adequately. This preference for ex post spending partly reflects decision makers' tendency to invest in spending that quickly translates to visible impact. Whereas spending on disaster recovery measures answers to an immediate need, with easily understandable impacts, the future positive impacts (e.g. reduced damage and destruction) resulting from investments in disaster risk reduction measures are harder to trace, while the cost of the investment directly reflects as expenditure in fiscal frameworks.

Table 1.2. Annual average losses and total amount of government spending on disasters (ex ante versus ex post)

	Annual average loss estimate (USD)	Annual government spending for disaster risk management (USD)	Ex ante vs. ex post expenditure estimates (per cent)
Australia	5.5 billion	528 million	4% (ex ante); 96% (ex post)
Canada	3.2 billion	Not available	Not available
Colombia	3.8 billion	300 million	Slightly above 50% ex ante, and slightly below 50% ex post, with considerable year-to-year variation
Costa Rica	280 million	Not available	Not available
France	1.24 million	413 million	Not available
Japan	61.5 billion	31.4 billion	25% (ex ante); 75% (ex post)
Mexico	2.9 billion	350 million	3% (ex ante); 97% (ex post)
New Zealand	769.2 million	Not available	Not available
Peru	4 billion	498 million	100% (ex ante)

Note: Ex post disaster risk management spending for Peru is currently not reported.
Source: Case study reports.

As mentioned above, it is rare for governments to systematically document the fiscal impact of disasters. However, given their importance for informing a government's financial planning and fiscal policy making, exercises that study fiscal impacts on an event-specific basis can be found more frequently. A summary of such studies is provided below for the Great East Japan Earthquake of 2011, the Canterbury earthquake sequence that occurred in New Zealand in 2010–11 and the Fort McMurray wildfire that affected Canada in 2016.

Fiscal impacts of major historical disasters

The 2011 Great East Japan Earthquake

The March 2011 Great East Japan Earthquake, followed by the tsunami and nuclear power accident, imposed an exceptional cost on Japan's central government. The triple disaster caused an estimated USD 300 billion in total economic costs, of which USD 210 billion was estimated to be damages. Quarterly GDP declined by 2.1% in the second quarter of 2011. The total central government funding for the event represented 4% of Japan's 2010 GDP and 20.7% of the initial general account budget. Funding was initially allocated to disaster relief, recovery and reconstruction through the general contingency budgets for fiscal years 2010 and 2011. Subsequent funding was allocated through three supplementary budgets in the 2011 fiscal year: one relied largely on the issuing of bonds, one was financed

primarily via cuts in previously authorised expenditure, and one was funded by budget surplus from the previous fiscal year. In the 2012 fiscal year, additional financing was appropriated, most of which was obtained through the issuing of reconstruction bonds (Sato and Boudreau, 2012; Mahul, Benson and Boudreau, 2013). In addition to experiencing expenditure impacts, the government also immediately enacted tax relief measures for affected populations and industries, and built tax incentives into its reconstruction policy, which were sometimes complemented by subsidies (Sato and Boudreau, 2012; Mahul, Benson, and Boudreau, 2013; Law Library of Congress, 2013).

The 2010–11 Canterbury earthquake sequence in New Zealand

The most costly disaster experienced by New Zealand has been the Canterbury earthquake sequence in 2010/11. The cumulative impact of the earthquakes is an example of the significant fiscal impact major disasters can have. As happened with the Great East Japan Earthquake, the government's budget was impacted simultaneously on the expenditure side (to pay for damaged assets and other liabilities) and on the revenue side (due to foregone tax receipts and foregone revenues from the government's own operating services). In the year to June 2011, the net fiscal outlays related to the earthquake were USD 6.3 billion. The government shouldered an estimated one-third of the total estimated costs through natural disaster insurance provided by the EQC (Box 1.4) and central government resources (IMF, 2016).

The 2016 Financial Statements of the Crown present consolidated information regarding the fiscal impact of this earthquake sequence in New Zealand. The total cost at the end of fiscal year 2016 was USD 10.3 billion, and the earthquake-related obligations still faced are estimated at USD 1.5 billion. The cost of repairing or replacing physical assets owned by the central government amounted to USD 706 million, or 6.8% of total central government costs[6]. The central government provided significant contributions for the reconstruction of public assets owned by subnational governments (local/district councils and regional councils[7]); it paid USD 1.19 billion to restore essential subnational government infrastructure (such as water supply and wastewater and storm water services) damaged during the earthquakes. The government-owned Earthquake Commission, which provides insurance coverage against earthquake and other perils for residential property, has paid out (net of reinsurance receipts) about USD 5.3 billion in compensation for privately owned residential property. Finally, the central government exceptionally provided USD 806 million to settle residential property claims for policies held with a private insurance company, AMI[8]. See Table 1.3for a summary of public expenses related to the earthquakes.

Table 1.3. Public expenses arising from 2010/11 Canterbury earthquakes (2011–16)

	Total to date (in million NZD)	30 June 2016 (in million NZD)	30 June 2015 (in million NZD)	Actual June 2014 (in million NZD)	Actual June 2013 (in million NZD)	30 June 2012 (in million NZD)	30 June 2011 (in million NZD)
EQC insurance claims	7 334	21	(444)	(242)	(107)	662	7 444
Local infrastructure	1 637	55	66	109	483	729	195
Land zoning	1 087	88	(1)	97	(8)	258	653
Southern Response support package	1 111	204	325	124	(53)	156	355
Christchurch central city rebuild	920	153	179	473	115	-	-
Crown assets	969	498	335	96	28	12	-
Other earthquake costs	1 242	338	129	249	17	96	413
Total Crown net earthquake costs	14 300	1 357	589	906	475	1 913	9 060
Gross earthquake expenses	20 448	1 414	904	918	815	2 823	13 574
Earthquake related revenue (e.g. reinsurance)	(6 148)	(57)	(315)	(12)	(340)	(910)	(4 514)
Operating expenses	12 084	587	(55)	326	266	1 900	9 060
Capital expenditure	2 216	770	644	580	209	13	-
Total Crown net earthquake costs	14 300	1 357	589	906	475	1913	9 060

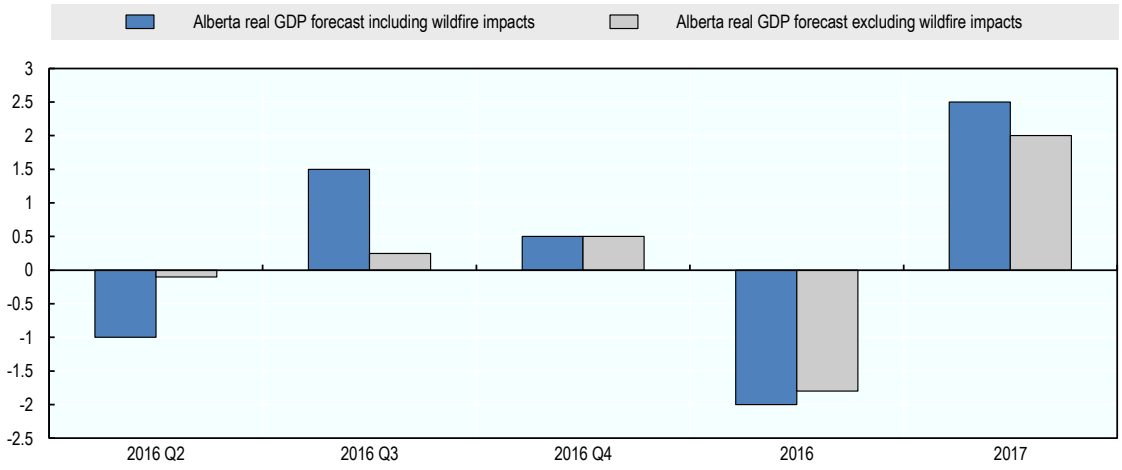
Source: Treasury, 2016 note 31, pp. 122-26.

The 2016 Fort McMurray wildfire in Canada

The Fort McMurray wildfire was one of the most costly disasters in Canada's recent history. It spread across an area of 590 000 hectares in northeast Alberta between May and July 2016, destroyed 2 400 homes and buildings, affected 88 000 people and resulted in damages amounting to USD 4.6 billion (EM-DAT, 2017). Estimates suggest that an additional USD 2.2 billion in indirect damages should be included in cost estimates, with businesses in the Fort McMurray area experiencing an estimated net revenue loss of CAD 54.7 million (USD 45.1 million) (Alam and Islam, 2017).

The Fort McMurray wildfire had a negative effect on Alberta's overall GDP; the lost oil sands production alone resulted in an estimated 0.33% drop in provincial GDP in 2016, translating to a 0.06% drop in nationwide GDP. Overall, the net effect on the provincial economy in the second quarter was estimated as a 1% reduction in GDP growth. Support from the government of Alberta (such as the provision of CAD 1 250 (USD 960) per adult and CAD 500 (USD 380) per dependent to evacuated households) and reconstruction activities, however, helped offset the impact on Alberta's economy (Antunes and Bernard, 2017; Conference Board of Canada, 2016). The impact of the wildfire on Alberta GDP is shown in Figure 1.3.

Figure 1.3. Impact of Fort McMurray wildfires on Alberta GDP



Source: Antunes and Bernard, 2017

To support the government of Alberta in bearing the costs of this disaster, the federal government of Canada provided CAD 468.7 million (USD 385.7 million) in financial support via the Disaster Financial Assistance Arrangements (DFAA), which largely covered the costs of the initial response to the fire, including first responders and evacuee relief. In addition, the Alberta government provided around CAD 160 million in emergency funding to affected households in the Fort McMurray area. Much of the remaining cost of the wildfire has been borne by insurers, as most residential and business insurance policies cover fire damage (Antunes and Bernard, 2017).

Notes

[1] In the context of disasters, "hazards" refers to the geophysical or hydrometeorological events that have the potential to cause injury or death to exposed people, to damage exposed assets, and to disrupt socio-economic activity. "Exposure" refers to the location of both assets and people in areas prone to any of the above described hazards. "Vulnerability" is defined as "the characteristics and circumstances of a community, system, or asset that make it susceptible to the damaging effects of a hazard" (World Bank, 2014a).

[2] The liability for claims payments is often shared between the affected households, private insurance companies and the government. The number of claims is a strong indicator of the potential contingent liability resulting from government-backed insurance.

[3] More details on this point can be found in the section on identifying contingent liabilities that follows.

[4] For instance, in New Zealand the Public Finance Act authorises expenditure on a national emergency without parliamentary appropriation, with the spending subsequently authorised in an appropriation act.

[5] The data set covered 34 advanced economies and 46 emerging economies. The coverage of the data depended on the economy and year, but in general data for the 1990s were for the central government, while for the 2000s the data were general government (for a number of mainly advanced economies).

[6] In New Zealand a significant share of public infrastructure assets, including schools, hospitals and national roads, is owned by the central government and managed by the relevant central government department.

[7] There are two levels of government in New Zealand, the central and the subnational. Local authorities can be cities (which serve a population of over 50,000 in a predominantly urban area) or districts (which serve towns and wider rural areas). Regional authorities are created for the functional management of some public services (e.g. transport and environmental management). Subnational authorities do not have constitutional mandates; their functions and powers are determined by the national parliament.

[8] In 2011, AMI Insurance requested Crown support to deal with the financial impact of the Canterbury earthquakes. Support was granted in the form of a Crown Support Deed, and in return the government gained control of AMI. In 2012, AMI sold its non-earthquake-related business to IAG New Zealand, and the Crown received the proceeds of the sale but retained direct control and ownership of the residual company. This business was renamed Southern Response Earthquake Services Limited. Since that time, the outstanding claims continue to be re-measured as settlement experience emerges, and the government continues to provide support; it will do so until outstanding claims are settled with policy holders. During 2013, the Crown subscribed additional uncalled capital to Southern Response Earthquake Services Limited.

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Chapter 2. Boosting financial resilience against disasters: Towards better management of disaster-related contingent liabilities

This chapter offers governments a step-by-step guide to boosting financial resilience against disasters through better management of their disaster-related contingent liabilities. For each proposed step, this chapter presents and reflects upon the findings of practices obtained through the nine case studies. It shows how governments can assess disaster-related contingent liabilities and benefit from including the results in fiscal planning and fiscal risk assessment processes. The chapter highlights good practices and provides a discussion of the persisting challenges governments face in increasing their financial resilience to disasters.

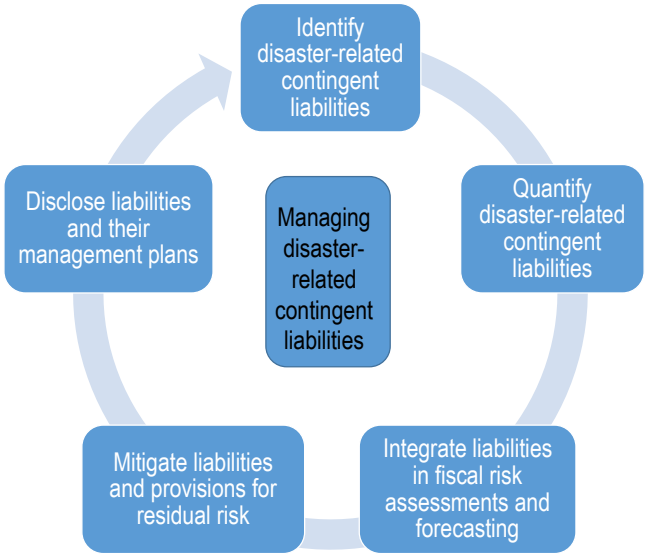
Introduction

While chapter 1 focusses on the economic and fiscal impacts of natural disasters, this chapter turns to the question of how governments can improve their management of disaster-related contingent liabilities with a view to increasing their financial resilience to natural disasters. The framework presented offers governments a step by step guide to better identifying, quantifying and managing their disaster-related contingent liabilities. Each step includes a set of findings on governments' achievements to date and highlights good practices with a view to informing governments' financial management strategies going forward.

The major steps in managing disaster-related contingent liabilities are listed below and illustrated in Figure 2.1:

- *Identify contingent liabilities.* Identifying of contingent liabilities establishes a baseline for the sources of financial commitments that may arise for a government when a disaster occurs. This step should not only make clear the sources of the government's explicit commitments to assume disaster-related costs, but also analyse potential implicit commitments, i.e. implicit liabilities.
- *Quantify contingent liabilities.* Once the sources have been established, it is desirable to estimate the level of these commitments under given disaster scenarios, based on disaster risk models that estimate return periods. Estimating the size of a government's liabilities can provide an informed basis for policy making before disasters occur.
- *Integrate contingent liabilities within a fiscal context.* In the case of a severe disaster, it may be important to know whether the public financial impacts could cause fiscal distress for the government. For this reason, disaster-related contingent liabilities should be considered in overall fiscal forecasting and fiscal risk analysis.
- *Evaluate mitigation efforts.* Evaluating a government's efforts to mitigate disaster-related liabilities and finance residual fiscal risk is indispensable as part of an integrative assessment of a government's contingent liabilities.
- *Disclose contingent liabilities.* In a final step, governments should disclose their disaster-related contingent liabilities as well as the way their approach to managing them. Such disclosure can build confidence that these liabilities are well managed.

Figure 2.1. Managing disaster-related contingent liabilities within public finance frameworks



Source: Authors

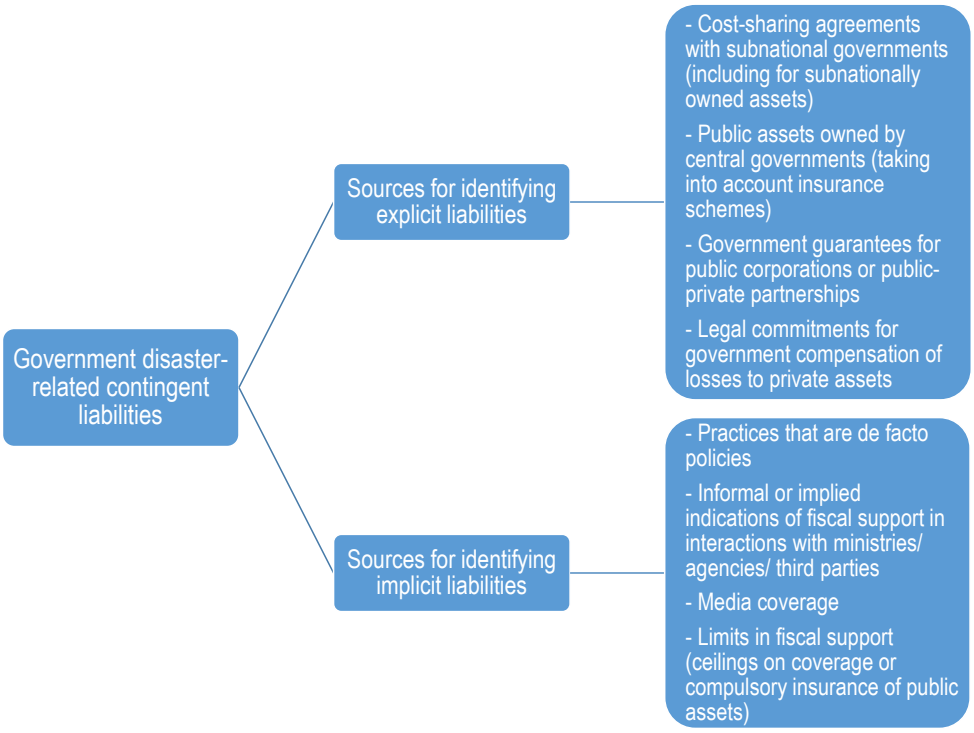
The sections that follow elaborate these steps and document and compare governments' practices.

Identification of disaster-related contingent liabilities

Distinguishing explicit from implicit contingent liabilities

Assessing a government's disaster-related contingent liabilities requires the identification of both explicit and, to the extent possible, implicit liabilities. Figure 2.2 provides an overview of the sources of both kinds of liabilities.

Figure 2.2. Sources of a government's disaster-related contingent liabilities



Source: Authors.

Explicit contingent liabilities, as indicated above, are payment obligations based on government contracts, laws or clear policy commitments that fall due in the event of a disaster. To identify explicit contingent liabilities arising from disasters, it is necessary to understand the legal and policy frameworks that determine a government's obligations to shoulder the costs caused by disasters. Explicit liabilities can arise from both central and subnational government commitments.

The legal framework, which includes laws, regulations and contractual obligations[1] with external entities, provides the basis for identifying explicit commitments for recovery payments that have been made by governments prior to any disaster. As an example, Box 2.1 shows the diversity of such commitments in Japan. Policies that were announced prior to a disaster but are not yet reflected in legal obligations should also be considered as part of this assessment. The laws, regulations, policies and contracts that determine explicit contingent liabilities:

- Define the central government's legal responsibility to finance post-disaster response and recovery, including cost-sharing arrangements between the central and subnational governments. More specifically:
    - They define the central government's legal responsibility to pay for public asset reconstruction and maintenance as well as its explicit liability with respect to providing recovery financing for damaged or destroyed private assets. Where legal requirements related to the insurance of public assets

exist, this assessment should analyse the government's exposure to uninsured losses, including co-insurance or deductibles, and consider the level of compliance with the legal requirements.

- They define the legal liability of the central government to pay for the recovery of assets owned by regional, local or municipal governments, as well as historical experience in this regard.
- They establish government guarantees for disaster losses incurred by public corporations and public-private partnerships (PPPs).

Box 2.1. Legal frameworks guiding Japanese government commitments in disaster assistance

In Japan, a number of laws recognise the government's legal or explicit commitment to support disaster response, reconstruction of public and certain private assets, and social and economic restoration:

- The Disaster Relief Act (1947) provides for disaster relief and welfare support (including repair of private housing, cash transfers and/or loans); it also establishes subsidisation of local government measures.
- The Disaster Countermeasures Act (1961) sets out central and local governments' responsibilities for disaster risk management and defines fiscal mechanisms for disaster response, e.g. subsidy, tax and debt measures.
- Other laws, such as the Act on Special Financial Support to Deal with Extremely Severe Disasters (1962) and the Act on Support for Livelihood Recovery of Disaster Victims (1998), further extend the scope of the government's financial responsibility. Following the Great East Japan Earthquake in 2011, the latter law was amended to increase the central government's responsibility for disaster relief – shared with local governments – from 50% to 80%.

A series of laws provides for government support to certain lines of insurance (earthquake, agricultural, fisheries, fishing boat and forest) and establishes a central government contingent liability to pay a portion of reinsurance payouts under these schemes. For example, in the case of earthquake insurance, the Japanese government is responsible for a specific share of the losses covered by the Japan Earthquake Reinsurance. The share of losses borne by the government increases with the amount of overall losses and is reassessed periodically based on the capacity of the insurance sector to cover earthquake losses.

Source: Sato and Boudreau, 2012.

Explicit government commitments for disaster assistance: A range of policies and practices

Governments' formal conditions for explicit disaster-related contingent liabilities include a mix of practices (Table 2.1). Central governments may have a wide range of explicit commitments to finance post-disaster costs, such as in Japan, or only a limited set of explicit commitments, such as in Colombia.

Japan makes explicit commitments to finance the recovery and rehabilitation of nationally and subnationally owned public infrastructure. It also provides explicit assistance to affected households for housing rehabilitation and temporary tax relief. Credit guarantees are provided for small and medium-sized enterprises (SMEs), complemented by safety net loans to overcome temporary cash-flow problems. The government also retains a portion of the liability of the Japan Earthquake Reinsurance (see Box 1.4).

Table 2.1. Governments' explicit commitments to provide post-disaster financial assistance

	Legal responsibility of central govt. to finance disaster response & recovery	Cost-sharing arrangements between central and subnational govts. to finance disaster response & recovery	Legal responsibility of central govt. to reconstruct/ maintain central government–owned public assets	Explicit liability of central govt. to finance rehabilitation & reconstruction of private assets	Legal liability of central govt. for other expenses incurred by subnational govts. (e.g. payments to businesses or individuals)	Govt. guarantees for disaster losses incurred by public corporations & PPPs
Australia	✓	✓	✓	✓	X	✓
Canada	✓	✓	X	X	X	X
Colombia	✓	X	X	X	X	X
Costa Rica	✓	X	✓	X	✓	X
France	X	X	X	X	X	✓
Japan	✓	✓	✓	✓	✓	✓
Mexico	✓	✓	✓	✓	✓	X
New Zealand	✓	✓	✓	Partially	Partially	✓
Peru	X	✓	✓	X	X	X

Source: Case study reports.

In contrast to the Japanese example stands Colombia, where the legal framework provides for only some explicit public commitments to finance post-disaster assistance. Colombia's practice is interesting: the government has a legal responsibility to finance post-disaster response and recovery, but no detailed commitments are specified. In contrast to both (and indeed to most economies) is Peru, which does not even establish a general, legally stipulated responsibility for financing post-disaster response and recovery (shown in column 2 of Table 2.1). In actual practice, however, the Peruvian government has regularly paid for the rehabilitation and reconstruction of public infrastructure, as well as compensated the losses incurred by the poorest population groups, hinting at the existence of quasi-explicit commitments or liabilities. France is another interesting example in this regard. While the authorities point to only a very limited set of explicit disaster-related contingent liabilities, across ministries and levels of government various disaster assistance schemes are in place. When activated, assistance through these schemes can be quite substantial, as was for instance the case following Hurricanes Maria and Irma, which struck the French Antilles in late 2017.

Commitments for recovering and replacing central versus subnational public infrastructure assets

The case studies reveal that all governments, explicitly or implicitly, provide finance for the recovery and reconstruction of assets owned by the central government. Many governments have made an effort to reduce this liability by conducting risk and vulnerability assessments, and by incentivising disaster risk reduction. For example, the Fund for Natural Disasters (FONDEN) provides financial assistance for public assets

damaged by a disaster, but it reduces the level of assistance when the same asset is damaged more than once and has not been insured. Other governments assume the liability to finance recovery of damaged public assets on more of an ad hoc basis, with no specific financing provisions for meeting these contingent liabilities in place. For subnationally owned infrastructure assets some governments have detailed prescriptions for sharing costs arising from damages across levels of government. Other governments negotiate the process on a case-by-case basis and have few ex ante provisions in place for financing any assistance that is given (Note: more on cost-sharing mechanisms can be found in Chapter 3).

Limited government assistance for state-owned enterprises or PPPs

Most governments have strived to limit their assistance for damages incurred by state-owned enterprises. In New Zealand, for example, government assistance is not usually available for state-owned enterprises, as they are expected to maintain sufficient insurance cover and emergency reserves to manage their risks. Only exceptional hardship may be considered for government financial support. In Colombia and Costa Rica the central governments do not provide guarantees for disaster losses incurred by public corporations and public-private partnerships. In Peru, obligations for financing disaster recovery of state-owned enterprises are delegated to subnational government levels. In contrast to these practices, the Mexican government supports the rebuilding of federal infrastructure, including that owned by the state productive enterprises.

Varying government commitment to support household recovery

Government support for the damages suffered by individual households can influence the degree to which households invest in disaster prevention measures, creating a potential moral hazard. A wide-ranging commitment to support households after a disaster may discourage individual households from investing in preventative action, while clear guidelines for and better communication about possible post-disaster assistance could increase households' preventative contributions.

Practices in providing post-disaster aid to households could not be more different. While most of the studied governments provide some level of immediate relief assistance (e.g. temporary shelter and food), practices differ significantly when it comes to providing financial support for the rehabilitation and reconstruction of private assets. For example:

- In Australia, support for private households affected by a disaster goes beyond emergency response needs and includes compensation for the cost of demolishing and rebuilding houses.
- In New Zealand, the central government makes a commitment to compensate private asset losses through its public earthquake insurance scheme (although only for those who have purchased the government insurance).
- Without having a clear legal obligation to do so, the government of Colombia has regularly compensated the affected population for loss of private houses.
- The government of Peru has tended to compensate the poorest households for costs incurred by the destruction of private assets, but this action has no explicit legal basis.
- In Mexico, assistance is provided for low-income households through FONDEN, which pays compensation of up to USD 6 500 per household for completely destroyed homes, up to USD 1 600 for partially destroyed homes, and around USD

300 for homes suffering minor damage. The payment is based on the extent of damage and is independent of any preventative measures households may have taken.

- In Japan, a post-disaster subsidy for housing (up to USD 30 000) is paid by the central and subnational governments to affected households, independent of their income. Japan's government is also among the few governments that make an explicit commitment to pay compensation to families of disaster victims (up to USD 50 000); for low-income households, compensation can be as high as USD 127 000. Japan's explicit individual household support also includes a temporary tax relief option.
- In France, basic relief items may be financed from an emergency relief fund, as well as from the relief fund for overseas territories (FSOM). The FSOM may also be used to assist uninsured households with the costs of disaster reconstruction; the exact eligibility criteria are decided following each disaster.

The role of post-disaster financial support to businesses in limiting a disaster's economic impact

Governments' post-disaster financial support to private businesses varies widely. For SMEs that have experienced significant damage to their assets or that have foregone a significant amount of income, many governments (such as those of Japan, Australia and Canada) provide loans at concessional interest rates or interest rate subsidies. In Japan, for example, this explicit assistance includes credit guarantees under a central government safety-net programme, which provides loans for SMEs facing temporary cash-flow problems. Canada has established the Small Business Financing Program, a loan loss-sharing programme between the government of Canada and private sector financial institutions that is designed to increase the availability of financing to small businesses. Each year, the programme helps small businesses access close to CAD 1 billion (7.6 billion USD) in financing for post-disaster recovery. In other economies, such as France, the government's post-disaster assistance to businesses focuses on preventing wage disruptions. Through a French Labour Ministry programme, for example, employers whose operations have been disrupted due to disasters or other exceptional circumstances can request public funding to help pay salaries.

Governments' limited effort to encourage disaster prevention by businesses

Governments consider post-disaster support to businesses an important way to limit the scope and duration of the disaster's negative economic impacts. However, the case studies revealed that most governments have done little to encourage businesses to adopt preventative measures prior to a disaster. In most economies, commercial property and business interruption insurance coverage rates are assumed to be very low, but there appear to be few or no systematic studies by governments designed to understand why businesses tend not to implement measures to reduce disaster risk, such as business continuity plans or physical asset protection measures. Such studies could help governments in promoting disaster prevention efforts among businesses thereby effectively limiting eventual government liabilities.

Tailored support to the agricultural sector

In many economies, tailored post-disaster assistance for the agricultural sector is available. In Mexico, Canada and France, for example, special funding frameworks have been established to support agricultural producers in bearing the costs of major disasters. In Mexico, such support is limited to low-income farmers without insurance who are affected by climate-related hazards, while in Canada support is more broadly available: under Canada's AgriRecovery Framework, federal and subnational governments have established an initiative that provides farmers with targeted assistance to help cover the extraordinary costs of recovery from natural disasters. The French national guarantee fund for agricultural disasters has been set up to provide compensation to agricultural businesses that suffered uninsurable losses due to natural hazards or disease outbreak. While such assistance programmes make up only a limited share of a government's overall assistance payments, they should nevertheless be structured with a view to incentivising loss prevention to avoid repetitive or even increasing damage payments.

A rising trend in implicit government commitments due to extreme events

Implicit contingent liabilities, as stated earlier, refer to post-disaster expenditures the government makes due to a perceived moral obligation or political pressure – that is, in the absence of any previous formal commitment to pay for them. Implicit government liabilities are therefore much more challenging than explicit liabilities to identify and to define. Broadly speaking, sources for identifying implicit liabilities can be one or more of the following:

- Any established practice that may be considered de facto policy.
- Any informal or implied indications of fiscal support in government statements.
- Any informal or implied indications of fiscal support in interactions between individual ministers, ministries or agencies and third parties, such as "letters of comfort" to third parties with respect to a public corporation, a subnational government or a PPP partner that suggest the government is well-disposed towards, generally supports or is in favour of an activity, project or entity. These might be implicit contingent liabilities if, for example, such an entity suffered losses in a disaster that impaired its ability to service its debt or deliver important services.
- Strong media coverage in the immediate aftermath of a disaster. This coverage may increase implicit contingent liabilities by increasing moral and political pressure for governments to provide assistance beyond the explicit commitments previously made. This pressure likely increases as knowledge about the magnitude of the disaster is spread and reiterated (Kunreuther and Michel-Kerjan, 2013).
- Any elements of the above that limit or offset the gross fiscal impact of the exposures. These include ceilings on coverage or compulsory insurance of public assets such as those of government-owned public corporations or subnational governments.

As these broad categories indicate, the types of assistance that have been provided under more implicit commitments by governments are wide-ranging. Nevertheless, one strong commonality in these implicit liabilities involves their trigger: in many economies, exceptional disaster events are the circumstances that give governments the grounds for going beyond their initial and explicit commitments.

In Japan, the already wide-ranging explicit commitments have been even further expanded during "exceptional circumstances," such as the Great East Japan Earthquake. This disaster – admittedly a major one – led the central government to shoulder a much greater share of the fiscal burden than it was legally obliged to. For example, all the disaster relief and recovery costs, which normally would have been shared with subnational governments, were in most cases shouldered by the central government. All other cost-sharing arrangements saw an increase in favour of the central government's share. In addition, tax reductions were broadened, and assistance for SMEs was expanded beyond the legal stipulations.

A similar practice can be seen in Mexico, where the government has responded to exceptional disasters by going beyond its explicit commitments to provide post-disaster financial assistance. During past disasters, for example, it has issued zero coupon loans for subnational governments unable to meet the minimum funding requirement for subnationally owned public assets.

In response to the Canterbury earthquakes, the New Zealand government bailed out a private insurance company, AMI, and provided several welfare benefits to the affected population that were not based on any prior explicit commitments. In addition to a number of temporary tax relief programmes after the earthquake, the government has offered homeowners in high-risk earthquake zones buyouts of their homes at near-market value. Between 2011 and 2015, 95% of eligible property owners participated in that initiative (Mitchell, 2015).

In Australia, an explicit category under the Natural Disaster Relief and Recovery Arrangements (NDRRA) - category D - has been established for exceptional disaster events. This category gives government the green light to go beyond its explicit commitments spelled out in categories A to C and provide unlimited support for any kind of assistance deemed necessary under the exceptional circumstances. Such additional commitments were triggered, for example, for the dredging of a port after the 2010/11 Queensland floods. Measures that are financed under such implicit commitments have to undergo a special approval process by the prime minister.

Tendency of implicit contingent liabilities to be greater where explicit commitments ex ante are limited

In economies like Peru and Colombia, where there are limited explicit commitments by the government to provide post-disaster financial assistance, implicit liabilities that are assumed tend to make up a larger share of disaster-related contingent liabilities. Indeed, the government of Peru has previously provided substantial and systematic financial support, including support for the affected population, for the rehabilitation and reconstruction of public assets, and for the reconstruction of private assets for the poorest households. Additional ad hoc actions by the government included cash transfers to each local government in emergency areas, the expansion of grants to protect vulnerable households and an authorisation for the housing ministry to deliver temporary housing solutions to affected citizens. All emergency decrees on which these interventions were based were valid for a limited time, typically for less than a year after approval.

Quantification of disaster-related contingent liabilities

To effectively manage and plan for disaster-related contingent liabilities within a government's public financial framework, it is useful to quantify or estimate their potential size. There are two suggested approaches to estimating the size of potential government contingent liabilities arising from disasters: direct estimation and estimation through probabilistic modelling.

Direct estimation of disaster-related contingent liabilities

A first approximation of a government's expected disaster-related liabilities can be obtained by gathering information from existing resources on past government spending on disasters. This includes, but is not restricted to, the following: historical data on government expenditures (e.g. the resources spent via dedicated disaster risk management funds, disaster-related contingent credit lines or catastrophe bonds and specific budget lines for disaster risk management spending), government-backed insurance claim payments and government guarantees for public (or public-private) corporations that materialised. All of the governments reviewed can use at least a number of these sources to establish a baseline understanding of their eventual financial liabilities in the event of a disaster.

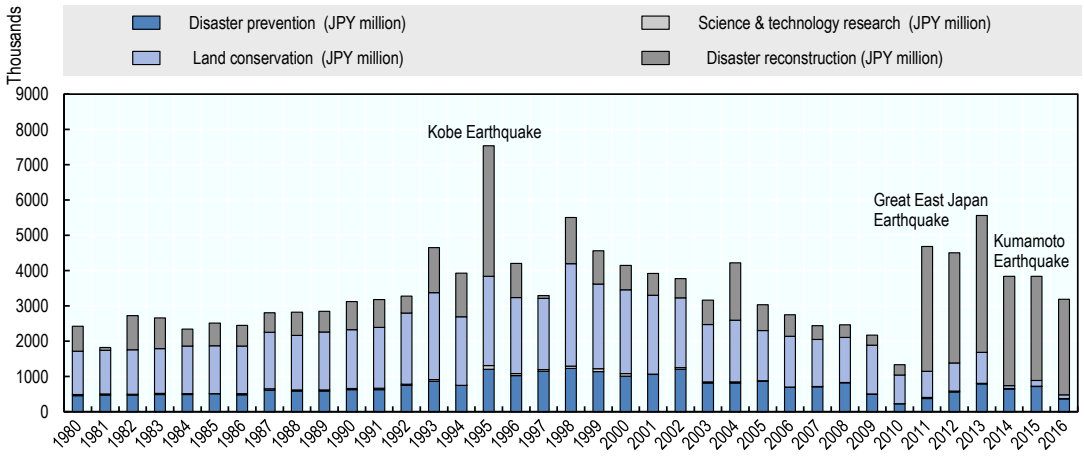
Historical data on direct government expenditures in response to past disasters can be a first step in estimating the probability of future losses and the expected size of fiscal costs for governments. The longer the period covered by the historical data and the larger the volume of coverage, the more reliable the estimate is likely to be. In Japan, for example, public spending in response to disasters has been recorded and publicly disclosed for some time. Table 2.2 shows that a quite comprehensive list of direct spending items gets recorded in Japan. In addition to the detailed ex post spending records, Japan has compiled a solid basis of ex ante risk reduction spending information. Figure 2.3 tracks these figures since 1980.

Table 2.2. Information from past disasters as a basis for quantifying disaster-related contingent liabilities: The case of Japan

Type of disaster-related expenditure	What gets recorded
Relief spending	Temporary housing, medical care, waste disposal, dispatching of Self-Defence Forces, etc.
Spending for the reconstruction of damaged public infrastructure and assets	Recovery/reconstruction of infrastructure assets, public schools, government buildings, etc.
Spending for the reconstruction of damaged private assets	Financial support for livelihood recovery of disaster victims, provision of disaster condolence grants, support for the reconstruction of agricultural facilities, etc.
Spending on increased social transfers due to a post-disaster economic slowdown	Items such as school attendance support, tuition support, expansion of job creation programmes and unemployment assistance
Expenditures due to guarantees issued to public or private entities suffering disaster losses	Earthquake reinsurance claims, disaster risk insurance for agriculture and fishery, credit guarantee for small and medium-sized enterprises
Post-disaster payments to subnational governments	Subsidy to disaster-affected subnational governments
Reduced tax collections	General changes in tax revenue published in the highlights of the general account budget document and in the accompanying documentation on Japan's fiscal condition
Disrupted operations of public corporations	Not included
Disrupted operations of private corporations	Not included
Deterioration in the terms at which the government can in the short term refinance public debt or raise additional debt	Not included

Source: Case study reports

Figure 2.3. Disaster prevention and recovery expenditure in Japan, 1980–2016



Note: The figures for the 2016 fiscal year are preliminary figures reflecting the initial budget.
Source: Cabinet Office Japan, 2016.

When the government maintains a dedicated disaster risk or catastrophe fund, payouts from the contingency appropriation are a useful source of information for estimating the size of potential liabilities. Examples of such funds obtained through the case studies can be found in Table 2.3.

Table 2.3. Sources for identifying and quantifying disaster-related contingent liabilities: governments' catastrophe funds and cost-sharing programmes

	Types of funds[1]
Australia	- Natural Disaster Relief and Recovery Arrangements (NDRRA) provide financial assistance from the central government, reimbursing up to 75% of eligible expenditure on relief and recovery payments made by subnational governments.
Canada	- Disaster Financial Assistance Arrangements (DFAA) provide financial assistance from central government, reimbursing up to 90% of eligible expenditure on relief and recovery payments made by subnational governments once a minimum expenditure threshold has been met.
Colombia	- National Disaster Risk Management Fund finances knowledge generation about risk, risk reduction, risk management, recovery and financial protection activities. - National Adaptation Fund is dedicated to financing disaster risk prevention.
Costa Rica	- National Emergency Fund (*Fondo Nacional de Emergencia*, NEF) provides funding for disaster recovery measures.
France	- Emergency relief fund finances assistance for immediate disaster relief - Relief fund for overseas territories (FSOM) finances assistance for the reconstruction of uninsured private assets and uninsurable subnational assets, and for immediate disaster relief - National guarantee fund for agricultural disasters (FNGRA) finances compensation for uninsurable crop losses due to natural hazards or disease outbreak - The CATNAT insurance scheme is backed by a state-guarantee
Japan	- The Annual Reserve for Disaster Recovery and a non-earmarked contingency reserve in the general account budget are two reserves available to finance the cost of disaster recovery
Mexico	- FONDEN (Fund for Natural Disasters) finances *ex post* disaster risk management measures. - The Fund to Support the Rural Population Affected by Climate Hazards provides support to low-income farmers who do not have agricultural insurance and who are affected by climate-related hazards
New Zealand	- The Natural Disaster Fund is an accumulated technical reserve in the earthquake insurance scheme
Peru	- FONDES (Fund for Interventions to Face Natural Disasters) finances both ex ante and ex post disaster risk management measures. - FONIPREL (Promotion Fund for Regional and Local Public Investment) may also be used for financing disaster risk management measures. - The Fiscal Stabilisation Fund can be used to finance national emergencies that affect Peru's fiscal stability.

Note: List of funds and programmes is not exhaustive.
Source: Case study reports.

Another useful source of information could be an insurance programme or a credit guarantee programme for small-scale farmers that includes a disaster cover and that has been operating long enough to generate a solid record of annual claims paid by the government. The JER provides a good example here. The Japanese government shares the liabilities arising from this privately provided disaster risk insurance with the private sector based on specified thresholds of total insurance claims. For example, for total insurance liabilities between USD 2 billion and USD 103 billion, the government will assume 99.5% of the costs. In New Zealand, the EQC provides an unlimited guarantee to compensate private asset losses from natural hazards (including earthquakes, tsunamis, landslides and flood impacts on land) emanating from its public earthquake insurance scheme.

Budget classifications and programmes can also be useful tools for identifying potential costs of disaster-related contingent liabilities (OECD, 2011), although expenditures for disasters in budget categories may not always be made explicit. A good practice in that regard can be found in Peru. Peru introduced the Budgetary Program 0068, a results-based

budget that records spending on preparedness and prevention measures for disaster risk management. Although the majority of funding recorded under Budgetary Program 0068 is used for ex ante disaster risk management funding, the budget shows how central and subnational spending can be systematically recorded for disaster risk management and provides a basis for expanding the records towards ex post funding.

Estimation of disaster-related contingent liabilities through probabilistic modelling

In the absence of – or in complement to – existing records, probabilistic modelling can estimate a government's potential exposure to disaster costs, i.e. contingent liabilities. Probabilistic modelling can also serve to estimate liabilities that could arise during more extreme loss events that are possible but not part of the historical record; governments could find this information helpful when deciding whether to take on new contingent obligations, or when analysing, communicating and managing the potential impact of existing exposures (GFDRR, 2014).

Increasingly, governments are using probabilistic catastrophe risk models, such as Hazus in the United States[2] or the CatSim model developed by the International Institute for Applied Systems Analysis (IIASA),[3] to gain a better understanding of their potential disaster losses and inform financial decision making. Probabilistic disaster risk assessments allow governments to estimate the total size of contingent liabilities for given disaster scenarios or return periods; they also provide estimates of the potential damage to government-owned buildings and infrastructure as well as to privately owned assets, which can be used to estimate the potential cost of compensation and financial assistance to individuals and businesses facing damages and losses. Where probabilities are known with reasonable confidence, this approach can be incorporated into cost-benefit analyses to determine which financial instruments are best suited to protect against potential fiscal shocks arising from disasters.

Some examples of the use of probabilistic models are provided here:

- In New Zealand, the government carried out a one-off study to understand the worst-case impact a major disaster could have for the central government. The 2010 study modelled the fiscal impact of a 7.8 earthquake affecting its capital, Wellington, and found an estimated government contingent liability of USD 11 billion to finance response and recovery for three consecutive years following the modelled earthquake scenario. The Canterbury earthquakes proved this study useful, as the actual fiscal costs came close to the estimates established in the study's model.
- Australia's Productivity Commission, the Australian government's independent research and advisory body, has sought to understand the government's future disaster-related contingent liabilities (in complement to the exercise of accounting for liabilities on the basis of past commitments through the NDRRA). It projects that the annual costs of disasters will increase from as much as USD 11.1 billion in 2018 to USD 11.5 billion by 2023.
- As part of the development of a national seismic profile, the Ministry of Economics and Finance in Peru estimated the exposed value of state assets at USD 2.6 billion in order to calculate the probable maximum loss of a 1 000-year return period event.

- France annually calculates the liability arising from the state guarantee of the CATNAT insurance scheme. To inform the definition of the state guarantee threshold, modelling is used to estimate the cost of disasters that might activate the guarantee.

An important baseline for estimating the exposure of government-owned assets' to disasters is the central asset inventory, which provides information on the number and type of assets, their residual value based on the quality of their maintenance and localised information on their natural hazard exposure. Table 2.4 provides an overview of current practices among the cases studied.

Table 2.4. Overview of public asset inventories across governments

	Public asset inventory?
Australia	Yes, partial; central government–owned buildings are monitored through a central inventory and insured through Comcover
Canada	Not currently established
Colombia	Not currently established
Costa Rica	Yes, but currently considered outdated and underestimated; update is planned that will include information regarding assets' location, value and insurance coverage
France	Yes, the general government account (Compte général de l'État, CGE) lists all public assets
Japan	Partial: Information is collected, e.g. on water infrastructure by river management authorities, but no national repository exists
Mexico	Yes, created in 2013; includes roads, bridges, water infrastructure, hospitals and schools (among others)
New Zealand	Information available scattered across ministries and agencies; not centrally collected
Peru	There is an information system on state-owned assets (Sistema de Informacion Nacional de Biens Estatales), but it cannot be used to estimate probable losses

Source: Case study reports.

The government of Colombia used the information on the estimated value of exposed public property (and of specific private property) to determine the magnitude of its disaster-related contingent liabilities. Estimated losses associated with public properties were defined as the government's explicit contingent liabilities, while estimated losses associated with private properties for which the government chose to compensate losses were defined as its implicit contingent liabilities (Colombia Ministry of Finance and Public Credit, 2011).

Governments' compilation of information to estimate their liabilities

As the discussion above has demonstrated, governments have a wide range of information that can help produce rough estimates of their potential disaster-related contingent liabilities. However, the case studies indicate that this information is not fully exploited in overall public financial planning for managing contingent liabilities:

- In New Zealand, the government records information on the central and subnational governments' past response and recovery spending, on spending for the reparation or replacement of damaged public infrastructure, on spending to increase welfare benefits following a natural disaster, on additional public resources allocated to recovery through special policies and on expenditures emanating from guarantees issued to the Earthquake Commission. However, this information is not compiled in a systematic manner for quantifying New Zealand's overall fiscal exposure to disaster-related contingent liabilities.

- Peru is a similar case. It has information on historical government expenditures for disaster risk management, as well as information from annual budget contingency appropriations and spending by the emergency management authority, but each set of information is separately maintained rather than combined to provide global estimates of the government's potential financial outlay.
- In Australia, central and subnational governments recognise the need to assess disaster-related contingent liabilities as part of budget planning (and, as will be shown in the following section, in their consideration of fiscal risk). Regular reviews are carried out based on past disaster-related expenditures and expected future expenditures resulting from past incidents. The NDRRA reimbursement requests are an important basis of information, and are complemented by an examination of subnational governments' public accounts.

While it may be challenging for governments to quantify their disaster-related contingent liabilities, and in some contexts neither desirable nor feasible, governments are encouraged to have at least a qualitative sense of the level of these liabilities and their potential impact on government finances. To gain this sense, a simple classification method can be used that defines liabilities as probable, possible or remote, based on judgments about their likelihood (IMF, 2016). The method suggests combining such a classification with broad estimates about the potential significance of the contingency, which is the probability multiplied by the estimated disaster exposure, to categorise the arising fiscal risks as minimal, small, moderate or major. Given the level of uncertainty involved, this approach is inevitably crude, but it may nonetheless help to focus attention on areas of greater potential risk. In Australia, for example, the annual Statement of Risks published with the budget each year contains a category of contingent liabilities described as "significant but remote", which receives a qualitative discussion when the budget plans are drawn up[4].

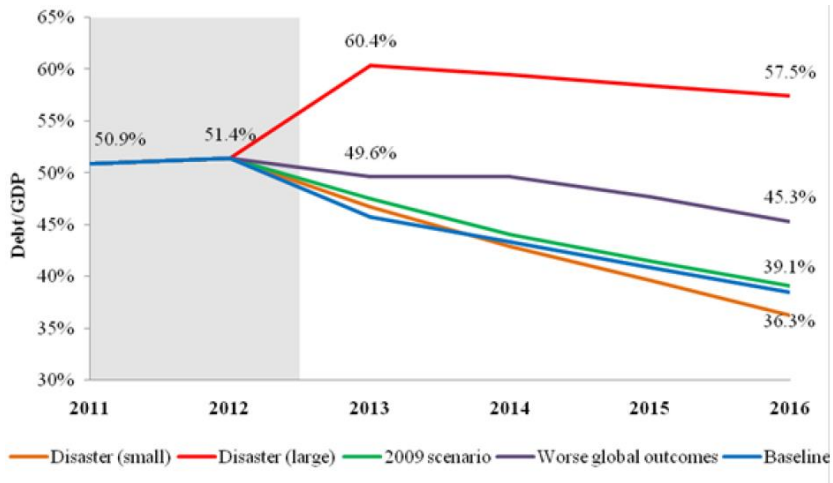
Estimation of fiscal impacts of disaster-related contingent liabilities and their integration in overall fiscal forecasting and fiscal risk assessments

Once disaster-related contingent liabilities are identified, and to the extent possible quantified, this information can be used to design and inform adequate financial planning and instruments as well as regulatory mechanisms. In a subsequent step, the potential comprehensive impact of disaster-related contingent liabilities on an economy's fiscal prospects can be evaluated as part of fiscal forecasts and fiscal risk assessments. Whether an economy chooses to engage in all or some of these steps might depend on the extent of the possible impact of disasters. Hence the information and practices described here are offered as guidance mechanisms rather than prescriptive policies to be applied across all governments.

A number of methods can be used to estimate the impact of contingent liabilities on the fiscal balance of an economy. The simplest method is to analyse the sensitivity of the current forecast path for public debt or the fiscal deficit to a disaster shock, for example, an assumed shock to the public finances of a certain percentage of GDP from a disaster (OECD, 2014). A standard sensitivity analysis of public debt sustainability can be conducted over a five-year period based on selected shocks. The size of a disaster-related shock could be varied to assess the sensitivity of public finances to shocks of different magnitudes, such as 1%, 5% or 10% of GDP. For example, the Philippine 2013 fiscal risk statement (Republic of the Philippines 2013) included a debt sustainability analysis that incorporated scenario analyses such as the occurrence of large disasters (see Figure 2.4). The 2015–17 Multiannual Macroeconomic Framework in Peru considered the

macroeconomic and fiscal consequences arising from a severe El Niño episode; the analysis suggested that the debt and deficit would increase slightly compared to the baseline (IMF, 2015).

Figure 2.4. Philippine national government debt-to-GDP scenario analysis



Source: Republic of the Philippines, 2013.

Sensitivity analysis has the advantages of methodological simplicity, limited data requirements and easy communication of results through tables or fan charts. It is commonly used to illustrate the sensitivity of public finances to small changes in macroeconomic parameters (GDP, interest rates, etc.), taken one at a time, or, when combined in plausible combinations, in alternative macroeconomic scenarios.

However, sensitivity and scenario analyses also have a number of shortcomings. In the context of exposure to the risk of a disaster shock, one of the more serious shortcomings is the lack of data on the probability of the shock. Another is the failure to account for interaction between shocks; much like other fiscal risks, a major disaster can cause an economic slowdown that exacerbates the initial shock to public finances, which can in turn potentially trigger further explicit and implicit contingent liabilities.

In a recent detailed survey and analysis of contingent liability realisations of all types, the International Monetary Fund (IMF, 2016) concluded that most fiscal risk scenario and sensitivity analyses tend to explore only modest-sized shocks and do not consider complexities in the impact on revenues and expenditures. In response it has put forward a new fiscal stress test methodology intended to analyse the impact of very large shocks. The stress scenario is forward looking rather than based only on past experience. One of its key elements is the range and likelihood of both explicit and implicit contingent liabilities, and their interaction with large macroeconomic shocks. Disasters are one source in the contingent liability component of the stress test but, especially for advanced economies, not the largest. The framework, however, can incorporate the scenario of a very large disaster occurring during a period of an economic shock already playing out, in turn triggering both explicit and implicit contingent liabilities. An example of such a scenario is the Great East Japan Earthquake, which according to the Japan Cabinet Office was a "crisis in the midst of a crisis" for the Japanese economy and its public finances (Ranghieri and Ishiwatari, 2014, citing Cabinet Office Japan, 2011). This very large disaster occurred during a period of prolonged economic underperformance and when public debt levels were

already very high, forcing the government to incur additional debts and increase taxation levels in an already tense fiscal environment (Ranghieri and Ishiwatari, 2014; Sato and Boudreau, 2012).

Practices showing strong recognition of major disasters in overall fiscal management

In several of the case study governments, fiscal management practices take major disasters into account. For example:

New Zealand's fiscal strategy aims at attaining a high level of fiscal resilience, taking into account a wide range of risks, including natural hazards, that the government may be exposed to. In addition to producing a detailed official account of government expenditures following major disaster events, the Treasury integrates the impact of major disasters in its fiscal forecasting and fiscal risk analysis as part of its annual budget reporting process, in which it sets desired fiscal buffers to withstand economic shocks that have been identified. The Treasury regularly measures the impacts of a number of key stress events, including the fiscal impact of a major disaster such as a major earthquake affecting Wellington (estimated to cause a USD 11 billion liability for the government). In this exercise, the Treasury evaluates the impact on net worth and net debt to GDP by modelling the combined worst-case outcomes stemming from the occurrence of a natural disaster during a financial crisis. While the specific costs of the scenarios are not quantified for the purposes of budget estimates, the impacts are considered in the development of the overall fiscal strategy.

The Australian government has likewise recognised the importance of the potential fiscal impact of a major disaster. It explicitly acknowledges disaster-related contingent liabilities, defined as potential costs to the central government arising outside of its control, in its annual Statement of Risks. In complement to this, the government budget estimates provide for expected ongoing payments through the NDRRA, the main source of funding from the central to subnational governments covering response and recovery costs after disasters. To arrive at longer-term projections of the future expected costs of disasters, the government of Australia conducts projection exercises and holds qualitative discussions to evaluate the disasters' potential fiscal impacts. Although it has no standard procedures to evaluate the macro-fiscal scenario that follows a combination of extreme events, these discussions allow the government to consider worst-case scenarios, such as the major Queensland flood that occurred during an economic downturn.

As part of the federal budgeting process, Mexico assesses (and develops a strategy for managing) the most relevant fiscal risks, namely short- and long-term macroeconomic risks and various contingent liabilities, which include those related to natural disasters. Owing to their potential significant impact on public finances, disasters are one of the long-term risks the government regularly assesses and considers in both medium- to longer-term fiscal forecasts. The results of these exercises, presented in the General Economic Policy Guidelines, are taken into account in the annual budgeting decisions on Mexico's major disaster fund, FONDEN.

In Japan, the Cabinet Office publishes an annual economic and fiscal outlook for use in preparing the budget of the next fiscal year. This outlook discusses medium- and long-term projections of government revenues and expenditures, including projected spending to continue recovery and reconstruction efforts for major disasters that occurred in previous fiscal years, such as following the 2011 Great East Japan Earthquake. Aside from this, fiscal impacts of potential future disaster-related contingent liabilities are not integrated in fiscal forecasting documents.

In Colombia, the potential impact of major disasters figures prominently in its fiscal impact and risk assessment. Analysis has shown that the potential fiscal impact of a major disaster is the second-largest fiscal risk the government can expect to deal with (legal actions pose the largest fiscal risk). As a result, the government has formally recognised natural disasters as a fiscal risk and has mandated their integration in fiscal risk assessments and in efforts to design a broader fiscal risk management strategy (World Bank, 2012).

Benefits of increasing visibility in the fiscal policy-making process

The examples above demonstrate that there are many ways to consider government disaster-related contingent liabilities in fiscal impact and fiscal risk assessments. While some governments have based their approach on quantitative methods forecasting future potential worst-case scenarios, others have studied and highlighted the impact of past events. Governments also integrate the results of these exercises in annual fiscal statements in many different ways. Some governments require precise quantitative forecasts of the impact of potential major disasters on a number of fiscal indicators, including debt, while others stick to a more qualitative discourse.

Even though fiscal risk assessment methods may differ, the objectives are very similar for all governments. Most aim at increasing the visibility of disaster-related contingent liabilities in the fiscal policy-making process. To further enhance this visibility, existing knowledge on the physical impact of extreme events – often available from disaster risk managers – could be used to inform the public financial analysis of potential worst-case scenarios. Greater internal dialogue between risk managers and financial officials would help to increase synergies. Similarly, although finance officials have recognised the importance of analysing potentially concomitant shocks (e.g. a disaster occurring during an economic downturn), sharing information on the physical impact of extreme disaster events and analysing governments' contingent liabilities based on these scenarios could give a more complete picture of the worst case governments would potentially have to deal with.

Disclosing government's disaster-related contingent liabilities

By disclosing disaster-related contingent liabilities – and the strategy for managing them – governments create trust in their capacity to manage the financial impacts of disaster risks. While identification is a prerequisite for disclosure, the scrutiny that comes with disclosure creates pressure to ensure that risks continue to be identified, and once identified are estimated and managed. It also helps to unlock additional information from parties outside the central agencies, and perhaps outside government, that may help identify (and quantify) fiscal risks, including contingent liabilities from disasters (IMF, 2009). Disclosure also promotes earlier and smoother policy response, increases trust among stakeholders in the quality of fiscal management, reduces uncertainty for investors and taxpayers and may as a result improve access to international capital markets (IMF, 2008). In a similar manner, publishing the government's strategy for managing disaster-related contingent liabilities subjects the strategy to beneficial scrutiny and provides an incentive to maximise the strategy's use. In specific cases, clearly defined exemptions to disclosure may be required, for example to minimise moral hazard, avoid negative economic side effects or avoid disadvantaging the economy in negotiations. Reporting on implicit contingent liabilities might also be inappropriate if it creates a sense that post-disaster assistance is unconditionally guaranteed.

Disclosure can take place through mechanisms for incorporating the potential fiscal impact of disaster-related contingent liabilities into budgeting and fiscal reporting or the overall fiscal risk management strategy. These mechanisms apply both to individual government entities and levels of government as well as to central government as a whole. The more important mechanisms for disclosure include these:

- the annual budget call circular, which may require line ministries to provide information on contingent liabilities, for internal monitoring purposes and possibly for publication in annual budget documents;
- ministry of finance documentation, including the medium-term fiscal framework, fiscal risk reports or stand-alone reports on contingent liabilities;
- regulations such as requirements to report contingent liabilities to the ministry of finance;
- a fiscal responsibility law requiring regular public disclosure of contingent liabilities (possibly alongside other fiscal risks).

Earlier findings on OECD governments' contingent liabilities and commitments in their budgeting and fiscal reporting showed that disaster-related contingent liabilities are not always featured (OECD, 2016). The results of the case studies undertaken for this report are consistent with this result: disaster-related contingent liabilities are not systematically reported; or else the reporting is limited to a qualitative mention or to ongoing recovery payments rather than future expected government outlays:

- Colombia formally recognises disaster-related contingent liabilities as a major fiscal risk, but the Medium-Term Fiscal Framework, which requires the government to include explicit expected contingent liabilities, does not include them.
- In New Zealand, all contingent liabilities valued at more than USD 73 million need to be individually reported annually in the audited Notes of the Financial Statements of the Government and in the Budget Economic and Fiscal Update (BEFU). The guarantee of the Earthquake Commission is included in the BEFU as one of the central government's contingent liabilities. However, this contingency is considered as unquantifiable, and the BEFU includes it without specific value, offering instead a brief description of its nature and a note on whether it has changed since the previous report.
- Australia's government discloses information on its explicit disaster-related contingent liabilities in its Statement of Risks (part of the Budget Papers). Future disasters are recognised as an unquantifiable contingent liability in the budget documents.
- Mexico requires the disclosure of the most relevant fiscal risks in the annual General Economic Policy Guidelines, which inform the central budget planning process. Fiscal risks that need to be referred to include natural disasters. In addition, FONDEN allocations for post-disaster reconstruction by disaster and sector are publicly disclosed online.
- Although Peru requires the publication of the government's explicit contingent liabilities, it has only recently started to mention disaster-related contingent liabilities in its Multiannual Macroeconomic Frameworks.

- In Japan, the disclosure of disaster-related contingent liabilities is limited to an outlook on projected expenditure for ongoing recovery and reconstruction efforts stemming from disasters that occurred in previous fiscal years, such as following the 2011 Great East Japan Earthquake. Fiscal impacts of potential future disaster-related contingent liabilities are not included.

Notes

[1] "Contractual obligations" refers to contracts made between governments and nongovernment organisations providing services to the government, and to contracts with entities providing infrastructure and other services under public-private partnerships.

[2] See FEMA, "Hazus," https://www.fema.gov/hazus.

[3] See IIASA, "CATSIM," http://www.iiasa.ac.at/web/home/research/researchPrograms/RISK/CATSIM.en.html.

[4] Government of Australia, "Budget 2016–17. Statement 8: Statement of Risks (continued)," www.budget.gov.au/2016-17/content/bp1/html/bp1_bs8-05.htm.

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Chapter 3. Mitigating disaster-related contingent liabilities and financing residual risks: Policy lessons

This chapter looks at how governments can reduce their expected disaster-related contingent liabilities through effective mitigating and financing strategies. It underlines the importance of setting clear and explicit disaster assistance rules, especially as they relate to the central governments' financial support to subnational counterparts. It also emphasises the need to take moral hazard risk into account in determining rules for financial assistance to private stakeholders. This helps ensure that public disaster assistance does not undermine disaster risk reduction investments, but instead encourages them. The chapter concludes with a discussion of financing residual risks.

While Chapter 2 focused on the identification and quantification of disaster-related contingent liabilities with a view to better managing them as part of governments' budgets and fiscal risk frameworks, this chapter focuses on strategies that help governments reduce their expected disaster-related contingent liabilities. Governments can reduce liabilities through two main lines of action: by clarifying and controlling explicit - and to the extent possible implicit - contingent liabilities and by managing moral hazard risks. Thus the mitigation strategies for governments could include all or a mix of the following:

- definition of clear cost-sharing mechanisms across levels of government;
- establishment of incentives for both subnational governments and non-governmental stakeholders to reduce disaster risks ahead of disasters;
- consideration of a ceiling on disaster recovery costs the government will assume;
- development of financial strategies to cover residual risks.

Since governments' mitigating actions are intrinsically linked with their approach to managing disaster-related contingent liabilities, the findings of this report provide relevant policy lessons, discussed below.

Cost-sharing mechanisms between central and subnational governments

A significant part of central government disaster-related contingent liabilities stems from reimbursing costs incurred by subnational governments for their recovery and rehabilitation efforts. As seen earlier, a large share of these costs originates in the damage to public assets managed or operated by subnational governments. The process of providing post-disaster financial assistance creates a natural opportunity for central governments to encourage their subnational counterparts to engage in appropriate risk management. Particularly in economies where central governments offer wide-reaching assistance for damage to subnationally owned assets, cost-sharing arrangements should encourage subnational governments to invest in risk reduction and assess the cost-effectiveness of risk transfer. One important component is to encourage "building back better" in reconstruction, i.e. using the funds for recovery to invest in risk reduction in order to avoid the same damages the next time a disaster occurs.

Table 3.1 shows that many governments, independent of their administrative set-up, have specific cost-sharing arrangements between their levels of government to reimburse the costs incurred by a disaster. Most governments demonstrate a sense of solidarity in sharing and distributing those costs to help those subnational governments most affected by disasters.

Table 3.1. Cost-sharing arrangements between levels of government

Economy	Cost-sharing arrangements
Australia	Central government compensates up to 75% of eligible costs of relief and recovery incurred by SNGs (exact amount depends on the total costs and the capacity of individual states to fund relief and recovery); eligible costs are clearly defined and range widely, from emergency assistance for populations to the restoration of public assets and assistance for small businesses, etc.
Canada	Central government compensates between 50% and 90% of eligible costs of relief and recovery incurred by SNGs (exact amount depends on the total costs and expenditure thresholds determined in line with each province's or territory's population size); eligible costs are clearly defined and range widely, from disaster compensation for uninsurable primary residences to the restoration of public assets and assistance for small businesses, etc.
Colombia	No cost-sharing agreement is specified.
Costa Rica	No cost-sharing agreement is specified.
France	• Solidarity provisions for local authorities are as follows: If damages to subnationally owned public assets caused by weather-related or geological hazards exceed EUR 150 000 (USD 180 000) central government assistance for their reconstruction to their pre-disaster state can be requested. The assistance is not capped. Upon ministerial decision, the central government's emergency relief fund and its relief fund for overseas territories (FSOM) may be tapped upon to support local authorities in providing relief in the immediate aftermath of a major disaster.
Japan	• SNGs need to finance emergency relief efforts by setting aside 0.5% of general-purpose local tax revenues as reserves (whereby the central government pays 50% of the costs if total spending is less than 2% of projected SNG tax revenue, or 90% if costs are higher). • Two-thirds of expenditure for public infrastructure recovery is covered by central government, one-third by SNGs for their infrastructure. If SNGs issue bonds to cover expenditures for public asset recovery, 95% of the interest can be covered by the central government.
Mexico	• Central government provides up to 50% of the costs of rehabilitation and reconstruction of subnationally owned public infrastructure (reduced to 25% if co-financing is requested a second time and the infrastructure remains uninsured; further reduced to 0% for any subsequent request for uninsured assets). SNGs can request funding from central government for assistance they provide to affected populations, but no specifics are given.
New Zealand	• The central government pays 100% of SNG-incurred costs stemming from caring for displaced or directly affected people. • The central government reimburses 60% of other response costs that reduce immediate danger to human life (e.g. draining floodwaters). • Central government reimburses 60% of essential infrastructure recovery costs. Other cost-sharing mechanisms include advance payments for response costs; contributions made by joint ministers through disaster relief funds set up by councils; and special policy support under exceptional circumstances for repair and recovery.
Peru	There is a cost-sharing agreement, but there are no details on the exact share each level of government is expected to pay in the event of a disaster.

Note: SNG = subnational government. The list of cost-sharing arrangements is not comprehensive.
Source: Case study reports.

The explicit commitments central governments have made to their subnational counterparts are sometimes exceeded under exceptional circumstances. In the aftermath of the major earthquakes experienced in New Zealand in 2010, 2011 and 2016 the central government assumed costs incurred by subnational governments that far exceeded its formal obligations. Central government support calledI into question the established definition of "essential infrastructure" – that is, the infrastructure it had committed to replace for subnational governments. This experience sparked reform discussions and a renewed interest by the central government in reducing disaster-related government liabilities through more effective and centrally monitored disaster risk reduction measures (e.g. building code and land use code enforcement).

Some governments do not clearly define the maximum levels of central governments' disaster recovery support to subnational governments. In France, for example, disaster recovery assistance for subnational governments is available through the solidarity provisions for local authorities when damages exceed EUR 150 000 (USD 180 000), but a maximum amount of financing is not defined.

A number of central governments have started to re-designtheir cost-sharing mechanisms to improve compliance with existing rules during disasters. In Australia state governments compile an overview of the insurance arrangements in place for the assets that they own.This information is provided to the attorney-general, who has the authority to review the arrangements, make recommendations for changes and penalise states that do not comply with those recommendations, including through reductions in the rate of reimbursement for reconstruction costs. In Mexico, the FONDEN mechanism encourages subnational entities to reduce their disaster risk by limiting reimbursement for assets damaged in a second or subsequent disaster.

Several lessons are emerging. Central governments must be clear and explicit in their commitments for reimbursing disaster-related costs incurred by subnational levels. Ceilings that limit central government contributions to subnational counterparts could be a helpful enforcement tool. Finally, governments can better leverage cost-sharing mechanisms to reduce future liabilitie. Governments could consider rewards for subnational governments that invest in risk reduction measurs, risk transfer products or enforcement of non-structural measures.

Cost-sharing mechanisms between government and private actors

Another source of a central government's disaster-related contingent liabilities is costs it covers for damages incurred by private stakeholders. This government support is often provided directly by central government agencies to the affected stakeholders, but is sometimes also channelled through and complemented by subnational governments (Table 3.2).

The expectation of ex post financial assistance can discourage private stakeholders from investing in risk reduction measures, including disaster insurance. France's overseas territories have much lower hazard insurance coverage (52%) than mainland France (close to 100%). The lower rate in the overseas territories is explained by the prevalence of traditional buildings that do not meet the building code and thus cannot be insured. Unlike in mainland France, post-disaster assistance by the central government in the overseas territories is not limited to basic needs, but may also include financial assistance for the reconstruction of uninsured private assets. With the exact eligibility criteria adapted after each disaster, private actors may have reason to assume that the government will step in to provide disaster recovery and reconstruction assistance (Grislain-Letrémy and Peinturier, 2012).

Governments' assistance for households varies across economies. While some governments focus their support on low-income households, others provide support to all affected persons, independent of their income levels. Post-disaster assistance for individual households is generally independent of any preventative measure taken by households. In line with this, the level of disaster insurance coverage for households is extremely low (as shown in Table 3.2),.

Governments recognise that assisting businesses with disaster-related costs is a key factor in limiting the overall economic impact of a disaster. Ex post assistance for disaster-

affected businesses has focused on limiting the liquidity constraints created by an interruption of business operations, including through low-interest-rate credits or the reduction of taxes due in the year of the disaster. Like household assistance, assistance to businesses has most often not been tied to previous preventative actions taken.

Table 3.2. Private property insurance against natural hazards

	Private (residential and commercial property)	Private coverage rate	Public assets	Public coverage rate
Australia	Cover for majority of natural hazard risks is available for residential and commercial properties.	Not available	Australian departments and agencies insure their government assets through Comcover.	160 assets insured
Canada	Cover for majority of natural hazard risks is available for residential and commercial properties, but flood insurance became available only recently.	10-15 %	Not compulsory	Not available
Colombia	Some disaster risk insurance is available on the private market.	Less than 2% of households covered	Not available	Not available
Costa Rica	Some disaster risk insurance is available on the market, with most insurance coverage provided by the National Insurance Institute.	Not available	Public assets must be insured.	Not available
France	Insurance available for all hazards, with the CATNAT scheme put in place to provide insurance for hazards otherwise considered 'uninsurable', i.e. hazards concentrated on a limited area, such as flooding, avalanches, volcanic activity or earthquakes.	Mainland France: 99%; Overseas territories: 52%	Public assets can be covered by insurance via the CATNAT system.	Not provided, but most public service infrastructure (e.g. hospitals, education facilities and government buildings), are protected by insurance under the CATNAT scheme.
Japan	Private household insurance against earthquake, tsunami and volcanic activity exists and is backed by the Japan Earthquake Reinsurance.	Railroads: 56-100% (typhoons and floods); 5-22% (earthquakes) Airports: 79% (typhoons and floods); Ports: 63% (typhoons and floods)	There is no disaster risk insurance for government-owned assets.	Not applicable.
Mexico	Additional non-government-backed insurance is available for households against fire, flooding and earthquakes.	29.5% of households covered by government-backed insurance	All national public infrastructure assets (except for federal roads) are covered by individual federal insurance policies and/or by FONDEN-backed insurance	100% coverage (except federal roads) of national infrastructure assets.
New Zealand	Commercial properties can purchase insurance against disasters through fire insurance.	Additional 22% of households covered by private insurance providers	-60% of subnationally owned infrastructure is mostly uninsured.	Most public assets insured (value USD 200 million); uninsured assets estimated at USD 90 million.
Peru	Private properties are insured through mortgages if insured at all.	No estimate available for commercial coverage rates	Public assets and infrastructure are insured; insurance is not obligatory.	Not available

Source: Case study reports.

The design of ex post government assistance for households and businesses should include incentives to invest in physical risk reduction measures. Rewards can be given to those households and businesses that adhered to existing rules on disaster risk prevention or for those that adapted voluntary protection measures, such as disaster insurance.

Managing remaining fiscal risk through multi-pronged financial protection strategies

Even after disaster-related contingent liabilities have been mitigated, some fiscal risk remains. Financial protection strategies help governments to manage these remaining contingent liabilities in a way that meets cost and liquidity objectives. In the past, the remaining fiscal risk was often met on an ad hoc basis after the disaster event (Bevan and Cook, 2015). However, governments are beginning to consider multi-pronged financial protection strategies based on more proactive planning to secure optimal access to post-disaster financing ex ante, before a disaster occurs (Table 3.3).

Table 3.3. Examples of mitigation tools for residual fiscal risk

Ex ante financing	Ex post financing
• Dedicated reserve fund • Contingency budget • Contingent financing (credit/grant) • Sovereign risk transfer • Insurance of public assets • Catastrophe bonds and other CAT-linked security/alternative risk transfer instruments	• Budget reallocation • Debt financing/borrowing • Taxation • Multilateral/international borrowing • International aid

Source: World Bank, 2014.

A dedicated reserve fund is a common ex ante budgeting mechanism for disaster-related contingent liabilities (explicit or implicit). It enables governments to respond immediately to disasters without having to cut other spending programmes or seek additional legislative authority. In many cases, such mechanisms have been established in response to particularly severe disaster events. Mexico's disaster fund (FONDEN), whose mandatory allocation is no less than 0.4% of the annual budget, is an example of a dedicated disaster reserve fund. In case of disaster, FONDEN provides the 32 Mexican states and the federal agencies with the necessary resources to cover losses and damages, whose magnitude exceeds their financial capacity.

In addition to reserve funds, governments commonly use supplementary budgets, financed e.g. by new debt or taxation. In economies where the expected frequency and severity of disaster events is lower, governments may opt for a general contingency budget line, although such an instrument is rarely earmarked only for disasters. Depending on other contingent financing requirements, – it often has only small and uncertain amounts available to meet the cost of disaster-related contingent liabilities. The national budget in South Africa, for example, includes a contingency reserve that can be used in case of disasters, specified in the Annual Division of Revenue Act. In Japan, a general contingency reserve in the general account budget supplements the annual contingency budget line for disaster recovery.

Contingent credit facilities, which also allow an immediate disbursement once a disaster hits, may be more efficient than dedicated reserves for governments that face high-damage/low-probability disaster events. This option is particularly popular in Latin

American economies. The government of Costa Rica has two such contingent credit loans: the Catastrophe Deferred Drawdown Option (CAT DDO) loan signed with the World Bank in 2008 and a contingent loan signed with the Inter-American Development Bank in 2012. In 2009, after the Cinchona earthquake and severe floods, Costa Rica used the CAT DDO twice to obtain a total of USD 24 million (World Bank Group, 2014).

Ministries of finance have an important role to play in ensuring appropriate scrutiny of decisions on financing residual fiscal risks and their incorporation in routine budget and public financial management processes. The balance between ex ante and ex post instruments to disaster risk financing is a key strategic issue. Isuch as tax incentives, extra-budgetary funds, public insurance and public-private partnerships can themselves, introduce new sources of fiscal risks or exacerbate fiscal risk if not well designed. Ministries of finance should advocate to integrate these decisions in governments' budgetary processes.

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Part II: Case Studies

Australia

Prevalence of natural hazards

The vast territory of Australia is marked by diverse climatic conditions and landscapes, and accordingly by a wide variety of weather-related and geophysical risks ranging from bushfires, floods and storms to earthquakes (See table below). The occurrence, frequency and intensity of different types of natural disasters vary with location.

Bushfires are prevalent in the Australia's hot and dry climate. Their potential magnitude depends not only on the prevailing climatic conditions when they occur, but also on the characteristics of the fires themselves, such as their temperature, moisture, wind speed and slope angle. Bushfires occur in Southern Australia mostly during the summer and autumn; in New South Wales and southern Queensland during the spring and early summer; and in the Northern Territory in winter and spring. They can cause significant destruction when they occur in populated areas; as did the 2009 Black Saturday bushfires in the state of Victoria, for example, which took the lives of 173 persons and cost over AUD 1.2 billion (USD 905 million) in insured losses alone.

Types of natural hazards to which Australia

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Category	Type of hazard
Geophysical	Earthquakes
Meteorological	Cyclones, severe storms
Hydrological	Floods
Climatological	Bushfires

Source: EM-DAT, 2017

Australia is also subject to frequent riverine and flash floods, often brought on by the effects of El Niño and La Niña. Riverine flooding is prevalent in low-lying inland regions and it can spread over large areas. Flash floods affect Australia's mountainous and coastal regions. Floods cause an estimated 30% of the annual recorded damage from all natural hazards in Australia. The 2010 Queensland flood took 36 lives, affected 200 000 people, and caused over AUD 6 billion (USD 4.5 billion) in damages.

Tropical cyclones – ten each season on average – develop over the warm Coral Sea and the Indian Ocean; these affect mostly the north western parts (in Western Australia, the Northern Territory and northeast Queensland), and occur predominantly during the summer. Cyclones can be very destructive, causing an annual average loss of an estimated AUD 266 million (USD 200 million), around one-fourth of the annual damages resulting from natural hazards. Severe storms such as thunderstorms can occur in all parts of Australia, and cause an annual average loss comparable to that of cyclones. The 1999 hailstorm in New South Wales caused an estimated AUD 2.3 billion (USD 1.7 billion) in damages.

Sitting on the edge of plate movements (the Indo-Australian plate pushing north against the Eurasian, Philippine and Pacific plates), Australia is exposed to a moderate earthquake risk; few potential events in the area could significant damage. Most of the earthquake damage recorded is attributed to one single event in 1989 in Newcastle (New South Wales), which resulted in 13 fatalities and around AUD 4 billion (USD 3.2 billion) in damages.

The impacts of climate change are expected to increase the severity of some natural hazards – bushfires, storms, floods, costal inundations – which could expose a higher number of people to risk in the future.

Major natural disasters in Australia (since 1980)

Disaster event/location	Year	Fatalities	People affected	Estimated economic damage in USD
Flood/ New South Wales, Queensland, Victoria	2010	35	175 000	7.3 billion
Black Saturday bushfires/Victoria	2009	173 (AIDR)	9 954 (EMDAT)	905 million (insurance claims alone)
Sydney hailstorm/New South Wales	1999	1 (EM-DAT)	6 024 (EMDAT)	1.7 billion (insurance claims alone)
Earthquake/Newcastle	1989	13 (AIDR)	2 115 (EMDAT)	862 million (insurance claims alone)

Sources: EM-DAT, 2017; AIDR, 2017

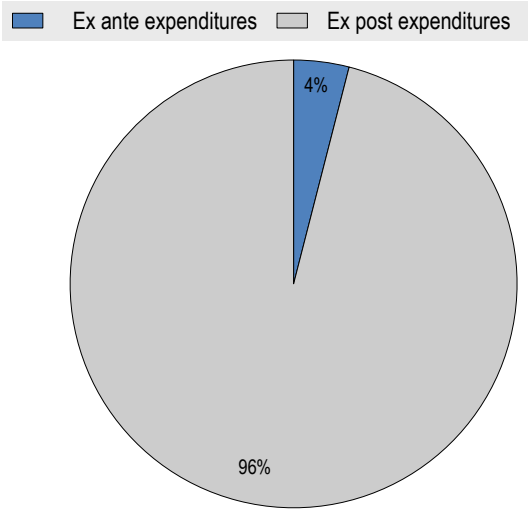
Past fiscal impacts of disasters

Estimates of the average annual loss from natural disasters in Australia vary significantly. They range from AUD 2.2 billion (USD 1.7 billion) (PreventionWeb, 2017) to AUD 11 billion (USD 8.3 billion)[1]. On average, less than half of damages are covered by insurance (Andrews et al., 2016). (Those figures include intangible costs such as mental health impacts.) Even though extreme temperatures and bushfires are the most deadly of natural hazards, storms – followed by floods – are the most destructive in terms of economic damage (EM-DAT, 2017).

The total amount of government spending for disaster response is estimated at AUD 700 million (USD 528 million) annually, of which the central government pays around 80%[2], a share that is estimated to increase over time (Deloitte Access Economics, 2013). Australia exhibits a significant vertical fiscal imbalance[3], and the central government has served as an important safety net for subnational governments facing fiscal risks from disasters, mainly by providing ex post financial assistance for disaster relief and recovery, i.e. through transfers.

Central government spending on ex ante disaster risk management (i.e. preparedness and risk prevention) has amounted to AUD 555 million (USD 415 million) over the period between 2002 and 2014. In the same period the central government spent AUD 13 billion (USD 9.8 billion) on ex post disaster risk management), with the Natural Disaster Relief and Recovery Arrangements (NDRRA) programme accounting for the bulk of this funding. The National Commission of Audit (2014) pointed out that payments by the NDRRA pose a considerable risk for managing the government's budget and fiscal strategies.

Ex ante versus ex post disaster risk management expenditures at national level, Australia 2002-14



Source: Australian Productivity Commission, 2014.

The records for subnational spending on ex ante and ex post disaster risk management are less complete. Since a significant amount of embedded ex ante spending on resilience measures - relating for example to public infrastructure - is made by subnational governments, ex ante expenditures are likely underestimated.

Estimated Australian government ex ante disaster risk management expenditure, 2002/03 – 2014/15

Financial year	NPANDR/SPPs	NEMP (million AUD)	Other (million AUD)	Total (million AUD)
2002/03	18.4	-	8.0	26.4
2003/04	10.2	-	10.2	20.4
2004/05	15.5	-	12.4	27.9
2005/06	30.9	-	20.0	50.9
2006/07	24.0	-	17.7	41.7
2007/08	30.2	-	17.4	47.6
2008/09	36.9	-	15.6	52.5
2009/10	34.1	3.6	15.0	52.7
2010/11	26.4	3.6	13.0	43.0
2011/12	30.0	3.6	13.0	46.6
2012/13	24.0	3.8	16.0	43.8
2013/14	17.6	3.6	16.0	37.2
2014/15	39.2	3.7	22.0	64.9
Total (million AUD)	337.4	21.9	196.3	555.6

Note: NPANDR = National Partnership Agreement on Natural Disaster Resilience; SPP = specific purpose payment; NEMP = National Emergency Management Projects; - = nil or rounded to zero.
[1] Expenditures were through the NPANDR starting in 2009/10; before then they were through SPPs.
[2] "Other" includes the National Bushfire Mitigation Program, National Flood Risk Information Portal and National Emergency Volunteer Support Fund along with support for the Bushfire CRC, the Bushfire and Natural Hazards CRC and the Australian Emergency Management Institute.
Source: Australian Productivity Commission, 2014

Estimated Australian Government ex post disaster risk management expenditure, 2002/03 – 2014/15

	NDRRA (in million AUD)	AGDRP (in million AUD)	Other (in million AUD)	Total (in million AUD)
2002/03	80.4	-	2.5	82.9
2003/04	46.9	-	-	46.9
2004/05	67.7	-	-	67.7
2005/06	69.1	-	-	69.1
2006/07	103.7	-	-	103.7
2007/08	18.0	39.3	10.0	67.3
2008/09	292.2	133.1	28.2	453.5
2009/10	106.1	43.5	47.0	196.6
2010/11	2 758.4	845.4	107.1	3 710.9
2011/12	2 960.6	80.0	50.5	3 091.1
2012/13	77.1	171.0	20.2	2 68.3
2013/14	2 064.9	0.3	2.1	2 067.3
2014/15	2 981.2	-	1.7	2 982.9
Total (million AUD)	11 626.3	1 312.6	269.3	13 208.2

Note: AGDRP = Australian Government Disaster Recovery Payment; - = Nil or rounded to zero.
[1] "Other" includes the Disaster Recovery Allowance, the former Disaster Income Recovery Subsidy, the National Aerial Firefighting Arrangements, Emergency Alert, *ex gratia* payments to New Zealanders and contributions to appeals.
'Other'column includes the Disaster Recovery Allowance, the former Disaster Income Recovery Subsidy, the National Aerial Firefighting Arrangements, Emergency Alert, ex gratia payments to New Zealanders and contributions to appeals. – Nil or rounded to zero.
Source: Australian Productivity Commission, 2014

Managing disaster-related contingent liabilities

Identification of disaster-related contingent liabilities

Explicit contingent liabilities

Explicit contingent liabilities arise from legal commitments of both central and subnational governments to provide disaster assistance. A comprehensive legal framework gives the Australian government a clear role in providing financial support for post-disaster relief and recovery. The table below summarises of the government's explicit obligations.

Explicit central government obligations for post-disaster financial assistance in Australia

Commitment to finance…	Yes	No
… post-disaster response and recovery	✓	
… a share of the costs incurred by subnational governments for post-disaster response and recovery	✓	
… reconstruction and maintenance of central government-owned public assets	✓	
… rehabilitation and reconstruction of private assets	✓	
… other expenses incurred by subnational governments (e.g. payments to businesses or individuals)		x
… government guarantees for disaster losses incurred by public corporations and public-private partnerships	✓	

Source: OECD Survey.

The Australian central government provides direct ex post disaster assistance for 1) individuals; 2) regional governments, and 3) public and private corporations. The main ex post funding for recovery and reconstruction is provided through the NDRRA, the Australian Government Disaster Recovery Payment (AGDRP) and the Australian Government Disaster Recovery Allowance (AGDRA), although other small funding envelopes exist in other government departments for specific types of costs and disaster events (e.g. support for the agricultural sector to address drought-related losses). The AGDRP and AGDRA provide limited income support and are meant to address immediate needs before any insurance payments become available; payments therefore do not take into account insurance coverage. The amount of support provided is pre-defined, although there is some discretion in the scope of eligibility for such payments. Most of the NDRRA funding is provided for recovery costs of state-owned public infrastructure, particularly in response to flood events.

For individuals, the following assistance is provided in the aftermath of a disaster[4].

- The Australian Government Disaster Recovery Payment[5] is a one-off payment of AUD 1000 for adults and AUD 400 for children adversely affected by a major disaster in Australia or overseas. The prime minister determines whether an event qualifies as major based on advice from the attorney-general.
- The Disaster Recovery Allowance[6] is a short-term (maximum 13-week) income support payment for those whose income has been affected by a disaster. It is paid to employees, small business owners and farmers.

For subnational governments, the central government provides financial assistance under the NDRRA, reimbursing up to 75% of eligible expenditure on relief and recovery payments.[7] The exact percentage of the reimbursement depends on the size of the disaster-related costs that the subnational government has incurred in a given year. Expenditure thresholds are established to calculate the level of financial support; these take into account the capacity of individual states to fund relief and recovery assistance. As the cost to the subnational government increases, so too does the assistance provided by the central government.

Cost-sharing arrangements and triggers for NDRRA assistance measures

NDRRA Category	Reimbursement rate and trigger
Category A	Reimbursement rate: 50% (if total eligible state expenditure in a financial year is below 1st threshold) or the higher of the above rate or 50% between 1st and 2nd thresholds plus 75% above 2nd threshold (if total eligible state expenditure in a financial year is above 2nd threshold). Trigger: Once eligible state expenditure for an event exceeds the small disaster criterion of AUD 240 000
Category B	Reimbursement rate: 50% between 1st and 2nd thresholds, 75% in excess of 2nd threshold Trigger: Once eligible state expenditure in a financial year exceeds 1st threshold
Category C (for severe impact events only)	Reimbursement rate: Determined at the time of agreement of measures (generally 50% of the agreed measures) Trigger: Subject to approval by the prime minister
Category D (for severe impact events only)	Reimbursement rate: Determined at the time of agreement of measures (generally 50% of the agreed measures) Trigger:Subject to approval by the prime minister.

Source: Disaster Assist, www.disasterassist.gov.au/Documents/Fact-sheets/NDRRA-Factsheet.doc

Eligible relief and recovery expenditures fall under the following four categories:

Category A measures (emergency assistance for individuals):

- emergency food, clothing or temporary accommodation
- repair or replacement of essential items of furniture and personal effects
- essential repairs to housing, including temporary repairs and repairs necessary to restore housing to a habitable condition
- demolition or rebuilding to restore housing to a habitable condition
- removal of debris from residential properties so as to make them safe and habitable
- extraordinary counter-disaster operations
- personal and financial counselling
- coverage of extraordinary costs associated with the delivery of any of the above forms of assistance.

Category B measures:

- restoration or replacement of an essential public asset
- betterment of an essential public asset
- concessional interest rate loan to small businesses and primary producers whose assets have been significantly damaged
- concessional interest rate loan to needy individuals or non-profit organisations whose assets have been significantly damaged
- concessional interest rate loan to small businesses, primary producers or non-profit organisations that have suffered a significant loss of income
- interest rate subsidy to small businesses or primary producers whose assets have been significantly damaged
- interest rate subsidy to small businesses, primary producers or non-profit organisations that have suffered a significant loss of income
- freight subsidy to primary producers whose assets have been significantly damaged
- grant to needy individuals or non-profit organisations whose assets have been significantly damaged
- counter-disaster operations to protect the general public

Category C measures are available only for major disasters, in addition to Categories A and B measures, and only after the disaster impacts have been assessed. Reimbursements under this category must be requested by subnational governments and approved by the prime minister. Eligible expenditures include clean-up and recovery grants for small businesses and primary producers and/or the establishment of a community recovery fund.

Category D measures provide assistance during major disasters when Categories A to C are insufficient. Reimbursements under this category also must be requested by subnational governments and require approval by the prime minister.

For private and public corporations the central government provides post-disaster assistance in the form of indemnities and guarantees for certain events, as described in Budget Paper 1 (Commonwealth of Australia, 2016a).

Implicit contingent liabilities

Category D measures provide ex post disaster assistance to regional governments in exceptional circumstances, beyond the assistance provided through Category A, B and C measures. In the past, this category of assistance was used for exceptional costs, such as the dredging of a port after the 2010-11 Queensland floods, and was meant to provide the government with the necessary flexibility to support unforeseen recovery and reconstruction needs. However, since "exceptional circumstances" are defined rather broadly and the exact amount of possible reimbursement not specified, this category grants significant discretion of the assistance provided and may entail a substantial fiscal impact. There has in fact been a concerted effort across levels of government to ensure that such payments do not raise unrealistic expectations with regard to future levels of central government assistance. For example, the assistance is provided only once the details of the disaster's impact have been assessed, and is subject to authorisation from the prime minister.

Estimation of insurance payouts

The proportion of losses covered by insurance can be an important determinant of the size of government contingent liabilities. Australia has a comprehensive general insurance market; cover is available for the majority of natural hazard risks to residential and commercial property, although some high risk properties may face unaffordable insurance rates.

The 2010/11 Queensland floods revealed the significant underinsurance of flood risk in that state. Many households had mistakenly believed that overland flood coverage was included in their standard fire insurance policy, and therefore did not purchase additional protection against flood risk. Since that time, the insurance industry and governments have invested significantly in improving consumer understanding of available coverage. Those efforts, combined with the flooding experience, have led to a major increase in the purchase of flood coverage. Investments in flood mapping by the insurance industry have also led to a better understanding of risk and a more granular approach to risk-based pricing of flood insurance. These in turn have led to very high premiums for some households in high-risk areas. The government has considered different approaches to addressing affordability concerns, most recently through a Northern Queensland Premium Affordability Task Force (Commonwealth of Australia, 2015); but no specific measures have been implemented thus far.

Commercial policies are generally "all risk", covering damages and losses from all types of natural hazards. Insurance availability and take-up is high, meaning that underinsurance among Australian businesses is unlikely.

The NDRRA may provide reimbursements for limited assistance to individuals for some losses granted by subnational governments, such as for debris clearance and replacement of household contents (e.g. white goods), although this is rare. Some assistance may also be provided to businesses, although this normally takes the form of subsidised loans. When such assistance is granted, it does not take into account whether coverage was provided (or available) through insurance for property damage or business interruption/ additional expenses. Government officials perceive the assistance to individuals and businesses as providing for immediate needs in complement to, or as a bridge to any insurance payments.

In addition to natural hazard insurance for households and the private sector, the public assets of more than 160 Australian government entities (including all departments of state)

are insured through Comcover, the Australian government's general insurance fund. Comcover covers only those entities that are within the general government sector and subject to the Public Governance, Performance and Accountability Act 2013 (i.e. Fund Members). Managed by the Department of Finance, Comcover keeps a register of insured public assets that are declared by each Fund Member, and provides cover for all general insurable risks including natural hazards (but excluding workers' compensation, which is the responsibility of Comcare). Comcover seeks information from Fund Members on assets to be covered by the fund and charges property premiums based on the sum insured and past claims experience, while taking into account the value of the property premium pool for the entire fund. Many states and territories also have self-managed funds or other public insurance arrangements for public assets under their responsibility. In some states and territories premiums are risk based, and reinsurance is secured to transfer some of the exposure to private markets.

Quantification of disaster-related contingent liabilities

Across all levels of government, Australia has recognised the need to assess disaster-related contingent liabilities as part of budget planning and fiscal risk considerations. The central and subnational governments in Australia carry out regular inventories of past disaster-related expenditures and expected future expenditures arising from past incidents. These assessments include an examination of spending at the subnational level based on data provided in NDRRA reimbursement requests and on public accounts of subnational governments. The process is jointly managed by the Attorney-General's Department, the Treasury and the Department of Finance. The type of information gathered is summarised in the table below.

Types of information from previous events available to calculate disaster-related contingent liabilities in Australia

Type of disaster-related contingent liability	What gets recorded
Relief spending	Expenditure by central government for relief payments
Spending for the reconstruction of damaged public infrastructure and assets	Central government and subnational government expenditure for public asset restoration expenditure (NDRRA reporting and subnational government public accounts)
Spending for the reconstruction of damaged private assets	Insurance payout data are available from the Insurance Council of Australia. Any NDRRA-eligible financial assistance to individuals/business available through NDRRA reporting
Spending on increased social transfers due to a post-disaster economic slowdown	Expenditure on Disaster Recovery Allowance
Expenditures due to guarantees issued to public or private entities suffering disaster losses	Any payment triggered is reflected in the Budget Papers All financial limitations on guarantees are included in Budget Paper 1
Post-disaster payments to subnational governments	Payments made under NDRRA, as stated in Budget Paper 3
Reduced tax collections	Not included
Disrupted operations of public corporations	Not included
Disrupted operations of private corporations	Not included
Deterioration in the terms at which the government can in the short term refinance public debt or raise additional debt	Not included

Source: OECD Survey.

Estimating the fiscal impacts of disaster-related contingent liabilities and integrating them into overall fiscal forecasting

The government discloses information on its explicit disaster-related contingent liabilities in the "Statement of Risks" in its Budget Papers, specifically Budget Paper 1 (Commonwealth of Australia, 2016a). Future disasters are recognised as an unquantifiable contingent liability in the budget documents. Since 2014, the Statement of Risks has explicitly acknowledged disaster-related contingent liabilities, defined as potential costs to the central government arising outside its control (Australian Productivity Commission, 2014). Similarly, some subnational governments, such as those of Victoria or New South Wales, consider potential disaster-related expenditures among their contingent liabilities (Commonwealth of Australia, 2014). Budget estimates include expected NDRRA expenditures for eligible costs not yet incurred for recovery and reconstruction from past events, although estimates do not include a forecast of expenditures due to potential future events that might entail NDRRA expenditures. The main reason for this is that NDRRA expenditures have varied significantly from year to year, making it difficult to forecast future expenditures with any level of accuracy.

AGDRP, AGDRA and NDRRA expenditures are funded from general revenues through special appropriation; no specific funds are set aside for these expenditures on an annual basis. Significant events in the past, most notably the 2010/11 Queensland floods funded recovery and reconstruction through a levy (which varied based on income, and was collected through the income tax system as part of the population's Medicare contributions) and cost-saving measures.

The following sources are frequently used to estimate the potential fiscal impacts of disasters: 1) expenditure reported from a general annual budget contingency appropriation; 2) identifiable projects for reconstructing public infrastructure; and 3) transfers to subnational governments to meet the cost of disaster recovery and rehabilitation that are identifiable in separate budget lines.

To mitigate the fiscal impact of disaster-related contingent liabilities and other fiscal risks, a non-appropriated Contingency Reserve[8] is included in the budget. Under the NDRRA no provision is made for future disasters, but the annual Budget Paper 3 (Commonwealth of Australia, 2016b) outlines expected payments to subnational governments for disasters that occurred in the previous fiscal year (see tables below).

Central government expense estimates under the NDRRA (million AUD)

	New South Wales	Victoria	Queensland	Western Australia	South Australia	Tasmania	Australian Capital Territory	Northern Territory	Total
2015/16	2.5	3.0	33.8	2.3	0.7	1.0		6.4	48.8
2016/17	4.6	9.0	38.6	19.0	7.7	1.1		2.5	82.4
2017/18	0.2	2.4	4.4	0.6	0.2	0.1		0.6	9.4
2018/19			1.0	0.4				0.1	1.5

Note: The estimated expenses reflect expected disaster-related costs caused by disasters that occurred in 2015-16.
Source: Commonwealth of Australia, 2016b.

Central government cash estimates under the NDRRA (million AUD)

	New South Wales	Victoria	Queensland	Western Australia	South Australia	Tasmania	Australian Capital Territory	Northern Territory	Total
2015/16	106.3			0.8					107
2016/17	112.2	0.1	1 103.0	3.4	0.4	0.1		22.3	1241.5
2017/18	9.8	130.9	187.4	11.8	12.4	57.3		28.9	438.5
2018/19	0.3		54.6	20.8		5.3		2.9	84.0

Note: The estimated cash payments illustrate when the central government expects to reimburse subnational governments for costs incurred in relation to past disasters.
Source: Commonwealth of Australia, 2016b.

To arrive at a longer-term projection of the future cost of disasters, the government performs different projection exercises. In 2014, for example, the Australian Productivity Commission estimated that the annual economic costs of disasters until 2018 would range between AUD 2.4 billion (USD 1.8 billion) and AUD 14.6 billion (USD 11.1 billion) annually, and would mount to AUD 2.6 billion (USD 1.9 billion) and AUD 15.1 billion (USD 11.5 billion) annually until 2023 (Australian Productivity Commission, 2014)[9].

The central government also holds a qualitative discussion to evaluate the potential fiscal impacts of disasters; the expectation is that the effect will be more strongly felt at the subnational level. There are no standard procedures to evaluate a macro-fiscal scenario that follows a combination of extreme events. Instead of projecting the coincident occurrence of such events, the government instead has had to learn from actual experiences such as the 2010/11 Queensland floods, which occurred, when Australia's economy was feeling the impacts of the global financial crisis.

Implementation arrangements for providing post-disaster financial assistance

Disaster response is the main responsibility of subnational (state and territory) governments, but central government assistance following a disaster is provided based on shared responsibilities between levels of government and other stakeholders. Subnational governments finance post-disaster assistance through a Disaster Relief Account, whose annual allocation is based on an estimated annual average need for ex post disaster financing (Australian Productivity Commission, 2014).

It was in recognition of the significant cost of disasters that the central government established the Natural Disaster Relief and Recovery Arrangements to provide disaster assistance to subnational governments. There are other national government programmes that provide post-disaster assistance, but the NDRRA is the major source.

Subnational governments determine the areas and stakeholders eligible for compensation as well as the level of assistance that will be provided to individuals and communities, without having to seek central government approval.

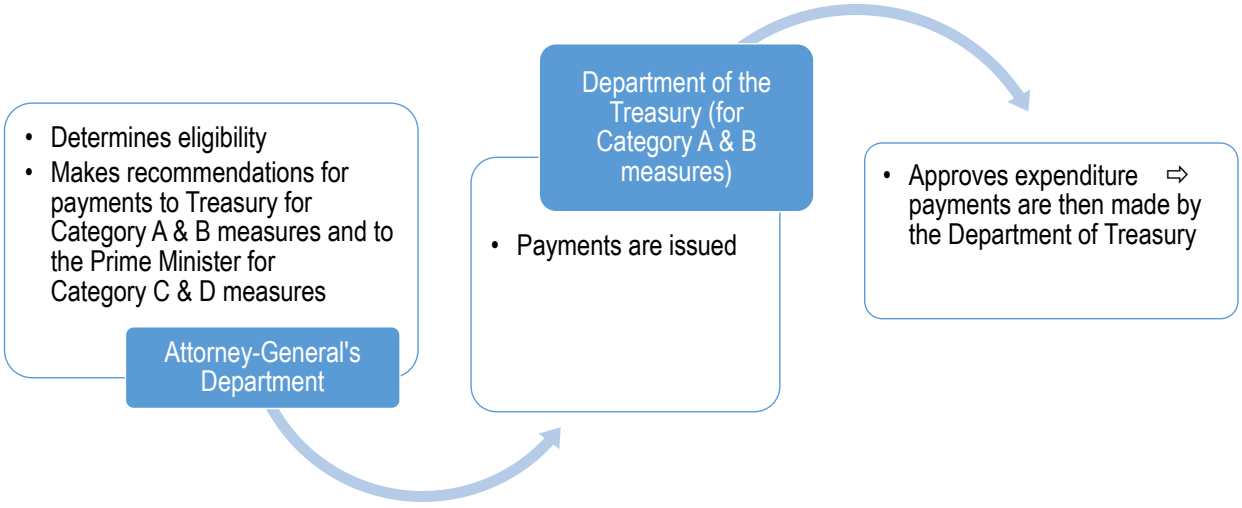
In the event of a disaster that activates the NDRRA, the central government provides the subnational governments with up to 75% of what the latter have determined to be eligible expenditure on relief and recovery assistance, as described in section 4.3.1. A number of different agencies are involved at the central government level in making post-disaster financial payment decisions. The figure below demonstrates the decision-making process.

For AGDRP and AGDRA assistance to Australian citizens and ex gratia assistance to New Zealand citizens, the Attorney-General's Department advises on how to determination

eligibility (whereas the prime minister determines whether the event is eligible outright for assistance); he Department of Finance manages the appropriation, and the Department of Human Assistance handles the payments.

NDRRA generally provides funds to return assets to their pre-disaster state. State and territory governments are expected to consider any need to relocate assets or build in additional resilience during reconstruction, although the Commonwealth government currently has few (if any) tools to encourage state and territorial governments to build back better. The states and territories are able to seek reimbursement for some costs related to investments that improve resilience, although such requests are not very frequent. There is some discussion of increasing NDRRA funding support for such investments.

Decision-making process for central government post-disaster assistance under NDRRA



Mitigating disaster-related contingent liabilities and financing residual risks

To mitigate previously identified, quantified and disclosed disaster-related fiscal risks, governments need to manage the size of contingent liabilities and decide how to provide for the residual risk.

In an effort to limit its disaster-related contingent liabilities ex ante, Australia takes the following steps:

- putting in place a clear cost-sharing formula with subnational governments for disaster reconstruction costs;
- clearly limiting the scope of compensation or financial assistance that will be made available (e.g. limiting private sector support to small business persons and farmers who experience a loss of income as a direct result of a disaster event);
- providing stakeholders with incentives to reduce or transfer disaster risks they face through several means:
    - fiscal transfer mechanisms to subnational governments to finance disaster risk reduction measures;
    - limits on the compensation available to individuals for damage that could be (have been) insured;

- limiting the compensation available to subnational governments for damage that could be (have been) insured;
- exercising centralised control over granting of government guarantees and other forms of contingent fiscal support.

Aside from these measures, the government invests in risk reduction. Disaster risk prevention and mitigation measures are primarily the responsibility of subnational governments. However, as with ex post assistance, the central government recognises its responsibility to support these measures to strengthen community resilience. Financial and capacity assistance is provided to disaster-affected regions. The overall budget for central government's structural and organisational risk reduction measures is AUD 26.1 million (USD 19.9 million) annually, which is complemented by regional and local government contributions. There is no central accounting of how much is spent on risk reduction in total by all actors.

Central and subnational governments have invested significant resources in structural changes to provide better services before, during and after disasters. At the subnational level, five states (Victoria, Western Australia, Queensland, Tasmania, Northern Territory) have combined all emergency management functions under the respective authority/commission as well as assurance authorities (Inspector-General officers). These changes are meant to assure governments that reform measures are being implemented, and are effective. (See Australian Productivity Commission, [2014] for an evaluation of the effectiveness of central government support to subnational governments.)

Notes

[1] The variation can be explained by (among other things) extreme events that drive the annual average significantly upwards, as well as by differences in measurement approaches.

[2] Not all subnational expenditure may be captured in this assessment.

[3] Vertical fiscal imbalance describes the situation where the central government raises revenues in excess of its spending responsibilities, while subnational governments have insufficient revenue from their own sources to finance their spending responsibilities (OECD, 2014).

[4] Additional contingent liabilities may arise due to man-made disasters. For terrorist attacks, for example, the Australian Victims of Terrorism Overseas Payment is a one-off payment, administered by regional governments, of up to AUD 75000 for Australian residents who are harmed or whose close family member is killed as a direct result of overseas terrorist acts.

[5] Section 1061K of the Australia Social Security Act 1991.

[6] Ibid

[7] Payments are usually made through reimbursements but advance payments can be made in response to extremely damaging disasters, where the cost is likely to be greater than what the state can manage in the short term.

[8] The Contingency Reserve in the annual budget is an allowance that principally reflects anticipated events that cannot be assigned to individual programmes at the time the budget is drafted. It is not a general policy reserve and, as stated, not appropriated. Allowances included in the Contingency Reserve can only be drawn upon once they have been appropriated by parliament.

[9] Potential climate change effects were excluded in this projection.

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Canada

Prevalence of natural hazards

Canada covers a large territory, lying between three oceans and stretching across mountain ranges, plains, forests and tundra. Weather patterns range from arctic to moderate, and geological patterns also vary widely. As a consequence, Canada is exposed to a broad range of natural hazards (See table below).

Wildfires, floods and droughts are three of the most costly hazards in Canada. In the past 30 years, wildfires have consumed an average of 2.5 million hectares of forest land a year, resulting substantial direct damage; the in annual costs of bringing these fires under control has ranged between USD 500 million and USD 1 billion (Natural Resources Canada, 2017). The 2016 Fort McMurray fire caused an estimated USD 4.6 billion in damage and reduced Canada's gross domestic product (GDP) by almost half a percentage point in the second quarter of 2016 (IBC, 2017a). Droughts can be a driver of wildfires, but can also cause significant damage on their own. The 1992 Prairie Provinces drought, for example, caused an estimated USD 5.8 billion in damage, much of which was related to loss in crop and livestock yields (Public Safety Canada, 2017a; EM-DAT, 2017).

Types of natural hazards to which Canada is exposed

Natural hazard category	Types of natural hazards
Geophysical	Earthquakes, volcanic activity, tsunamis
Meteorological	Hail, winter storms, tornados, fog, snow, extreme temperatures
Hydrological	Floods, storm surges, icebergs, sea ice, avalanches, landslides
Climatological	Wildfires, droughts

Sources: EM-DAT, 2017; Public Safety Canada, 2017a

Major natural disasters in Canada since 1980

Disaster event/ location	Year	Fatalities	People affected	Estimated damage in USD
Prairie provinces drought/ Manitoba, Saskatchewan, Alberta	1992	0	0	5.8 billion
River flood/ Southern Alberta	2013	4	100 000	5.7 billion
Wildfire/ Fort McMurray	2016	2	90 000	4.6 billion
Winter storm/ Ontario, Quebec, Manitoba	1998	28	18 745	4.6 billion
Thunderstorm/ Toronto	2013	0	0	1.4 billion
Hail storm/ Calgary	1991	0	0	885 million
Assiniboine river flood/ Manitoba, Saskatchewan	2011	Not available	Not available	633 million
Tornado/ Southern Ontario	2005	0	-	500 million

Sources: EM-DAT, 2017; Public Safety Canada, 2017a

Floods occur frequently across Canada, most often caused by spring thaw and heavy storm rainfall. Along the coasts, storm surges can also lead to flooding. Floods in southern Alberta in the summer of 2013 resulted in USD 2.7 billion in damage, while a storm surge in 2004 in Kings County, Prince Edward Island, caused around USD 2.6 million in damage (Public Safety Canada, 2017a).

Storms also pose a major risk all across Canada. A thunderstorm in Toronto in 2013 caused USD 1.4 billion in damage. Hailstorms and tornadoes too have had significant negative impacts in the past. The summer 2005 tornadoes in southern Ontario, for example, resulted in damage estimated at USD 500 million. Winter storms can occur throughout Canada and have caused major damage in the past. The 1998 winter storm in Eastern Canada caused USD 4.6 billion in damage and 28 fatalities (Public Safety Canada, 2017a; EM-DAT, 2017).

Geophysical hazards such as earthquakes occur much more rarely but nonetheless pose a major threat. The subduction zone off the coast of British Colombia has the potential to cause major earthquakes and threatens large metropolitan areas, including Vancouver. A less strong earthquake in eastern Canada could cause comparable damage due to the higher vulnerability of the built environment. The Insurance Bureau of Canada (IBC) estimates the total damages of a magnitude 9.0 earthquake off the western coast of Vancouver Island at around CAD 75 billion (USD 62 billion), and those of a magnitude 7.1 earthquake in the Quebec City-Montreal-Ottawa corridor at almost CAD 61 billion (USD 50 billion). Although no tsunami has occurred in the recent past, two tsunamis struck British Columbia in the early 1960s, and the risk of a tsunami occurring in the future is considered high (Public Safety Canada, 2017a).

Past fiscal impact of disasters

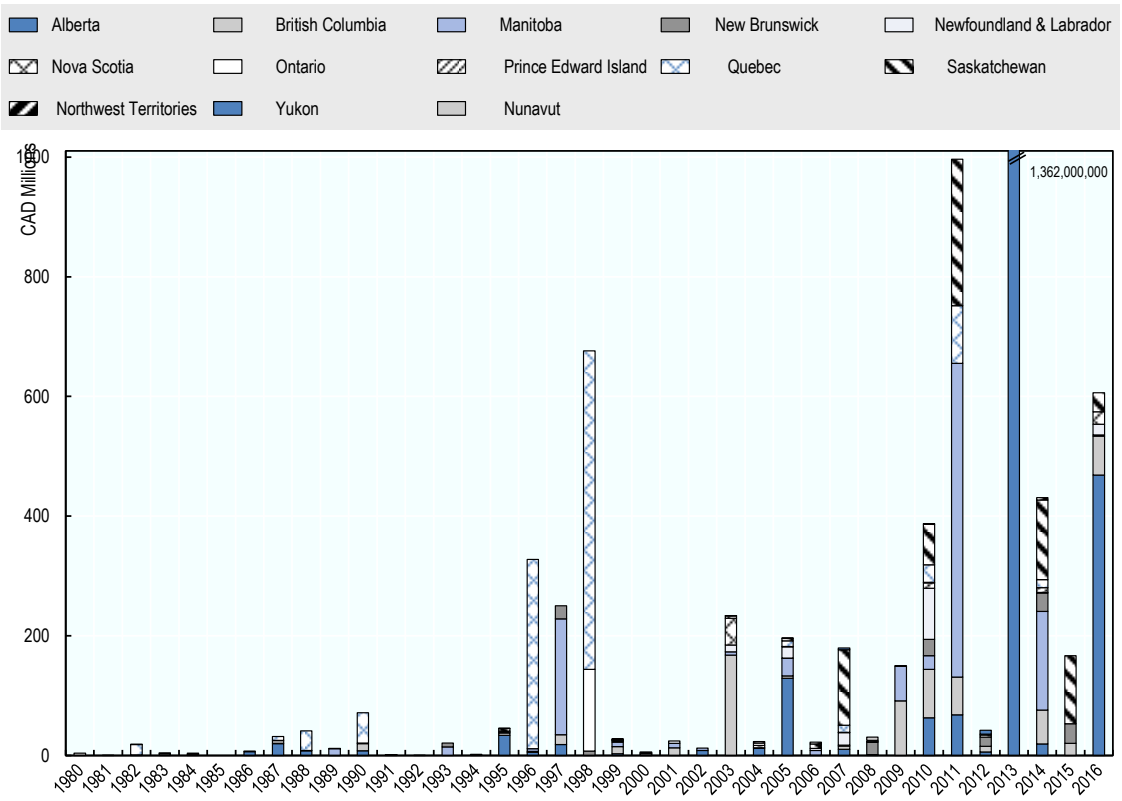
Annual average losses caused by disasters have been estimated at USD 1.14 billion (PreventionWeb, 2017). Information from the Canadian Disaster Database (CDD), a publicly accessible web-based repository of historical information on natural and manmade disasters, suggests that between 1980 and 2016 annual average losses amounted to USD 629 million (Public Safety Canada, 2017a). The overall probable maximum loss has been estimated at USD 23.2 billion (1.45% of GDP) for 500-year return events, and at USD 36.4 billion (2.28% of GDP) for hazardous events with a 1000-year return period (PreventionWeb, 2017).

Subnational governments lead disaster response and the provision of financial assistance for disaster recovery (Murphy, 2011). Each provincial and territorial government[1]is responsible for administering disaster financial assistance in its jurisdiction and for determining the rules for the assistance it provides. When disaster recovery costs at subnational level exceed an established initial threshold, the affected provincial or territorial government may request post-disaster financial assistance from the federal government (Office of the Parliamentary Budget Officer, 2016).

The majority of the federal government's financial resources for post-disaster relief and recovery are financed by the Disaster Financial Assistance Arrangements (DFAA), with some additional support available via smaller federal programmes. The DFAA is financed through an annual budget. The potential increase in financial requirements that unforeseen events such as natural disasters could pose for the funding capabilities of the central government is reflected in the design and implementation of its debt management programme, which is flexible and adaptable, and is also factored into its broader contingency plans.

Since the inception of the DFAA in 1970, a total of CAD 4.8 billion (USD 3.7 billion) has been distributed to provincial and territorial governments in the aftermath of disasters. Overall, annual federal reimbursements of provincial and territorial response and recovery costs via the DFAA have increased from CAD 4.3 million (USD 3.6 million) in 1980 to CAD 175.8 million (USD 144.8 million) in 2014. The increase is linked to a higher occurrence of extreme weather events in the past five years and an increase in both asset values and concentration (Parliamentary Budget Office, 2015; Office of the Parliamentary Budget Officer, 2016; Statistics Canada, 2015).

Annual reimbursements via the DFAA to provincial and territorial governments, 1980-2014



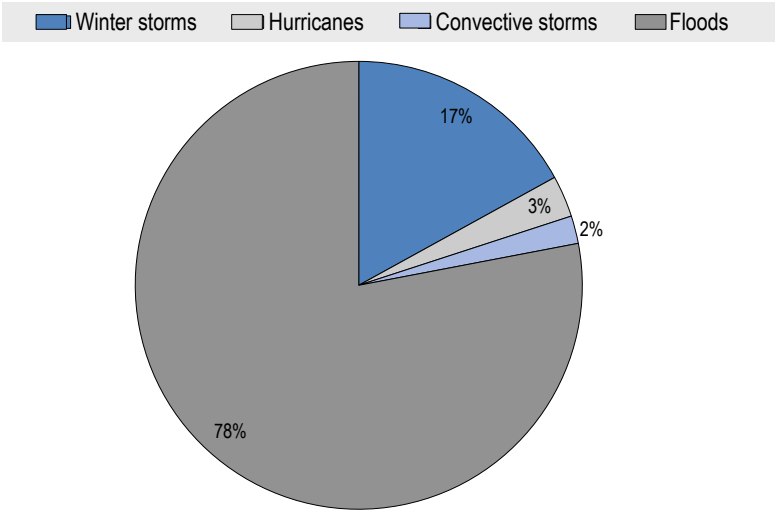
Source: Parliamentary Budget Office, 2015.

The majority (78%) of DFAA expenditure has been in response to floods (CAD 1.4 billion; USD 1.16 billion), for which insurance only became available in 2015. The southern Alberta and southeastern British Columbia flood of June 2013, for instance, resulted in CAD 1.35 billion (USD 1.11 billion) in costs to the DFAA, while the 2011 Assiniboine River flood resulted in CAD 769 million (USD 633 million) in DFAA transfers, 68% of which was disbursed to Manitoba and 32% to Saskatchewan. In 2014, flash floods following a period of heavy rain in Saskatchewan required DFAA post-disaster assistance of CAD 160 million (USD 131.7 million) (Office of the Parliamentary Budget Officer, 2016).

Manitoba, Saskatchewan, Alberta and Quebec, which are exposed to a wide variety of hazards, have been the principal recipients of assistance under the DFAA, while the remaining provinces made less frequent use of that assistance (Office of the Parliamentary Budget Officer, 2016; Nadarajah, 2016).

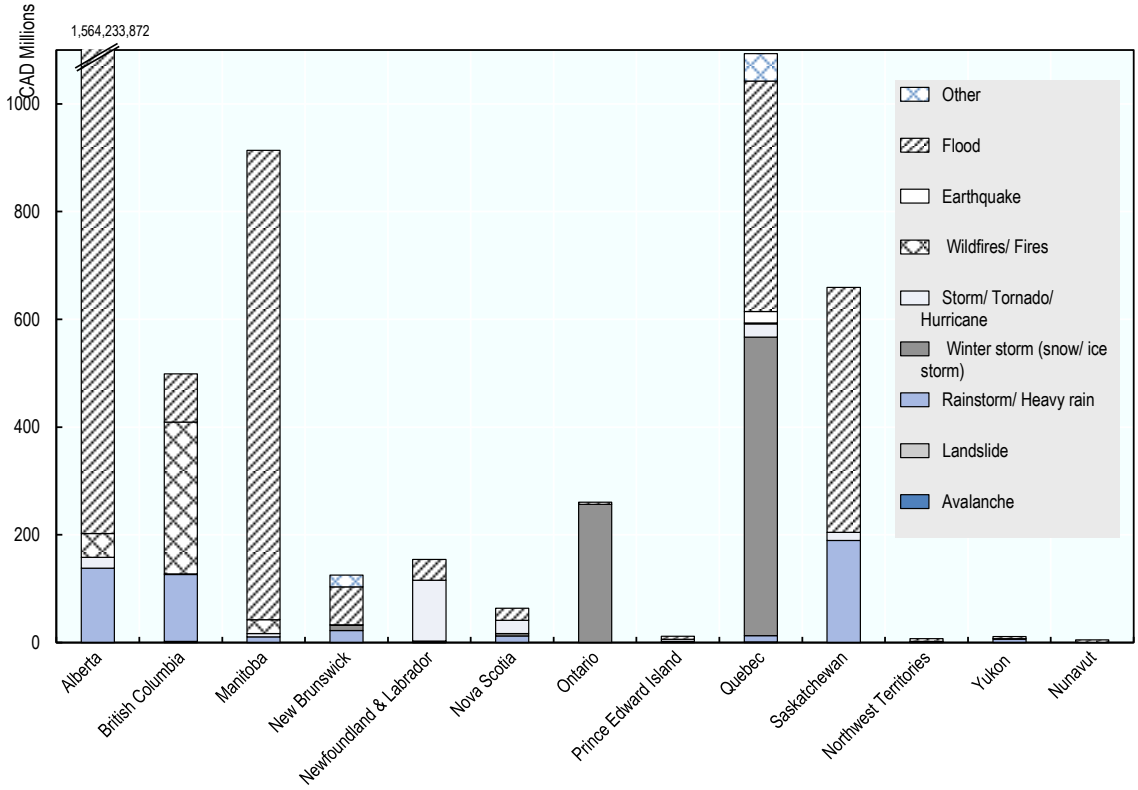
Given the continual and growing demand for federal disaster response and recovery funding, the central government increasingly encourages investments in disaster risk reduction measures to mitigate ex ante the impact of future disaster. Since 2014, through the National Disaster Mitigation Program (NDMP) and the new Disaster Mitigation and Adaptation Fund, the central government has contributed to disaster risk reduction efforts at subnational level a number of times, particularly for flood risk management (Government of Canada, 2017).

Share of DFAA payments by hazard, 1970-2014



Source: Office of the Parliamentary Budget Officer, 2016.

DFAA payments to provincial and territorial governments by hazard, 1980-2014



Source: Parliamentary Budget Office, 2015.

Managing disaster-related contingent liabilities

Identification of disaster-related contingent liabilities

Explicit contingent liabilities

Explicit contingent liabilities arise from payment obligations that are based on laws, or clear policy commitments that could fall due in the event of a disaster. In Canada, a number of federal laws and policies recognise the federal government's explicit commitment to sharing with provincial and territorial governments the cost of responding to disasters and reconstructing public and private assets. The tables below illustrate the extent of the federal government's explicit commitments to provide post-disaster financial assistance.

Explicit central government obligations for post-disaster financial assistance in Canada

Commitment to finance…	Yes	No
… post-disaster response and recovery	✓	
…a share of the costs incurred by subnational governments to finance post-disaster response and recovery	✓	
… reconstruction and maintenance of central government-owned public assets		x
… rehabilitation and reconstruction of private assets		x
… other expenses incurred by subnational governments (e.g. payments to businesses or individuals)		x
…government guarantees for disaster losses incurred by public corporations and public-private partnerships		x

Note: The Emergency Management Act states that the Minister of Public Safety and Emergency Preparedness may provide financial assistance for eligible events upon the passing of an Order in Council. Legislation authorizes, but does not make financial assistance obligatory. However, given that no request for assistance has been declined to date under the DFAA, it could be considered a quasi-statutory programme.
Source: OECD Survey.

Laws and policies underpinning explicit central government contingent obligations

Legal basis/guideline	Description of obligation
Emergency Management Act[1]	Under section 4 (1) (j): the Minister of Public Safety and Emergency Preparedness may provide financial assistance to a province if: a provincial emergency has been declared to be of concern to the federal government by the Governor in Council under Section 7(c) the Minister is authorised by the Governor in Council under Section 7(d) to provide financial assistance the province has requested assistance.
Guidelines for the Disaster Financial Assistance Arrangements[2]	Reimbursable costs: - costs related to emergency operations in the immediate disaster period such as rescue, transportation, shelter, health, food and security - costs related to post-disaster period for individuals, such as damage to primary residences (not cottages), replacement of essential furnishing and clothing, and assistance to small owner-operated businesses (where insurance is not available at a reasonable price) - costs related to repairing public infrastructure, such as roads, bridges, buildings, and sewer and water utilities. Progressive cost-sharing scale, with up to 90% of the costs eligible for federal reimbursement
Guide to AgriRecovery[3]	Reimbursable costs: extraordinary costs that agricultural producers incur in order to recover and that cannot be covered with assistance from existing programming 60% of the costs eligible for federal reimbursement; 40% to be borne by provincial and territorial governments

Source: OECD Survey; Department of Justice Canada (2018), Minister of Agriculture and Agri-Food (2014), Public Safety Canada (2018).

The Emergency Management Act provides the legal framework for some of the federal government's disaster-related contingent liabilities. The Minister of Public Safety and Emergency Preparedness may provide financial assistance to provincial and territorial governments that request it if an emergency has been declared and the Governor in Council has authorised the assistance.

The federal assistance is provided through the DFAA cost-sharing reimbursement programme. Under the DFAA, provincial and territorial governments may request reimbursement of their net costs – that is, costs for post-disaster recovery (e.g. repairing public infrastructure such as roads, bridges, buildings, and sewer and water utilities) and for assistance to affected households and businesses, minus any financial assistance from other sources and any recoveries from insurance payouts or legal actions. Eligible costs under the DFAA include those related to emergency operations, damage inspection, appraisal and clean-up, and restoration and reconstruction of public (and sometimes private) works and infrastructure to their pre-disaster condition. Additional repair or replacement costs required to meet current federal, provincial codes and standards for construction, access, fire and occupational safety are also eligible. Eligible items may also include assistance for the recovery of essential personal property of individuals, small businesses and farmsteads.

Certain costs of provincial and territorial governments cannot be shared with federal funding available via the DFAA. These include restoring or replacing insured or insurable items and repairing damaged luxury items or non-primary dwellings. Indirect costs are likewise ineligible for cost-sharing under the DFAA; these include loss of income, disaster-related reductions in provincial sales taxes revenue, legal and other costs associated with the settlements of estates of people killed by the disasters, assistance to businesses other than small businesses, and interest on loans obtained for bridge financing or on late payments made by provinces. Other categories of costs not eligible for reimbursement under DFAA are damages caused by man-made hazards or health emergencies and costs related to fighting forest, prairie or grass fires or wildfires (except where they pose a threat to built-up areas) and damages limited to one economic production sector or incurred on reserves.

As defined in the DFAA Guidelines, reimbursements to subnational governments are made on a progressive scale. The threshold that needs to be met in order to qualify for federal reimbursements via the DFAA starts at CAD 3.07 (USD 2.53) per provincial citizen, resulting in initial thresholds ranging from CAD 114 450 (USD 94 162) in the more sparsely populated Nunavut to over CAD 43 million (USD 36 million) in Ontario. Once eligible disaster recovery expenses incurred by the affected provincial or territorial government exceed the initial threshold, at least half of the expenses eligible for financial assistance under the DFAA are reimbursable. The maximum federal reimbursement rate is 90% of eligible costs and applies when the final threshold of CAD 15.37 (USD 12.65) per citizen has been passed. The cost-sharing formula is adjusted annually for inflation (Public Safety Canada, 2017b).

Expense thresholds under the DFAA, 2017

Province/ territory	Population 2017 (Q1)	Initial threshold amounts for 50% federal reimbursement (CAD)	Final threshold amounts for 90% federal reimbursement (CAD)
Alberta	4 280 127	13 139 990	65 785 552
British Columbia	4 777 157	14 665 872	73 424 903
Manitoba	1 328 346	4 078 022	20 416 678
New Brunswick	757 771	2 326 357	11 646 940
Newfoundland & Labrador	529 696	1 626 167	8 141 428
Nova Scotia	952 024	2 922 714	14 632 609
Northwest Territories	44 263	135 887	680 322
Nunavut	37 280	114 450	572 994
Ontario	14 094 167	43 269 093	216 627 347
Prince Edward Island	149 383	458 606	2 296 017
Quebec	8 356 851	25 655 533	128 444 800
Saskatchewan	1 158 339	3 556 101	17 803 670
Yukon	37 693	115 718	579 341

Source: Public Safety Canada, 2017b.

Cost-sharing formula under the DFAA

Provincial/territorial expense thresholds (per capita of provincial population) for DFAA reimbursement	Provincial/territorial share (%)	Federal share %)
First CAD 3.07	100	0
Next CAD 6.15	50	50
Next CAD 6.15	25	75
Remainder (over CAD 15.37)	10	90

Source: Public Safety Canada, 2017b.

Where the DFAA does not apply, other forms of federal disaster assistance may be available through smaller programmes. A post-disaster support program for agricultural producers AgriRecovery has been set up as a complementary cost-sharing mechanism between the central and provincial/territorial levels of government to provide margin-based support for income losses and disaster relief to affected agricultural producers. Costs are shared between the central government and the respective affected provincial or territorial government using a 60:40 cost-sharing formula (AAFC, 2017). Through AgriRecovery, CAD 118.5 million (USD 97.7 million) has been channelled to agricultural producers affected by extraordinary natural hazards in 2015-16, a 9% increase since the framework's inception (Government of Canada, 2016). Farmers may also benefit from flexible payment arrangements and government-backed loans to finance recovery offered by Farm Credit Canada.

For small businesses (excluding the farming industry and not-for-profit organisations), the Small Business Financing programme offers loans up to CAD 1 million (0.7 million USD) for post-disaster recovery. Costs related to natural hazards affecting indigenous groups on reserves are not eligible for DFAA reimbursement (Public Safety Canada, 2017b). Through the Indigenous Services Canada (ISC) Emergency Management Assistance Program (EMAP) First Nations or tribal councils for reserves, lands set aside in Yukon under Cabinet Directive (Circular No. 27) and lands formerly defined as a reserve or lands set aside which now form part of modern treaty settlement lands may request reimbursement for disaster response or recovery activities (ISC, 2018).

In addition, indigenous low-income households on reserves may benefit from the Emergency Repair Programme (ERP) that provides up to CAD 20 000 (USD 16 500) per household in support of emergency repairs on homes following disasters[2]. To qualify, household income must be below an established range based on household size and geographic region (CMHC, 2018).

When an extraordinary event such as a disaster has prevented a large number of taxpayers from meeting their tax obligations, the fairness provisions in Canadian tax legislation allow the Canada Revenue Agency (CRA) to forgive or cancel penalties and interest charges on late tax remittances or late filing of a return due to the disaster. To indicate that relief is available, the CRA issues a news release, after which taxpayers may request to be considered for relief.

For damaged natural environments, restoration and recovery funding is available via the Environmental Damages Fund. Provincial, territorial and municipal governments as well as non-governmental organisations and aboriginal groups are eligible to apply for funding (Public Safety Canada 2017c).

As provincial and subnational governments have primary responsibility for providing post-disaster assistance and may determine their own rules for this, provinces and territories have their own range of programmes available for this purpose (Public Safety Canada, 2017c).

Federal disaster assistance programmes

Programmes	Agency	Description	Beneficiaries
Disaster Financial Assistance Arrangements (DFAA)	Public Safety Canada	Cost-sharing programme to reimburse a portion of eligible provincial/territorial expenditures arising from natural disasters	Provincial or territorial governments
AgriRecovery	Agriculture and Agri-food Canada (AAFC)	Cost-sharing framework to provide targeted assistance to alleviate extraordinary costs related to disaster recovery in the agricultural sector	Agricultural producers
Federal Loan Assistance	Farm Credit Canada	Flexible payment arrangements and government-backed loan guarantees to support recovery from disasters	Agricultural producers
Canada Small Business Financing Programme	Industry Canada	Loan guarantee programme to secure loans against inadvertent non-compliance with payment terms due to disasters or other reasons	Small businesses with gross annual revenues ⩾ CAD 10 million
Emergency Repair Programme (ERP)	Canada Mortgage and Housing Corporation	Financial contributions to assist disaster recovery	Low-income households on reserves
Taxpayer relief provisions	Canada Revenue Agency (CRA)	Taxpayer relief provisions to help taxpayers meet tax obligations under extraordinary circumstances, such as disasters.	Affected taxpayers
Environmental Damages Fund	Environment Canada	Financial awards to support projects aimed at remediation or restoration of the environment	Community groups, universities and local governments
Emergency Management Assistance Program (EMAP)	Indigenous Services Canada	EMAP provides funding to First Nations communities so they can build resilience, prepare for natural or man-made hazards and respond to them.	First Nations located on: • a reserve, as defined in s. 2 (1) of the Indian Act, R.S.C., 1985, c. I-5 • lands set aside in Yukon as per Cabinet Directive (Circular No. 27) entitled Procedure for Reserving Land in the Yukon and Northwest Territories (1955) • lands formerly defined as a reserve or lands set aside which now form part of modern treaty settlement lands

Source: Public Safety Canada, 2017c, 2017d; ISC, 2018.

Examples of provincial and territorial disaster assistance programmes

Ontario has two disaster assistance programmes in place. The Disaster Recovery Assistance for Ontarians Program reimburses homeowners, tenants, small owner-operated businesses, farmers, and not-for-profit organisations for basic, essential disaster-related costs not covered by insurance. The Municipal Disaster Recovery Assistance programme provides assistance to municipalities for extraordinary costs associated with emergency response and for repairs to essential property and infrastructure following a natural disaster.

In British Columbia, the Disaster Financial Assistance programme is designed to compensate individuals for essential uninsurable losses (e.g. caused by coastal flooding) and to reimburse local governments for damaged infrastructure. Compensation is unavailable if damages are located in designated flood plains, unless such buildings were determined properly protected prior to the disaster, and for wildfire losses.

Source: Raikes and McBean, 2016; MAH, 2018a; 2018b; Government of British Colombia, n.d.

Implicit contingent liabilities

The central government's contingent liabilities are clearly limited to reimbursing provincial and territorial governments for natural hazard-related costs; but exceptions have been previously made for major man-made disasters. For instance, in the case of the 2013 Lac Mégantic train derailment, the federal government provided funding for immediate response, recovery and reconstruction as well as economic recovery and decontamination.

Provincial and territorial governments may also set their own widely varying rules for post-disaster assistance to affected households and businesses. Thus, implicit contingent liabilities may arise at subnational level. For example, Alberta covers 100% of primary residence damage, while British Columbia covers only 80% of damage up to a total claim of CAD 300 000 (USD 247 140) (Office of the Parliamentary Budget Officer, 2016). Households that have moved from one province or territory to another may have the expectation that post-disaster support in their new province will be at par with what is available in the old.

Ad hoc post-disaster support may also create implicit contingent liabilities. For example, following a 2013 ice storm in southern Ontario and Toronto that caused major power outages the Ontario government distributed more than 500 000 gift cards to affected individuals and families (cards were worth CAD 50 [USD 41] and CAD 100 [USD 82] respectively). Such actions may create expectations that compensation will generally be available after other disaster-related power outages (Spitz, 2013).

The results from two surveys also illustrate that implicit contingent liabilities at subnational level may emerge in case of disaster (IBC, 2017a; Thistlethwaite et al., 2017): in 2014, over a third (38%) of survey respondents said they expected the government to help pay for the costs caused by an earthquake, and in 2017, nearly half the respondents said they expected the government to assist in financing flood-related damage costs (IBC, 2014; IBC, 2017a; IBC, 2017b).

Estimation of insurance payouts

The amount of insurance paid out to compensate for losses incurred by disasters is an important determinant of the size of government contingent liabilities. In Canada, insurance payouts in the case of disaster are not regularly estimated, but a review of the types of hazard insurance available has been carried out (Office of the Parliamentary Budget Officer, 2016). Hazard insurance is available for both households and businesses.

Under most available household policies, damages caused by fire, wind and hail are covered. Flood insurance for residential properties became available in most provinces only in 2015, following the experience of the destructive 2013 Alberta floods (limited flood insurance became available in 2018 in Quebec). Since 2015, home insurance thus increasingly also includes protection against inland flooding caused by riverine, creek or lake overflow and heavy rainfall, although it is limited to properties outside high-risk floodplains; coastal flood insurance remains unavailable. Take-up of household insurance is low: estimates suggest a rate of 10-15% (Raikes and McBean, 2016; Nadarajah, 2016; IBC, 2017a). Earthquake insurance may be purchased in addition to standard home insurance, with higher deductibles than for other perils. In addition to home insurance, motor vehicle insurance is available for multiple perils (including non-catastrophe perils) through a public insurance company operating in British Columbia, Manitoba, Quebec, and Saskatchewan (IBC, 2017b).

Farmers have available AgriInsurance, a federal-provincial-producer cost-shared asset and business continuity natural hazard insurance. AgriInsurance is a provincially delivered programme to which the federal government contributes a portion of total premiums and administrative costs. At slightly over 60%, take-up for horticulture crops is relatively high, but take-up for fresh fruit and vegetable production remains low. For five provinces– Alberta, Saskatchewan, Manitoba, New Brunswick and Nova Scotia – the federal government also provides a reinsurance arrangement (deficit financing) (AAFC, 2012, 2016).

In addition, businesses may choose from several types of business insurance policies, such as commercial property insurance and business interruption policies that cover hazard-related losses (IBC, 2017c).

Quantification of disaster-related contingent liabilities

In Canada, the estimated financial impacts of potential future natural hazard events are assessed through the federal All-Hazards Risk Assessment exercise conducted periodically and co-ordinated by Public Safety Canada with input from various other relevant departments and agencies. This initiative examines six impact categories, including "economy", which involves an assessment of the direct and indirect economic cost of emergency events, as estimated by the finance ministry, Finance Canada (OECD, 2015). In recent years, Public Safety Canada has been piloting an updated approach and methodology to all-hazards risk assessments to inform its way forward and ensure continued relevance in a changing environment.

In order to ascertain the overall risks to the fiscal framework, forecasting of future central government expenses uses records of historical DFAA expenses and the results of ex post evaluations of the economic and fiscal impacts of past natural disasters. Forecasting was last performed in 2016, when the Office of the Parliamentary Budget Officer provided an estimate of the average annual DFAA costs for weather-related disasters in light of their increasing fiscal cost. The analysis built on information from IBC and SwissRe on insured losses and total losses as well as historical records available from the DFAA, and used

imputed values where such information was missing. Catastrophe modelling was used to estimate future annual losses for hurricanes, convective storms (thunderstorms) and winter storms. The analysis concluded that weather-related hazards in the future would generate about CAD 902 million (USD 717 million) in total annual costs to the DFAA, up from CAD 360 million (USD 360 million) in 2011-16 (Table 6.9).

Types of information from previous events available to calculate disaster-related contingent liabilities in Canada

Type of disaster-related contingent liability	What gets recorded
Relief spending	Financial assistance distributed via the DFAA
Spending for the reconstruction of damaged public infrastructure and assets	Financial assistance distributed via the DFAA
Spending for the reconstruction of damaged private assets	Financial assistance distributed via the DFAA
Spending on increased social transfers due to a post-disaster economic slowdown	Not included
Expenditures due to guarantees issued to public or private entities suffering disaster losses	Not included
Post-disaster payments to subnational governments	Financial assistance distributed via the DFAA
Reduced tax collections	Not included
Disrupted operations of public corporations	Not included
Disrupted operations of private corporations	Not included
Deterioration in the terms at which the government can in the short term refinance public debt or raise additional debt	Not included

Source: OECD Survey

Estimated future DFAA annual weather-related payouts to territorial and provincial governments, 2017-23

	DFAA's share of total event loss (%)	Estimated annual total damage 2017-23 (million USD)	DFAA amount 2017-23 (million USD)
Hurricanes	19.2	81.47	15.68
Convective storms	0.27	553.88	1.51
Winter storms	12.12	1 419.79	171.70
Floods	27.71	2 005.86	555.53
Total		4 061.25	744.56

Source: Office of the Parliamentary Budget Officer, 2016.

Estimating the fiscal impacts of disaster-related contingent liabilities and integrating them into overall fiscal forecasting

The central government includes an adjustment for risk in the fiscal forecast to account for potential economic and fiscal risk. This risk adjustment is re-evaluated and modified as economic and fiscal risks unfold, and changes year to year depending on various circumstances.

While the 2017 budget (Government of Canada, 2017) includes a projection of the budgetary balance and federal debt-to-GDP ratio under various economic growth scenarios, it does not specify disaster-related contingent liabilities as such. Similarly, Canada's "Fiscal and Economic Prospects" report (Conference Board of Canada, 2017) do not discuss the fiscal impact of a natural disaster, despite featuring a range of other fiscal risk scenarios.

Under Part VI of the Financial Administration Act, the annual Public Accounts of Canada[3] includes a disclosure of contingent liabilities, including those under the federal disaster assistance programmes DFAA and AgriRecovery. In addition, all past payouts under the DFAA have been listed and published in a detailed overview in response to Parliamentary Budget Office Request IR0206. This overview unravels all past spending under the DFAA by provinces, hazard and year, and specifies remaining liabilities as well as whether advance and interim payments have been made (Parliamentary Budget Office, 2015).

In a natural disaster scenario, there is the potential for a significant increase in financial requirements over a very short time horizon. The current debt management strategy maintains Treasury bill issuance well below the market's capacity, to ensure that issuance can be increased on short notice if required. Once a disaster has passed or if the effects persist, debt management strategies would aim to decrease the elevated stock of Treasury bills by terming out debt issuance – thereby ensuring that the central government is prepared to rapidly increase issuance in response to a future crisis.

The government of Canada's contingency planning takes the form of a prudential liquidity plan (PLP) that it can access if it temporarily loses access to funding markets or requires more funding than the market is able to provide in the very near term. The PLP is analogous to Basel III liquidity requirements for financial institutions. In the federal government's case, the plan currently holds sufficient liquidity to cover at least one month of net projected cash-flows. These flows include payroll, benefit payments, programme funding and the servicing of debt and liabilities on the expense side, and government tax receipts on the revenue side.

Implementation arrangements for providing post-disaster financial assistance

In Canada, central government shares the responsibility for post-disaster relief and recovery wit provincial and territorial governments, which are first to be involved in response and recovery efforts. When a disaster requires a response and recovery that exceeds sub-national capacities federal assistance may be made available.

Under the provisions of the Emergency Management Act, provincial and territorial governments may request assistance from the Minister of Public Safety, including assistance under the DFAA if an emergency has been declared with a Federal Order-in-Council for the hazardous event in question. The emergency declaration must authorise the provision of financial assistance. While provincial and territorial governments are encouraged to submit a request as soon as possible, they may do so up to six months after the end of the event. The Regional Director of Public Safety Canada serves as initial federal liaison with provincial officials and co-ordinates review of provincial requests for assistance via the DFAA (Public Safety Canada, 2017b).

A request for reimbursement under the DFAA is processed as soon documentation of provincial/territorial expenditure is receives. This includes invoices for goods or services purchased and paid for as part of disaster response and recovery measures as well as accounts and records of post-disaster financial assistance provided to households and businesses by the respective provincial or territorial government. Federal assistance is provided only after federal auditors have reviewed disaster recovery-related expenditures incurred by provincial or territorial governments against the DFAA eligibility criteria. If the initial provincial/territorial expenditure threshold is not exceeded, the file is simply closed; otherwise provincial/territorial authorities have up to five years after the emergency declaration to submit the final reimbursement claim. The actual transfer of the full reimbursement sum can take place up to eight years after the hazardous event. To meet the

funding needs more quickly, advance and interim payments to provincial and territorial governments are possible. These must be requested in writing and supported by adequate documentation, including information detailing actual interim expenditures and estimate revisions, and must be submitted at any time for interim payments, and within the first 12 months following the end of the event for advance payments (Public Safety Canada, 2017b; Office of the Parliamentary Budget Officer, 2016). First Nations or tribal councils may address rrequests for assistance via the EMAP to ISC's regional offices, which specify the respective application procedures (ISC, 2018).

For assistance distributed to agricultural producers via the AgriRecovery framework, provincial and territorial governments can launch a request to Agriculture and Agri-Food Canada, the federal agency charged with administration of this programme. The disaster event and its impacts are then jointly assessed to determine whether agricultural producers should receive assistance. During the assessment process, governments may consult with producers and/or sector organisations to gain a better understanding of the disaster, its impacts, and the needs of affected producers with respect to recovery. If the joint assessment concludes that an AgriRecovery response is necessary, participating governments launch the support initiative and notify eligible agricultural producers (AAFC, 2017). Mitigating disaster-related contingent liabilities and financing residual risks.

To mitigate previously identified, quantified and disclosed disaster-related contingent liabilities, governments need to control and ideally reduce their size and decide on how to provision for the residual risk.

Increasingly, Canada's government is encouraging investments in mitigation and prevention measures to address the pressure that rising costs place on the DFAA, and to attain a more balanced approach to emergency management planning. Specifically, it may offer additional support for the repair and rebuilding efforts that result in more resilient structures. The total amount eligible for cost sharing is limited to 15% of the total eligible actual costs associated with repair and reconstruction of damaged public and private infrastructure. As of July 2017, the central government has issued payments related to disaster risk reduction projects totalling CAD 4 million (USD 3.3 million). As of July 2017, provincial and territorial governments had forecasted investments of CAD 386 million (USD 318.63 million) in future mitigation projects; these costs are to be shared by the federal government under the DFAA.

Under the Emergency Management Act responsibility for ex ante disaster risk management measures in Canada lies with provincial and territorial governments, which in turn may delegate responsibilities in this area to municipalities through legislation. To support provincial and territorial governments in the fulfilment of their responsibilities in this regard, and in recognition of the value of ex ante disaster risk management, the central government in 2014 launched the National Disaster Mitigation Program (NDMP) to financially support disaster risk management efforts at subnational level, with flood risk management as the primary focus. The initial budget was set at CAD 200 million (USD 165.09 million) over five years (Public Safety Canada, 2017e). The NDMP complements previous federal disaster risk reduction programmes, such as the discontinued Flood Damage Reduction Program. For First Nations or tribal councils funding for mitigation and preparedness measures can be made available through EMAP (ISC, 2018).

The 2017 federal budget, too, illustrates this shift towards disaster risk management ex ante, with CAD 2 billion (USD 1.65 billion) earmarked over 11 years to a new cost-shared Disaster Mitigation and Adaptation Fund. Projects to support climate-related disaster

mitigation will be one of the categories eligible for funding provided to provincial and territorial governments. In addition, the 2017 budget foresees CAD 16.4 million over five years allocated to disaster risk assessment of federal transportation infrastructure assets (Government of Canada, 2017).

Notes

[1] Provincial and territorial governments describe the administrative divisions responsible for subnational governance in Canada. The major difference between a province and a territory is that provinces receive their power and authority from the Constitution Act, 1867, whereas territorial governments have powers delegated to them by the Parliament of Canada. There are ten provinces (Alberta, British Columbia, Manitoba, New Brunswick, Newfoundland and Labrador, Nova Scotia, Ontario, Prince Edward Island, Quebec and Saskatchewan) and three territories (Northwest Territories, Yukon and Nunavut).

[2] For northern or remote areas the maximum total amount may be increased by an additional 25%.

[3] See for example the Public Accounts of Canada for 2015-16, at www.tpsgc-pwgsc.gc.ca/recgen/cpc-pac/2016/pdf/2016-vol2-eng.pdf.

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Colombia

Prevalence of natural hazards

Colombia, which is located in the north-western part of South America, includes several distinct natural regions, among them the Andes Mountains traversing Colombia, the Amazon rainforest, the Pacific Ocean in the west and the Caribbean Sea in the North. These varied natural landscapes with their climatic differences have shaped Colombia's exposure to natural hazards (Table below).

The Andes are part of the Ring of Fire, a region that is subject to major earthquakes and volcanic eruptions. An estimated 86% of the population of Colombia is exposed to medium to high earthquake risk. Although less frequent than hydrometeorological disasters, earthquakes and volcanic eruptions have inflicted major losses. The eruption of the Nevado del Ruiz volcano in 1985, which triggered massive avalanches of ice, water and rocks resulted in some 23 000 fatalities and an estimated USD 1 billion in damages (Table 7.2). The Paez earthquake in 1994 caused 295 fatalities, and the Armenia earthquake in 1999 some 1 185 fatalities and an estimated USD 1.8 billion in damages (Campos Garcia et al., 2011).

Types of natural hazards to which Colombia is exposed

Category	Type of hazard
Geophysical	Earthquakes, volcanic activity, landslides
Meteorological	Cyclones, severe storms
Hydrological	Floods, tsunamis
Climatological	El Niño, La Niña;events ; droughts

Source: EM-DAT, 2017.

Major natural disasters in Colombia (since 1980)

Disaster event/location	Year	Fatalities	People affected	Estimated damage (in USD)
Volcanic eruption/ Nevado del Ruiz	1985	21 800	12 700	1 billion
Landslides Villatina/ Medellin	1987	640	6 436	not available
Earthquake/ Armenia	1999	1 186	1 200 000	1.9 billion
Floods (La Niña)	2010/11	556	3 78 85 99	6.3 billion

Sources: EM-DAT, 2017; UNGRD (data submitted to authors), ECLAC, 2012.

The humid tropical conditions in the Amazonia, Orinoquia and Caribbean regions frequently bring heavy rains. El Niño and La Niña weather phenomena have also had significant impacts on the rate and intensity of floods, droughts and landslides. An estimated 28% of the population of Colombia is exposed to major flood risk, and 31% to high or medium landslide risk. Intensive urbanisation across the four major metropolitan areas (Bogotá, Medellín, Cali and Barranquilla) has compounded the damages and losses suffered from floods and landslides by causing deteriorating environmental conditions, drying of wetlands and watersheds, loss of forests and vegetation and the resulting erosion and increased runoffs. Due to pressures on the land and uncontrolled development, the number of households and assets in high-risk areas has increased. Insufficient infrastructure further increases the vulnerability of these areas. The floods caused by the 2010/11 La Niña event caused an estimated USD 6.3 billion in cumulative damages.

Climate change is expected to expose Colombia to new risks. Shifting precipitation patterns are expected to change the climate of the Caribbean region to a more arid one. Temperature increases are likely to be especially marked in the Andean region, and a transition from a semi-humid to a semi-arid climate is foreseen for parts of that region. Although the impact of this change on the year-to-year variability of precipitation is still uncertain, disasters related to rainfall variability are projected to become more frequent (OECD, 2014).

Past fiscal impacts of disasters

Estimates of the average annual loss from natural hazards in Colombia range from USD 177 million (Campos Garcia et al., 2011) based on historical records, to USD 381 million (PreventionWeb, 2017). Most of the resources in the aftermath of a disaster are provided by the government. Of the damages caused by the 2010/11 major floods, for example, only 7% were insured (OECD, 2014). Annual average disaster-related government contingent liabilities have been estimated at USD 490 million (GFDRR, 2012).

The majority of resources for managing disasters come from the General Budget of the State. Between 1998 and 2010 the resources invested amounted to an estimated USD 2.5 billion, which corresponds to an approximate annual total of USD 300 million (Campos Garcia et al., 2011). In 2011 and 2012 the government invested 0.9% and 0.7% of gross domestic product (GDP), respectively, in flood response (CONFIS, 2011, 2012 as cited in OECD, 2014). Financing needs were covered by an additional tax on high-value real estate (0.1% of GDP); a levy on financial transactions; a loan from the World Bank; and reallocations within the current budget (CONFIS, 2011). Although regular evidence on disaster risk management expenditures is not available, existing data comparing spending in different years show that there is considerable annual variation.

El Niño and La Niña years are marked by especially big outlays for disaster-related government spending. For example, the La Niña event that took place in 2010/11 led to a total government investment for both the immediate response and recovery spending estimated at USD 1.5 billion. The El Niño event in 2014/15 led to a total of USD 608 million in government spending, of which USD 66 million was financed by the National Unit for Disaster Risk Management (Unidad Nacional para la Gestión del Riesgo de Desastres, UNGRD).

Colombia's National Disaster Risk Management Fund (hereafter "the Fund") derives from an earlier Calamities Fund established in 1984, and is based on Law No. 1523. Managed by the UNGRD, the Fund finances research into disaster risks as well as activities related to disaster risk reduction, to disaster risk management as well as activities related to disaster recovery and financial protection. It is the first funding instrument tapped in case of a

disaster. The Fund is essentially a disbursement mechanism, whose financing is allocated from the national budget, including different sectoral budgets. The Fund has a very small annual fixed allocation; when a disaster response exceeds what is available in the Fund, the UNGRD has to mobilise other funding resources, including private donations (whose share can be as high as 8% as during the Mocoa landslide in 2017). There is no information available on the Fund's size or regularity of funding provision. For the time being, the Fund is not regulated but functions through a compromise among different vested actors and agencies.

The Adaptation Fund (Fondo de Adaptación, AF) was initially created following the 2010/11 La Niña rainy season in order to provide funding for the reconstruction and recovery of areas affected by the disastrous rainfalls. The National Development Plan 2014-18 expanded the focus of the AF beyond recovery funding for La Niña-related events and introduced funding for disaster risk reduction and climate change adaptation measures. To accelerate implementation of projects, the AF is allowed to use special procurement processes until 2018.

Colombia also has access to funding through a World Bank-provided Catastrophe Deferred Drawdown Option (CAT DDO) that provides USD 250 million in standby funding in case of an emergency (OECD, 2014). The 2010/11 La Niña floods and mudslides triggered the CAT DDO in December 2011. In 2016, the CAT DDO was renewed to provide USD 250 million in standby funding until 2021 (IEG, 2016).

To increase resources during emergency response and recovery, the central government seeks to increase flexibility in current budget allocations so as to redeploy spending during disasters (OECD, 2014). Funding may be reassigned from sectoral budgets as well as from the general budget administered by the Ministry of Finance and Public Credit. If funds remain insufficient after reassigning existing budgets, the Ministry of Finance and Public Credit requests a budget increase through congress. Until now the scope for budget reassignment has been limited, however, as the great majority of the budget provisions do not allow for such reallocations (World Bank, 2012b).

Managing disaster-related contingent liabilities

Identification of disaster-related contingent liabilities

Identification of disaster-related contingent liabilities requires the identification of both explicit and, to the extent possible, implicit liabilities.

Explicit contingent liabilities

Explicit contingent liabilities arise from legal commitments of both central and subnational governments to provide disaster assistance. The Colombian Government has made a commitment to finance disaster recovery, but that commitment does not explicitly specify cost-sharing agreements (though currently negotiations are under way to change this), nor does it establish a legal responsibility to pay for public or private asset reconstruction. Law No. 1523/2012, which established the institutional framework for disaster risk management in Colombia does not make government obligations in this realm explicit, but broadly states that disasters must be addressed under the principles of equality and protection.

Explicit central government obligations for post-disaster financial assistance in Colombia

Commitment to finance…	Yes	No
… post-disaster response and recovery	✓	
… a share of the costs incurred by subnational governments for post-disaster response and recovery		×
… reconstruction and maintenance of central government-owned public assets		×
… recovery and reconstruction of private assets		×
… other expenses incurred by subnational governments (e.g. payments to businesses or individuals)		×
… government guarantees for disaster losses incurred by public corporations and public-private partnerships		×

Source: OECD Survey.

Several reviews have been carried out to identify the central government's existing disaster-related contingent liabilities. Looking at past expenditure by the government in the aftermath of a natural disaster, the reviews find several liabilities that can be considered as quasi-explicit, given the regularity with which they have been assumed by the government. These include recovery and reconstruction costs of central and sub-national public assets. The government of Colombia has also regularly compensated the losses of private houses for the poorest population groups (strata 1 and 2) under the assumption that this compensation would surpass local governments' ability to pay. The responsibility to pay for these houses is claimed to be both "legal" and "political", and so there is some ambiguity in whether the liability is explicit or implicit (Ministry of Finance and Public Credit, 2011). The government has in addition assumed disaster-relates costs incurred by state-owned enterprises.

Implicit contingent liabilities

As mentioned above, the disaster-related contingent liabilities of Colombia's government are not entirely explicit; Law 1523/2012 indicates a broad obligation by government to provide post-disaster support but it does not specify commitments in detail. Therefore, the government's past assistance efforts could be classified as implicit liabilities, meaning they are not determined by a law or a contractual rule.

This ambiguity leaves significant room for manoeuvre. For example, even though a semi-explicit commitment from the government is in place to provide post-disaster assistance for low-income population groups, there is no law that stipulates how much each group should receive. Thus in specific circumstances nothing impedes the government from providing post-disaster assistance to any population group, regardless of income.

Estimation of insurance payouts

At present, the national government does not have regular information on the size of past or potential future insurance payouts. It is estimated around 3% of households are insured against the impacts of disasters. Knowledge about businesses disaster coverage is equally scant, although larger businesses tend to have better coverage than smaller ones.

Equally little is known about the insurance coverage of public assets; currently, it is estimated to be less than 5%. The government has only recently begun to regularly assess the sources of the liabilities related to state-owned enterprises and the past costs to government during disasters. It can be assumed that insurance coverage for such enterprises is currently very low. The government is currently engaged in establishing a database on public assets and their respective insurance coverage.

Quantification of disaster-related contingent liabilities

No regular information is currently available on the actual government expenditure on disaster risk management, either at the national or sub-national level. The government has relied on modelling disaster losses and damages for its estimation of disaster-related contingent liabilities. As part of its disaster risk financing policy objectives, the government plans to conduct regular (annual) assessments of these liabilities, based on expected government expenditures. In 2017 such an assessment of future disaster-related government expenditures was carried out for the first time. This initial assessment focused on the quantification of expected spending related to hazardous events triggered by La Niña.

In a 2010 review, the Ministry of Finance and Public Credit (2011) estimated the annual expected loss from disasters to be USD 490 million, with the probable maximum loss for 100-year and 500-year return periods at USD 2.9 billion and USD 5.6 billion, respectively. The fiscal deficit index for disasters captures the relationship between the demand for resources to cover losses that a government would have to assume in the aftermath of a disaster, and the government's ability to generate internal and external funds to replace the damaged assets; an index greater than 1indicates insufficient ability of a government to respond to disasters. The index for Colombia has been calculated at 1.28 (Government of Mexico and World Bank, 2012a).

Estimated annual disaster-related contingent liabilities in Colombia

Estimated contingent liability	Million USD	% GDP	% Budget
Annual expected loss	490	0.2	0.7
100-year probable maximum loss	2 976	1.2	4.4
250-year probable maximum loss	4 417	1.8	6.6
500-year probable maximum loss	5 655	2.3	8.4

Source: Mechler et al., 2016.

In the absence of evidence on actual government expenditures for disaster risk management, the size of the different funding sources and instruments, including the National Disaster Risk Management Fund and the Adaptation Fund, can approximate yearly funding.

With regard to disclosing disaster-related contingent liabilities, the Ministry of Finance and Public Credit currently publishes information on its website about the progress being made to diminish contingent liabilities.

Estimating the fiscal impacts of disaster-related contingent liabilities and integrating them into overall fiscal forecasting

Through its Risk Deputy Directorate, the Ministry of Finance and Public Credit aims to, reduce Colombia's fiscal vulnerability. Toward this end, it monitors the risks to which its assets, liabilities, and specified contingent liabilities are exposed. In analysing the fiscal impact of a range of government contingent liabilities, the ministry showed that disaster-related contingent liabilities pose a significant fiscal risk. This estimation does not include the fiscal impact of disasters on subnational governments. The result of the fiscal impact calculation led the government to formally recognise natural hazards as a source of fiscal

risks; to make fiscal disaster risk assessment part of a mandatory fiscal risk assessment; and to integrate the calculation into a broader fiscal risk management strategy (Mechler et al., 2016).

With regard to fiscal forecasts, the Ministry of Finance publishes the Medium-Term Fiscal Framework by 15 June every year and submits its results to the Economic Commissions of the Senate and the House of Representatives (World Bank, 2012b). This publication includes projections of government revenues and expenditures over the next decade. Contingent liabilities are outlined in a separate chapter; however, disaster-related contingent liabilities are at present not included.

By publishing the Medium-Term Fiscal Framework on the Ministry of Finance and Public Credit website, the government discloses its contingent liabilities and follows the legal prescriptions of Law No. 819 of 2003, which requires the government to publish a detailed record of its fiscal analysis, including 10-year projections. The law also requires this publication to include a chapter on the government's explicit expected contingent liabilities.

The fiscal impacts of natural disasters are not considered in the national debt strategy. The macroeconomic and fiscal forecasts consider shocks based on different market variables, but disaster-related impacts are not currently included.

Implementation arrangements for providing post-disaster financial assistance

When a disaster occurs, subnational governments – i.e. municipalities followed by departments – are the first to respond and provide necessary financial resources. If their financial capacity is exceeded, central government assistance comes into play. However, Colombian law does not specify explicit roles or cost-sharing arrangements for the different levels of government, though negotiations are ongoing to establish formal agreements on cost sharing. In the event of a disaster, the board of the National Disaster Risk Management Fund decides on the resources needed and determines priorities for the Fund's allocation. Responsibility for managing the Fund lies with the aforementioned UNGRD. Law 1523/2012 requires all entities in the National System for Disaster Risk Management to provide financing. The Ministry of Finance and Public Credit is required to ensure that sufficient financial resources for the Fund are available in the Fund. When a disaster response exceeds what is available in the Fund, other funding resources, including donations, may be mobilised. Donations can be substantial; as mentioned above, they made up 8% of the total budget during the 2017 Mocoa landslide.) Upon exhaustion of the Fund, Colombia draws on the contingent credit line CAT DDO, established through the World Bank, to fund emergency relief and recovery.

Mitigating disaster-related contingent liabilities and financing residual risks

Article 220 of Law No. 1450 of 2011 requires the Ministry of Finance and Public Credit to design a strategy to reduce fiscal vulnerability to disasters. With the Policy Strategy for Public Financial Management of Natural Disaster Risk a first strategy document was drawn up with technical assistance from the World Bank in 2017. The document recommends to assess, reduce and manage fiscal risk stemming from disasters. It describes three main policy objectives: 1) identification and understanding of fiscal risk due to disasters; 2) financial management of natural disaster risk, including the implementation of innovative financial instruments; and 3) catastrophe risk insurance for public assets Ministry of Finance and Public Credit, 2017. These priorities are also part of the Colombia's National Development Plan 2014-18, based on Law No. 1753 of 2015.

To reduce disaster-related contingent liabilities ex ante, the government of Colombia has emphasised the importance of disaster risk reduction. The National Plan for Disaster Risk Management, Colombia's core policy for disaster risk management, includes a strong focus on disaster risk reduction, with clear goals for public stakeholders to achieve by 2025 (UNGRD, 2016). The Adapation Fund created following the devastating impacts of the 2010/11 El Niño and La Niña events as well as the National Disaster Risk Management Fund may be tapped into for supporting disaster risk reduction projects. The National Plan for Disaster Risk Management also includes a project that seeks to inform the design of disaster risk insurance instruments for central and subnational public assets, critical infrastructure, as well as for businesses and households (UNGRD, 2016). With support from the World Bank, technical guidance has been developed for concessionaires under public-private partnership schemes for road infrastructure. In addition, a framework agreement for regulating insurance intermediaries has been reached with Colombia Compra Eficiente, Colombia's public procurement agency; the key objective is to standardise procurement arrangements with insurance intermediaries.

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Costa Rica

Prevalence of natural hazards

Located between the Caribbean Sea and the North Pacific Ocean, along the subduction zone of the Caribbean and Cocos tectonic plates, Costa Rica is exposed to several natural hazards, which are themselves influenced by several large-scale climate phenomena such as the El Niño-Southern Oscillation. As much as 36.8% of Costa Rica's landmass is exposed to three or more natural hazards; 77.9% of its population and 80.1% of its gross domestic product (GDP) are located in areas exposed to multiple hazards (World Bank, 2005). The most severe economic impact in the past four decades has been from earthquakes and hurricanes, followed by floods.

Costa Rica borders the Pacific Ring of Fire, one of the most earthquake-prone and volcanically active regions in the world. Since 1980, Costa Rica has suffered eight severe earthquakes. The most recent major earthquakes occurred in Cinchona in 2009 and in Nocoya in 2012; the former caused direct economic losses estimated at USD 200 million and 31 fatalities, and the latter caused economic losses of USD 45 million. The 1991 earthquake in Limon, which caused economic losses of USD 444 million and 47 fatalities, was one of the worst in Costa Rica's history.

Types of natural hazards to which Costa Rica is exposed

Natural hazard category	Types of natural hazards
Geophysical	Earthquakes, volcanic activity
Hydrological	Floods
Meteorological	Tropical storms and hurricanes
Climatological	Droughts

Source: GFDRR 2010.

Major natural disasters in Costa Rica since 1980

Disaster event	Year	Fatalities	People affected	Estimated damage
Hurricane Johan	1988	28	127 500	736 million
Limon earthquake	1991	47	10 569	444 million
Tropical Storm Tomas	2010	28	4 005	354 million
Limon, Cartago and Heredia floods	1996	6	20 000	250 million
Hurricanes Cesar and Douglas	1996	51	572 000	216 million
Cinchona earthquake	2009	31	~129 000	200 million
Hurricane Otto	2016	9	50 000	198 million

Sources: MIDEPLAN, 2014; EM-DAT, 2017.

Rugged terrain and tropical weather with rainy and dry seasons also expose Costa Rica to climatological hazards, such as hydro-meteorological events and, to a lesser extent, droughts. With 18 severe floods since 1980, Costa Rica has on average suffered one major flood every two years. Currently, the highest accumulated losses from natural hazards in Costa Rica are the result of floods. In 2005, for instance, heavy rains affected Limon, Heredia, Cartago and Alajuela Provinces. Losses caused by the ensuing floods and landslides were estimated at USD 133 million. In 2015, rain-induced floods and landslides in the province of Limon and in Sarapiqui and Turrialba cantons generated estimated losses of USD 173 million (MIDEPLAN, 2014b).

Its location along the Caribbean Sea also exposes Costa Rica to tropical storms and hurricanes. In 1996 Hurricane Cesar and Douglas made landfall, resulting in 51 fatalities and affecting over half a million people as well as causing economic losses of USD 216 million. More recently, Tropical Storm Tomas in 2010 and Hurricane Otto in 2016 caused economic losses of USD 354 million and USD 198 million, respectively.

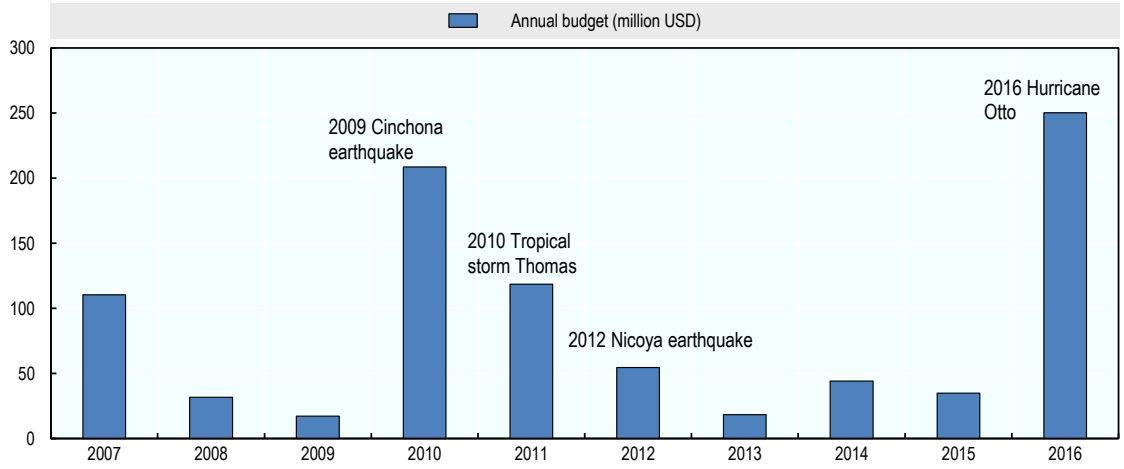
Past fiscal impacts of disasters

Estimated annual average losses from disasters in Costa Rica range from USD 37 million (PreventionWeb, 2017) to USD 280 million (UNISDR, 2015). If a major earthquake occurred, annual average losses could greatly exceed these estimates. A 250-year return period earthquake, for example, is estimated to cause up to USD 10 billion in damages (World Bank, 2016). The Costa Rican government has covered the majority of costs caused by major disasters. For example, the government covered 81% of the Limon earthquake losses (USD 361 million), 95% of Hurricane Cesar losses (USD 207 million), and 90% of Hurricane Tomas losses (USD 317 million).

Public resources for disaster risk management are primarily channelled through the National Emergency Fund (Fondo Nacional de Emergencia, FNE), and are managed by the National Commission for Risk Prevention and Emergency Response (Comisión Nacional de Prevención de Riesgos y Atención de Emergencias, CNE). The primary objective of the FNE is to finance post-disaster recovery measures, but it may also allocate funding to ex ante measures (GFDRR, 2010). In the past, the FNE has mainly been used for the recovery of temporarily interrupted public infrastructure and for emergency assistance to the affected population, e.g. to recover housing and small-scale agricultural infrastructure. For ex ante measures, additional funding is provided via the CNE budget. In keeping with the National Development Plan 2015-18, projects funded from other state institutions also need to dedicate resources to implementing disaster risk reduction activities (MIDEPLAN, 2014a; Kellett, Caravani and Pichon, 2014).

The FNE is funded from mandatory transfers from all public institutions, fixed at 3% of budget surplus, and donations from various sources. When an emergency is declared, public institutions may also be required to provide the FNE with additional emergency management funds ex post. From 2007 to 2016, the fund held USD 889 million, averaging USD 89 million per year. The lowest contribution was USD 17 million in 2009, and the highest was USD 209 million in 2010; this range illustrates the volatility of available resources. Single large-scale events, such as Hurricane Otto late in 2016, caused losses that exceeded the FNE's funds by nearly USD 45 million. In comparison, funding for disaster risk reduction measures in 2007 included just over USD 17 million allocated through the FNE, topped up by USD 3.2 million from the CNE budget (Kellett, Caravani and Pichon, 2014).

Annual budget of the National Emergency Fund from 2007 to 2016



Note: USD values are based on the exchange rate of the Central Bank of Costa Rica 20 April 2016. Data for 2016 are preliminary.
Source: National Emergency Commission (data submitted to authors); OECD survey response.

As introduced by the National Risk Management Policy (Política Nacional de Gestión del Riesgo) 2016-30 (CNE, 2015b), some social programmes feature emergency protocols to redirect and prioritise resources to the population affected by a disaster, adding to the post-disaster support funding available via the FNE. Examples include the emergency social assistance programme of the Joint Institute for Social Aid (Instituto Mixto de Ayuda Social); the unemployment subsidy programme of the Ministry of Labour and Social Security (Ministerio de Trabajo y Seguridad Social) and the productive entrepreneurship programme of the Rural Development Institute (Instituto de Desarollo Rural). In addition, the policy requires public institutions in the financial sector to put risk retention and transfer mechanisms in place to protect investments in public infrastructure, ensure provision of resources for disaster recovery, and enable the continuity of services in case of disaster.

To guide the disaster response and recovery efforts, National Law No. 8488 on Emergencies and Risk Prevention (Ley Nacional de Emergencias y Prevención de Riesgos) requires the government to activate an Emergency General Plan once an emergency is declared. The plan should identify both the financing needs created by the disaster and the funding to be allocated via the FNE. If the disaster response requires an allocation from institutional extraordinary budgets, the respective Emergency General Plan must indicate how much.

In the case of major disasters, Costa Rica sometimes relies on international assistance for financial support for response and recovery. Following the 2009 Chinchona earthquake, for instance, the central government requested international financial assistance for recovery – especially for the reconstruction of infrastructure (roads and bridges) and houses, for the recovery of the agriculture and dairy products sector, and for immediate emergency response items (Reliefweb, 2009).

A study by the Inter-American Development Bank (IDB, 2015) determined that should Costa Rica experience events with return periods of 500, 100, or 50 years, the Costa Rican government would not have sufficient resources to handle the losses and the cost of rebuilding damaged infrastructure. The result would be substantial negative impacts on fiscal sustainability.

Managing disaster-related contingent liabilities

Identification of disaster-related contingent liabilities

Explicit contingent liabilities

Explicit contingent liabilities arise from payment obligations that are based on laws, or clear policy commitments that could fall due in the event of a disaster. The table below lists the disaster-related contingent liabilities of the Costa Rican government.

Explicit central government obligations for post-disaster financial assistance in Costa Rica

Commitment to finance…	Yes	No
… post-disaster response and recovery	✓	
… a share of the costs incurred by subnational governments for post-disaster response and recovery		×
… reconstruction and maintenance of central government-owned public assets	✓	
… rehabilitation and reconstruction of private assets	✓	
… other expenses incurred by subnational governments (e.g. payments to businesses or individuals)		×
… government guarantees for disaster losses incurred by public corporations and public-private partnerships		x
… post-disaster response and recovery		x

Source: OECD Survey.

National Law No. 8488 on Emergencies and Risk Prevention introduces the principle of solidarity underpinning disaster risk management in Costa Rica and outlines the responsibility of public institutions to ensure adequate levels of protection against disasters and post-disaster recovery (CNE, 2006). Although the law mentions the responsibility of the state, the definition is broad, highlighting the central government's responsibility to reconstruct public assets and provide emergency support to the most vulnerable populations after a disaster, without specifying thresholds for qualifying for post-disaster recovery.

Financial support mechanisms for the private sector and explicit guarantees for disaster losses incurred by public corporations and public-private partnerships (PPPs) are not included in the central government's explicit commitments to post-disaster assistance. Instead, the technical guidelines published by the PPP Monitoring Unit within the Public Credit Directorate at the Ministry of Finance require that PPPs purchase hazard insurance or otherwise transfer their risk.

Both the National Risk Management Plan (Plan Nacional de Gestión del Riesgo; CNE, 2015a), and, as mentioned earlier, the National Risk Management Policy (CNE, 2015b) specify that social programmes should include emergency protocols to allow redirection of resources for disaster recovery purposes, as well as post-disaster compensation for populations affected by the event. In line with this provision, the central government typically provides financial support to the affected population during the emergency and compensates the poorest population groups for the loss of private property. The Ministry of Housing provides assistance to families whose houses have been damaged or destroyed during disasters. Low-income families can receive substantial subsidies to reconstruct their

houses or relocate, whereas more affluent households are given access to housing banks that provide subsidised loans to rebuild houses. In the aftermath of large-scale disasters such as Hurricane Otto, families also receive subsidies to rent houses while repairs are made to their permanent homes. There are no specific cost-sharing arrangements between central and subnational governments in place.

Implicit contingent liabilities

Implicit contingent liabilities are expenditures that may arise due to moral obligations without any prior commitments, or due to public expectations or political pressure on the government. Implicit liabilities are not determined by a law or a contractual rule.

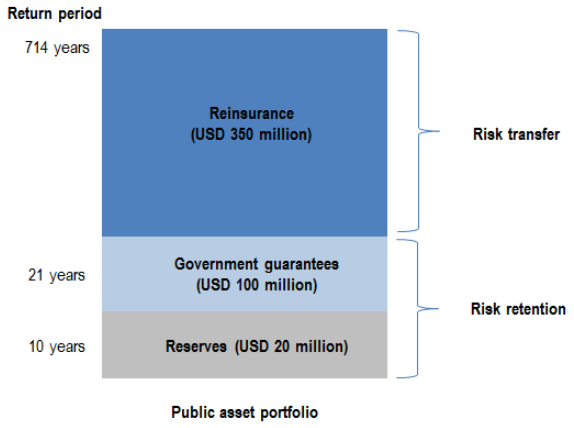
Given the Costa Rica's strict regulations about the use of public resources, closely overseen by the Comptroller General, no implicit liabilities can be identified for Costa Rica. This does not mean that implicit contingent liabilities could not arise in the future.

Estimation of insurance payouts

Various insurance operators provide insurance schemes to protect private assets against disaster risks. Most insurance coverage is provided by the National Insurance Institute (Instituto Nacional de Seguros, INS), a public insurer similar to a private insurer in its operations; the INS provides various types of insurance coverage, although not for high-risk structures (e.g. assets located too close to coasts or rivers). Insurance policies for cars, industries, businesses, plantations and residential homes include coverage for risks such as earthquakes, floods, landslides, hail, hurricanes, tsunamis and volcanic eruption, among others. Optional coverage for properties in disaster-prone areas is not always available or is available only with high deductibles, at high cost, or upon the implementation of specific risk prevention measures (OECD, 2016a).

According to the General Internal Control Law (No. 8292) and the National Risk Management Policy, public assets must be insured. Public institutions - including public enterprises with high-value assets – such as the Costa Rican Electricity Institute (ICE), the Costa Rican Department of Social Security (CCSS), and the Costa Rica Petroleum Refinery (RECOPE) – are responsible for the protection and preservation of their assets, which includes risk transfer. The National Insurance Institute offers a dedicated catastrophe risk transfer vehicle (CRTV) that to insure public assets at a lower cost than private insurance. With the CRTV the central government retains most of the risk while transferring excess losses to international financial markets (Ghesquiere and Mahul, 2010.

Insurance for public assets, as offered by the National Insurance Institute



Source: Ghesquiere and Mahul, 2010.

Quantification of disaster-related contingent liabilities

The National Risk Management Policy 2016-30 highlights the need to create mechanisms to record and measure mechanisms for public spending on disaster risk management, including disaster recovery and reconstruction spending, in order to forecast the impact of future events and ensure continuity of services. The government currently does not regularly quantify the size of disaster-related contingent liabilities.

The table below shows the relevant information that is already available to quantify disaster-related contingent liabilities. This includes historical data on government expenditures for disaster relief, as tracked in the annual budgetary execution and emergency spending from the CNE reported in the medium-term budgetary framework. Expenditure for the reconstruction of public infrastructure as specified in the Emergency General Plans is also recorded, as is expenditure reported from the National Emergency Fund.

Types of information from previous events available to calculate disaster-related contingent liabilities in Costa Rica

Type of disaster-related contingent liability	What gets recorded
Relief spending	Expenditure by central government for emergency and relief purposes
Spending for the reconstruction of damaged public infrastructure and assets	Restoration expenditure for affected central government-owned assets
Spending on increased social transfers due to a post-disaster economic slowdown	Not included
Expenditures due to guarantees issued to public or private entities suffering disaster losses	Not included
Post-disaster payments to subnational governments	Not included
Reduced tax collections	Not included
Disrupted operations of public corporations	Not included
Disrupted operations of private corporations	Not included
Deterioration in the terms at which the government can in the short term refinance public debt or raise additional debt	Not included

Source: OECD Survey response.

In addition, the Ministry of Economic Policy and National Planning (Ministerio de Planificación Nacional y Política Económica, MIDEPLAN) maintains a disaster loss database in which it collects data on damage caused by post-1988 hydrometeorological and geophysical events that triggered emergency declarations. Emergency management plans are the primary source of information feeding this database. They include the results of damage assessments and information on disaster relief and recovery needs; the total amount of government spending allocated for emergency response and reconstruction; and information on the affected and displaced population. There is a plan to eventually add data for hazardous events that did not trigger an emergency declaration.

Although Costa Rica has an inventory of public infrastructure assets, it is currently outdated and underestimated. This renders calculation of potential contingent liabilities for public budgets rather difficult. In line with the new National Risk Management Policy and National Risk Management Plan, the inventory of public assets and assets under state responsibility (including concessions) is expected to be updated to include (among other things) information on the location, value and insurance coverage of those assets.

Estimating the fiscal impacts of disaster-related contingent liabilities and integrating them into overall fiscal forecasting

The Ministry of Finance's Public Credit Directorate (PCD), which is in charge of identifying contingent liabilities, works with the Secretariat of the Budgetary Authority and the Central Bank of Costa Rica to develop fiscal sustainability scenarios (deterministic and stochastic models) and conducts macroeconomic modelling (fiscal balance models). However, these macroeconomic and fiscal forecasts do not consider disaster impacts. Likewise, the debt management strategy does not include the potential impact of disasters. The scenarios generated with debt projections include variables that have quantified effects on the final public debt outcome, such as exchange rates and primary deficits. Contingent liabilities are not included in the debt projections because they are not measured (Ministry of Finance, 2016b).

For earthquakes and tropical cyclones, fiscal risk probability analyses are already being conducted. The Ministry of Finance currently does not publish fiscal risk reports, although the International Monetary Fund (IMF) has recommended that the ministry prepare an annual report on fiscal risks as part of the annual budget documents. This report should contain information on macroeconomic risks, public debt, public corporations, debt guarantees, contingent liabilities, concession contracts, disasters, financial institutions, subnational governments and social security and health (IMF, 2013). Following this recommendation, the PCD is currently developing a proposal to create a fiscal risks office.

Implementation arrangements for providing post-disaster financial assistance

Under Law No. 8488, the CNE is the authority charged with both ex ante disaster risk management and post-disaster response and recovery, including the management and co-ordination of post-disaster financial assistance via the FNE. The respective regional, municipal and community emergency committees support the CNE in its emergency response operations.

As stated above, in the Emergency General Plans the CNE determines which emergency and reconstruction works will be funded with FNE resources and which with transfers from regular public institutional budgets. The latter source of funding particularly applies to public institutions in the social sector that have programmes to cover the emergency needs of affected populations. Even though these extraordinary budget allocations are not

channelled through the FNE, they must be included in the Emergency General Plans. The CNE board then designates public institutions (i.e. ministries and municipalities) as executing units in line with their competencies in the territory where the emergency was declared. Once designated, executing units are required to present investment plans that specify the allocation and execution of resources for the approval of CNE.

The National Risk Management Forum (Foro Nacional de Gestión de Riesgo), which brings together all stakeholders and institutions given a role under Law 8488, ensures the successful implementation of risk management policies and funds by monitoring the work of the CNE, including in the emergency response and post-disaster recovery stages.

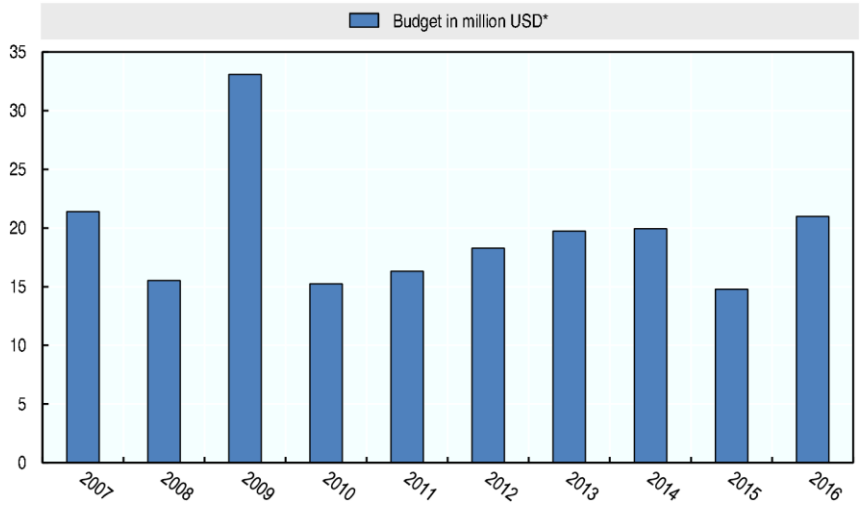
Mitigating disaster-related contingent liabilities and financing residual risks

Law 8488 describes prevention and preparedness as tasks that are shared by the whole of government and society at large. According to the law, central and subnational governments share the responsibility of budgeting and planning for disaster risk management. The relevant budget lines must adhere to the guidelines set forth in the National Risk Management Policy and National Risk Management Plan (CNE, 2015a, 2015b).

Although the strategic objectives for risk prevention are firmly anchored in national development documents, no budget measure indicates the overall budget envelope dedicated to risk prevention efforts. Recognising this, the central government has made provisions to develop needed budget guidelines; these will allow identification of resources for disaster risk management, adjustment of the public accounts catalogue to record relevant expenses; and the creation of guidelines to mainstream disaster risk management. Going further, the government expects to have the ability to identify and measure disaster risk management items in national accounts as of 2018, as the necessary methodologies to estimate and to account for these expenditures have been recently developed.

The range of disaster risk reduction activities undertaken by the CNE through the FNE includes both disaster preparedness measures and structural and non-structural disaster risk reduction measures, such as the construction of protective infrastructure, community-based prevention projects, research activities, early warning projects, and the development and mainstreaming of hazard maps and building codes (e.g. a nationwide seismic building code). Currently, around 40 of the 81 municipalities in Costa Rica have hazard maps in place (Kellett, Caravani and Pichon, 2014). The CNE budget over the past decade has amounted to a total of USD 190 million – on average, USD 19 million per year.

Annual budget of the National Emergency Management Commission (CNE) from 2007 to 2016



Note: USD values are based on the exchange rate of the Central Bank of Costa Rica 20 April 2016.
Source: Administrative-Financial Management Direction (data submitted to authors); OECD survey response.

Not all funding for disaster risk reduction passes through the CNE institutional structure and budget. MIDEPLAN has set disaster risk management as a transversal axis in the National Development Plan 2015-18, and has developed tools for identifying and mitigating disaster risks in public investment projects. Disaster risk management has been incorporated into the design, formulation and execution of public investment projects within the framework of the National Public Investment System; the goal is to ensure the sustainability of public investment and reduce the cost of restoring services and rebuilding infrastructure following a disaster. MIDEPLAN requires that disaster risks are analysed for public investment projects, and that the analysis includes both the costs of those actions and economic and social impacts (MIDEPLAN, 2014a).

Costa Rica complements risk mitigation activities with financial instruments for disaster response. These include the National Emergency Fund and contingent credit lines as available ex ante financing tools, and ad hoc budget reallocations and international assistance for ex post financing. A USD 65 million Catastrophe Deferred Drawdown Option (CAT DDO) loan signed with the World Bank in 2008 and a USD 100 million contingent loan with the Inter-American Development Bank further complements the funding available for disaster recovery. These credit lines provide liquidity to ensure the government has enough resources at hand to adequately respond to a disaster. In 2009 Costa Rica used the CAT DDO line twice to obtain a total of USD 24 million after the Cinchona earthquake and severe floods, while the Inter-American Development Bank credit line has not yet been used (World Bank, 2014; IDB, 2012).

Costa Rica is currently preparing a new financial protection strategy to reinforce the financial management of risks associated with disasters a set of new instruments as well as enhancing current instruments. The upcoming strategy is expected to include the possibility of new contingent credit lines for larger amounts, and subscription to disaster risk transfer platforms such as the Caribbean Catastrophe Risk Insurance Facility. The vision of this new strategy is to diversify the options available for facing the fiscal impact of disaster without compromising macroeconomic stability.

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France

Prevalence of natural hazards

Due to its diverse topography and distinct climates, France is exposed to a wide range of natural hazards. Mainland France is surrounded by long coastlines, major river systems such as the Seine and the Rhône as well as mountain ranges, including the Pyrenees and the Alps, characterise France's territory. The overseas regions and departments (régions d'outre-mer ROM and départements d'outre-mer, DOM)[1] are characterised by their tropical climate, with some of them home to active volcanoes (French Antilles, la Réunion) (OECD, 2017).

Types of natural hazards to which France is exposed

Natural hazard category	Types of natural hazards
Geophysical	Earthquakes, tsunamis, volcanic activity (French Antilles, La Réunion)
Hydrological	Floods; storm surge; landslides; avalanches
Meteorological	Storms; hurricanes, extreme temperatures
Climatological	Droughts; forest fires

Source: EM-DAT, 2017; OECD Survey response.

Major natural disasters in France since 1980

Disaster event/location	Year	Fatalities	People Affected	Estimated damage (in USD) billion
Storms Martin and Lothar & subsequent landslides/ South-western and Western France	1999	92	> 3 400 000	8.5
Storms Xynthia/ South-western France	2010	53	500 079	4.2
Storms Daria/ Western and North-Eastern France	1990	10	-	4
Flood/ Ile-de-France and North-eastern France	2016	5	-	2.4
Hurricanes Irma and Maria/ French Antilles	2017	13	-	2.4
Heat wave/ mainland France	2003	19 490		1.5
Rhône Floods/ South-eastern France	2003	-	> 32 000	1.8

Source: EM-DAT, 2017; OECD Survey response; CCR, 2017.

Storms and hurricanes threaten both metropolitan France and the overseas territories. Storm Lothar in 1999 caused around USD 8 billion in damages and left 88 people dead. Storm Xynthia caused 53 casualties and USD 4.2 billion in damages (EM-DAT, 2017).

Floods occur throughout the year, and often follow major storms. The 2016 floods that affected the Paris region and North-Eastern France resulted in an estimated USD 2.4 billion

in damages. The 2003 Rhône floods were geographically more limited, but nonetheless resulted in damages of around USD 1.8 billion (OECD, 2017).

Although not as frequent as floods and storms, heatwaves and earthquakes pose a significant threat. The 2003 European heatwave, for instance, struck France particularly strongly, resulting in an estimated 19,000 casualties. While no major earthquake has occurred in recent years, seismic risk in the region of Provence-Alpes-Côte d'Azur is high (OECD, 2017).

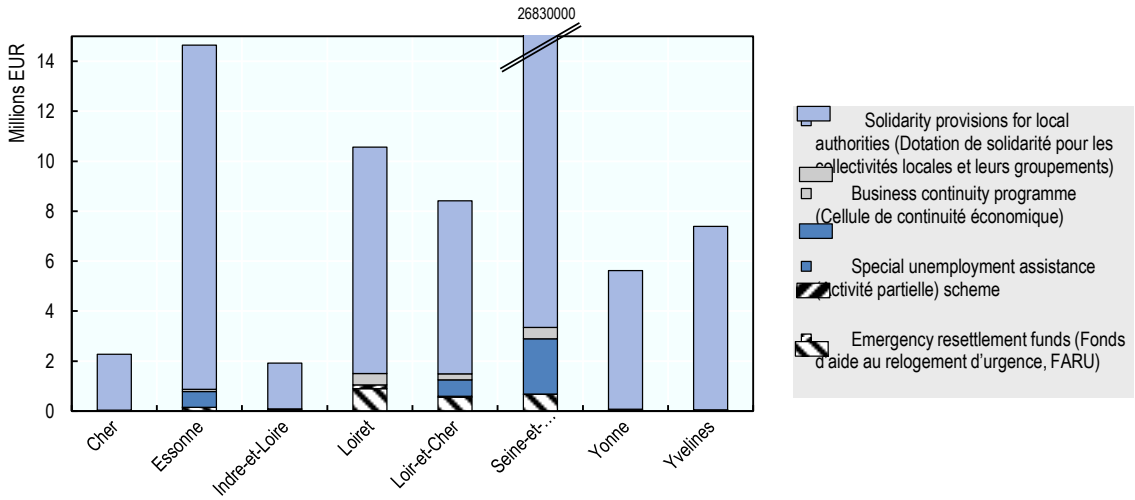
Past fiscal impact of disasters

Annual average losses caused by disasters are estimated at USD 1.24 million, corresponding to 0.05% of annual GDP between 1980 and 2016[2] (EM-DAT, 2017). For hazards with a 500-year return period, the overall maximum probable loss has been estimated at USD 23.5 billion, with a 500-year earthquake alone expected to cause USD 20 billion in damages, and a 500-year storm USD 3.5 billion (PreventionWeb, 2017).

Since its creation in 1982, the CATNAT (Catastrophes Naturelles) public-private insurance partnership scheme, paid out annually, on average, around USD 1.2 billion to compensate for disaster damages (CCR, 2016a). To ensure liquidity in case of a major disaster the CATNAT is backed by a state guarantee. So far, the government only had to step in once, in 2000, when the government injected about USD 250 million[3] to meet outstanding payment requests in response to storms Martin and Lothar from the previous year.

In addition to the CATNAT scheme, several disaster assistance and emergency response programmes financed by the central government are in place. Following the 2016 Seine and Loire floods, for instance, affected households, businesses and subnational governments across eight affected departments received a total of around USD 100 million (EUR 81 million) through the solidarity provisions for local authorities, the emergency relief fund as well as assistance for the private sector, and the subnational emergency rehousing fund[4] (Perrin et al., 2017).

Public assistance following the 2016 Seine and Loire floods



Note: Data has been compiled by the DGSCGC and completed by prefectures. Data for Paris, which was also affected by the 2016 Seine floods, was not available.
Source: Perrin et al. 2017.

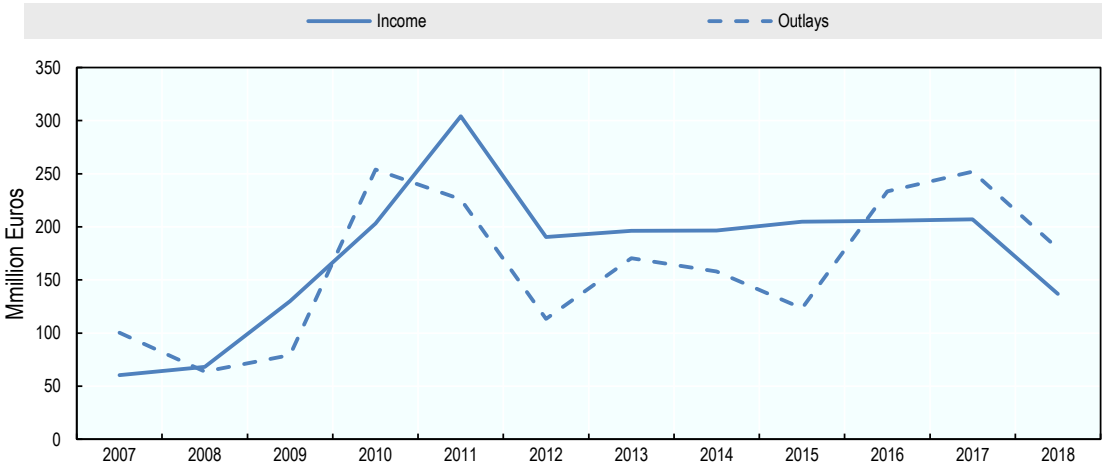
To enable the recovery from hurricanes Maria and Irma in late 2017, the central government provided an estimated USD 625 million in assistance, including via the relief fund for overseas territories (Fonds de secours pour l'Outre-mer, FSOM) through which USD 24 million were channelled to affected households (Cour de Comptes, 2017). One third of the assistance was provided in the form of emergency assistance, the remainder was earmarked for disaster reconstruction (USD 100 million in reconstruction loans) and economic support (Government of France, 2018). Following the decision of an inter-ministerial committee for the reconstruction of the affected islands, an additional about USD 170 million was provided to affected businesses and households. Much of this was spent via the special unemployment assistance (Activité partielle) scheme, with up to USD 12,500 available to individual businesses making use of this scheme (USD 3.4 millions). In addition, the maximum hours eligible for support under the special unemployment assistance scheme were increased by 60 percent to 1600 hours, which along with vocational trainings offered to affected employees at full salary totals up to around USD 57 to 94 million in additional costs to the French government. To further support business recovery, the government allowed companies to pause tax and social debt payments for several months, and put employers' social security contributions on hold until November 2018, with the possibility of abandoning claims and staggering payment for 5 years starting 2020 (summing up to USD 56 million). Households were eligible for exceptional public assistance, such as USD 63 per child/ total of USD 250 per family, and 4200 households on Saint-Martin and Saint-Barthélemy received cash cards of about USD 375 per adult and USD 125 per child, summing up to USD 2.5 million in costs to the French government. To support sub-national authorities in the recovery efforts, the central government provided around USD 80 million in financial assistance to the two affected overseas local governments[5] (Le Monde, 2018; Government of France, 2018).

In France, subnational governments have an important role in supporting households and businesses affected by disasters in their recovery. Subnational governments may directly make assistance to households and businesses available, for instance through welfare payments from Community Centres for Social Action (Centres communal d'action sociale, CCAS). County councils (conseils départementaux) and regional councils (conseils régionaux) may also provide assistance for the recovery of affected individuals, as has been the case in the aftermath of the 2016 Seine and Loire floods: The Loir-et-Cher department council, for instance, provided USD 619,000 to municipalities, who then disbursed the assistance to affected households. An additional USD 250,000 was provided to Romorantin-Lantehnay, a particularly affected commune in Loir-et-Cher (Perrin et al., 2017). On the other hand, sub-national authorities channel the above-mentioned assistance from central government sources to affected households and businesses (Perrin et al., 2017).

While public spending for disaster recovery and reconstruction for some major disasters, such as hurricanes Maria and Irma, may at times be considerable, central and sub-national governments have also engaged substantial resources in ex ante disaster risk management. The Fund for the Prevention of Major Natural Hazards (Fonds de Prévention des Risques Naturels Majeurs, FPRNM) or short Barnier Fund (Fonds Barnier) is the principal instrument for co-funding disaster risk prevention measures. Central government co-funding generally ranges between 100% for non-structural measures to 40-50% for structural measures. The Barnier Fund has consistently retained about USD 220 million for disaster risk prevention, but disbursement varies in line with prevention policy priorities and disaster recovery and reconstruction needs. For 2018, available funding has been reduced to about USD 162 million, down from around USD 245 million in 2017 (Sénat,

2018a). Budgetary programme 181 foresees an additional USD 270 million in central government financing for ex ante disaster risk management measures in 2018, representing a 1.5 percent increase from 2017 to 2018 (Sénat, 2018b).

Barnier Fund budget and forecast, 2008-2015



Note: Outlays do not include management fees. 2016 outlays include a compensation of EUR 55 million in 2016 and EUR 70 million in 2017 to the state budget.
Source: Sénat, 2018b.

Overall detailed disaster risk prevention investment records are difficult to establish, but a one-off study from 2009 shows that the central government provided around USD 407 million for ex ante disaster risk management in that year. Flood-related expenditures accounted for nearly half of that. Co-financing from sub-national governments provided an additional USD 292 million in 2009. Records for sub-national investments into measures that did not receive central government co-financing are not regularly compiled, but the draft budget for 2018 suggests that sub-national governments have earmarked around USD 1.2 million for flood risk management measures without co-funding in 2018 (Nicklaus et al., 2013; Sénat, 2018a).

2009 Central government ex ante disaster management spending

Hazards	Central government expenditure (in EUR million)	% of total expenditure
Floods	155	46
Earthquakes	62	18
Forest fires	41	12
Avalanches	5	1
Multi-risks	77	23

Source: Nicklaus et al., 2013.

Managing disaster-related contingent liabilities

Identification of disaster-related contingent liabilities

Explicit contingent liabilities

Explicit contingent liabilities arise from payment obligations that are based on laws, or clear policy commitments that could fall due in the event of a disaster. Even though various public recovery assistance instruments are available in France, the authorities noted few explicit obligations related to disaster response and recovery.

Explicit central government obligations for post-disaster financial assistance in France

Commitment to finance…	Yes	No
… post-disaster response and recovery	✓	
… a share of the costs incurred by subnational governments for post-disaster response and recovery	✓	
… reconstruction and maintenance of central government-owned public assets	✓	
… rehabilitation and reconstruction of private assets		X
… other expenses incurred by subnational governments (e.g. payments to businesses or individuals)	✓	
… government guarantees for disaster losses incurred by public corporations and public-private partnerships	✓	

Source: OECD Survey; Collectivités locales, 2017a, b.

The CATNAT insurance scheme is a key element of France's disaster recovery financing framework. To prevent illiquidity in case a major disaster triggers insurance pay-outs beyond available reserves, the central government provides a state guarantee sourced from the general budget. If claims exceed 90% of the special reserve and annually defined equalisation reserves, the government is required to step in (OECD, 2017; CCR, 2015; Grislain-Letrémy and Calvet, 2012).

CATNAT insurance scheme – a public-private partnership for disaster compensation & prevention

CATNAT is a public-private mutual-based insurance scheme inscribed in France's constitutional principle of solidarity. The CATNAT scheme was established in 1982 to offset shortcomings of the insurance market by providing insurance for all individuals and businesses against hazards otherwise considered 'uninsurable', i.e. hazards concentrated on a limited area, such as flooding, avalanches, volcanic activity or earthquakes.

Funding for the CATNAT comes from an additional premium at mandatory uniform state-fixed rate for all property insurance policies as well as for motor vehicle insurances, irrespective of its exposure to natural hazards. Initially established at 5.5%, the premium has now risen to 12% for all-risk home and business insurance and 6% for motor vehicle insurances. The proceeds go to the CATNAT reserve.

To prevent illiquidity in case a major disaster triggers insurance pay-outs beyond available reserves, the central government provides a state guarantee sourced from the general budget. The state guarantee given to the CCR turns the CATNAT insurance scheme into an explicit disaster-related liability. If claims exceed 90% of the special reserve and annually defined equalisation reserves, the government is required to step in.

While the insurance premiums do not take risk levels, nor prevention efforts by policyholders into account, the scheme serves as a key funding source for the Barnier Fund. A fixed percentage of sums collected is retained to provide funding for disaster risk prevention, decoupling the Barnier Fund from direct state budget resources.

Source: Grislain-Letrémy and Peinturier, 2012; Grislain-Letrémy and Calvet, 2012; CCR, 2015; OECD, 2017

In addition to the CATNAT scheme, a range of disaster assistance programmes are in place at central government level in France, hinging on the principle of solidarity. The programmes at central government level complement assistance provided by sub-national governments, which are first in line for assisting households and businesses in the aftermath of disasters in France. This includes disaster response and relief measures, such as the provision of necessities and welfare payments. In addition, sub-national governments have a key role in financing disaster response, as well as the recovery of sub-nationally owned public assets (OECD, 2017; General Local Authorities Code (Article R1424)).

Overview of public disaster recovery instruments

	Legal Basis	Description	Beneficiaries
CATNAT insurance scheme	Law n° 82-600	Insurance scheme backed by a state-guarantee covering natural hazards	Insured households, businesses, public assets following the declaration of a state of emergency
Solidarity provisions for local authorities (*Dotation de solidarité pour les collectivités locales et leurs groupements*)[6]	General Local Authorities Code (Article 1613)	Central government assistance for the reconstruction of uninsurable sub-national assets damaged by natural hazards	Local authorities
Emergency relief fund (*fonds de secours d'extrême urgence*)	Ministry of Interior (Bulletin NOR: INTE1719314C)	Central government assistance for immediate disaster relief (purchase of basic necessities; e.g. food, clothing, accommodation)	Affected individuals
Emergency relocation fond (*fonds de relogement d'urgence,* FARU)	General Local Authorities Code (Article L2335-15)	Central government assistance to facilitate emergency housing or temporary rehousing in case of premises that pose a danger to residential health or safety	Local authorities, competent local public institutions, or public interest groups
Relief fund for overseas territories (*Fonds de secours pour l'Outre-mer,* FSOM*)*	Ministry of Interior (Bulletin 76-72 of 6 February 1976); ad hoc bulletins for individual disaster events	Central government assistance for the reconstruction of uninsured private assets, uninsurable subnational assets, and for immediate disaster relief (purchase of basic necessities)	Households and small businesses, local authorities
National guarantee fund for agricultural disasters (*Fonds national de gestion des risques en agriculture, FNGRA*)	Law no. 2010-874 on the modernisation of agriculture and fishery	Central government compensation for uninsurable crop losses due to natural hazards or disease outbreak	Agricultural producers
Special unemployment assistance (*Activité partielle*) scheme	Labour Ministry (Bulletin no 2013-12 of July 12, 2013)	Central government compensation for employees' loss of income caused by business disruptions	Employees via employers

Source: Collectivités locales, 2017a, b; Perrin et al., 2017; Ministère de l'Intérieur et Ministère de l'action et des comptes publics, 2017; Services de l'État en Guadeloupe, 2017; CCR, 2016b; Ministère du travail, 2018.

To assist subnational authorities with financing the recovery of public assets following a disaster declaration, the Ministry of Interior (Ministère de l'Intérieur) put the solidarity provisions for local authorities in place. Through the solidarity provisions subnational governments can receive financial assistance for shouldering the costs of recovering subnationally owned assets. The solidarity provisions foresee that central government

assistance for a reconstruction of damaged assets to their pre-disaster state can be requested, if damages to uninsurable assets caused by weather-related or geological hazards exceed USD 180,000 (EUR 150,000) in a given commune. The assistance is funded from budgetary appropriations from budgetary programme 122 'specific competitions and administration' (Concours spécifiques et administration) (Collectivités locales, 2017b, Grislain-Letrémy and Peinturier, 2012).

Upon ministerial decision, the emergency relief fund (Fonds de secours d'extrême urgence) maintained by the Ministry of Interior can be accessed to support local authorities in providing relief to the affected population in the immediate aftermath of a hazardous event (man-made or natural). The total available assistance is capped at EUR 300 (USD 370) per affected adult and EUR 100 (USD 120) per affected child and may only be used for the purchase of basic necessities. Businesses cannot benefit from the emergency relief fund. Financing for the emergency relief fund is obtained from budgetary programme 161 'Emergency appropriations' (crédits d'extrême urgence) (Ministère de l'Intérieur et Ministère de l'Action et des Comptes Publics, 2017). In addition, the Minister of the Interior may provide financial assistance from the Emergency Relocation Fund (fonds de relogement d'urgence, FARU) to support local authorities, competent local public institutions, or public interest groups providing emergency housing or temporary housing to occupants of premises that pose a danger to residential health or safety (Collectivités locales, 2017a).

In light of the high exposure of France's overseas territories and the comparatively low CATNAT insurance penetration[7], the relief fund for overseas territories (Fonds de secours pour l'Outre-mer, FSOM) has been established. It can be activated in addition to the above-mentioned funds. Administered by the Ministry of Overseas Territories (Ministère des Outre-Mer) the FSOM has two pillars: disaster relief support to affected households in meeting basic needs in the aftermath of a major disaster, and assistance for disaster reconstruction of uninsured private and subnational public assets. The exact eligibility criteria depend on the disaster in question, which makes the FSOM a flexible instrument, but could lead to "charity hazard". To avoid this, the fund has limited the relative compensation of damages. For example, following hurricane Maria in September 2017, the business recovery via the FSOM was limited to 20-30% of the damages incurred by uninsured, small or family-owned enterprises that suffered substantial damages disrupting business continuity (DIECCTE Guadeloupe, 2017). Financing for the FSOM is obtained through budgetary appropriations from budgetary programme 123 'overseas territories living standards' (conditions de vie Outre-mer) (Grislain-Letrémy and Peinturier, 2012).

In case agricultural businesses suffer uninsurable losses due to natural hazards or disease outbreak, compensation from the national fund for the management of agricultural risks (Fonds National de Gestion des Risques en Agriculture, FNGRA) may become available. Damages to standing or stored crops, cultivations, farmland and livestock are considered insurable, and thus excluded from compensation via the FNGRA. The fund is sourced from a mandatory premium for agricultural insurance policies, stocked up by a central government contribution. On average, the central government provides about one third of the resources for this fund, with significant year-to-year fluctuations (Ministère de l'Agriculture et de l'Alimentation, 2015; Grislain-Letrémy and Peinturier, 2012; Lidsky et al., 2017).

Budget of the National Fund for the Management of Agricultural Risks in Mio EUR, 2010-2016

Year	2010	2011	2012	2013	2014	2015	2016
Premium for agricultural insurance policies	110,8	101,4	113,3	120,0	122,5	119,5	58,6
Government contribution	32,8	9,2	111,8	22,2	19,2	25,4	81,0

Source: Lidsky et al., 2017.

To support businesses in paying wages during business disruption, the Labour Ministry (Ministère du travail) has established the unemployment assistance (Activité partielle) scheme. Not limited to disaster-related business disruptions, this scheme allows employers to request public compensation for paying salaries in case of disaster-related business disruptions. This assistance is limited to 1000 hours per year and employee (Ministère du Travail, 2018).

Implicit contingent liabilities

Extraordinary disasters, such as hurricanes Maria and Irma in fall 2017 or the 2016 Seine floods, where the scale of damages, but also the public's attention in France have been particularly high, have in the past resulted in decisions in favour of providing additional assistance beyond the disaster assistance mechanisms outlined above.

Following hurricanes Maria and Irma that struck the French Antilles in late 2017, the Ministry of Overseas Territories implemented a series of measures to support the recovery of the affected areas. This included exceptional assistance for business recovery (aide exceptionnelle pour le redémarrage des entreprises sinistrées) ranging from EUR 1000 to 10 000 per business, depending on the duration of the business disruption (DIECCTE Guadeloupe, 2017). Similarly, the 2016 Seine floods resulted in the provision of exceptional assistance for the private sector, with the Minister of the Economy, Industry and Digital Affairs (Ministre de l'Économie, de l'Industrie et du Numérique) reactivating the business continuity programme (cellule de continuité économique,) first launched following the 2015 Paris attacks. Through the ad hoc business continuity programme, nearly 500 affected small and medium sized businesses located in areas affected by the floods received a total of around USD 1.55 million in recovery support. The maximum recovery support per business was capped at USD 3,680, with up to USD 12,270 available in severe cases (Perrin et al., 2017).

Estimation of insurance pay-outs

Owing to the CATNAT insurance scheme described in the box above, overall hazard insurance penetration is very high in metropolitan France (99%). At 52%, the coverage in France's overseas territories is much lower, in part explainable by the high prevalence of vulnerable building structures that do not follow the building code, a prerequisite to insurability (Grislain-Letrémy and Peinturier, 2012).

Public assets can be covered under the CATNAT scheme, including central and sub-national public assets, as well as state-owned enterprises' assets, such as railroads. Much of France's public service infrastructure, such as hospitals, education facilities and government buildings, are protected by insurance under the CATNAT scheme, as are most

sub-national public assets. Museums and other cultural heritage assets do not fall under this scheme, but benefit from the principle of self-insurance applicable to government assets (Grislain-Letrémy and Peinturier, 2012).

The CCR regularly prepares overviews of annual damage sums to be expected under the CATNAT scheme, and uses this information in modelling future expected damages and insurance pay-outs. The damage estimates and modelling results are used to inform the annual adjustment of the state guarantee (OECD, 2017; Grislain-Letrémy and Calvet, 2012).

Quantification of disaster-related contingent liabilities

Currently, disaster-related contingent liabilities are not quantified ex ante in France, but some data that could be used to do so is available. For public assistance from one of the various disaster recovery and relief funds and programmes (see Table 4), the respective line ministries managing these keep the records. Although such records are available, there is no standardised process to compile the information in a centralized overview of government relief and recovery payments to quantify the overall disaster-related contingent liabilities arising from them. In some cases, such as after major events like the 2016 Seine and Loire floods, the Ministry of the Ecology and the Ministry of Interior put together overviews of assistance made available from the various programmes, drawing on records kept by the respective line ministries and sub-national governments (Perrin et al., 2017).

Types of information from previous events available to calculate disaster-related contingent liabilities

Type of disaster-related expenditure	What gets recorded
Relief spending	Records for relief payments via public assistance programmes kept by responsible ministries.
Spending for the reconstruction of damaged public infrastructure and assets	Payment records via the CATNAT scheme for compensated damages to insured public assets
Spending for the reconstruction of damaged private assets	Payment records via the CATNAT scheme for compensated damages to insured private assets
Spending on increased social transfers due to a post-disaster economic slowdown	Payment records for social transfer schemes, such as FARU and the special unemployment assistance
Expenditures due to guarantees issued to public or private entities suffering disaster losses	State guarantee to the CCR quantified each year and published in general government budget
Post-disaster payments to subnational governments	Records for payments via public assistance programmes (e.g. solidarity provisions for local governments) kept by responsible ministries.
Reduced tax collections	Not available
Disrupted operations of public corporations	Not available
Disrupted operations of private corporations	Special unemployment assistance as provided by the Ministry of Labour
Deterioration in the terms at which the government can in the short term refinance public debt or raise additional debt	Not available

Source: OECD Survey response.

Payment records via the CATNAT scheme are comprehensive and published in the CCR's annual activity report, distinguishing compensated damages to public and private insured assets. The CCR uses the payment records in modelling the cost of disasters that might require an activation of the state guarantee, such as a 100-year Seine flood, a 7-8 Richter scale earthquake in the Côte d'Azur, a 500-year heatwave, or a category 5 cyclone. The

models are updated each year, and inform the definition of the state guarantee threshold. The state guarantee to the CCR itself is quantified each year and published in the general government budget (République Française, 2017).

Estimation of fiscal impacts of disaster-related contingent liabilities and their integration in overall fiscal forecasting

French authorities noted that disaster-related contingent liabilities are not considered a fiscal risk, if below the threshold for activation of the state guarantee to the CATNAT scheme. In turn, liabilities resulting from the various other public assistance schemes in place across ministries are thus not seen as a fiscal risk.

Although data on past public spending for disaster recovery and reconstruction purposes is not used to approximate future disaster-related contingent liabilities by default, the debt management agency, Agence France Trésor (AFT), has started to consider external events among the fiscal risks facing public finances. To keep track of these, an incidents database that accounts losses resulting from external events, which may include disasters, as well as from inadequate or failed internal processes, has been put in place. In addition, macro-financial scenarios prepared by the AFT are starting to consider disasters. The scenarios are used to inform the central government's debt management strategy (AFT, 2018). Sensitivity analyses to estimate the impact of contingent liabilities on the fiscal balance are not used.

Implementation arrangements for providing post-disaster financial assistance

In France, subnational governments are first in line for financing disaster response and supporting household and business recovery from hazardous events. They are also in the driver's seat for financing the recovery of sub-nationally owned public assets outside the CATNAT scheme. To assist subnational governments in carrying out their responsibilities in terms of providing disaster relief and recovery, the central government may make additional assistance available, with implementation arrangements differing from programme to programme.

The Ministry of Interior's solidarity provisions for local authorities have different implementation arrangements depending on the damage sum weather-related or geological hazards have inflicted upon sub-national assets. Once damages to sub-national assets exceed EUR 150,000 (USD 180,000) subnational recipients may file for recovery assistance within two months of the disaster. The ministerial representative responsible for the department verifies the damage estimates submitted by affected sub-national authorities, with the General Commissariat for Ecology and Sustainable Development (Commissariat Général à l'Ecologie et au Développement Durable, CGEDD) providing support when requested. If damages to sub-national assets exceed EUR 1 million (USD 1.2 million), or if damages spread across multiple departments, the CGEDD is required to participate in the damage evaluation and confirm the results. In case of damages to sub-national assets exceeding EUR 6 million, an inter-ministerial inspection has to assess the damages and decide the amount of public assistance made available. Maximum available central government support may range between 30-60% of the total sum of damages to sub-national assets, with the remainder to be paid by the affected subnational government. As a last step, the prefect transfers the agreed level of public assistance to the affected local authorities (Collectivités locales, 2017b).

Solidarity provisions: implementation arrangements

Damages to sub-national assets	Procedure
⩾ USD 180,000	subnational recipients may file for recovery assistance; request needs to be verified by ministerial representative responsible for the department
⩾ USD 1.2 million or damages spreading across multiple departments	General Commissariat for Ecology and Sustainable Development required to participate in damage evaluation
⩾ USD 7.4 million	Inter-ministerial inspection required to assess the damages; maximum support capped at 60% of total damages

Source: Collectivités locales, 2017b.

To support individual victims of man-made or natural hazardous events in their recovery, the Minister of Interior may also open access to the emergency relief fund – independent of the declaration of a state of disaster. The prefect is charged with assembling information on relief needs in the affected municipalities, building on information received from the affected municipalities, the CCAS and from relevant central government services at department level (Direction Départementale des Finances Publiques, DDFiP, and Direction Régionale des Finances Publiques, DRFiP). The estimated sum, along with information on beneficiaries, is submitted to the Ministry of the Interior, which transfers the agreed assistance to the respective prefects, who then provide the assistance to beneficiaries in the affected area (Ministère de l'Intérieur and Ministère de l'action et des comptes publics, 2017).

In the overseas territories, the FSOM may be activated by a decision of the Minister of Overseas Territories. The FSOM can be used to provide disaster relief to affected households, as well as assistance for the reconstruction of damaged uninsured private and subnational public assets. An interministerial committee decides on the level of compensation based on reports received by local authorities. The exact eligibility criteria depend on the disaster in question, making the FSOM a flexible financing instrument (Ministère de la Transition écologique et solidaire, 2014).

In case an exceptional weather event results in substantial crop losses or disease outbreak, the prefect of the affected department may submit a request to activate the FNGRA to the Ministry of Agriculture (Ministère de l'Agriculture et Alimentation), following consultation with the National Committee for Agricultural Risk Management (Comité national de gestion des risques en agriculture, CNGRA). The fund can be used to provide compensation to farmers that suffered uninsurable losses due to an exceptional weather event or disease outbreak, e.g. losses to fodder crops due to hail or crop losses due to drought, if these sum up to at least 30% of crop losses, or at least 13% in value losses, and are specified in the respective ministerial decree activating the FNGRA. Since 1980, more than 62% of the compensation provided was due to droughts. Damages to standing or stored crops, cultivations, farmland and livestock are considered insurable, and thus excluded from compensation via the FNGRA. Upon activation by ministerial decree affected farmers may send their compensation claims and the necessary supporting documents to the respective departmental directorate for territories (and the sea) (Direction départementale des Territoires (et de la Mer), DDT (M)) for evaluation and compensation (Ministère de l'agriculture et de l'alimentation, 2015; Lidsky et al., 2017).

The application of special unemployment assistance (Activité partielle) is decided by the Ministry of Labour, which receives requests from employers via its subnational representations, the deconcentrated government services (services déconcentrés de l'État,

DIRECCTE). The decision on whether support will be made available should respect a 30 days time-limit after the hazardous event. In case a business submits another request within the 36 months following its initial request, the decision regarding this assistance will be made following consultation with the business (Ministère du travail, 2018).

In addition to the public assistance programmes available at central government level, the public-private CATNAT insurance scheme can be activated in case of disaster. The scheme comes into effect following a disaster declaration by the municipality, confirmed by an interministerial decree as the legal criteria for activation. Compensation is available to all insurance policy holders in the affected municipalities, as outlined in the decree. In case a disaster triggers insurance pay-outs beyond available reserves, the central government provides a state guarantee sourced from the general budget. If claims exceed 90% of the special reserve and annually defined equalisation reserves, the government is required to step in (OECD, 2017; CCR, 2015; Grislain-Letrémy and Calvet, 2012).

Mitigating disaster-related contingent liabilities and financing residual risks

To mitigate the previously identified, quantified and disclosed disaster-related contingent liabilities need to be managed, and decide on how to provision for the residual risk.

The CATNAT system is the key pillar for mitigating disaster-related contingent liabilities in France. While the annually set state guarantee for the system means that CATNAT constitutes a disaster-related contingent liability, the affordable uniform rate means that penetration rates are high. In light of the broad coverage of both private and public assets, it reduces the need for public assistance via the available schemes, while setting clear thresholds and limits for government intervention. However, as hazard insurance premiums do not take hazard exposure, nor self-protection measures into account, incentives for reducing disaster risks are slightly skewed, which may in part explain the low levels of private ex ante investments in disaster risk management[8] (DREAL, 2013).

Consistent investments in the construction and maintenance of disaster risk prevention are another important pillar in limiting potential disaster-related contingent liabilities upfront. The central-government fund for the prevention of major natural hazards, the Barnier Fund (FPRNM) is the key financing instrument for co-funding disaster risk prevention. It receives its funding from the CATNAT insurance scheme, with the fixed percentage of sums retained currently at 12% (up from an initial 2.5% until 2003). The central government portion sourced from the Barnier Fund generally ranges between 100% for non-structural measures to 40-50% for structural measures, with annual spending averaging to aboutUSD 220 million per year. For 2018, available funding has been reduced to USD 162 million, down from around USD 245 million in 2017 (Sénat, 2018). About USD 14 million of that are usually earmarked for drawing-up disaster risk prevention plans (Prevention Plans against Natural Risks, PPRNs). An additional USD 44 million for ex ante disaster risk management measures is added from budgetary programme 181 in 2018, with much of this earmarked for flood risk management purposes (OECD, 2017; Sénat, 2018). Sub-national co-financing for disaster risk prevention averages to an additional 40%, summing up to around USD 292 million in 2009, with the central government providing about USD 407 million for ex ante disaster risk management in that year (Nicklaus et al., 2013). In 2018, it is expected that subnational governments will invest an additional USD 1.2 million for flood risk management projects that do not receive co-funding from the Barnier Fund (Sénat, 2018a).

Notes

[1] Overseas regions: Guadeloupe, French Guiana, Martinique, Réunion, Mayotte.

Overseas collectivities: French Polynesia, Saint Pierre and Miquelon, Wallis and Futuna, Saint Martin, Saint Barthélemy.

Overseas territories: French Southern and Antarctic Lands.

[2] Based on the OECD (2017) gross domestic product (GDP) indicator, available at http://dx.doi.org/10.1787/dc2f7aec-en.

[3] January 2018 EUR-USD exchange rate: 1.25 (Statista, 2018)

[4] In case local authorities need to carry out emergency resettlements, the prefectures may make support via the emergency rehousing funds (*Fonds d'aide au relogement d'urgence,* FARU) available for up to six months. Applicable purposes include rehousing in case of structural or health hazards, but also rehousing in case an exceptional event, such as a disaster, has rendered housing uninhabitable. Grants cover between 75% to 100% of accommodation costs incurred by the local authority (Collectivités locales, 2017a).

[5] Support was earmarked for the reconstruction of school buildings (USD 42 million), sport facilities (USD 1.1 million), electrical grids (ca. USD 18 million), water networks (USD 7 million), social housing (7.5 USD million) and the Saint-Martin hospital (USD 8 million). In addition, the central government provided around USD 22 million for protective measures against natural hazards, such as shelters and early warning systems.

[6] *Dotation de solidarité en faveur de l'équipement des collectivités territoriales et de leurs groupements touchés par des événements climatiques et géologiques* [Solidarity grant in support of local authorities affected by climatic and geological events]

[7] While coverage via the CATNAT scheme is 99% in Metropolitan France, it is only 52% in France's oversea territories (OECD, 2017; Grislain-Letrémy and Calvet, 2012).

[8] For instance, surveys conducted by the DREAL Rhône-Alpes in 2006, 2009 and 2013 showed that only 18% of the population in risk zones took self-protection measures in 2013, down from 21% in 2009 (DREAL, 2013).

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Japan

Prevalence of natural hazards

Japan is exposed to multiple hazards: Earthquakes, tsunamis and volcanic eruptions occur frequently, as do other hazards such as landslides, floods and typhoons.

The islands of Japan extend along the Pacific Ring of Fire, a region exposed to major earthquakes and active volcanoes. About 200 volcanoes, among them 60 that are active, are spread throughout the islands. Japan's location at the meeting point of four tectonic plates creates significant seismic risk and explains Japan's frequent earthquakes and tsunamis (MLIT, 2007). Earthquakes have caused more reported damage and disaster-related fatalities than any other hazard faced by Japan. The Great East Japan Earthquake of 2011 caused nearly 20 000 deaths and an estimated USD 210 billion in damages. Business disruptions and decreased domestic demand led to an estimated reduction in gross domestic product (GDP) of 3.5% in the first quarter and of 0.7% for the full year following the earthquake. The Kobe earthquake in 1995 caused over 5 000 fatalities and an estimated USD 100 billion in damages (Cabinet Office, Japan, 2016; Benson, Boudreau and Mahul, 2013).

Types of natural hazards to which Japan is exposed

Natural hazard category	Types of natural hazards
Geophysical	Earthquakes; volcanic activity; tsunamis
Meteorological	Typhoons; extreme temperatures
Hydrological	Floods; storm surge; landslides; avalanches
Climatological	-

Sources: EM-DAT, 2017; Cabinet Office, Japan, 2016.

With more than 75% of the land surface in Japan covered by mountains and hills, Japan is also subject to landslide and avalanche hazards. Landslides may occur after periods of intensive rainfall or be triggered by seismic events (Nadim et al., 2006). In 2014, torrential rainfall in Hiroshima Prefecture triggered a series of landslides that killed 82 and caused an estimated USD 38 million worth of damage, while the 2016 Kumamoto earthquake generated a series of landslides around Mount Aso that significantly contributed to the earthquake's total damage of USD 20 billion (Miyabuchi, 2016; EM-DAT, 2017).

Flooding is also a concern in Japan. Its rivers are relatively short but have steep declivity, meaning that the ratio of peak flow discharge to basin area is relatively large and that water levels can rise rapidly (MLIT, 2007). In 2004, torrential rain in Niigata and Fukushima Prefectures caused more than 50 landslides and flash flooding along several rivers, resulting in 21 fatalities and an estimated USD 2 billion in damage. Japan has also experienced flooding from storm surges associated with typhoons, which frequently make

landfall in Japan (MLIT, 2007). In 2000, a storm surge and heavy rainfall from typhoon Saomai triggered several landslides across Chūbu and Kansai, causing an estimated USD 7 billion in damage. Similarly, a storm surge, landslides and inland flash floods form typhoon Mireille led to 66 fatalities and an estimated USD 10 billion in damage in 1991; which made it Japan's costliest storm in 30 years. Winter storms, such as the 2014 blizzard that hit large parts of Honshu and caused an estimated USD 5.9 billion in damage and 37 fatalities, have also caused significant damage in the past (EM-DAT, 2017).

Major natural disasters in Japan since 1980

Disaster event/ location	Year	Fatalities	People injured/affected/displaced	Estimated damage
Great East Japan Earthquake	2011	19 846	368 820	USD 210 billion
Kobe earthquake	1995	5 297	541 636	USD 100 billion
Chūetsu earthquake	2004	40	62 183	USD 28 billion
Kumamoto earthquake	2016	49	298 432	USD 20 billion
Typhoon Mireille (no. 19)/ Chūgoku and Kyushu	1991	66	91 128	USD 10 billion
Typhoon Saomai/ Chūbu and Kansai	2000	18	360 110	USD 7 billion
Blizzard/ Honshu	2014	37	2 800	USD 5.9 billion
Flash flood and landslide/ Niigata and Fukushima	2004	21	25 807	USD 2 billion
Landslides/ Hiroshima	2014	82	1 100	USD 38 million

Sources: EM-DAT, 2017; Cabinet Office, Japan, 2016.

Past fiscal impact of disasters

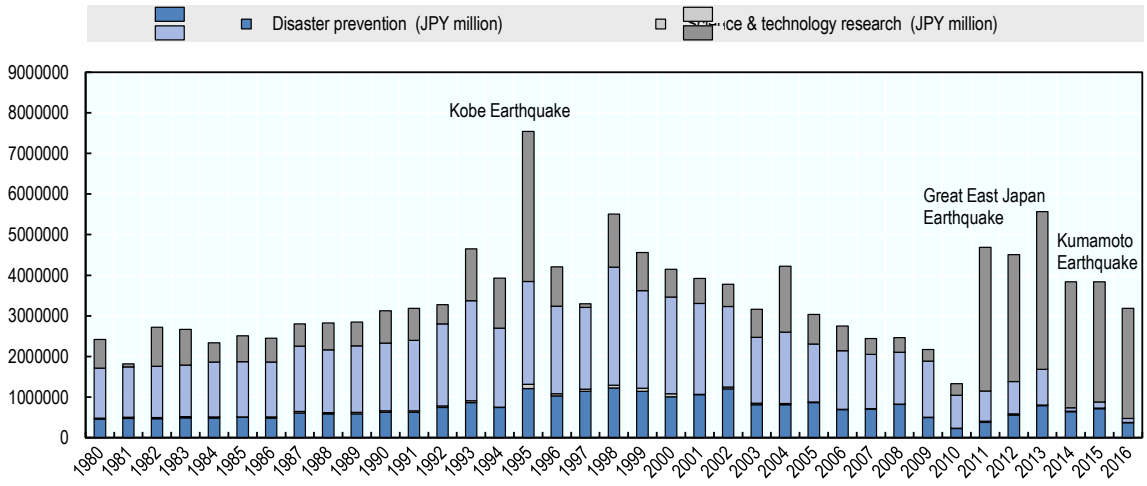
Annual average losses caused by disasters in Japan have been estimated at USD 61 billion (PreventionWeb, 2017). In line with the current moderate levels of disaster insurance penetration[1] and broad explicit disaster-related contingent liabilities, the government of Japan provides a significant portion of the necessary post-disaster recovery resources (Cabinet Office, Japan, 2016; Mahul and White, 2012).

Between 1980 and 2016, the average annual amount of central government spending for disaster risk management through the general account budget was JPY 3.5 trillion (USD 31.4 billion) (Cabinet Office, Japan, 2016). Of this, 66% was allocated to ex post expenditure in response to disasters, while 34% was spent ex ante on prevention and mitigation measures and land conservation. However, since the 2011 Great East Japan Earthquake, the share of funding earmarked for ex post measures has increased to 75%, while the share spent on ex ante measures has been reduced to 25%.

Financial resources for post-disaster relief and recovery come from the annual reserve for disaster recovery, around JPY 73 billion (USD 656 million) and from a non-earmarked contingency reserve in the general account budget; the latter's annual allocation is around JPY 350 billion (USD 3.1 billion) but may vary from year to year (OECD, 2010). When necessary, additional funding can be allocated through the supplementary budget system, which allows for budget reallocations in response to unexpected events. In the past, additional funding has also been obtained through government bonds and loans, as well as

through increased revenue streams from tax increases, share sales, and reductions in the salaries of civil servants (Law Library of Congress, 2013). The ex post expenditure in response to disasters changes depending on their occurrence and severity of events, with large-scale disasters inducing significant spikes in central government spending.

Disaster prevention and reconstruction expenditure in Japan, 1980-2016

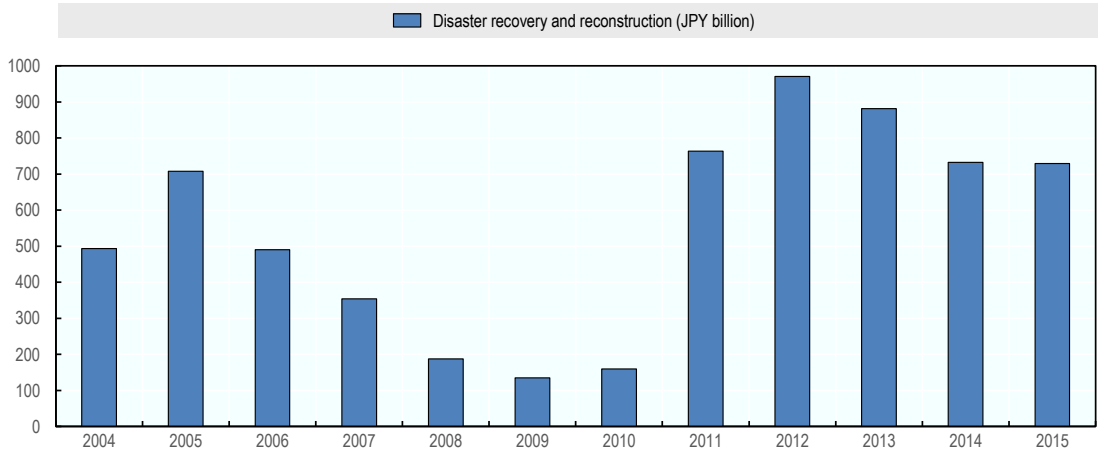


Note: The figures for the 2016 fiscal year are preliminary, reflecting the initial budget.
Source: Cabinet Office, Japan, 2016.

The Great East Japan Earthquake in 2011, for example, resulted in government spending that represented an estimated 8% of its GDP and 20.7% of the general account budget in fiscal year 2012[2], totalling around USD 36.5 million (Sato and Boudreau, 2012; Mahul and White, 2012). Initially, funding for disaster relief, recovery and reconstruction was allocated via the general contingency reserve for fiscal years 2010 and 2011. Three supplementary budgets were passed in fiscal year 2011, with one relying largely on the issue of bonds and loans, one financed primarily via cuts in expenditure previously authorised for other purposes and one funded by budget surplus from the previous fiscal year. In fiscal year 2012 additional financing was appropriated, most of it through the issue of reconstruction bonds and loans (Sato and Boudreau, 2012; Benson, Boudreau and Mahul, 2013; Law Library of Congress, 2013).

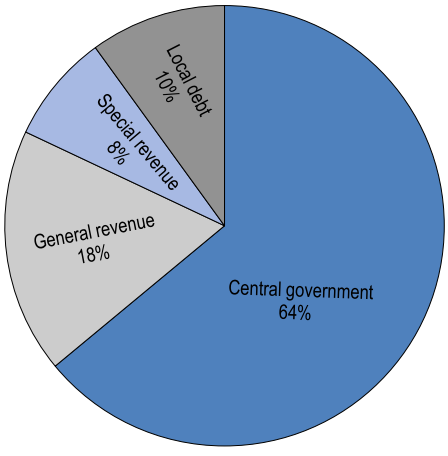
Subnational governments play an important role in financing post-disaster relief and recovery efforts, as well as prevention efforts. The majority of recovery and reconstruction expenditure, however, is provided by the central government. To prevent disaster-related resource shortages at the subnational level, the Disaster Relief Act requires all prefecture governments to reserve 0.5% of general-purpose local taxes over three years in a disaster relief fund, and the central level may transfer additional resources to affected subnational governments in the aftermath of a disaster. The local reserve has to be spent and cannot be accumulated. If no disaster occurs in a given year, the funds can be spent on infrastructure repairs.

Subnational governments' post-disaster recovery/reconstruction expenditure for infrastructure, 2004-15



Source: MIC, 2016.

Sources of subnational governments' post-disaster recovery/reconstruction expenditure for infrastructure in Japan, 2015



Source: MIC Japan, 2016/2017.

Managing disaster-related contingent liabilities

Identification of disaster-related contingent liabilities

Many of the disaster-related contingent liabilities in Japan are defined by its legal and policy frameworks for disaster management. There have, however, been instances in the past when society's expectations of the government went beyond what it is explicitly obliged to provide. For the most severe disasters, specific acts may be enacted to free up additional resources to help fulfil both explicit and implicit post-disaster recovery obligations.

Explicit contingent liabilities

Explicit contingent liabilities arise from payment obligations that are based on laws, or clear policy commitments that could fall due in the event of disaster. In Japan, a number of laws recognise the government's legal or explicit commitment to support disaster response and the reconstruction of public and private assets. Tables below illustrates the extent of the Japanese government's legal responsibility to provide post-disaster financial assistance.

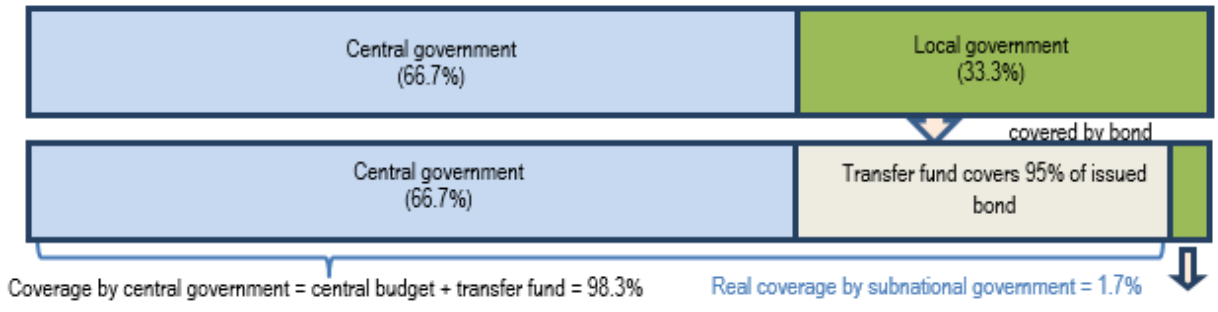
Explicit central government obligations for post-disaster financial assistance in Japan

Commitment to finance…	Yes	No
… post-disaster response and recovery	✓	
… a share of the costs incurred by subnational governments for post-disaster response and recovery	✓	
… reconstruction and maintenance of central government-owned public assets	✓	
… rehabilitation and reconstruction of private assets	✓	
… other expenses incurred by subnational governments (e.g. payments to businesses or individuals)	✓	
…government guarantees for disaster losses incurred by public-private partnerships	✓	

Source: OECD Survey.

In Japan, municipalities have primary responsibility for the recovery and reconstruction of public assets (e.g. roads and public buildings), but the central government contributes financially in proportion to the scale of the disaster (OECD, 2009). According to the Act on National Treasury's Sharing Of Expenses For Project To Recover Public Civil Engineering Works Damaged By Disaster (1951) and the Act on National Treasury's Sharing Of Expenses For Recovery Of Public School Facilities Damaged By Disaster (1953), the central government is required to furnish two-thirds of recovery expenditure for public infrastructure, with the remaining third covered by subnational governments. The central government owns a significant share of infrastructure. The Ministry of Land, Infrastructure, Transport and Tourism (MLIT), for example, owns 109 major river infrastructures as well as all national highways. Furthermore, where local governments issue bonds to cover the expenditure for post-disaster recovery and reconstruction of public infrastructure, 95% of the interest and redemption costs can be covered by the central government through the transfer fund to the local government. In that case, the central government covers 98.3% of the recovery cost of the infrastructure facilities in the aftermath of a disaster.

Financial burden sharing of the disaster recovery/reconstruction cost for infrastructure



Source: MLIT (data submitted to authors).

The Disaster Relief Act (1947) and the Disaster Countermeasures Basic Act (1961) set out the responsibilities of central and subnational governments (prefectures) for disaster relief, and establish cost-sharing arrangements between central and subnational governments for disaster relief expenses. The subnational governments must provide emergency relief, including temporary housing and medical care along with food, water and other basic necessities. To speed up relief activities, the prefecture may delegate part of its responsibility to provide disaster relief to the municipal level. To ensure sufficient financial resources for the fulfilment of this obligation, prefectures are required to set aside reserves in prefectural disaster relief funds. If prefectural relief spending is less than 2% of the prefectural tax revenue projection for the relevant fiscal year, the central government is required to cover 50% of the disaster relief costs. In case the total amount exceeds 2% of the revenue projection, the central government can cover a maximum of 90%. For the removal of debris, the Waste Management and Public Cleansing Act (1970) specifies equal cost sharing between the central and subnational level.

The government's explicit disaster-related contingent liabilities are not limited to the Act on Special Financial Support to Deal with Extremely Severe Disasters (1962) and the Act on Support for Livelihood Recovery of Disaster Victims (1998). The central and subnational governments are equally responsible for providing up to JPY 3 million (USD 30 000) in post-disaster subsidies to affected households for rehabilitation of housing. In addition, the laws provide the option of reducing taxes for affected citizens.

Under the Act on Provision of Disaster Condolence Grant (1973), additional financial support may be given to individuals who lost with family members in a disaster, or to disaster victims who suffered injury or disease. The exact amount of such post-disaster grants, which can be as high as JPY 5 million (USD 50 000), is determined by the municipality. For low-income households, these grants may be supplemented with special disaster victim support interest-free loans of up to JPY 12.7 million (USD 127 000). The central government and subnational governments (prefectures and municipalities) share these expenses equally.

Overview over the laws underpinning the explicit contingent liabilities at the central and subnational level

Legal basis	Cost-sharing arrangements for post-disaster relief and recovery
Act on National Treasury's Sharing of Expenses for Project to Recover Public Civil Engineering Works Damaged by Disaster (1951) (公共土木施設災害復旧事業費国庫負担法)	Recovery and reconstruction of infrastructure assets: Central government: between 2/3 and 100% Subnational governments: between 0% and 1/3
Act on National Treasury's Sharing of Expenses for Recovery of Public School Facilities Damaged by Disaster (1953) (公立学校施設災害復旧費国庫負担法)	Recovery and reconstruction of public school facilities: Central government: 2/3 Subnational governments: 1/3
Disaster Relief Act (1947) & Disaster Countermeasures Basic Act (1961) (災害救助法・災害対策基本法)	Disaster relief (e.g. temporary housing, medical care, provision of food, water, etc.): Central government: 50-90% Subnational governments: - Prefectures: 10-50% - Municipalities: 0%
Waste Management and Public Cleansing act (1970) (廃棄物の処理及び清掃に関する法律)	Removal of debris: Central government: 0-50% Subnational governments: - Municipalities: 0-50%
Act on Support for Livelihood Recovery of Disaster Victims (1998) (被災者生活再建支援法)	Support for the recovery efforts of affected citizens: Central government: 50% Subnational governments: - Prefectures: 50%
Act on Provision of Disaster Condolence Grant (1973) (災害弔慰金の支給等に関する法律)	Post-disaster grants for disaster victims: Central government: 50% Subnational governments: - Prefectures: 25% - Municipalities: 25%
Act on Special Financial Support to Deal with Extremely Severe Disasters (1962) (激甚災害に対処するための特別の財政援助等に関する法律)	Special financial assistance to subnational governments and victims in various areas in the event of an extremely severe disaster: Ex. Loss of earning post-disaster is eligible for unemployment benefits
Small and Medium-sized Enterprise Credit Insurance Act (1950) (中小企業信用保険法)	Central government: 100% Subnational governments: 0%
Act on Financial Support of Farmers, Forestry Workers and Fishery Workers Suffering from Natural Disasters (1964) (天災による被害農林魚業者等に対する資金の融通に関する暫定措置法)	Low-rate loans for affected farmers, forestry and fishery workers: Central government: 1/3 Subnational governments: - Prefectures: 1/3 Association representing affected business: 1/3

Under the Disaster Countermeasures Basic Act, the central government is expected to accept local bonds to assist subnational governments in their disaster relief and recovery responsibilities[3].

Under the Small and Medium-sized Enterprise Credit Insurance Act (1950), small and medium-sized enterprises (SMEs) that have been affected by a disaster are eligible for additional credit guarantees offered by the Credit Guarantee Association through a central government safety net guarantee programme. Additionally, safety net loans can be made available to affected SMEs that face temporary cash-flow problems due to radical changes in the business environment, including those caused by a disaster. The Act on Financial

Support of Farmers, Forestry Workers and Fishery Workers Suffering from Natural Disasters (1964) provides low-interest loans for businesses in the primary sector, such as agriculture and aquaculture businesses. The loans may be used for purchases for agricultural purposes, such as for seeds, fertiliser, livestock and agricultural equipment. The central and subnational governments together with the affected association (e.g. the fishermen's association) finance these loans equally.

The central government retains a portion of liability with Japan Earthquake Reinsurance (JER), through an arrangement with the private insurance market (OECD, 2015). Under this scheme, the private and public sectors share the aggregate limit of indemnity for a single seismic event (JPY 11.3 trillion, USD 103 billion), as follows:

- For earthquake insurance liabilities up to JPY 88 billion (USD 804 million), the JER is liable for 100 % of insurance claims.
- Over JPY 88 billion and up to JPY 224 billion (USD 2.06 billion), the central government is liable for 50% while the JER and private insurers (i.e. those to which the JER has retroceded risk) are liable for 50%.
- From JPY 224 billion to JPY 11.3 trillion (USD 103 billion), the central government is liable for approximately 99.8% and private insurers (including the JER) are liable for approximately 0.2%.

If earthquake insurance liabilities for one event exceed the indemnity cap of JPY 11.3 trillion (USD 103 trillion), the decision about providing funding is informed by the perspectives of relevant stakeholders (OECD, 2015). The Ministry of Finance has increased the central government's share of indemnity as a result of the reduced reserve balance of the private sector after recent large-scale disasters.

Implicit contingent liabilities

Underpinning, the broad explicit contingent liabilities such as those outlined above – and potentially expanding them – are the implicit expectations of society. Following an extremely severe disaster, the Japanese government has been expected to restore social and economic well-being beyond the explicit liabilities outlined above. This approach is in line with traditional Japanese values, such as a strong sense of community and group solidarity, and can also create significant implicit contingent liabilities (Sato and Boudreau, 2012). The Act on Special Financial Support to Deal with Extremely Severe Disasters (1962) provides the legal framework for expanding the central government's disaster-related contingent liabilities; specifically, it holds the central government responsible for providing additional financial assistance to subnational governments and to disaster victims. Such financial assistance is varied and can include additional financing for the recovery of public infrastructure; additional subsidies for the recovery of residential buildings; and additional unemployment benefits. Areas eligible for special financial aid are determined by cabinet decree. Between 2012 and 2016, the cabinet designated 21 disasters as extremely severe.

One such disaster was the Great East Japan Earthquake. One of the largest earthquakes and one of the costliest disaster ever recorded, it triggered an expansion of the government's explicit disaster-related contingent liabilities. In light of the disaster's unprecedented impact, the central government shouldered a much greater share of the fiscal burden than it was legally required. To enable speedy recovery in the aftermath of the event, the central government covered nearly all costs related to disaster relief and recovery in the early recovery stage, as the scale of the disaster by far exceeded subnational financing capacities.[4] In addition, the central government financed 80% (rather than the usual 50%)

of the costs related to post-disaster subsidies earmarked for the rehabilitation of housing, and 70% (rather than the usual 50%) of the costs related to condolence grants (Sato and Boudreau, 2012).

The central government also implemented a series of tax measures to support the disaster-affected population and enterprises, ranging from special treatment for asset losses (such as income and local tax deductions) and real estate tax exemptions in areas affected by tsunami, to tax incentives and financial subsidies for investments in the affected areas. The SMEs affected were also eligible for tax reductions on oil, alcohol and tobacco taxes, and were given extended deadlines for the payment of other taxes (Sato and Boudreau, 2012; Law Library of Congress, 2013).

In addition, the industries eligible for special loans and debt-restructuring schemes under the Small and Medium-sized Enterprise Basic Act (1963) were expanded to include the construction industry, where in addition interest rates were lowered and application periods for the available support schemes were extended. Under the two programmes set up to facilitate the provision of loans and credit guarantees, affected SMEs received almost 340 000 loans totalling over JPY 7.4 trillion (USD 62.7 billion) in fiscal year 2012. Businesses in affected areas were also eligible for support under the new Restoration and Maintenance Subsidy Project for Facilities of Small and Medium Enterprise Groups. Through the project, 525 affected SMEs received around JPY 272.3 billion (USD 2.4 billion) in subsidies from the central government in fiscal year 2012, and prefectural governments added another JPY 123.1 billion (USD 1.2 billion). In addition, cost-free loans and lease subsidies to set up temporary stores and factories and to lease equipment were made available via municipal governments. For businesses that suffered severe damage from the nuclear disaster in Fukushima, the Ministry of Economy, Trade and Industry (METI) made available around JPY 12 billion (USD 107 million) in long-term, interest-free, unsecured loans (Law Library of Congress, 2013; METI, 2013).

Despite the support programmes for businesses, the number of applicants for employment insurance benefits grew nationwide by 40% in the ten months following the earthquake. In response to this need, the Ministry of Health, Labour and Welfare (MHLW) increased by 60 days the duration of unemployment benefits for those unemployed due to the Great East Japan Earthquake, bringing the total days available to 210 (or 230 for those who lived in the area directly affected by the tsunami and nuclear disaster). As a result, the number of individuals receiving unemployment benefits in the disaster-stricken prefectures increased by 104% between January 2011 and January 2012 (Higuchi et al., 2012). The MHLW also used resources from the existing Employment Creation Fund to grant JPY 900 000 (USD 9 000) to SMEs that hired a job-seeking disaster victim within 18 months following the event, while the METI provided special support to new graduates in the affected areas (Law Library of Congress, 2013).

Estimation of insurance payouts

Although Japan currently has no disaster risk insurance scheme for government assets, infrastructure assets owned and administered by private and quasi-public companies, such as railroads, airports and ports, are typically covered by private insurance. For example, quasi-public railroad companies, most of which are partly owned by municipalities, have been taking out group insurance – with the industry association the designated policy holder – to reduce and stabilise the premium.

Disaster risk insurance of quasi-public and private infrastructure in Japan

Infrastructure type		per cent of enterprises that take out insurance against typhoon and flood	per cent of companies that take out insurance against earthquake
Railroads	Large companies	78%	22% (some use Cat Bonds and/or commitment credit line)
	Small-medium companies	56%	5%
	Quasi-public companies	100%	Not available
Airports		79%	13%
Ports		63%	Not available

Source: MLIT (data submitted to authors).

In Japan, private household disaster insurance penetration is moderate. Only 29.5% of households have private insurance for earthquake, tsunami and volcanic activity that protects assets (specifically buildings for residential use and household goods) (Cabinet Office Japan, 2016) and that is backed by the government-supported Japan Earthquake Reinsurance. The premiums are risk based, and consequently are vary across prefectures and depending on the construction material used; discounts are available for earthquake-resistant buildings (Mahul and White, 2012; MoF, n.d.). An estimated 22% of households are covered by hazard insurance offered by co-operative mutual insurers, which includes coverage of residential dwellings against damage caused by fire and natural hazards such as flooding and earthquakes. The policies are more comprehensive than those offered by private insurers and are offered at flat premium rates; in this they resemble a saving mechanism. Insurance coverage rates vary by location. In areas very exposed to risks, awareness tends to be higher and so insurance coverage rates are higher as well. Major earthquake events tend to trigger an increase in insurance purchases.

For private businesses, natural hazard insurance (for floods and earthquakes) is available through corporate fire insurance policies. The premium of such subscriptions is significantly higher than for policies backed by Japan Earthquake Reinsurance. The government has not made efforts to promote the take-up of business insurance, perhaps because of premium rates, and perhaps because of the government assistance already provided to businesses in case of a disaster. The latter would include, for example, subsidies for the renovation of assets.

Co-operative mutual insurers offer disaster insurance outside the JER scheme, but are accountable to their respective ministries. For example, the biggest co-operative mutual insurer, the National Mutual Insurance Federation of Agriculture (JA Kyosai) reports to the Ministry of Agriculture, Forestry and Fisheries, but cedes the majority of its liabilities to international reinsurance markets. This approach results in significantly higher premiums than those backed by Japan Earthquake Reinsurance (Mahul and White, 2012).

The Financial Services Agency (FSA), which oversees the insurance sector and other financial services in Japan, has been keeping track of insured losses arising from large disasters based on data collected from each individual insurer. In addition, the General Insurance Rating Organisation of Japan decides on the size of insurance payouts in the case of earthquakes. The number of payments by insurance companies is later published, technically allowing an estimation of future public contingent liabilities related to damage to residential and commercial assets. Nevertheless, there currently is no direct link between insurance payouts and the level of public payments (OECD, 2015; FSA, 2016; Benson, Boudreau and Mahul, 2013).

Quantification of disaster-related contingent liabilities

Currently, disaster-related contingent liabilities are not quantified ex ante in Japan, but public spending in response to disasters is recorded and publicly disclosed ex post. The table below provides an overview of the disaster-related spending publicly disclosed on the website of the Ministry of Finance (MoF, 2017).

National repositories that collect information on infrastructure and its vulnerability characteristics can help governments systematically assess the exposure of public infrastructure to major natural hazards, and hence contribute significantly to an understanding of potential government liabilities. Japan ensures that this information is collected by river management authorities (and others), but no single centralised national repository seems to exists. MLIT draws up technical standards and encourages monitoring of infrastructure conditions by subnational governments.

Types of information from previous events available to calculate disaster-related contingent liabilities in Japan

Type of disaster-related expenditure	What gets recorded
Relief spending	Relief spending
Spending for the reconstruction of damaged public infrastructure and assets	Spending for the reconstruction of damaged public infrastructure and assets
Spending for the reconstruction of damaged private assets	Spending for the reconstruction of damaged private assets
Spending on increased social transfers due to a post-disaster economic slowdown	Items such as school attendance support, tuition support, expansion of job creation programmes and unemployment assistance
Expenditures due to guarantees issued to public or private entities suffering disaster losses	Earthquake reinsurance claims, disaster risk insurance for agriculture and fisheries, credit guarantee for SMEs
Post-disaster payments to subnational governments	Subsidy to disaster-affected subnational governments
Reduced tax collections	General changes in tax revenue as published in the highlights of the general account budget document and in the accompanying documentation on its fiscal condition
Disrupted operations of public corporations	Not included
Disrupted operations of private corporations	Not included
Deterioration in the terms at which the government can in the short term refinance public debt or raise additional debt	Not included

Estimating the fiscal impacts of disaster-related contingent liabilities and integrating them into overall fiscal forecasting

The MoF, through its Budget Bureau, is the lead institution for fiscal policy making in Japan. The Budget Bureau drafts the initial annual budget, which is then submitted to the cabinet for revision and submission to Parliament.

In terms of fiscal forecasts, the Cabinet Office publishes an annual economic and fiscal outlook[5] as part of budgetary preparation for the forthcoming fiscal year. The outlook discusses medium- and long-term projections of government revenues and expenditures. It may include an outlook on projected expenditure for ongoing recovery and reconstruction efforts for disasters that occurred in previous fiscal years; the 2011 Great East Japan Earthquake, for example, continued to require funding throughout fiscal year 2017, perhaps even until 2021. Although fiscal forecasting documents include projected expenditure in support of ongoing disaster relief and recovery efforts, they do not integrate the estimated fiscal impacts of potential future disaster-related contingent liabilities.

Prior to the 2011 Great East Japan Earthquake, the Central Disaster Management Council[6] also conducted a series of damage analyses, including a comprehensive assessment of the expected impacts of potential major events, such as earthquakes in the Tokyo region or along the Chishima trench. The scenarios estimated the likely human and physical damages as well as the potential economic impact of these disasters, but did not quantify the expected fiscal impact. The Great East Japan Earthquake revealed shortcomings in the available approaches to quantify the impacts of disasters ex ante – the actual damage that occurred far exceeded what had been predicted (Government of Mexico and World Bank, 2012; OECD, 2015; Ali, 2016).

Japan has aimed to manage major disasters in a revenue-neutral manner, through raising taxes and issuing bonds. For this approach to work in the future, an important precondition is a prudent fiscal strategy.

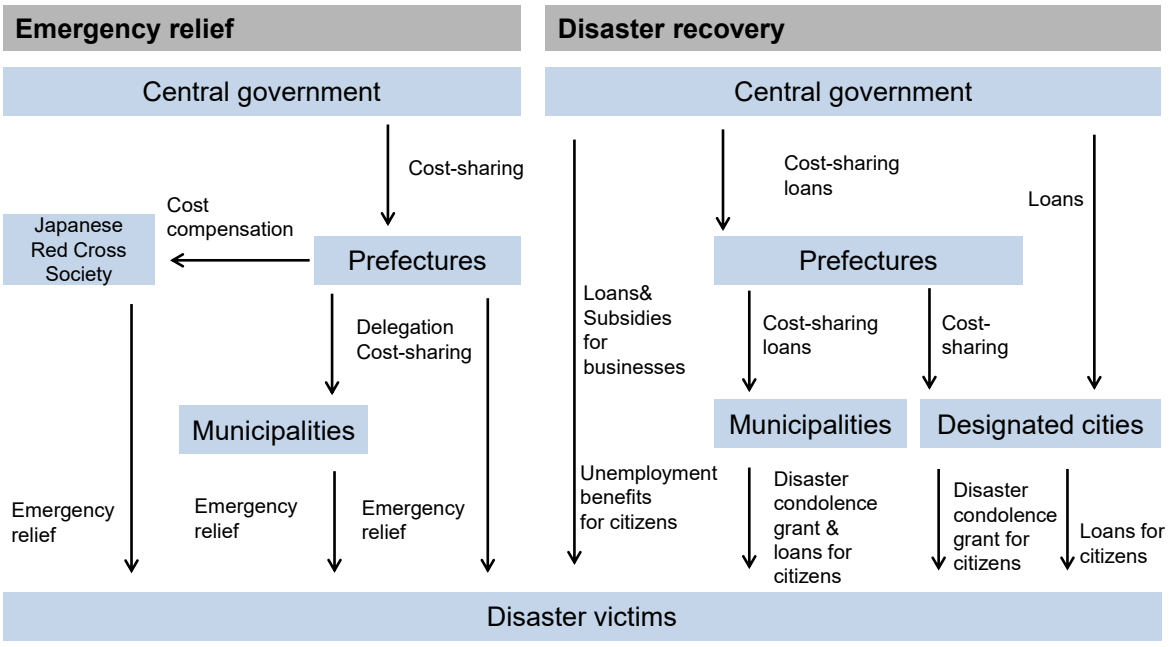
Implementation arrangements for providing post-disaster financial assistance

The responsibility for post-disaster relief and recovery in Japan is shared between subnational governments and the central government, but most of the financial liability falls to the latter. In case of budgetary shortfalls at the subnational level, the central government is expected to channel additional resources through cost-sharing arrangements and loans to the subnational governments affected.

Municipalities have primary responsibility for recovery and reconstruction expenditures for public assets (roads or public buildings), although the central government makes a significant financial contribution, in proportion to the scale of the disaster.

For disaster recovery assistance to affected citizens, the central and subnational governments typically share the cost. In case of exceptionally large-scale disasters, such as the Great East Japan Earthquake, the central government contribution in support of emergency relief and recovery can be increased. provides an overview of the roles and responsibilities of central and subnational governments in the provision of post-disaster assistance to disaster victims.

Overview of the provision of post-disaster financial assistance across levels of government in Japan



Source: Adapted from MHLW, 2011

At the central government level, the MOF manages the general contingency reserve. The Cabinet Office and the Central Disaster Management Council has a co-ordinating role in the disaster management phase and ensures efficient and adequate support for disaster relief and recovery. Where necessary, the Cabinet Office delegates responsibilities to the respective line ministries, such as the MLIT, and agencies. The MHLW leads in facilitating measures to support businesses from the primary sector and SMEs, and provides unemployment benefits and other measures related to re-employment and the recovery of social welfare facilities.

Mitigating disaster-related contingent liabilities and financing residual risks

To mitigate previously identified, quantified and disclosed disaster-related fiscal risks, governments need to control and ideally reduce the size of contingent liabilities and decide on how to provision for the residual risk.

Japan seeks to manage its disaster-related contingent liabilities ex ante, as follows:

- The central government limits its commitments by sharing costs for disaster reconstruction with subnational governments, hence limiting contingent liabilities exposure,
- By offering income tax deductions for earthquake insurance premiums, the government encourages stakeholders to reduce or transfer disaster risks they face.
- There are centralised controls over the granting of government guarantees for disaster losses.
- There are dedicated subnational reserve funds and a general contingency reserve at the central level.

On the disaster risk financing side, Japan has considered the potential contributions of investments in risk reduction and established a financing mix that builds on a general contingency reserve and subnational disaster relief funds as ex ante provisions for disaster response. In case of larger-scale disasters, ex post budget adjustments are possible through the supplementary budget system, as well as off-budget spending through loans and bonds.

As part of its strategy to provision for disaster risks, Japan invests significantly in prevention, mitigation and preparedness measures. These in turn contribute to a reduction in disaster-related contingent liabilities. Much like the responsibilities for disaster relief and recovery, those for disaster risk reduction and mitigation are shared across levels of government. The Cabinet Office designs the Basic Disaster Management Plan, the national blueprint for disaster risk management, while prefectural and municipal disaster management councils design local disaster management plans in line with it. To ensure sufficient funding for the implementation of structural and non-structural measures for disaster risk reduction and mitigation, the efforts of the central and subnational governments complement each other. The MLIT, for example, is in charge of protective works along large rivers, while protective works along smaller rivers are implemented by subnational governments, which can request central-level subsidies (OECD, 2009).

In addition, through non-structural measures such as assessing and modelling exposure and communicating the results to a wide audience, Japan is building an enabling environment for mainstreaming self-protection measures and increasing insurance coverage.

Since 1980, the central government has invested an annual average of around JPY 721 billion (USD 6.4 billion) in disaster prevention measures, and an annual average of around JPY 1.5 trillion (USD 13.5 billion) in land conservation. In addition, an annual average of around JPY 31 billion (USD 278 million) has been spent in support of science and technology research for disaster risk reduction. The subnational (prefectural and municipal) contribution to this is more difficult to quantify, as only limited disaggregated information is available on subnational disaster-related expenditures.

Notes

[1] Of the damage caused by the 2016 Kumamoto earthquake, for example, only 15% was covered by insurance, while around 16% of the damage caused by the Great East Japan Earthquake was insured (Aon, 2017; Mahul and White, 2012).

[2] In Japan, the fiscal year runs from 1 April until 31 March of the following year.

[3] Financial liabilities (debts) of subnational governments to the central government can be carried over to following fiscal years to be repaid once sufficient subnational revenue is available.

[4] This was especially the case in the three most affected prefectures: Fukushima, Iwate and Miyagi.

[5] www5.cao.go.jp/keizai3/econome/h29eiyaku1.pdf.

[6] The Central Disaster Management Council is a co-ordinating body within the Cabinet Office of Japan. Under the authority of the Prime Minister, the Council promotes a comprehensive approach to disaster management inside the government (Cabinet Office, Japan, 2016).

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Mexico

Prevalence of natural hazards

Located in North America between the Caribbean Sea to the southeast, the Gulf of Mexico to the east, and the North Pacific Ocean to the west, Mexico is home to distinct landscapes and natural hazards of all types, including geological, hydro-meteorological and climatological.

Mexico's national territory is subject to high seismic activity due to the interaction of three major tectonic plates: the Cocos plate, the North American plate, and the Pacific plate. As a result, central and southern Mexico is exposed to significant seismic risk. Tsunamis can occur along the Pacific coast and more than half of Mexico's territory is exposed to the risk of strong earthquakes. The 1985 Mexico City earthquake, which caused at least 6 000 casualties and an estimated USD 4.1 billion in damage is one of the most destructive earthquakes in recent history. Along the volcanic arc in the south as well as within the Baja California Peninsula, several active volcanoes threaten the territory (CalTech, 2009; OECD, 2013).

Types of natural hazards to which Mexico is exposed

Natural hazard category	Types of natural hazards
Geophysical	Earthquakes; volcanic activity
Meteorological	Tropical cyclones; extreme temperatures
Hydrological	Floods; landslides
Climatological	Droughts; wildfires

Source: OECD, 2013.

Major natural disasters in Mexico since 1980

Disaster event/location	Year	Deaths	People injured/affected/displaced	Estimated damage (in USD billion)
Hurricanes Manuel and Ingrid	2013	192	155 000	5.7
Hurricane Emily	2005	7	1 000 000	5
Mexico City earthquake	1985	6 000	2 100 000	4.1
Floods/Tabasco	2007	-	-	2.9
Hurricane Odile	2014	6	-	2.5

Sources: EM-DAT, 2017; CENAPRED, 2007 as cited in OECD, 2013.

Mexico is one of the few economies in the world exposed to tropical cyclones originating in two ocean basins: the North Atlantic, where the cyclonic season starts in June and ends in November; and the North Pacific, where the season starts in May and lasts until November. Nearly a quarter (23%) of Mexico's territory is exposed to high or very high

tropical cyclone risk, 17% to medium risk, and 60% to low risk (OECD, 2013). In 2013, Hurricanes Ingrid and Manuel hit Mexico from the Atlantic and Pacific coasts in the space of 24 hours; heavy rains and landslides caused 192 deaths and affected an estimated 155 000 people. Considered as a single event, the hurricanes were the most expensive disaster recorded in Mexico's recent history, with an estimated USD 5.7 billion in damages. Hurricane Emily in 2005 was another damaging event, affecting over 1 million people and causing some USD 5 billion in damages.

Floods resulting from heavy rains occur throughout the year, and not just during tropical cyclones. Especially during the rainy season (March to November) the frequency of floods is higher in Mexico's south, but flooding can also occur in the north. In 2007 devastating floods affected the state of Tabasco, causing USD 2.9 billion in damages.

Along Mexico's Sierra Madre mountain range, the risk of landslides and avalanches is high. One of the many landslides caused by Hurricane Manuel, for example, almost entirely destroyed la Pintada, a small village in the western Sierra Madre Mountains (Nadim et al., 2006).

Finally, Mexico is exposed to a number of climatological hazards, such as droughts and frosts. In 2015 a drought heavily affected Guerrero, suffering economic damages of around USD 26 million. Hailstorms and frosts frequently occur in central and northern Mexico and have caused significant damage to agriculture in the past. In 2011, Atzalán in Veracruz was heavily affected by frost, suffering economic damages of around USD 2 million (OECD, 2013). Climate change is expected to cause an increase in the incidence and magnitude of climatological and hydrometeorological disasters in Mexico (Monterroso and Conde, 2013; OECD, 2013).

Past fiscal impacts of disasters

Estimates of the annual average losses from disasters in Mexico range from USD 2 billion to almost USD 3 billion (CENAPRED, 2016; EM-DAT, 2017; PreventionWeb, 2017), corresponding to around 0.12% of annual gross domestic product (GDP) between 2000 and 2015. The impact of single large-scale disasters, such as the 1985 earthquake that caused damages equating 2.2% of GDP, can significantly exceed this. Despite their relatively low average impact of disasters, repairing disaster-related damages can create a significant burden for public finances, especially in states with comparatively low per capita income or multi-hazard exposures (OECD, 2013).

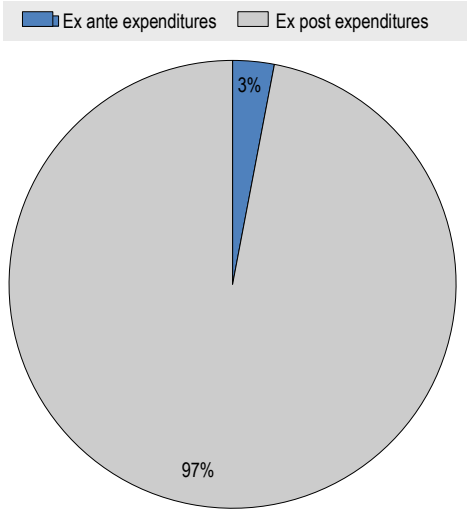
The annual amount of government spending on ex post disaster assistance, including reconstruction of public assets and low-income housing, came to USD 1.46 billion between 1999 and 2011; the majority was used to rehabilitate subnational public infrastructure. The central government finances all costs related to nationally owned assets, and 50% of costs related to subnationally owned assets; subnational governments are expected to finance the rest.

Most central government spending on disaster risk management comes from the Fund for Natural Disasters (Fondo de Desastres Naturales, FONDEN). The fund is mandated to finance emergency assistance, post-disaster recovery and reconstruction of public infrastructure, and rehabilitation and reconstruction of low-income housing (World Bank et al., 2012). Under Mexico's Federal Budget and the Fiscal Responsibility Law (Ley Federal de Presupuesto y Responsabilidad Hacendaria, LFPRH), a minimum of 0.4% of programmable federal spending must be distributed between FONDEN and two related disaster risk management funds, the Fund for Disaster Prevention (Fondo Para la

Prevencíon de Desastres Naturales, FOPREDEN) and the Fund to Support the Rural Population Affected by Climate Hazards (Fondo de Apoyo Rural por Contingencias Climatológicas). Between 2005 and 2010, on average FONDEN spent around USD 19 million per year. In exceptional years, when the costs have run beyond this allocation, the Federal Budget Law allows the Ministry of Finance to arrange exceptional budget allocations.

FOPREDEN is FONDEN's account for ex ante risk prevention spending. FONDEN is mandated to invest through FOPREDEN in hazard identification and assessment, in risk prevention and mitigation measures, and in local community capacity building for disaster risk prevention. The annual budget allocation for FOPREDEN depends on the total funding allocated to FONDEN, and may be topped up by any uncommitted post-disaster relief and recovery funds at the end of the year. In fiscal year 2017 USD 10 million was allocated to FOPREDEN; ex ante expenditures thus account for only a small share of the government funding for disaster risk management in Mexico. However, there are other risk prevention programmes financed by other ministries. Although a systematic picture is difficult to obtain, a few examples can be given here: The Ministry of Social Development has a budget for risk prevention of an estimated USD 10 million a year; the hydraulic infrastructure projects of the National Water Commission (Comisión Nacional del Agua, CONAGUA) are worth over USD 1 billion a year; and the 2030 Water Agenda has projected spending another USD 6 billion in infrastructures for risk reduction over the next 20 years (OECD, 2013).

Ex ante versus ex post disaster risk management expenditures through FONDEN/FOPREDEN in Mexico



Source: World Bank et al., 2012.

Subnational governments are responsible for a considerable share of ex post government assistance. The Law regarding the Financial Discipline of Federal and Municipal Entities (Ley de Disciplina Financiera de las Entidades Federativas y los Municipios) gives subnational governments primary responsibility for post-disaster support to affected populations and for recovery of damaged subnational public infrastructure. At subnational level, governments spent an estimated USD 521 million annually for ex post disaster assistance, representing about 36% of total government ex post assistance.

Managing disaster-related contingent liabilities

Identification of disaster-related contingent liabilities

Explicit contingent liabilities

Explicit contingent liabilities arise from payment obligations that are based on laws, or clear policy commitments that could fall due in the event of disaster. The table below provides an overview of the explicit government obligations for providing disaster assistance in Mexico.

Explicit central government obligations for post-disaster financial assistance in Mexico

Commitment to finance…	Yes	No
… post-disaster response and recovery	✓	
… a share of the costs incurred by subnational governments for post-disaster response and recovery	✓	
… reconstruction and maintenance of central government-owned public assets	✓	
… rehabilitation and reconstruction of private assets	✓	
… other expenses incurred by subnational governments (e.g. payments to businesses or individuals)	✓	
…government guarantees for disaster losses incurred by public corporations and public-private partnerships		X

Source: OECD Survey.

Through FONDEN, the central government of Mexico provides disaster assistance for the following purpose:

- Rehabilitation and reconstruction of damaged federal public infrastructure, (covering 100% of costs).
- Rehabilitation and reconstruction of damaged subnational public infrastructure (covering up to 50% of costs).
- Support to strengthen resilience of damaged infrastructure against future disasters– i.e. to improve rather than merely replace infrastructure (an estimated 25% of approved funding requests are for this purpose [World Bank et al., 2012]).financing the rehabilitation and reconstruction of low-income housing.

Post-disaster assistance through FONDEN is available only if an emergency has been officially declared[1], if the disaster has been scientifically confirmed, and if a damage assessment has been carried out (this is usually done jointly by the central and subnational governments).

To discourage overreliance on disaster assistance provided through FONDEN, rules have been established that limit reimbursement for uninsured public infrastructure that is damaged more than once. If support for reconstruction of a federal asset is requested a second time, FONDEN covers 50% instead of 100% of costs. For subnationally owned infrastructure, FONDEN covers 25% rather than 50%. FONDEN will not provide resources for a third reconstruction request. For insured public infrastructure, however, eligibility for FONDEN funding remains the same even after repeated reconstruction requests.

Under the Law regarding the Financial Discipline of Federal and Municipal Entities and the General Law of Civil Protection (Ley General de Protección Civil) subnational governments have the primary responsibility to provide post-disaster support for damage to subnationally owned public infrastructure and for the population affected. The General

and Operational Rules for FONDEN allow subnational governments to request funding from the central government to support affected populations when subnational financing capacities are exceeded and an emergency has been officially declared. However, the laws do not specify a maximum amount for post-disaster assistance that can or should be provided to subnational governments, allowing room for discretion. As specified in the Disaster Fund Specific Operations Guidelines (Lineamientos del Fondo para la Atención de Emergencias), the need for assistance is reassessed on a ten-day basis. Assistance ends if the General Directorate of Civil Protection, assisted by the National Centre of Communications (Centro Nacional de Comunicaciones, CENACOM) and subnational authorities, determine that the emergency situation is over, or if subnational entities have recovered their operative and financial capacities.

Low-income households whose homes have been damaged or destroyed by a disaster receive compensation through FONDEN of up to USD 6 700, to be used for reconstruction. For damaged housing items that cannot be covered by insurance, the Housing Institute may offer a small allocation of USD 1 100 to USD 1 400 per household. The compensation amount is based on the extent of damage and is independent of any kind of ex ante preventive provisions made by the household. The compensation for low-income households is handled by the Ministry of Territorial Development. Compensation is also available for household contents damaged during a disaster. Complementing the housing compensation, the Ministry of Social Development provides temporary employment allowances for households whose income has been affected by a disaster.

Everything related to the restoration of public services, such as water and waste management, can be immediately financed through the Immediate Partial Support Mechanism (Apoyos Parciales Inmediatos, APIN). Funding for immediate relief items, such as food, medical supplies, bedding, and cleaning supplies can be funded via the Emergency Fund (Fondo para la Atención de Emergencias, previously Fondo Revolvente). Both funds are part of FONDEN. The Emergency Fund makes up around 10% of FONDEN's resources (World Bank et al., 2012). It can be accessed if an emergency declaration is issued by the Ministry of Interior (Secretaría de Gobernación, SEGOB). However if only one subnational government (i.e. state) is affected and a national disaster declaration is not warranted, the state may still be eligible for central government funding under the Emergency Fund, provided a subnational disaster has been declared. In addition, resources for post-disaster recovery in the months after the disaster are available via the FONDEN Trust.

The Fund to Support the Rural Population affected by Climate Hazards (Fondo de Apoyo Rural por Contingencias Climatológicas) was established to provide support to low-income farmers who do not have agricultural insurance and who are affected by climate-related hazards. The maximum federal contribution is set at 70% of the insurance premium for farmers for insurance offered through the Mexican Government Insurance Company Agroasemex S.A. (World Bank, 2009).

Implicit contingent liabilities

Implicit contingent liabilities are expenditures that might arise due to moral obligations not linked to any prior commitments, or due to public expectations or political pressure on the government. In Mexico, the central government has made additional funding for ex post disaster assistance available in cases of exceptional need. The year 2010 saw the creation of the Reconstruction Fund for Federal Entities (Fondo de Reconstrución de Entidades federativas), through which zero coupon loans with a 20-year maturity were issued by the

Ministry of Finance via Mexico's national public works bank BANOBRAS. These loans were made to affected subnational governments that had requested support through FONDEN but were unable to meet the minimum self-funding requirement for subnationally owned public assets (World Bank et al., 2012).

Contractual obligations that may arise from the government's ownership of state-owned enterprises can create a secondary set of disaster-related contingent liabilities – although Mexico does not acknowledge them as explicit liabilities. The recent steps towards privatising some major state-owned enterprises in Mexico, such as the petroleum company PEMEX or the Federal Electricity Commission (Comisión Federal de Electricidad, CFE) have reduced the potential liability for the government stemming from damages incurred by disasters. PEMEX has obtained private insurance costing USD 426 million the two-year policy protects against a maximum USD 1.75 billion in damages.

Estimation of insurance payouts

For central-government-owned infrastructure, insurance coverage is relatively clear. FONDEN has identified and assessed the vulnerability of such infrastructure and these assets are all covered against disaster damages by FONDEN-backed insurance. Federal roads, however, have not been insured and remain an important government liability in the event of a disaster (OECD, 2013).

The use of insurance by subnational governments, i.e. states, to cover damages to their public infrastructure, has been relatively limited. States own approximately 60% of all public infrastructure assets. By 2011, only 5 of 31 states had purchased an insurance policy. FONDEN supports states in identifying state-owned assets at risk, in carrying out vulnerability assessments, and in deciding upon an appropriate risk transfer strategy. However, only three states have carried out these three steps under FONDEN guidance, and another seven are currently working with FONDEN in this regard. One of the barriers states face in obtaining public asset insurance may be to the difficulty of diversifying risk exposure.

For farmers, the Ministry of Agriculture administers a public insurance programme that offers indemnity insurance against floods, hail and earthquakes. As a result, 60% of farmers are covered against disaster damages to their crops. Uninsured farmers have been covered by state insurance policies.

For businesses, there is no compulsory insurance against the impacts of disasters.

Insurance coverage for public assets at subnational (state) level in Mexico, 2011

State	Chiapas	Guerrero	Hidalgo	Jalisco	Veracruz
Duration	1 year	1 year	1 year	2 years	1 year
Sectors	Housing, hydraulic, roads, urban	Housing, roads	Housing, hydraulic, roads, urban	Housing, hydraulic, roads, urban	Education, housing, hydraulic, roads
Insurer	Interacciones	Banorte – Generali	Inbursa	Inbursa	Interacciones
Covered risks	Geological and hydrometeo-rological	Any direct physical loss or damage caused by natural disasters recognised by the federal government (geological and meteorological events)	Geological, hydrometeorological; coverage is not restricted to the list	Any risk of physical loss or damage caused by a natural disaster declared by the federal government as an emergency or disaster for the state of Jalisco	Any risk of physical loss or damage caused by a natural disaster and recognised as such by the federal government

Source: OECD, 2013.

Private insurance coverage protecting households against the impacts of disasters remains relatively low in Mexico. The number of private households that are insured against disasters as part of their mortgage is estimated at 6.5 million. The Federal Institute for Workers' Housing (Instituto del Fondo Nacional de la Vivienda para los Trabajadores, INFONAVIT) annually hires an insurance policy on behalf of more than 5 million loan holders. The insurance covers the reconstruction of housing damaged by earthquakes and hydro-meteorological hazards but does not cover household goods (for which the Housing Institute may provide up to USD 1 400 in compensation per household). Mexico is also currently running trials on linking disaster insurance to property taxes.

Quantification of disaster-related contingent liabilities

The table below provides an overview of disaster-related contingent liabilities that are quantified in Mexico.

Types of information from previous events available to calculate disaster-related contingent liabilities in Mexico

Type of disaster-related expenditure	What gets recorded
Relief spending	Federal expenditure through FONDEN is recorded, but only for immediate attention to emergency needs, such as the provision of water, staple food, medicines, blankets, etc.
Spending for the reconstruction of damaged public infrastructure and assets	Federal expenditure allocated via FONDEN in response natural disasters, such as hurricanes, earthquakes or heavy rain
Spending for the reconstruction of damaged private assets	Federal expenditure allocated via FONDEN to reconstruct low-income housing damaged by natural disasters, such as: hurricanes, earthquakes or heavy rain
Spending on increased social transfers due to a post-disaster economic slowdown	Federal expenditure allocated via the temporary employment programme administered by the Ministry of Social Development (*Secretaría de Desarrollo Social*, SEDESOL)
Expenditures due to guarantees issued to public or private entities suffering disaster losses	Not included
Post-disaster payments to subnational governments	Assistance transferred to subnational governments and earmarked for reconstruction purposes is recorded
Reduced tax collections	Not included
Disrupted operations of public corporations	Expenditure dispersed via the Continuity of Operations Programs for the Health and Education sectors *(Programa Hospital Seguro y Escuela Segura*), via FOPREDEN
Disrupted operations of private corporations	Not included
Deterioration in the terms at which the government can in the short term refinance public debt or raise additional debt	Not included

Source: OECD survey response.

To estimate the size of disaster-related contingent liabilities, Mexico uses historical data on expenditure disbursed via FONDEN and the agricultural disaster funds, as well as results from the National Risk Atlas (Atlas de Riesgos) and available information on property values in hazard areas.

A public asset inventory database, which was created in 2013 and is biannually updated, assists in the estimation of disaster-related contingent liabilities with information on public assets (roads and bridges, water distribution, hospitals, schools and others) and their insurance coverage.

For high-impact perils, such as earthquakes, hurricanes and heavy rain, the Technical Committee of FONDEN (Comité Técnico de FONDEN) uses catastrophe modelling based on the Loss Estimation for Federal Risk System (R-FONDEN), a probabilistic catastrophe risk assessment tool, to estimate the frequency and intensity of disasters and to forecast potential costs.

For subnational infrastructure, subnational governments are responsible for analysing risk exposure and quantifying the expected necessary expenditure for reconstruction and post-disaster support to the affected population.

Disclosure of information on disaster-related contingent liabilities

Once disaster-related contingent liabilities are recognised and quantified, disclosing them within existing budgets enables rational and informed decision making. According to Article 16 of the Federal Budget and Fiscal Responsibility Law, the "most relevant risks to public finances in the short run" have to be published in the annual General Economic Policy Guidelines[2], which annually inform development of the central budget. This list of risks includes a reference to natural disasters. In addition, FONDEN allocations for post-disaster reconstruction, broken down by disaster and sector are publicly disclosed on line.[3]

Estimating the fiscal impacts of disaster-related contingent liabilities and integrating them into overall fiscal forecasting

The Ministry of Finance assesses and manages fiscal risks. Each type of fiscal risk is treated by a different unit in the ministry. The Insurance, Pensions and Social Security unit for example is in charge of identifying, evaluating and managing the fiscal risks arising from natural disasters.

In Mexico, the federal budgeting process involves assessment and development of a management strategy for the most relevant fiscal risks, namely short- and long-term macroeconomic risks and various contingent liabilities, which include natural disasters. Owing to their potential adverse impact on public finances, natural disasters are one of the long-term risks regularly assessed and considered in both medium- and long-term fiscal policy. The results are taken into account in the annual budget allocations to FONDEN and the information presented in the General Economic Policy Guidelines (Estados Unidos Mexicanos, 2017).

Fiscal forecasts evaluate the potential impacts of fiscal risks on revenues and expenditures. Impacts of short-run macroeconomic risks on revenues and expenditures are estimated using a partial equilibrium approach and simulating likely changes to the main economic and financial variables that determine the budget. (The latter include the peso/dollar exchange rate, the oil price and the interest rate.) There is an implicit assumption that the risks are independent, symmetrical and linear.

More complex risks – the potential damages from concomitant disasters, the knock-on impacts a disaster may trigger or and the occurrence of a major disaster during times of fiscal constraints or economic downturns – are not currently considered in Mexico's fiscal risk analysis. However, there are available policy tools for managing such risks. The Budget Revenues Stabilisation Fund (Fondo de Estabilización de los Ingresos Presupuestarios, FEIP) and the Federal States Revenues Stabilisation Fund (Fondo de Estabilización de los Ingresos de las Entidades Federativas, FEIEF) save up budgetary resources for use when government revenues fall below predicted levels, e.g. due to economic downturns.

Implementation arrangements for providing post-disaster financial assistance

The Ministry of Interior is responsible for natural disaster declarations, which are issued if an adverse event causes damage exceeding local operational and financial response capacity. On average, 30 such declarations are issued each year (World Bank et al., 2012). The request to SEGOB can be made by subnational governments (i.e. the governor of the affected state) or relevant national agencies within ministries. These declarations are then verified by the technical agency in charge of the disaster type. Following confirmation of the disaster declaration, SEGOB takes the lead in the post-disaster assistance process.

In a second step, and within one day of the disaster declaration, a Damage Assessment Committee is established consisting of central and subnational government representatives from the affected regions and the responsible federal agencies. Within ten days the Committee has to identify and quantify damage to public infrastructure.

Subnational governments, i.e. states, have 30 calendar days after the declaration is published to submit their request for central government support through FONDEN. Such requests must show that the state's funding needs exceed its own financial capacities.

The General Directorate of FONDEN evaluates the funding requests and must verify the following before submitting them to the Ministry of Finance (World Bank et al., 2012):

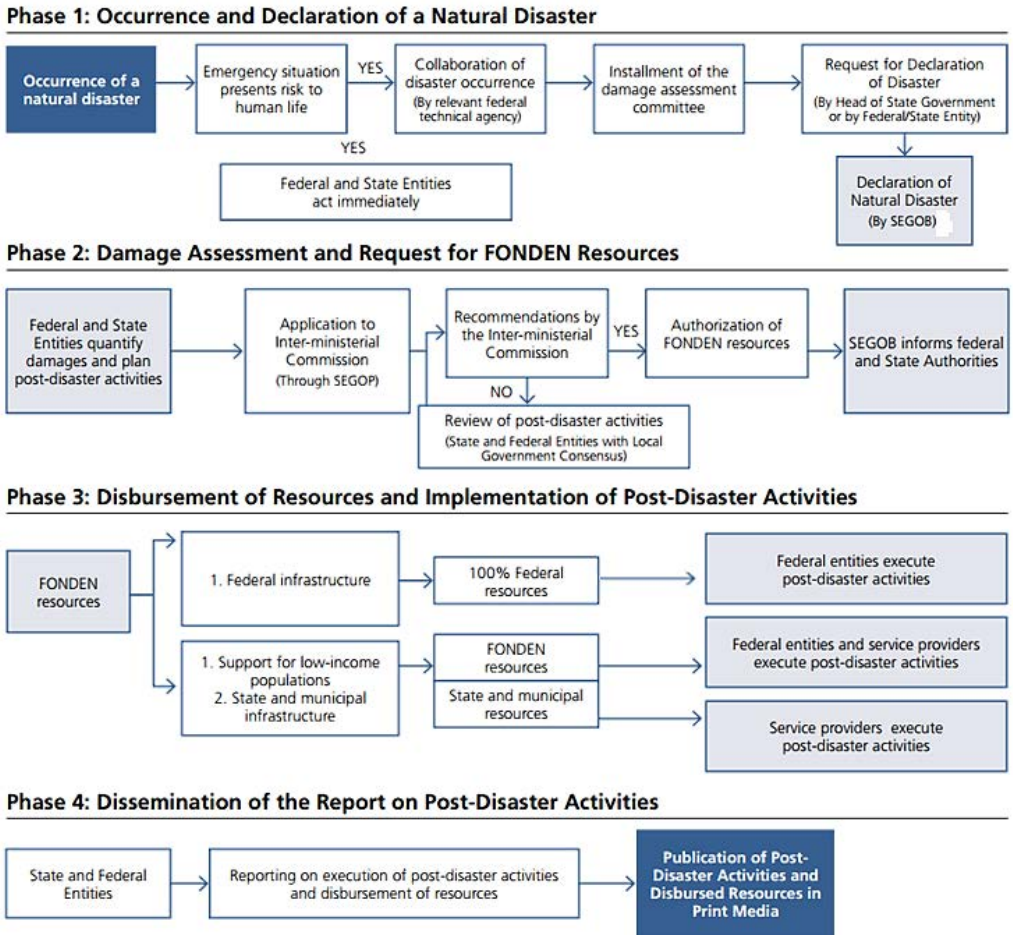
- There is no duplication of effort among the federal and state entities.
- The requested resources are only intended to address damage caused by the disaster (not pre-existing damage).
- No asset reported as damaged has previously received any reconstruction financing from FONDEN. If an asset has received FONDEN support but did not secure catastrophe insurance following the disaster, then it will be eligible for lower levels of support, in accordance with the fund's policies.

The Ministry of Finance has five days to authorise the funding. The fiduciary of the FONDEN Trust is the state-owned development bank BANOBRAS, which operates according to the mandate of the Ministry of Finance. It disburses approved expenditures to the businesses contracted by the central or subnational government to carry out reconstruction – that is, expenditures are not disbursed to the federal agencies or subnational governments responsible for the reconstruction. This is done to expedite the process and ensure efficiency (OECD, 2013).

For subnationally owned infrastructure, governments seeking reimbursement of up to 50% from the central government must submit a list of reconstruction activities the relevant federal agency is then in charge of these. FONDEN resources are provided on the understanding that the remainder of the reconstruction activities will be conducted by state and municipal agencies (World Bank et al., 2012).

As mentioned earlier, for more immediate access to financing, the Immediate Partial Support Mechanism provides financing to address urgent disaster needs, such as lifeline infrastructure, debris removal or equipment rental. This part of FONDEN financing is approved by the Ministry of Finance within 24 hours of the receipt of a request from a federal or state entity and should be used within 30 days.

Implementation arrangements for providing post-disaster financial assistance in Mexico



Source: World Bank et al., 2012.

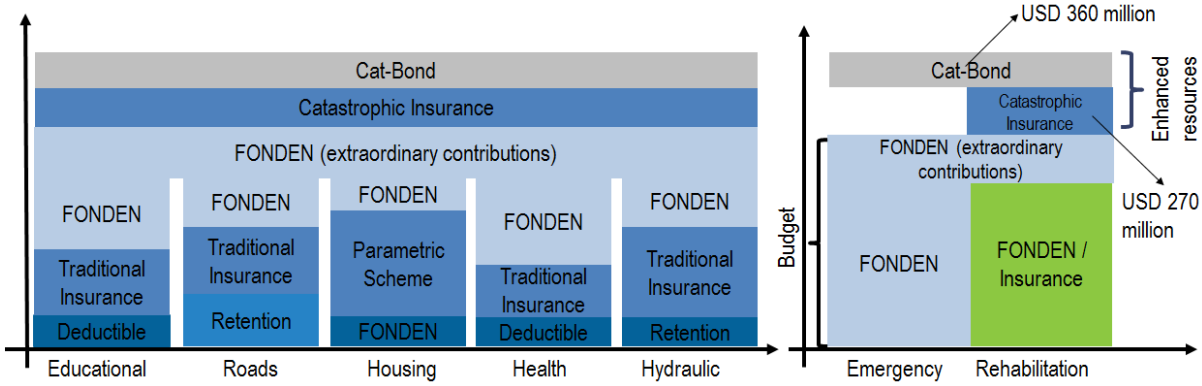
Mitigating disaster-related contingent liabilities and financing residual risks

To mitigate previously identified, quantified and disclosed disaster-related fiscal risks, governments need to control and ideally reduce the size of contingent liabilities, and decide on how to provision for the residual risk.

The central government of Mexico administers a comprehensive, layered approach to disaster risk financing, including provisions for sharing reconstruction costs across levels of government and early recovery funding made available during national emergencies. With FONDEN, the federal government has established a clear cost-sharing agreement with the subnational governments that limits the federal government's obligation to provide post-disaster support, while assisting states in meeting their obligations as the primarily responsible authorities. In addition, the Disaster Fund Specific Operational Guidelines limit repeat eligibility for post-disaster support to insured public assets, encouraging subnational governments to invest in disaster risk transfer. The scope of post-disaster support is clearly limited to low-income population and uninsured low-income farmers, and avoids claims from businesses and those able to afford insurance. Nonetheless, insurance take-up by households and businesses remains low (OECD, 2013).

To absorb the risk of insufficient funds in FONDEN, sector-specific risk transfer mechanisms have been designed. Insurance exists for centrally and subnationally owned public infrastructure. As explained above, while FONDEN covers up to 50% of the reconstruction cost the first time a subnationally owned asset is damaged, it will cover only 25% the second time if no insurance has been purchased, and will offer no funding for subsequent requests. States should consequently insure at least 50% of the value of their infrastructure, as specified in the Disaster Fund Specific Operations Guidelines. For both centrally and subnationally owned public infrastructure, the take-up of insurance varies considerably across Mexico (OECD, 2013).

FONDEN's Risk Transfer Mechanisms



Source: Comisión Nacional de Seguros y Fianzas, 2017.

As part of FONDEN's risk transfer mechanisms, indemnity-based excess-of-loss catastrophe insurance has been part of the Mexican risk transfer mix since 2011 (World Bank et al., 2012). The excess-of-loss coverage for indemnity is triggered when requests to FONDEN exceed USD 56 million due to a single natural disaster. The premium paid by Mexico for the coverage in 2017-18 reached USD 50 million and represents 18% of the maximum limit of liability coverage. The high cost can be explained by the significant disaster losses registered due to Hurricanes Manuel and Ingrid in 2013 (OECD, 2013), although it has been decreasing in the latest renewals.

In 2006 Mexico signed up for a catastrophe bond (CatMex), the first of its kind in Latin America (CatMex) for coverage against earthquakes; this was then converted to a multi-risk instrument (MultiCat Mexico) that also covered tropical storms. The bond's 2012-15 renewal provided coverage of up to USD 315 million, with USD 140 million for earthquakes, USD 100 million for Pacific coast hurricanes, and USD 75 million for Atlantic hurricanes. In 2015 Hurricane Patricia triggered the MultiCat, resulting in a USD 50 million indemnity to FONDEN. The latest renewal in 2018 includes a Cat-Bond worth USD 260 million, providing coverage against losses from earthquakes. The September 2017 earthquakes triggered the catastrophe bond, resulting in a USD 150 million indemnity (World Bank, 2017).

In complement to the disaster recovery assistance arrangements and risk transfer instruments described above, Mexico has also recognised the need to reduce disaster-related contingent liabilities for the government by focusing on risk prevention and mitigation management through FOPREDEN and other risk prevention funds administered by different ministries, as earlier described.

Notes

[1] Mexico's General Law of Civil Protection Chapter VI, Articles 29–37) specifies the requirements for an emergency declaration. Different technical agencies are involved in examining the declaration: CONAGUA for hydro-meteorological hazards, CONAFOR for forest fires and CENAPRED for geological and other hazards.

[2] *Criterios Generales de Política Económica para la Iniciativa de Ley de Ingresos y el Proyecto de Presupuesto de Egresos de la Federación Correspondientes al Ejercicio Fiscal 2017* [General Economic Policy Guidelines for the Income Law Initiative and the Federal Expenditure Budget Project for the Fiscal Year 2017], http://finanzaspublicas.hacienda.gob.mx/work/models/Finanzas_Publicas/docs/paquete_economico/cgpe/cgpe_2017.pdf.

[3] *Recursos destinados a desastres por Estado* [Disaster resources by State], www.gobernacion.gob.mx/es/SEGOB/Recursos_destinados_a_desastres_por_Estado.

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New Zealand

Prevalence of natural hazards

New Zealand is made up of two main islands in the South Pacific (North and South Islands) that are located between the equator and Antarctica and on the juncture of the Australian and Pacific plates. New Zealand's location and geography exposes it to a broad range of hazards, including earthquakes, tsunamis, volcanic activity, ex-tropical cyclones, floods and droughts.

Types of natural hazards affecting New Zealand

Category	Types of hazard
Geophysical	Earthquakes, tsunamis, volcanic activity
Hydrological	Flooding,
Meteorological	Flooding, ex-tropical cyclones
Climatological	Wild fire; droughts

Source: ODESC, 2007.

Located at the southwest end of the Pacific Ring of Fire, New Zealand is particularly susceptible to earthquakes (and related tsunamis) and volcanic eruptions. Based on its seismic history, there is a high probability of a magnitude 6 earthquake occurring at least once per year, and a magnitude 7 earthquake at least every five years (GeoNet, 2017).

Around 22% of the population of New Zealand (1 million inhabitants) is exposed to significant earthquake risk. The most recent major earthquakes occurred in Kaikoura (2016), resulting in economic losses of USD 3.9 billion, and in Canterbury (201-11), resulting in economic losses of over USD 15 billion.

Major natural disasters in New Zealand (since 1980)

Disaster Event	Year	Fatalities	People affected	Economic damage in USD
Kaikoura earthquake	2016	2	Not available	3.9 billion
2012/13 drought	2012/13	0	Not available	823 million
Canterbury earthquake	2011	181	301 500	1 500 billion
Canterbury earthquake	2010	0	300 002	650 billion
February 2004 storm (flood)	2004	4	5 350	275 million
1997/98 El Niño drought	1998	0	Not available	544 million

Sources: EM-DAT, 2017; ODESC, 2007.

Volcanoes, arising from the subducted Pacific plate, are found in the centre, north and west of the North Island as well as offshore. Ruapehu eruptions in 1995 were the largest volcanic events in New Zealand in 50 years. They deposited ash as far as 250 km from the volcano, affecting Hawke's Bay, Gisborne and the Bay of Plenty. A wide flight-exclusion zone disrupted air travel and major highways were closed several times. Total economic losses were estimated at around USD 94 million.

Floods are the most frequently occurring natural hazard in New Zealand. Although fatality rates have significantly decreased, floods still cause major disruptions through evacuations of people and damage to property. They regularly cause millions in damage to structures, infrastructure and agriculture. The February 2004 storm caused widespread and damaging floods with estimated losses of USD 275 million (ODESC, 2007).

Significant landslides occur frequently in New Zealand due to its steep slopes, active tectonics, and high rainfall in some areas. There have been at least 15 rainstorms in the past 35 years that have caused extensive landslides over large areas, especially in the erodible mudstone hill area of the North Island (from Manawatu-Wanganui to Gisborne). The Kaikoura earthquake (2016) triggered thousands of smaller landslides along the steep coastal hills, caused 11 significant landslides, and destroyed or disrupted major road and rail infrastructure. The effects of such events are far-reaching. Pasture loss decreases productivity; silt washed into streams and rivers degrades water quality and increases flood risk; and transport infrastructure disruption has significant economic consequences. The annual cost of soil erosion is estimated at USD 72–109 million.

New Zealand's climate is influenced by the El Niño–Southern Oscillation, which results in drier conditions in northern and eastern areas, with stronger-than-normal north-easterly airflows during La Niña phases. The 1997/98 drought, associated with a strong El Niño event, severely affected eastern regions, from Hawke's Bay to Central Otago. Economic losses were estimated at USD 544 million, or 0.9% of gross domestic product (GDP) (2006 value), affecting New Zealand's farming community particularly hard. Other recent major drought episodes, which were not related to the El Niño oscillation, occurred in the period 2012-13. Economic losses were estimated at USD 823 million (EM-DAT, 2017).

Past fiscal impacts of disasters

The estimated annual average loss from disasters in New Zealand is USD 832 million, corresponding to 0.47% of GDP. The probable maximum loss for 100-year and 500-year return periods has been calculated at USD 4.6 billion and USD 7.3 billion, respectively (PreventionWeb, 2017). The values seem to be underestimated however, given recent experiences with major earthquakes in New Zealand.

New Zealand currently does not hold a comprehensive database of economic losses or fiscal impacts from past disasters. The government has committed to developing a mechanism for more systematic reporting of ex ante and ex post public spending on disaster risk management.

The most costly recent disasters in New Zealand have been the Kaikoura and Canterbury earthquakes in 2016 and 2010/11, respectively. Some information regarding the fiscal costs of these events is publicly available in the Treasury's reports. In the case of the Kaikoura earthquake the reports show a significant increase in infrastructure spending to repair roads and other utilities. Preliminary estimates of the total costs are at around USD 2 billion to USD 3 billion, with the majority of costs funded through budget allowances or from insurance proceeds (excluding Earthquake Commission [EQC] claims costs). As a result, the forecast of the Treasury's Half Yearly Economic and Fiscal Update of 2017 shows the net operating package at USD 7.2 billion in 2017 (Treasury, 2017).

Two-thirds of the costs incurred by the Canterbury earthquake sequence of 2010 and 2011 were funded by insurance companies through insurance and reinsurance, and by the public sector, which financed around one-third of the costs through natural disaster insurance provided by the EQC and central government resources (IMF, 2016). The 2016 Financial Statements of the Crown present consolidated information regarding the fiscal impact of this earthquake sequence. The total cost at the end of fiscal year 2016 was USD 10.3 billion, and the earthquake-related obligations still faced are estimated at USD 1.5 billion. The cost of repairing or replacing physical assets owned by the central government amounted to USD 706 million, or 6.8% of total central government costs.[1] The central government provided significant contributions for the reconstruction of public assets owned by subnational government (local/district councils and regional councils[2]); these amounted to USD 1.19 billion for the restoration of essential subnational government infrastructure, such as fresh water supply, wastewater services and storm water services. From the EQC, which provides insurance coverage against earthquake and other perils for residential property, the government is expected to assume some of USD 5.3billion paid out in compensation for privately owned residential property. Finally, the central government exceptionally provided USD 806 million to settle residential property claims for policies held with a private insurance company, AMI, which became financially distressed as a result of the 2010/11 earthquakes[3].

Canterbury earthquake public expenditures (2011-16)

	Total to date (million NZD)	30 June 2016 (million NZD)	30 June 2015 (million NZD)	Actual June 2014 (million NZD)	Actual June 2013 (million NZD)	30 June 2012 (million NZD)	30 June 2011 (million NZD)
EQC insurance claims	7 334	21	(444)	(242)	(107)	662	7 444
Local infrastructure	1 637	55	66	109	483	729	195
Land zoning	1 087	88	(1)	97	(8)	258	653
Southern Response support package	1 111	204	325	124	(53)	156	355
Christchurch central city rebuild	920	153	179	473	115	-	-
Crown assets	969	498	335	96	28	12	-
Other earthquake costs	1 242	338	129	249	17	96	413
Gross earthquake expenses	20 448	1 414	904	918	815	2 823	13 574
Earthquake related revenue (e.g. reinsurance)	(6 148)	(57)	(315)	(12)	(340)	(910)	(4 514)
Total Crown net earthquake costs	14 300	1 357	589	906	475	1 913	9 060
Operating and capital expenses							
Operating expenses	12 084	587	(55)	326	266	1 900	9 060
Capital expenditure	2 216	770	644	580	209	13	-
Total Crown net earthquake costs	14 300	1 357	589	906	475	1913	9 060

Source: Treasury, 2016, note 31, pp. 122-26.

Typically, the central government compensates subnational governments for at least 60% of the cost of public infrastructure reconstruction (OECD, 2016). To prepare for potential disaster-related contingent liabilities, the EQC invests the premiums that it receives into the Natural Disaster Fund.[4] The fund serves as an accumulated technical reserve in the insurance scheme. The fund accumulates investment income from money held in the fund and from insurance premiums[5], and it pays the Earthquake Commission's operational costs and payouts of insurance claims after a natural disaster. In the event of a major natural disaster likely to involve claims in excess of USD 182 million, the EQC must consult with the minister of finance before liquidating any part of the fund's investment portfolio, apart from the holdings of New Zealand bank bills.

Until the Canterbury earthquakes in 2010 and 2011, there had not been any major claims on the Natural Disaster Fund. The fund had accumulated a value of USD 4.3 billion (NZD 5.9 billion) at the beginning of the 2010/11 financial year. EQC has been drawing down on the fund to meet claims since the first Canterbury earthquake in September 2010, and the fund has been depleted as EQC settles its liabilities. Reflecting the underlying risk of the scheme, premiums have been increased with the expectation that the fund will be replenished to pre-Canterbury levels within nine years (presuming another major event does not occur in the meantime).

In general, the New Zealand's approach to financing disaster recovery and reconstruction has revolved around running a strong fiscal position with low debt levels, which allows the cost of an event to be absorbed without unduly affecting core public services or the wider economy (Treasury, 2014). However, the increased external borrowing following the Canterbury earthquake sequence, which occurred during a period of domestic and global economic weakness, saw the New Zealand government's fiscal buffer decline: net debt

increased from 13.6% of GDP in 2010 to 23.5% of GDP in 2012. In 2011, concerns about the New Zealand's public finances - both as a result of the global recession and the repair and reconstruction costs associated with the Canterbury earthquake sequence - led Standard & Poor's to downgrade the long-term foreign currency sovereign rating of New Zealand to "AA" (from AA+). The New Zealand government's fiscal strategy aims at bringing the debt down again to levels that can sustain major disruptive events.

Managing disaster-related contingent liabilities

Identification of disaster-related contingent liabilities

Explicit contingent liabilities

Explicit contingent liabilities arise from legal commitments for both central and subnational governments to provide disaster assistance. The table below provides a summary of the explicit commitments made by the New Zealand government.

Explicit central government obligations for post-disaster financial assistance in New Zealand

Commitment to finance…	Yes	No
… post-disaster response and recovery	✓	
… a share of the costs incurred by subnational governments for post-disaster response and recovery	✓	
… reconstruction and maintenance of central government-owned public assets	✓	
… rehabilitation and reconstruction of private assets	Partially	
… other expenses incurred by subnational governments (e.g. payments to businesses or individuals)	Partially	
… government guarantees for disaster losses incurred by public corporations and public-private partnerships	✓	

Source: OECD Survey.

Generally speaking, New Zealand's commitment to providing post-disaster assistance is based on a strong sense of national solidarity. The 2015 Guide to the National Civil Defence Emergency Management (CDEM) Plan[6] (the CDEM Guide) provides New Zealand with the policy framework for the comprehensive disaster risk management by all public entities at national and subnational levels. The arrangements, roles, and responsibilities of agencies for disaster risk management that are laid out in the guide – and that offer an overview of government commitments for providing disaster assistance – are summarized below.

The central government makes an explicit commitment to compensate costs for rebuilding government-owned assets. The CDEM Guide (Section 33.8) states that central government assumes responsibility for restoring those facilities that it owns or manages. The relevant government agency is responsible for managing risks, maintaining adequate insurance cover and completing the restoration of the facilities. The central government owns assets such as schools and hospitals, as well as national roads and power production plants (the power distribution is privatised). Water infrastructure is owned by subnational governments, as are flood protection measures. During the Canterbury earthquakes, for example, the central government paid for repairing and replacing its assets, including the Canterbury hospitals, the University of Canterbury and Lincoln University, the Justice and Emergency Services Precinct, and Canterbury schools.

Central government assistance is not normally available for state-owned enterprises, local authority-controlled trading organisations, airport and port companies, or electricity retailers. Such organisations should maintain sufficient insurance cover and emergency

reserves to manage their risks. If special problems of risk management and hardship can be demonstrated, government assistance may be requested on an exceptional basis.

The initial and primary responsibility for responding to and recovering from an emergency rests with subnational governments. The central government may provide physical assistance (e.g. by deploying central government personnel to assist on the ground) or financial assistance, which may comprise partial or full reimbursement of the costs of response and recovery. The current explicit cost-sharing arrangement between the central and subnational governments, and the cost eligibility criteria for response and recovery expenses, are detailed in Section 33 of the CDEM Guide, as follows:

- The central government repays 100% of response costs incurred by subnational governments that are associated with caring for displaced or directly affected people. Eligible costs for "caring for the displaced" include accommodating, transporting, feeding and clothing people who cannot continue to live in their usual place of residence as a result of an emergency. Also eligible are costs related to the in situ welfare of people who are isolated in their homes and therefore unable to access essential goods and services.
- In addition, the central government reimburses 60% of "other response" costs that reduce the immediate danger to human life and the potential consequences of an emergency. For example, while not incurred prior to the emergency, the costs of pumping and draining floodwaters are regarded as meeting the intent of other response costs and are therefore eligible costs. Subnational governments should be able to demonstrate that costs reduce danger to life and harmful consequences when discussing claims with the Ministry of Civil Defence and Emergency Management (MCDEM).
- The central government also reimburses 60% of essential infrastructure recovery costs incurred by subnational governments. Eligible costs include the repair or recovery of essential infrastructure assets; repair or recovery of river management systems; and repair or recovery of other community assets that were damaged as a consequence of the failure of flood protection schemes.
- For both "other response" and essential infrastructure recovery costs, the established 60% reimbursement rule is applied above the following thresholds: 1) 0.0075% of the net capital value[7] of the city council, district council or unitary authority[8] involved; 2) 0.002% of the net capital value of unitary authorities where the assets in question are of a type ordinarily managed by regional councils; or 3) 0.002% of net capital value in the case of regional councils.
- Other financial mechanisms to support subnational governments include the following: 1) advance payments for response and recovery costs when significant response and recovery costs are expected; 2) contributions made by joint ministers through disaster relief funds set up by councils; and 3) special policy support provided under exceptional circumstances to establish new programmes for repair and recovery.[9]

During the last major disasters the cost-sharing arrangements between central and subnational governments came under discussion. The central government made contributions that far exceeded its expected obligations, and questions were raised about the CDEM Guide's definitions of what "essential infrastructure" entails. It became clear that many subnational governments had not sufficiently provisioned for the 40% of the costs they were responsible for, and that the financial preparedness and capacity of

subnational governments varied significantly. Ongoing reform discussions will centre on revising the current cost-sharing arrangements, while also looking at reducing future exposure to risks, such as by increasing the effectiveness of building code enforcement and assessing the application of land-use policies. The discussions will also aim at improving information on local risk exposure and will likely include alternatives to the current "light-handed" disclosure regime regarding insurance arrangements for local government assets (OECD, 2016). The reforms are also expected to allocate to subnational governments a greater share of the costs for more frequent, low-impact events, while ensuring that the central government still shoulders a significant portion of the costs from less frequent, severe events.

In addition to support listed in Section 33 of the CDEM Guide, other central government agencies may provide financial assistance to people who are affected by a natural disaster. The Ministry of Social Development supplies civil defence to evacuees for immediate needs such as temporary accommodation, food and clothing. During the recovery phase, the ministry also provides: 1) relocation and re-establishment grants for low-income, uninsured households where essential household equipment has been destroyed; 2) rural assistance payments for farming families to meet their essential living needs; 3) psychological support for counselling and support services for people affected by disasters; and 4) taskforces to help clear up and repair damage. The Inland Revenue Department provides tax assistance for those affected by disasters. The Ministry for Primary Industries uses an adverse events framework to provide recovery assistance for farms and farming families, and the New Zealand Transport Agency provides road subsidy assistance for the repair of local roads and bridges.

The central government has committed to compensating private asset losses from some natural hazards (earthquake, tsunamis, landslides and flood impacts on land) through its public earthquake insurance scheme.[10] This scheme is managed by the EQC, a statutory agency. The central government provides an unlimited guarantee for any disaster that exceeds the EQC's capacity to pay its insurance claims.

Implicit contingent liabilities

Disaster-related contingent liabilities are understood to be implicit liabilities when they are not determined by a law or contractual rule. They include assistance provided in the aftermath of a disaster that is based on a moral commitment by the government.

As shown in the above section, New Zealand specifies a wide range of explicit commitments for disaster assistance by the government. Nevertheless, during past disasters the government has gone beyond those explicit commitments. For example, following the Canterbury earthquakes, the central government undertook the following actions:

- The government supported a private insurance company in financial distress and provided several welfare benefits to affected populations that were not based on prior commitments.
- The government offered homeowners in a high-risk "red zone" – with a high likelihood of earthquake damage – buyouts at near-market value. Between 2011 and 2015, 95% of eligible property owners participated in this programme, leading to the purchase of 7 800 properties in the red zone (Mitchell, 2015).
- The central government offered special "needs grants" to people who had urgent and necessary needs and no other way to meet the costs.

- The central government provided additional support through the welfare system in the form of new benefits, such as a financial allowance for employees of small businesses that could not operate or pay staff wages because of earthquake damage. Businesses could re-apply after four weeks if they were still unable to operate, but they were expected to use insurance cover for loss of earnings before accessing the wage subsidy.
- The government instituted a range of tax changes to facilitate relief in the period immediately following the Canterbury earthquakes.

Another implicit liability could arise for the central government if the cabinet[11] agrees to additional financial assistance on a case-by-case basis when the scale of the disaster is so great that it overwhelms subnational governments' or other stakeholders' ability to respond and/or recover. There are a number of mechanisms not anticipated in the 2015 CDEM Plan that could be applied across various sectors in the event of a major disaster. Generally, the trigger point that allows them to be activated is the declaration of an emergency (local or national). The relevant mechanisms include the following:

- Ministry of Social Development: Enhanced taskforce for clean-up and hardship assistance for people who need new clothes or appliances
- Ministry of Primary Industries – Rural assistance payments for essential living expenses following an adverse event
- Inland Revenue – Tax smoothing/deferral facilities
- New Zealand Transport Authority Assistance in helping to rebuild roads
- Ministry of Business, Innovation and Employment: Temporary accommodation

Estimation of insurance payouts

The proportion of losses covered by insurance can be an important determinant of the size of government contingent liabilities, as high levels of uninsured losses may result in political pressure on the government to provide financial support.

New Zealand has a high level of hazard insurance penetration. Homeowner insurance is provided on an all-perils basis, including the capped coverage provided by the EQC. The EQC is a central government entity providing insurance to residential property owners for damages to houses and contents stemming from an earthquake, a natural landslide, a volcanic eruption, hydrothermal activity or a tsunami. All-risk coverage for commercial buildings is provided by private insurers without government support and shows a similarly high level of penetration. Many businesses also have business interruption insurance.

Almost half of public assets in New Zealand have insurance; this coverage cost around NZD 280 million (USD 200 million) annually in 2012 (Controller and Auditor-General, 2013). Insurance for public assets is not obligatory, but public entities are required to analyse the risks to their assets and choose adequate financial protection (OECD, 2016). As a result, the majority of uninsured public assets are those for which insurance either is not available or is very expensive – i.e. land, landfills and water assets (including flood protection assets) as well as transport infrastructure and other assets such as furniture. The total value of uninsured assets is calculated at about NZD 128 billion (USD 90 million) (Controller and Auditor-General, 2017).

The EQC premium cost is NZD 0.20 for every NZD 100 of home or contents coverage by fire insurance. EQC premiums have increased substantially in recent years (they were NZD 0.05 for every NZD 100 prior to the Canterbury earthquake) in order to address the gap between premium rates and the underlying risks covered by the scheme. This premium is paid to private insurance companies, which pass it on to the EQC. At the NZD 0.15 premium rate the maximum annual EQC premium for one home and its contents is NZD 180 (or NZD 207 including 15% Goods and Services Tax). This provides the maximum cover of NZD 100 000 for the home and NZD 20 000 for both contents and insured residential land directly related to the dwelling. This amount of insurance coverage is available per event. Gross earned premiums paid in 2016 amounted to USD 203.7 million. In June 2017, the government announced reforms to the EQC Act; these changes are anticipated to come into effect in 2020. Among other things, they include increases to the monetary caps detailed above (Beehive.govt.nz, 2017).

There was some disruption to the insurance market following the Canterbury earthquakes, as many insurers decided not to write new policies (renewals only), partly out of concerns that some damage from the earthquakes was not repaired.

Data indicate that from 1984 to 2014, the insurance industry paid out USD 20.5 billion (on average USD 662 million per year) for damages caused by major disasters. The majority of this amount stems from the Canterbury earthquake, with an estimated payout of USD 19.3 billion (including USD 8 billion from the EQC). Excluding Canterbury, the average annual payout amounts to USD 1.2 billion (or USD 38.6 million per year). Among hazard events, earthquakes cause the highest insurance payouts, followed by floods (LGNZ, 2014).

The EQC transfers the financial risk posed by the New Zealand's natural hazards through financial arrangements. These arrangements include: 1) the Natural Disaster Fund; 2) an international reinsurance programme that is renewed every year; and 3) a backstop government guarantee in the event that the reserves and reinsurance lines of the EQC are exhausted[12] (EQC, 2008). If disaster losses exceed these provisions, financial assistance by the central government is required by law (Section 16 of the Earthquake Commission Act 1993)[13]. The Treasury may meet the deficiency of funds by providing either a grant or a loan.

Quantification of disaster-related contingent liabilities

The government does not conduct a quantification of disaster-related contingent liabilities on a regular basis. The New Zealand public accounting system complies with the International Public Sector Accounting Standard regarding contingent liabilities (IPSAS 19), and is able to produce relevant information to quantify disaster-related contingent liabilities. Such information includes: 1) response and recovery spending made by central and subnational governments; 2) spending for the reparation or replacement of damaged public infrastructure and assets furnished by central and subnational governments; 3) central government spending on increased welfare benefits during natural disaster emergencies; 4) additional public resources allocated to disaster recovery, such as the ones included in special policies; and 5) expenditures due to the guarantee issued to the Earthquake Commission. Currently, however, no public body systematically captures, consolidates or publicly reports all this information so as to facilitate accurate quantification of New Zealand's overall fiscal exposure to disaster-related contingent liabilities. The information is either unreported or fragmented among national agencies, state-owned enterprises and regional, district and city councils.

Estimating the fiscal impacts of disaster-related contingent liabilities and integrating them into overall fiscal forecasting

The fiscal strategy of New Zealand aims at attaining a high level of fiscal resilience, taking account of all the risks, including natural hazards, that the government is exposed to. The Treasury is responsible for reporting and advising on the management of specific fiscal risks in each budget, and setting desired fiscal buffers to withstand economic shocks.

Following release of the "Investment Statement: Managing the Crown's Balance Sheet" report in 2014[14] (Treasury, 2014), the Treasury has built on its understanding of risks that could have a major financial impact on the government's balance sheet. This effort includes measuring the financial impact of a number of key stress events, such as modelling the fiscal impact of a major earthquake affecting Wellington. The approach makes it possible to combine worst-case outcomes from two simultaneous fiscal shocks – for example a natural disaster and a financial crisis – to evaluate the impact on net worth and net debt to GDP. While the specific costs of the scenarios are not quantified for the purposes of budget estimates, the impacts are considered in developing the overall fiscal strategy, which could in turn lead to consideration of the means for reducing the impact of these risks.

Through a multiple agency effort, New Zealand is currently undertaking a national risk assessment project to better understand the social and economic consequences of large-scale to maximum credible events related to various shocks and stresses, including natural hazards.

Previously the government made an effort, through one-off studies, to understand the worst-case impact a major disaster could have for the central government. In 2010 the government conducted a study using historical data from previous earthquakes, to model the fiscal impact of a 7.8 earthquake affecting Wellington. The results showed an estimated contingent liability of USD 11 billion to finance public expenses for response and recovery over the three years after the earthquake (Fookes, 2011). Time proved this study useful, as the actual fiscal costs of the subsequent Canterbury earthquakes were comparable to the estimates in the scenario.

Regarding disclosure of contingent liabilities, all contingent liabilities that have a value greater than USD 73 million need to be individually reported every year in the audited Notes of the Financial Statements of the Government and in the Budget Economic and Fiscal Update (BEFU) – specifically in the chapters on "Risks and Scenarios" and "Specific Fiscal Risks". Both the Financial Statements and the Budget Updates include sensitivity analyses for a range of events, but not specifically for disaster-related shocks (Ter-Minassian, 2014). In addition, all contingent liabilities, including guarantees, with an exposure greater than NZD 10 million (USD 7.3 million) must be approved by the minister of finance and reported to parliament.

The guarantee to the Earthquake Commission is included in the BEFU as one of the central government's contingent liabilities. The independent actuary for the EQC undertakes half-yearly valuations of the total liability for the government. Based on these valuations, the EQC estimates the unfunded liabilities that might need support from the central government's guarantee. However, this contingency is considered unquantifiable and included without specific value in the BEFU report. Unquantifiable contingencies are presented with a brief description of their nature, and a notation on whether they have changed or remain unchanged from the previous corresponding BEFU report.

Implementation arrangements for providing post-disaster financial assistance

As seen above, in New Zealand the central government's post-disaster assistance is extensive. The main implementation arrangements for providing this assistance are summarised in the following paragraphs.

When an event occurs beyond subnational governments' ability to cope using their own resources, the central government provides financial assistance. There are no other formal criteria that trigger central government intervention. As specified in the CDEM Guide[15] assistance is administered by MCDEM. Section 33 of the CDEM Guide describes the process by which the central government provides financial assistance to subnational governments (cities/councils) for response and recovery. In t system laid out in the CDEM Guide, the MCDEM repays subnationally incurred expenses for the response to and recovery from natural disasters of any kind.

The claim submission process starts with a council preparing the claim and supporting data, and submitting it to the director of CDEM. The director may subsequently seek independent verification that the charges shown in the claim are fair and reasonable.[16] When the director is satisfied that a claim represents an accurate statement for reimbursement of the costs, the claim is then certified and items considered eligible are noted. In a final step, the director recommends the amount eligible for reimbursement to the minister of civil defence, who approves the request or delegates approval to the cabinet (the central decision-making body of executive government) if the claimed amount exceeds his or her delegated authority. Once a decision on the claim has been made, the CDEM director arranges for payments to be made.

The CDEM Guide also makes provisions for when central government can advance resources to subnational governments instead of reimbursing them. When subnational governments are expected to face significant response and recovery costs – i.e. if the agreed estimate of the overall reimbursable costs is greater than NZD 250 000 (USD 180 000) – they can receive these costs in advance, subject to cabinet approval. Any advance would be offset against subsequent subnational government claims.

The central government can also contribute to local recovery expenses through local disaster relief funds set up by subnational governments, i.e. by their mayors. The minister of civil defence, together with either the prime minister or the minister of finance, may authorise a lump sum contribution to a disaster relief fund of up to NZD 100 000 (USD 73 000), which generally is made only in the event of larger disasters. Higher contributions need to be approved by the cabinet. Government contributions, once made, are disbursed by the administrators of the fund. Administrators are encouraged to closely co-ordinate their approach to funding allocation closely with those of the Ministry of Social Development and the Housing Corporation of New Zealand. Donations received by subnational governments in the aftermath of a disaster are also to be channelled through local disaster relief funds. The disaster relief funds have the purpose of providing hardship assistance for the local population affected.

Subnational governments can seek "special policy" financial assistance from the central government for recovery works intended to decrease future vulnerability to or the likelihood of another event. The local authority must make a business case for the central government to fund such proposals, which could entail structural mitigation or relocation. Payments under this special policy are approved by the cabinet. Each case is evaluated on its own merits, and there are no predetermined co-financing arrangements or set levels of support to be provided by the government. In some cases, loans rather than grants may be

appropriate. Since it can take time to establish a business case for such measures, the proposals can be submitted at any time after an event. Proposals generally undergo a lengthy consultative process during preparation to make it less likely that they will be refused at the final decision stage. Once approved, special policies are administered through a national department, in most cases the MCDEM.

Special policy funding provided to a local authority is covered by an agreement between the central government agency and the recipient, which requires that grant monies be held in special interest-bearing bank accounts, and that surplus funds and any interest earned on such funds be returned to the central government. The director of CDEM monitors implementation of the special policy and undertakes further co-ordination if necessary.

Central government-owned infrastructure is rehabilitated and reconstructed by the respective national departments in charge. For example, the Ministry of Education reconstructs schools, and decides on their potential relocation in that process. The relevant District Health Board, in conjunction with the Ministry of Health, is responsible for rehabilitating or reconstructing hospitals.

Mitigating disaster-related contingent liabilities and financing residual risks

To mitigate previously identified, quantified and disclosed disaster-related fiscal risks, governments must control and ideally reduce the size of contingent liabilities, and decide on how to provision for the residual risk.

In New Zealand, the MCDEM is responsible for administering the Civil Defence Emergency Management Act 2002. MCDEM takes the lead in facilitating, promoting, strategically guiding and nationally co-ordinating the various key activities across the "4Rs" - reduction, readiness, response, and recovery. However, New Zealand's hazard and risk management framework places strong emphasis on disaster risk management at the local level. Investment decisions in structural disaster risk reduction measures, including avoidance, are generally made at the subnational level.

It is difficult to assess the total expenditure for managing natural disaster risks in New Zealand, because this information is not consistently collected and aggregated at a national level. Some studies suggest that central government expenditures for disaster risk management are skewed towards response and recovery, rather than disaster risk reduction. The MCDEM, a business unit within the Department of the Prime Minister and Cabinet, is funded to support and develop the emergency management sector, educate communities, and manage emergencies. For the year ended 30 June 2018, funding of approximately NZD 16 million (USD 12 million) has been allocated. The central government funds the MCDEM with USD 8 million annually to manage disasters. The central government funds climate information and water resource databases at an estimated USD 4.3 million annually, and the official weather forecast service (MetService) with USD 12.4 million annually. Some research on climate change and flood hazard research is also funded through the national science system.

Government expenditure for risk reduction is mostly through administration of the core regulatory framework. Key to this is the Building Act 2004 (which covers building standards and guidelines relative to various hazards including seismic acceleration) and the Resource Management Act 1991 (which covers policy and guidance on the management and control of land use, including with regard to natural hazards and the impacts of climate change). Other efforts to develop disaster risk reduction and resilience, such as through

regulating lifeline utility sectors and direct ownership of national infrastructure, are harder to cost out from general government expenditure in these areas.

As flooding is New Zealand's most frequent natural hazard, in 2008 the Ministry of Environment conducted a review of the flood risk management system (Ministry of Environment, 2008). The report compiled council investment reports and discussions with central government agencies. Based on the data gathered, the report concluded that subnational governments spend about USD 123 million annually on activities related to flood risk management. The majority of this spending is on traditional river control activities to reduce flood risk through stopbanks, channel clearance or floodways.

Despite individual laws and policies supporting the need for long-term risk reduction measures (e.g. Coastal Policy Statement, the building code for earthquakes), currently there is no national framework for assessing the value of these measures ex ante. This gap is something that New Zealand is considering as it develops the next National Civil Defence Emergency Management Strategy – also referred to as the National Disaster Resilience Strategy – after adopting the Sendai Framework for Disaster Risk Reduction 2015-30.

In addition to financing preparedness and risk reduction activities, New Zealand has made some provision for financing its residual risk, as seen earlier. The public insurance programme for natural disasters provided by the Earthquake Commission is the main initiative to manage the residual risk of disasters. The insurance cost is assumed by the population, and the risk of having to compensate private losses is transferred, offsetting or reducing the need for post-disaster public resources. To meet their share of the funding requirements for restoring locally owned public infrastructure damaged by natural disasters, subnational governments have established a pooling arrangement (the Local Authority Protection Programme) (OECD, 2016).

Public losses arising from damaged public infrastructure and public spending on welfare benefits are financed ex post, since New Zealand does not have a national ex ante risk financing strategy. However, individual government agencies are responsible for their own risk management and for securing risk insurance. The government does not have regular budgetary provisions to deal with natural disaster emergencies, dedicated contingency reserves funds to face recovery costs, or ex ante financial instruments to provide liquidity in the aftermath of a catastrophe, such as contingent credit lines and catastrophe bonds. The central government has typically financed extraordinary disaster-related fiscal expenses by increasing public borrowing.

As previously mentioned, the government is reviewing the cost-sharing arrangement with local governments. The goal is to ensure that: 1) the arrangement does not reduce the incentive for local governments to manage risks to the infrastructure they operate; 2) local governments have the capacity to meet their share of the costs; 3) the share of risk exposure is clear; and 4) the sharing of costs is equitable.

Notes

[1] In New Zealand a significant share of public infrastructure assets, including schools, hospitals and national roads, are owned by the central government and managed by the relevant central government department.

[2] New Zealand is structured with two levels of government, the central and local levels. Local authorities can be cities (which serve a population of over 50 000 in a predominantly urban area) or

districts (which serve towns and wider rural areas). Regional authorities are created for the functional management of some public services (e.g. transport and environmental management), and unitary authorities unite both functions in one. Local authorities do not have constitutional mandates; their functions and powers are determined by the national parliament.

[3] In 2011, as a result of the financial impact of the Canterbury earthquakes, AMI Insurance requested Crown support. Support was granted in the form of a Crown Support Deed, and in return the government gained control of AMI. In 2012, AMI sold its non-earthquake-related business to IAG New Zealand, and the Crown received the proceeds of the sale but retained direct control and ownership of the residual company. This business was renamed Southern Response Earthquake Services Limited. Since that time, the outstanding claims continue to be re-measured as settlement experience emerges; the government continues to provide support and will do so until outstanding claims are settled with policy holders. During 2013, the Crown subscribed additional capital to Southern Response Earthquake Services Limited.

[4] In 1993, the Earthquake Commission Act replaced the Earthquake and War Damage Commission with the Earthquake Commission, and replaced the Earthquake and War Damage Fund with the Natural Disaster Fund.

[5] In 2016, the investment income earned in the fund amounted to USD 52.3 million, and gross earned premiums amounted USD 203.7 million.

[6] See MCDEM (2015)/.

[7] The net capital value is used as the basis for property tax assessments.

[8] A unitary authority is a territorial authority that also performs the functions of a regional council.

[9] Special policy financial support from central government is not available routinely. It is intended to assist communities in those rare circumstances when disasters of an unusual type or magnitude cause damage that overwhelms community resources. In considering proposals for special policy financial support, the cabinet will examine closely all other provisions made for risk management by the local authority.

[10] Government assistance is not ordinarily available for restoring household assets, except through the Ministry of Social Development's social housing assistance and its contributions to ad hoc disaster relief funds.

[11] The Cabinet consists of the council of senior government ministers that are accountable to the New Zealand Parliament. Cabinet meetings are chaired by the Prime Minister.

[12] In 2008, the EQC estimated that the Natural Disaster Fund would be able to meet its maximum probable liability, a magnitude 7.5 Wellington earthquake, and be rebuilt within a reasonable time to continue as New Zealand's financial reserve for recovery from natural disasters. The consensus was that the fund should be maintained at around USD 5 billion, if supported by USD 1.8 billion of reinsurance.

[13] In a major disaster, the EQC is responsible for meeting a defined initial dollar value of total claims (the "deductible") with its reserves from the Natural Disaster Fund, and reinsurers are responsible for further "layers" of total claim costs, up to a contractual limit. The current insurance strategy of the EQC requires USD 1.27 billion of reserves from the Natural Disaster Fund to pay as "deductible" on its current reinsurance programme of USD 3.4 billion.

[14] This report fulfils a fiscal reporting requirement set by parliament when it amended the Public Finance Act in 1989. It provides information on the shape and health of the government's portfolio of assets and liabilities at the end of the last full financial year. It outlines how the balance sheet has changed in recent years and includes forecasts on its anticipated composition and size through 30 June 2018.

[15] The guide covers all types of hazards, not just natural hazards.

[16] Where there is any doubt that the costs claimed by a local authority are emergency expenditure, the director may refer the claim back to the appropriate local authority or CDEM Group for reassessment.

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Peru

Prevalence of natural hazards

The risk of disasters caused by natural hazards in Peru is linked to its geographical location and the nature of its exposed assets and infrastructure. Peru is located on the Pacific Ring of Fire, a region exposed to major earthquakes and active volcanoes. In addition, the presence of the Humboldt Current, the proximity of the Equator, the influence of the Amazon region, and Peru's rugged terrain traversed by the Andes mountains expose Peru to a number of geological hazards, including mudflows, and landslides. Its location in the tropical and subtropical belts on the western coast of the South American continent also exposes Peru to climatological events such as the El Niño phenomenon, which can cause extreme rainfall, floods, droughts, freezes, hailstorms, and strong winds.

Types of natural hazards to which Peru is exposed

Natural hazard category	Types of natural hazards
Geophysical	Earthquakes
Hydrological	Floods, flash floods, landslides and mud-flow (huaycos)
Meteorological	El Niño
Other	Mass movement

Source: EM-DAT, 2017.

Peru is characterised by high seismicity. In Peru, as in its Andean neighbours, seismic activity originates in the subduction zone between the Nazca and South American plates and in the continental fault system in the Andes Mountains. The highly seismic hazard zones are concentrated along the coast, where the nation's capital, Lima, and the port city Callao are located. As home to almost a third Peru's population and around 45% of its gross domestic product (GDP), Lima and Callao together make up Peru's disaster hotspot. Close to three quarters (71%) of Peru's population are at very high or high seismic risk. The most recent major earthquakes occurred in Nazca in 1996, (with economic losses exceeding USD 1.2 billion), Arequipa in 2001 (losses of USD 311 million) and Pisco in 2007 (losses exceeding USD 1.2 billion and almost 600 fatalities).

The northern coast of Peru is especially vulnerable to El Niño oscillations that are typically characterised by prolonged torrential rains, mainly in the regions of Tumbes, Piura, Lambayeque, La Libertad and Ancash. The impacts of El Niño in Peru mainly have to do with flooding. At least 23% of the population of Peru live in flood-prone areas. The 1982/83 and 1997/98 El Niño events were especially devastating for Peru's economy; estimated damages were USD 1.2 billion for the 1983 floods, and an estimated USD 1.8 billion for the 1997/98 (EM-DAT, 2017).

Catastrophic landslides primarily in the Andes occurred due to seismic activity or heavy rains, claiming thousands of casualties in communities downstream from the

Huaytapallana, Huayhuash, Urubamba and Vilcabamba cordilleras. The last major landslide occurred in 2010 in Cusco; economic losses were estimated at USD 230 million. The most recent major drought occurred in 1992 and caused an estimated USD 250 million in losses.

Major natural disasters in Peru since 1980

Disaster Event	Year	Fatalities	People affected	Economic loss (USD)
El Niño phenomena events	1982/83	512	1 907 720	1 billion
Nazca earthquake	1996	17	170 247	107 million
El Niño phenomena events	1997/98	366	1 064 607	1.8 billion
Arequipa earthquake	2001	83	444 876	311 million
Pisco earthquake	2007	596	655 674	1.2 billion
Cusco landslides and torrential rain	2010	26	24 774	230 million
El Niño Costero events (2016–17 South America floods)	2016/17	113	1 227 784	Not available

Sources: INDECI, 2017; EM-DAT, 2017.

The estimated annual average loss from disasters is USD 4 billion, with the probable maximum loss for 100-year and 500-year return periods estimated at USD 22.3 billion and USD 52.6 billion, respectively (PreventionWeb, 2017). For a major (1 000-year return period) earthquake hitting the Lima and Callao regions in Peru (with an annual exceedance probability of 0.1%) losses for all private property and infrastructure are estimated to be over USD 72 billion (IADB, 2009).

Since 2011, structural investments and measures for risk reduction have been registered within the Budgetary Programme 0068 for Vulnerability Reduction and Emergency Response to Disasters. Through this budgetary programme, USD 2.49 billion has been invested between 2012 and 2016, which corresponds to an approximate annual total of USD 498 million (MEF, 2017c).

Ex ante disaster risk management budget in Peru from 2012 to 2016 (million USD)

	2012	2013	2014	2015	2016	Total
National government	44.5	122.7	312.2	467.5	274.0	1220.9
Regional government	24.7	81.9	120.0	226.8	147.8	601.2
Local government	21.1	57.2	164.2	257.3	169.0	668.7
Total per year	90.2	261.8	596.4	951.6	590.8	2,490.8

Source: MEF, 2017c.

The Budgetary Programme 0068 is a results-based budget programme focused on preparedness and prevention measures for disaster risk management. Ex post disaster risk management spending is currently not reported through a specific results-based budget line, but introducing such a budget line is being considered. The Budgetary Programme 0068 is financed mostly by ordinary budget, but may receive funding from other sources. The majority of funding from the programme is used for ex ante disaster risk management, but funding may also be redirected towards emergency response and disaster management once

a disaster has occurred. Central funding is complemented by subnational funding. In addition to the funding available via the Budgetary Programme 0068, the Fund for Interventions to Face Natural Disasters (Fondo para Intervenciones ante la Ocurrencia de Desastres Naturales, FONDES) finances both ex ante and ex post disaster risk management measures. In addition to emergency relief, FONDES may be used to support the implementation of recovery and rehabilitation measures. The competition-based Promotion Fund for Regional and Local Public Investment (Fondo de Promoción a la Inversión Pública Regional y Local, FONIPREL) may also be used to fund disaster risk management activities.

Responsibility for managing the contingency reserve lies with the National Civil Defence Institute (Instituto Nacional de Defensa Civil, INDECI). The Ministry of Finance, co-ordinating with INDECI, is responsible for transferring resources to public entities at national, regional and local level. Use of the contingency reserve is fully disclosed, operation by operation, in the quarterly financial evaluation of budget execution.[1]

From 2003 to 2016, the contingency reserve allocated USD 178 million to disaster recovery, an average of USD 12 million per year. The Budget Law of 2016 allocated a USD 917 million transfer (0.5% of GDP) in additional funding to the contingency reserve for the exclusive purpose of funding recovery in response to the El Niño event; however, Law No. 30458 allocated only USD 91 million for the FONDES fund. During the 2003-15 period, support for populations affected by emergencies amounted to USD 62 million – or an average of USD 5 million per year.

Peru has another dedicated fund for ex post financing, called the Fiscal Stabilisation Fund (FSF). The Law to Foster Fiscal Responsibility and Transparency (No. 30099) authorises the use of resources from the FSF in major national emergencies that can affect Peru's fiscal stability, such as a disaster. The Ministry of Finance has had access to public balance statements of the FSF since 2006. From 2006 to 2016, resources from this fund were not withdrawn for disaster purposes. At the end of 2016, the fund's resources were at USD 8 258 million, but they have previously exceeded USD 9 billion. In 2016 a decision was made to allocate amounts in excess of 4% of GDP to a newly created infrastructure public-private partnership (PPP) fund.

In 2016 Law No. 30458 created another contingency fund earmarked for disasters: the aforementioned FONDES, which allows resources to be transferred to the three levels of government with the purpose of strengthening risk reduction, preparedness and recovery. The law allocated USD 91 million to create the fund; in 2017 the regular budget allocated another USD 15 million; and the Emergency Decree No. 004-2017 added USD 400 million to respond to the El Niño costero events that affected Peru from November 2016 to May 2017.

In April 2017, the Ministry of Finance published a report to update its macroeconomic projections, taking account of the El Niño costero events that had been affecting Peru since November 2016. The update projects an increase in public spending of 3.2% of GDP (USD 6.4 billion) for the period 2017 to 2021.[2] Resources are managed by the recently created Reconstruction with Changes Authority (Autoridad para la Reconstrucción con Cambios).

Peru has expanded its financial protection against disasters beyond budgetary resources, contingency reserves and dedicated funds. Since 2010, Peru has been accumulating contingent credit lines. The main purpose of these credit lines is to provide liquidity in the event of a disaster, and so ensure that Peru has enough resources at hand to respond appropriately. In 2016, Peru had contingent credit lines for a total of USD 4 billion. From

this balance, USD 1.2 billion is dedicated exclusively to disasters and another USD 2.8 billion is multi-purpose, meaning that could also be used for disaster response. Therefore, a total of about USD 4 billion is available to provide liquidity for post-disaster assistance. These credit lines have not yet been used for emergency events, but the El Niño costero event will likely require funding from them.

Peru's contingent credit lines

Lending institution/ issue date/ loan type	Loan amount (million USD)	Expiration
Inter-American Development (IDB) 2015 - Catastrophe Deferred Drawdown Option (CAT DDO)	300	2018
World Bank 2016 – human capital (DDO)	1 250	2019
World Bank 2016 – fiscal risk (DDO)	1 250	2019
World Bank 2010 – risk management (CAT DDO)	100	2016
CAF–Development Bank of Latin America 2013 – natural disasters	300	2016
IDB 2013 – natural disaster emergencies	300	2019
Japan International Cooperation Agency (JICA) 2014 – natural disasters	100	2017
World Bank 2015 – risk management (CAT DDO)	400	2018
TOTAL	4 000	

Source: MEF, 2016b.

Managing disaster-related contingent liabilities

Identification of disaster-related contingent liabilities

Identification of disaster-related contingent liabilities requires the documentation of both explicit and, to the extent possible, implicit liabilities. To identify explicit contingent liabilities arising from disasters, it is necessary to understand Peru's legal and policy frameworks that determine the government's obligations to shoulder the costs caused by the disasters.

Explicit contingent liabilities

Explicit contingent liabilities arise from legal commitments by both central and regional governments to provide disaster assistance. The table below shows that in Peru, laws do not explicitly articulate the responsibility of the central government to finance post-disaster response and recovery.

Explicit central government obligations for post-disaster financial assistance in Peru

Commitment to finance…	Yes	No
… post-disaster response and recovery		×
… a share of the costs incurred by subnational governments for post-disaster response and recovery		×
… reconstruction and maintenance of central government-owned public assets		×
… rehabilitation and reconstruction of private assets		×
… other expenses incurred by subnational governments (e.g. payments to businesses or individuals)		×
…government guarantees for disaster losses incurred by public corporations and public-private partnerships		×

Source: OECD Survey.

There is a robust legal framework for disaster risk management in Peru, including specific measures and assignment of responsibility for financial management, together with strategies to be implemented at various levels. However, this framework does not provide

explicit public obligations for post-disaster financial assistance, apart from giving the Ministry of Economy and Finance (Ministero de Economía y Finanzas, MEF) the role of designing a financial protection strategy and the right to contract ex ante financing (such as contingent credit facilities) in preparation for possible post-disaster expenses. There is no specific mention of cost-sharing arrangements between central and subnational governments, nor any specific legal responsibility for central government to provide funding in support of subnational measures related to the management of disasters. Nor is the central government legally responsible for the reconstruction of publicly or privately owned assets. Finally, the government does not provide guarantees for disaster losses incurred by public corporations and PPPs. Instead, each PPP contract specifies its own provisions for responding to disasters. In some cases this means that insurance is purchased, while in others a reserve is created or the state acts as a grantor to cover the costs caused by disaster-related damages. When the state acts as grantor, contracts may also specify financial guarantees by the MEF in support of a payment to be made.

Implicit contingent liabilities

Disaster-related contingent liabilities are understood as implicit liabilities when they are not determined by a law or a contractual rule. In this case, the public resources provided in the aftermath of a disaster are based on a moral commitment by the government.

Peru's repeated and significant commitment to provide disaster assistance in the past is based on moral commitment and political will rather than a legal obligation. Past expenditures by the central government in the aftermath of disasters reveal a number of implicit liabilities.

The national government has provided financial support to the affected population during emergencies; has assumed the rehabilitation and reconstruction costs of public infrastructure and services; and has compensated the poorest population groups for the loss of private houses. For example, after the Pisco earthquake in 2007 the government granted subsidies to support affected families to rebuild their houses. In response to the 2016-17 floods caused by the El Niño costero event, the government also took action with several emergency decrees that included measures and funding for the following:

- Allowing national, regional and local governments to redirect their budgets to finance emergency activities;
- Providing cash transfers to each local government in emergency areas;
- Expanding grants to protect vulnerable houses exposed to seismic risk;
- Providing transfers to regional governments to finance maintenance activities in hospitals located in emergency areas;
- Authorising the housing ministry to deliver temporary housing solutions to citizens in disaster-affected areas;
- Granting assistance to affected families with collapsed houses.

All emergency decrees have a limited time of validity, typically less than a year after approval (MEF, 2017a).

Estimation of insurance payouts

Although insurance of all public assets (national, regional and local) is compulsory in Peru, the regulations state that compliance may be subject to an entity's priorities and budget

availability (World Bank, 2016).[3] The government of Peru does not regularly estimate the size of insurance payouts in case of a disaster; but in 2014, at the request of the Ministry of Finance, the World Bank undertook a first preliminary analysis of public assets' insurance for some institutions of the government. It found that not all of the assets reviewed were insured, and that those entities that had taken out insurance had done so on their own initiative due to the lack of compulsory "corporate insurance" procedures. The analysis also identified several cases in which finding a company to insure these public assets had been difficult.

Quantification of disaster-related contingent liabilities

The government of Peru has relied on modelling disaster losses and damages for the purpose of estimating disaster-related contingent liabilities. The Ministry of Finance, together with the Inter-American Development Bank (IDB), developed a national seismic profile in 2014. The results of the study showed that the value of state assets exposed to seismic risk was USD 69 billion. The maximum probable loss for a 1000-year event was USD 1.1 billion for public assets (IDB, 2015).

The government does not conduct an inventory of disaster-related contingent liabilities on a regular basis. However, Peru has produced relevant information to quantify disaster-related contingent liabilities, such as the following:

1. Historical data on government expenditures
2. Expenditure reported from a general annual budget contingency appropriation
3. Expenditure reported from a dedicated disaster contingency appropriation
4. Expenditure by the emergency management authority

Types of information from previous events available to calculate disaster-related contingent liabilities in Peru

Type of disaster-related contingent liability	What gets recorded
Relief spending	Expenditure by central governments for emergency and relief purposes; post-disaster housing subsidies
Spending for the reconstruction of damaged public infrastructure and assets	Restoration expenditure for affected central government-owned assets
Spending on increased social transfers due to a post-disaster economic slowdown	Expenditures by function (health, education, etc.)
Expenditures due to guarantees issued to public or private entities suffering disaster losses	Expenditure from public institutions to disburse non-financial guarantees when contract provisions are triggered (applicable only in the case of PPPs)
Post-disaster payments to subnational governments	Payments made by the MEF to regional and local governments when their capacity is exceeded
Reduced tax collections	Not included
Disrupted operations of public corporations	Not included
Disrupted operations of private corporations	Not included
Deterioration in the terms at which the government can in the short term refinance public debt or raise additional debt	Not included

Source: OECD survey response.

Established by Law No. 29664, INDECI is responsible for identifying and assessing risks to public infrastructure, while the National Centre for Risk Estimation, Prevention and Reduction (CENEPRED) is responsible for gathering information on the vulnerability of

public assets, which includes the estimation, prevention and reduction of risks. Peru has developed a spatial information system[4] that allows identification of hazards and vulnerabilities by regions as well as identification of evacuation routes. The system also features a structural seismic vulnerability study of Lima hospitals. However, it does not provide information related to the value of properties. Concerning past impacts of disasters on public assets, Peru does not record specific information on the costs of asset rehabilitation and reconstruction following a disaster. There information on general public asset spending on rehabilitation and reconstruction, but this does not specify whether the activities were undertaken in the aftermath of a disaster or not.

Although state-owned enterprises may be another source of potential disaster-related contingent liabilities for the central government, the central government is not legally obliged to assume such costs. Where assistance may be necessary, the responsibility is at the subnational government level.

Estimating the fiscal impacts of disaster-related contingent liabilities and integrating them into overall fiscal forecasting

The Ministry of Finance does not have a central unit responsible for managing fiscal risks in relation to a disaster event. Several directorates have responsibilities related to risk management functions: the Risk Management Directorate, the General Directorate of Macroeconomic Policy and Fiscal Decentralisation, the General Directorate of Public Investment and the General Directorate of Public Budget. Peru also does not have a global strategy for managing fiscal risks, although fiscal risk management is included in macro fiscal policy guidelines; these encourage holistic analysis of fiscal risks to foster holistic management of overall fiscal risks, with the goal of improving public asset and liability management.

According to the Law to Foster Fiscal Responsibility and Transparency (No. 30099 – Article 18), the Ministry of Finance is responsible for publishing Multiannual Macroeconomic Framework (MMF) reports, which include macroeconomic projections and assumptions for a four-year period (the published year and the next three). Projections are reviewed by the central bank and the document is published twice a year (April and October). Information on the long-term sustainability of fiscal policy is limited to analysis of public debt trends (IMF, 2015).

The only reference in MMF reports to contingent liabilities arising from disasters appeared in the 2016-18 editions. The government analysed the impact of a severe El Niño episode (similar to the 1997/98 event) in fiscal projections through a probabilistic scenario analysis based on historical data. The analysis suggests the debt and deficit would increase slightly compared to the baseline.

The scenario included an increase in public spending of 1% of GDP to finance prevention and reconstruction plans for public infrastructure and services, in addition to regular use of the contingency reserve resources. Taking into account the increase in spending combined with the reduction in fiscal revenues, the projected fiscal deficit would be between 1% and 1.5% of GDP.

The law also requires the publication of a report assessing government's explicit expected contingent liabilities. In June 2015, the authorities published the first report on explicit contingent liabilities of the non-financial public sector, although this does not examine disaster-related contingent liabilities. In 2016, a special mention of disaster-related contingent liabilities was introduced into the report.

Implementation arrangements for providing post-disaster financial assistance

In 2011, Law No. 29664 created the National Disaster Risk Management System (SINAGERD), which provides Peru with the legal framework for implementing comprehensive disaster risk management by all public entities at all levels of government (national, regional and local). The subsidiarity principle contained in the law places the decision-making level as close to the population as possible. Regional and local governments are thus responsible for implementing disaster risk management processes, including assessment, prevention, reduction, emergency response, rehabilitation and reconstruction. The national government will intervene only when the amount of assistance required exceeds the funding capacities of regional and local governments.[5]

Each year in the budget formulation process, regional and local governments prioritise the allocation of resources to provide direct and immediate support to the population affected, and to launch action to quickly recover interrupted basic services as well as rehabilitate public infrastructure. Based on the subsidiarity principle, when the emergency needs exceed the response capacity of sub-national governments, the Ministry of Finance evaluates and identifies the most adequate and cost-efficient tools to obtain the complementary financial capacity at national level required to respond properly to the emergency and reconstruction phases.

The National Disaster Risk Management Council[6] is the authority in charge of political decision-making in the aftermath of disasters, but it did not convene for the 2015 El Niño event, or during the 2017 El Niño costero event. Within the council, the president of the republic and the Presidency of the Ministries Council work with the INDECI to lead the emergency response. The Ministry of Economy and Finance is responsible for implementing the strategy for financial protection against disasters.

In order to assess the gap between capacity and needs, INDECI developed a national mechanism to evaluate losses and needs.[7] Based on this mechanism, governments at national, regional and local level report losses and needs and are able to assess the gaps in capacity. The mechanism identifies and registers qualitative and quantitative information regarding the extension, intensity and location of damages.

During an emergency, accounting guidelines for national, regional and local budgets are published to ensure that the emergency expenses are properly recorded in the Financial Management Integrated System (SIAF). The government budget office must request the required budget codes for the disaster-related activity from the General Directorate of Public Budget at the Ministry of Economy and Finance. Once the government has this information, expenses can begin to be charged to the activity.

Mitigating disaster-related contingent liabilities and financing residual risks

In 2016, the Ministry of Economy and Finance published the financial protection strategy it had designed and been implementing since 2012, with six priority lines of action for evaluating, reducing and managing disaster-related fiscal risks, as follows:

1. Identification, quantification and assessment of the fiscal risk of disasters associated with natural hazards
2. Formulation of components for developing and implementing tools for risk retention and transfer
3. Establishment of guidelines for the use of available funds in responding to major disasters

4. Promotion of the assessment, prevention, and reduction of disaster risk, as well as promotion of emergency preparedness through financial mechanisms within the results-based budget framework
5. Promotion of the development of a domestic catastrophe insurance market for responding to disasters associated with natural hazards
6. Co-ordination and promotion of the operational continuity of the state (MEF, 2016a).

Article 42 of the SINAGERD law on operational rules stipulates that the financial risk management strategy is organised around three lines of action: 1) risk assessment, prevention and reduction; 2) risk preparation, response and rehabilitation; and 3) reconstruction. In the preparation, response and rehabilitation process, resources are used from annual budgets of public entities (budgetary programmes), from the contingency reserve; those from the Fiscal Stabilisation Fund; those from contingent credit lines and from other sources. As of 2017, the priorities are no longer specified; instead, Article 42 now only clarifies the sources of financing (Supreme Decree No. 057-2017-PCM).

Peru has also developed permanent financial mechanisms for disaster risk reduction measures. In 2010, the Budgetary Programme 0068 for Vulnerability Reduction and Response to Disasters was created within the results-based budget framework. The purpose was to have a connecting disaster risk management policy among the various ministries of central government as well as subnational governments (regional and local). This tool can be used to assign resources for interventions aimed at reducing the population's vulnerability – thus allowing the government to identify, prioritise, and co-ordinate its action more efficiently.

In addition, disaster risk management has been incorporated into the design, formulation, and execution of public investment projects within the framework of the National Multi-year Programming System (Sistema Nacional de Programación Multianual y Gestión de Inversiones). The aim is to ensure the sustainability of public investment and reduce the cost of restoring services and rebuilding infrastructure following a disaster. The new public investment system "Invierte.pe" is expected to fully incorporate disaster risk management as well.

Furthermore, Supreme Decree No. 111-2012-PCM approved the National Policy on Disaster Risk Management as a mandatory policy for national government entities. Within the results-based budget framework, the ministries are expected to allocate more resources for ex ante risk reduction through Budgetary Programme 0068 and other mechanisms (municipal incentives and funds that promote the development of programme budgets), in order to reduce the possible medium- and long-term fiscal effect of disasters on the government.

Another example of Peru's promotion and implementation of disaster risk reduction policies is Law No. 30191, approved in 2014. Its purpose is to establish measures to assist national, regional and local government entities in preventing and mitigating disaster risk factors and in preparing to respond to disasters at the national level. This law led to the creation of the Protection Bond for Dwellings Vulnerable to Seismic Risks (Bono de Protección de Viviendas Vulnerables a los Riesgos Sísmicos), designed to reduce the vulnerability of homes in poverty-stricken areas through structural reinforcement.

Notes

[1] The contingency reserve consists of three elements: 1) a mandatory provision for unforeseeable events, such as natural disasters (1% of ordinary revenues); and two non-mandatory provisions for 2) payroll policy and 3) policy decisions under consideration but not finalised at the time of budget submission. The average overall reserve over the past five years was about 3.5% of initial total budget spending.

[2] In August 2016 Law No. 30499 was approved to establish the structural fiscal path of the non-financial public sector for 2017-21. For 2017, the deficit target was 2.5% of GDP.

[3] The relevant law is General Law of the National System for State Assets (No. 29151), approved by order No. 007-2008-VIVIENDA.

[4] Information about the system (called SIGRID, Sistema de Información para la Gestión del Riesgo de Desastres) is available at http://sigrid.cenepred.gob.pe/sigrid/.

[5] Peru classifies emergencies and disaster damages in five levels. Levels 1, 2, and 3 are types of disaster events that sub-national governments can handle on their own. Levels 4 and 5 warrant national government intervention. At these levels, the Ministry of Finance in co-ordination with INDECI intervenes to supply central government resources. Level 5 refers to a major event of catastrophic proportions that exceeds Peru's response capacity and requires the declaration of a state of national emergency, signalling that international aid might be needed.

[6] The council is formed by the president, the Presidency of the Ministries Council, and the Ministries of Finance, Defence, Education, Security, Environment, Agriculture, Transport and Housing. The president has the power to call other ministries as well as public and private entities when needed.

[7] INDECI, "Guide for Assessing Damages and Needs in Peru", http://www.indeci.gob.pe/objetos/secciones/MTc=/MzI2/lista/OTYx/201705101716401.pdf.

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OECD PUBLISHING, 2, rue André-Pascal, 75775 PARIS CEDEX 16
ISBN 978-92-64-53700-2 – 2019

Fiscal Resilience to Natural Disasters

LESSONS FROM COUNTRY EXPERIENCES

Natural disasters continue to cause widespread damage and losses, with fast growing economies particularly exposed. Governments often shoulder a significant share of the costs of disaster recovery and reconstruction. This is true in OECD countries and even more so in developing economies, where private insurance markets are not as well developed. The fiscal impact of disasters on a government's budget can be sizeable. Expenditures for the government arise from both explicit and implicit commitments to compensate for disaster losses.
This report presents the results of a study that compares country practices in the management of the financial implications of disasters on government finances for a set of OECD member and partner countries particularly exposed to natural hazards.

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