WORLD BANK GROUP

Financial Protection for Public Assets

A PRACTITIONER'S GUIDE FOR PUBLIC OFFICIALS

Cover image: Roland Marte/Pixabay

Financial Protection for Public Assets

A PRACTITIONER'S GUIDE FOR PUBLIC OFFICIALS

Developed by

WORLD BANK GROUP

In support of

SEADRIF
SOUTH EAST ASIA
DISASTER RISK INSURANCE FACILITY

Telephone: 202-473-1000
Internet: www.worldbank.org

Table of Contents

Note: Return to Table of Contents from anywhere in the document

Acknowledgments

This guide is aimed as resource for government practitioners seeking to develop and implement a financial protection program on public assets. It builds on materials developed in support of discussions on public asset insurance under the Southeast Asia Disaster Risk Insurance Facility (SEADRIF) platform. Further, it draws on lessons learned in preparing and implementing public asset risk financing and insurance solutions across advanced and emerging economies in Asia.

The guide has been prepared by a team of the Crisis and Disaster Risk Finance unit in the World Bank Group's Finance, Competitiveness, and Innovation Global Practice. The team was led by Benedikt Signer (Program Coordinator) with lead authors Rob Antich, Greg Fowler, Lit Ping Low, and David Middleton. The guide has further benefitted from a range of contributing authors who contributed their time and insights. It was prepared under the overall guidance of Olivier Mahul (Practice Manager).

The lead authors of the guide bring long professional experience in the public and private sector.

Rob Antich	Rob Antich is a specialist in sustainable governance, and formerly managed Comcover, the Australian Government's general insurance fund, which provides risk and claims management services to over 160 Australian Government agencies, insures over $80bn in assets and handles over 2000 new claims each year.
Greg Fowler	Greg Fowler was formerly the Senior Commercial Lead for Insurance in the Ministry of Business, Innovation and Employment in New Zealand, and led the development and implementation of an All of Government risk financing solution for the New Zealand government.
Lit Ping Low	Lit Ping Low is a policy and finance economist on climate change and disaster risk and resilience. She has advised governments and organisations in Asia, Europe and the US on climate change and disaster risk assessment, management and financing.

David Middleton	David Middleton is an insurance consultant, having spent over 40 years in the industry, including 17 as the CEO of the New Zealand Earthquake Commission. David has worked in the underwriting, claims, insurance broking and reinsurance broking sectors of the industry.
Benedikt Signer	Benedikt Signer has supported over 25 countries in implementing financial risk management solutions to help respond to climate and disaster shocks. He co-led the design and implementation of the Global Risk Financing Facility and leads World Bank support to the Southeast Asia Disaster Risk Insurance Facility (SEADRIF), Asia's first joint regional risk financing initiative.

Contributing authors to the guide include:

- **James Allchorne**, Underwriter of Global Property and Energy, Hiscox London Market (Chapter 3)
- **Antoine Bavandi**, Crisis and Disaster Risk Finance, The World Bank (Chapter 8)
- **Julie Dela Cruz**, Director, Arcadis (Chapter 8)
- **Steven Eglinton**, FBCS, FBCart.S, MIoD, Director, BimEnable & GeoEnable (Chapter 4)
- **Matthew Foote,** Senior Director, Willis Tower Watson (Chapters 1, 3 and 8)
- **Hideaki Hamada**, Disaster Risk Financing and Insurance Program, The World Bank (Chapter 1)
- **Kaavya**, **Ashok Krishna**, Disaster Risk Financing and Insurance Program, The World Bank (Chapter 1)
- **Giuseppe Molinario**, Global Facility for Disaster Reduction and Recovery, The World Bank (Chapter 8)
- **John Plevin**, Disaster Risk Financing and Insurance Program, The World Bank (Chapter 6)
- **Anirudh Rao**, Global Earthquake Model Foundation (Chapter 8)
- **Nicola Ranger**, Disaster Risk Financing and Insurance Program, The World Bank (Chapters 1, 3 and 8)
- **David Simmons**, Head, Disaster Risk Finance, Climate and Resilience Hub, Willis Tower Watson (Chapter 8)
- **Sally Sfeir-Tait**, Chief Executive Officer, RegulAItion (Chapter 8)

The team gratefully acknowledges inputs and comments from peer reviewers from the World Bank including Jose Angel Villalobos, Abigail Baca and Fiona Elizabeth Stewart; and from practitioners in several countries that the World Bank has supported including Maria Palanca, Former Head of Insurance, GSIS, Philippines, and Djoko Trenggono, Former Director of Operations, AXA Indonesia. Further review and comments from the insurance industry helped ensure the report reflects current best market practice. This review was coordinated through the Insurance Development Forum (IDF), coordinated by Ekhosuehi Iyahen, the Secretary General of the IDF. Valuable feedback was received from the following reviewers: Karina Whalley, AXA; Claudia Thyme, AXA XL; Ruth Lux, Guy Carpenter; Michael Roth and Ralph Weiss, Munich Re; Eric LeMercier and Stève Udriot, SCOR; and Matthew Foote, Willis Towers Watson.

The production of the guide benefitted from the support of colleagues from the Disaster Risk Financing and Insurance Program, The World Bank, including Sonal Chinchwadkar, Kaavya Ashok Krishna, Penny Li, Bhavin Thakrar, and from editorial services from Publications Professionals LLC. Design and layout is by Svenja Greenwood.

The World Bank's **Disaster Risk Financing and Insurance Program** (DRFIP) helps developing countries manage the potentially high cost from disasters and climate shocks. DRFIP provides analytical and advisory services, convening services, and financial services to over 60 countries worldwide to support the development and implementation of comprehensive financial protection strategies against climate and disaster risks.

For information and publications on disaster risk finance: www.financialprotectionforum.org

The **Southeast Asia Disaster Risk Insurance Facility** (SEADRIF) is a regional platform that provides participating nations with advisory and financial services to increase preparedness, resilience and cooperation in response to climate and disaster risks. By increasing pre-disaster planning and post-disaster relief and reconstruction funding, SEADRIF protects people and their livelihoods, and contributes to ongoing economic development and poverty reduction.

For information on SEADRIF: www.SEADRIF.org

Abbreviations and Acronyms

ACT	Australian Capital Territory
ACV	actual cash value
ACTIA	Australian Capital Territory Insurance Authority
AoG	all of government
APEC	Asia-Pacific Economic Cooperation
ARC	African Risk Capacity
ARF	all-of-government risk financing
ARP	(UK) Adaptation Reporting Power
ASEAN	Association of Southeast Asian Nations
BIM	building information modeling
CARILEC	Caribbean Electric Utility Services Corporation
CCRI	Coalition for Climate Resilient Investment
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CCRIF SPC	Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company
CDAP	CARILEC Disaster Assistance Program
CMIP6	Coupled Model Intercomparison Project
COPE	construction, occupancy, protection, and exposure
CRTF	Catastrophe Reserve Trust Fund
D-NAR	Digital National Asset Register
DPMs	damage proxy maps
DRF	disaster risk financing
EMAC	Emergency Management Assistance
EO	earth observation
EQC	(New Zealand) Earthquake Commission
e-PIMS	Electronic Property Information Mapping Service
FONDEN	National Fund for Natural Disasters
GED4ALL	Global exposure database for all
GIS	geographical information system
ICT	information and communication technology
IoT	Internet of Things
IPWEA NZ	Institute of Public Works Engineering Australasia, New Zealand
ISO	International Standards Organization
IT	information technology
MBIE	Ministry of Business Innovation and Employment
MOF	Ministry of Finance
NAICS	North American Industry Classification System
NAMS	New Zealand Asset Management Support
NRE	National Response Event

NSW	New South Wales
OECD	Organisation for Economic Co-operation and Development
PAR	public asset register
PCRIF	Pacific Catastrophe Risk Insurance Company
PML	probable maximum loss
RADAR	radio detection and ranging
RAMP-UP	Resource Allocation Management Program for Utility Personnel
RFP	request for proposal
RMAGs	regional mutual assistance groups
RPA	Risk Protection Arrangement
SAR	synthetic-aperture radar
SEADRIF	Southeast Asia Disaster Risk Insurance Facility
SIC	Standard Industry Classification
SINAPROC	Sistema Nacional de Protección Civil, Mexico
SIR	self-insured retention
SMART	specific, measurable, achievable, relevant, and timebound
SoC	Statement of Cover
SPC	Segregated Portfolio Company
TCFD	Task Force on Climate-related Financial Disclosures
TCOR	total cost of risk
TIV	total insured value
TWG	The Writing Group
TWIA	Texas Windstorm Insurance Association
UNITAR	United Nations Institute for Training and Research
VMIA	Victorian Managed Insurance Authority
WCIA	Washington Cities Insurance Authority

Overview

O.1.

The Need for Financial Protection for Public Assets

Disasters caused by natural hazards can lead to widespread damage and losses to infrastructure assets and disrupt the provision of their services. These disruptions impede the smooth functioning of economies and societies, and are estimated to cost households and firms more than US$400 billion per year across low- and middle-income countries.[1] Damages to power generation and distribution and to transport infrastructure alone cost about US$18 billion a year in low- and middle-income countries.[2] In addition to physical damages of the infrastructure assets, the disruption to infrastructure services and public services—such as energy, water, transport, health, and education—lead to greater knock-on impacts to the broader economy and livelihoods. Those impacts are expected to increase as a result of climate change.

Governments often bear the brunt of the costs of disasters.[3] There are a number of direct and indirect ways that disasters impact on public assets affect governments. Many infrastructure and assets are publicly owned and governments are responsible for their operation. Governments often assume a significant proportion of the recovery and reconstruction costs of infrastructure, particularly for uninsured publicly owned assets— one type of contingent liabilities for the government (see Box O.1). Additionally, for the same disaster event, governments face reduced revenues caused by disruption of economic activities including from their own revenue-generating public assets. This can be called consequential damages or consequential losses. The revenue reduction can create a significantly adverse fiscal impact. Securing funding for the reconstruction of damaged assets post-disaster to enable service recovery is therefore of great importance to governments. Disasters often have disproportionate impacts on the poor and most vulnerable in terms of loss of property and income, leading to the need for further government support.

1 Stephane Hallegatte, Jun Rentschler, and Julie Rozenberg, "Lifelines: The Resilient Infrastructure Opportunity," *Sustainable Infrastructure* (Washington, DC: World Bank, 2019). See https://openknowledge.worldbank.org/handle/10986/31805 License: CC BY 3.0 IGO.
2 Hallegatte, Rentschler, and Rozenberg. "Lifelines."
3 Organisation for Economic Co-operation and Development (OECD), *Disaster Risk Assessment and Risk Financing. A G20 / OECD Methodological Framework*, (Paris: OECD, 2012).

Financial protection strategies can help countries to manage the impact on infrastructure of disasters and to protect service delivery to the population. The objective should be for rapid, reliable, and cost-efficient finance to be available so it can speed recovery and reconstruction and for support plans and systems that will quickly restore service delivery to the population. This approach becomes increasingly important in a world of growing risks that are associated with climate change and strained finances.

Countries are increasingly aware of the need to strengthen the financial protection of public assets. *Public asset* is a term used to describe assets across a wider range of services and functions of government, including education, administration, and health. Often, this term expands to include critical infrastructure and other assets owned through public-private partnerships. In many decision-making contexts, the definition of public assets and critical infrastructure are used interchangeably. See Annex 1 for further discussion on this. Many countries, particularly those in Southeast Asia, have made significant advances in recent years putting in place the policies and measures towards improved financial protection of public assets. This agenda is a key priority under the Southeast Asia Disaster Risk Insurance Facility (SEADRIF), which provides both technical support and financial instruments to its members (see Box O.2.).

Box O.1.

Contingent Liabilities from Disasters

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. Explicit disaster-related contingent liabilities are payment obligations that are based on government contracts, laws, or clear policy commitments that need to be met in the event of a disaster. Implicit contingent liabilities that are disaster-related are those expenditures that the government makes in response to a disaster without prior formal commitments. The expectation for such payments might arise from political or moral pressure to speed up recovery that will stimulate growth.

Box O.2.

The SEADRIF Public Asset Financial Protection Program

Financial protection of public assets was identified as a key priority by SEADRIF member countries, particularly support for policy development through analytical, advisory, and financial services. The Technical Working Group for a Public Asset Financial Protection Program (the TWG), which is co-chaired by Japan and the Philippines, is delivering a program of work to develop and appraise options for SEADRIF to provide joint financial solutions and a Technical Services Support Program for its members. The support program includes providing analytical and advisory services, training and knowledge sharing, and innovation. This guide is developed as part of the Technical Services Support Program, drawing on a set of knowledge series and webinars delivered in May – Nov 2020.

O.2.

Objectives and Structure of This Guide

The objective of this guide is to provide government officials with an understanding of the steps required to design, develop, implement, and maintain effective financial protection of public assets, particularly through risk transfer and insurance. This series will draw on case studies globally to illustrate the key issues commonly encountered when designing and implementing financial protection measures. The overall focus of the series is on the following key areas:

- **Why** should governments develop a financial protection strategy for public assets?
- **When** can insurance be a good option for the financial protection of public assets?
- **Who** are the key stakeholders (both external and internal) that play roles in each stage of the insurance development process?
- **What** are the most important step-by-step considerations involved in developing a strategy for public asset insurance?
- **How** can public officials work with and leverage the commercial insurance and reinsurance market participants to support public asset insurance?

This guide will focus on risk transfer solutions, primarily in the form of insurance, for public assets. Risk transfer solutions help governments reduce some of the financial burden for emergency, rehabilitation and reconstruction efforts and manage the timely reinstatement of services. The chapters will describe how insurance should be considered in the context of a wider disaster risk-financing strategy. They cover the main aspects for an end-to-end development of public asset financial protection and insurance. Each chapter, as shown in Figure O.1 and Table O.1, covers a theme related to the process, highlighting issues and considerations from the perspective of governmental officials and other stakeholders that are tasked with developing solutions.

Figure O.1.
Overview of the Knowledge Series

The chapters draw on and are intended to supplement information provided in a number of other guides and reports, prepared to support public asset insurance. In particular, the following are useful resources and are recommended for background reading:

- **2020: World Bank - Catastrophe Insurance Program for Public Assets—Operational Framework.** This technical contribution to the Asia-Pacific Economic Cooperation (APEC) finance ministers' process provides a broad overview of risk-financing mechanisms and instruments applied throughout the APEC region. It examines all the components of a financial protection strategy for public assets.
- **2019: Insurance Development Forum - Guide to Insuring Public Assets.** This guide outlines some of the main considerations in the use of insurance and reinsurance for the financial protection of public assets. The guide provides an overview of the general types and structures of insurance available for public asset coverage, as well as the processes of insurance and reinsurance applicable to public assets. It includes a high-level overview of key functions such as claims management. It also provides a summary of the relative differences between the two main applied types of insurance products: indemnities and parametric.
- **2016: LGNZ - Risk Financing in Local Government.** This guide for New Zealand's local governments provides comprehensive background to the concepts underlying the financial protection of public assets. It highlights the key concept of risk appetite, which underpins much of the strategic design of a risk-transfer program. It does so by defining the level of risk deemed appropriate among all stakeholders, while also addressing capacity and price questions. This arrangement leads to determining the level of self-insurance that is acceptable to risk owners as part of a strategic approach.

A growing number of organizations and initiatives are working to scale up the use of risk financing tools (including insurance), or act as knowledge platforms to disseminate information and resources. Some of these are noted in Table O.2 as sources for further information.

Table O.1.
Chapters and Descriptions

1.	
High-Level Implementation Roadmap	The chapter outlines the steps commonly required in the formation of a public asset financial protection program. The program is framed in four stages: design, development, implementation, and renewal. The chapter outlines key decisions and considerations for government officials.
2.	
Policy, Institutional, and Regulatory Requirements	This chapter focuses on the design stage, specifically the roles of policies, governance, institutions, and regulations in the establishment and operation of a public asset insurance program. It details the need for governments to outline their objectives and to build a consensus around priorities.
3.	
Information Requirements for Public Asset Disaster Risk Financing and Insurance	This chapter addresses the data requirements along the four stages for a public asset financial protection program. It includes an overview of approaches for assessing and quantifying asset exposure, use of catastrophe risk analytics, data about historical loss and damage, methods for risk-based pricing, and underwriting information requirements.
4.	
Public Asset Management	This chapter covers the wider aspects of public asset management and the role of insurance. It illustrates the key aspects of a public asset management program, including public asset registries. It also highlights key policy and business requirements for such systems and their data and functional needs.

5.

Using the Domestic and International Insurance Markets

This chapter outlines the various considerations for setting up an insurance program and for engaging with the insurance market. It covers the structures commonly used, and their advantages and disadvantages.

6.

Pooling and Mutual Options for Public Assets Insurance

This chapter includes a description of approaches, advantages, and disadvantages of pooling and mutualization of large-scale programs for public assets insurance. It will include case studies of existing programs around the world.

7.

Launching and Managing Insurance Programs

This chapter outlines the operational aspects of managing a large-scale program of public asset insurance. The chapter looks at the roles and responsibilities of governmental officials and stakeholders. It considers multiyear aspects, renewals, and claims management processes.

8.

Emerging Technologies for Public Asset Financial Protection

This chapter examines the use of technology such as systems analytics, market drivers and trends which may affect the future direction of financial protection solutions for public assets.

Table O.2.
Relevant organizations and initiatives with additional resources

Organization / initiative	Objective
Centre for Disaster Protection https://www.disasterprotection.org/	To support countries and the international system to manage risks – moving from reaction to readiness.
Coalition for Disaster Resilient Infrastructure https://www.cdri.world/	A partnership of national governments, UN agencies and programmes, multilateral development banks and financing mechanisms, the private sector, and knowledge institutions that aims to promote the resilience of new and existing infrastructure systems to climate and disaster risks in support of sustainable development.
Financial Protection Forum https://www.financialprotectionforum.org/	Global knowledge platform that curates knowledge and promotes best practices in Disaster Risk Finance (DRF) across countries, institutions, civil society and thought leaders who are engaged in climate and disaster risk management and financial protection strategies.
Geneva Association https://www.genevaassociation.org/	An international think tank of the insurance industry with research programmes on Climate Change and Emerging Environmental Topics, Health & Ageing, Socio-economic Resilience, New Technologies & Data, Cyber, Evolving Liability and Public Policy & Regulation.
Global Platform for Disaster Risk Reduction https://www.unisdr.org/conference/2019/globalplatform/home/	A biennial multi-stakeholder forum established by the UN General Assembly to review progress, share knowledge and discuss the latest developments and trends in reducing disaster risk.

Organization / initiative	Objective
Insurance Development Forum https://www.insdevforum.org/	To optimise and extend the use of insurance and its related risk management capabilities to build greater resilience and protection for people, communities, businesses, and public institutions that are vulnerable to disasters and their associated economic shocks.
START Network https://startnetwork.org/	To catalyse change in shifting humanitarian financing from a reactive to a proactive model, creating a more balanced system that shifts power and decision-making to those closest to the frontline and facilitating collective innovation to solve humanitarian problems locally and globally
Understanding Risk (UR) https://www.understandrisk.org/	UR is a global community of experts and practitioners with interest in the field of disaster risk identification, specifically risk assessment and risk communication.

1.

High-Level Implementation Roadmap

What You Will Learn

This chapter provides a summary of stages and steps, set out as a roadmap, required to form a public asset financial protection program that includes insurance or another risk transfer mechanism.

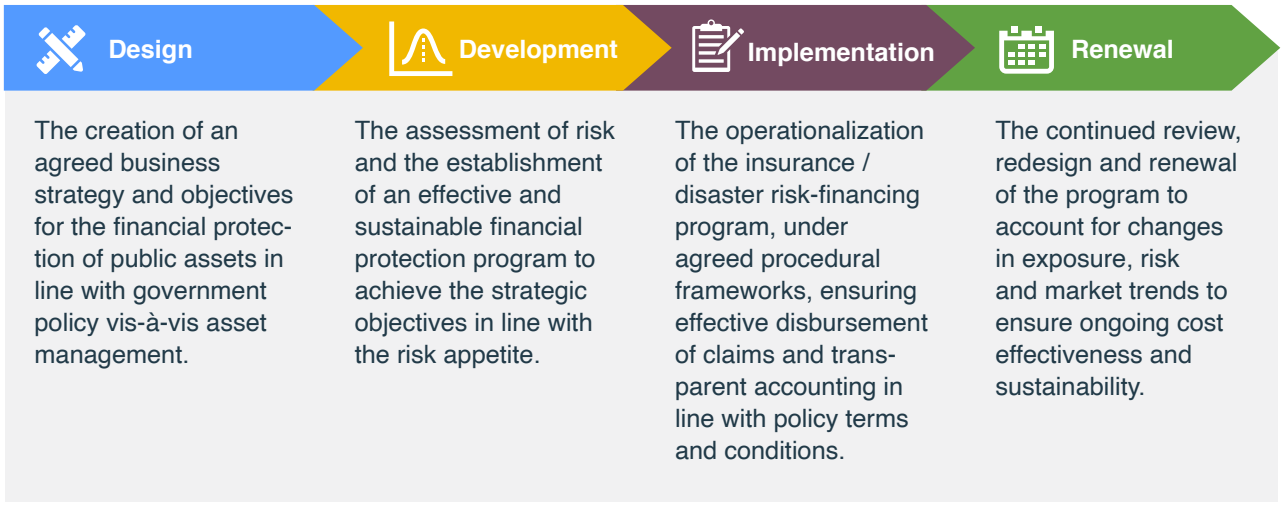
1.1.

Introduction

This first chapter provides a summary of key stages for government officials as they build their understanding of the steps needed to design, develop, implement, and renew effective financial protection programs about public assets, particularly through risk transfer and insurance.

This chapter has been structured to show an idealized approach from the start of a government's instituting a program of financial protection for public assets. Using this approach, governments can reconcile their current progress against each stage and can plan for next steps in the development of their programs. The steps are organized along four key stages (design, development, implementation, and renewal of a program) as shown in Figure 1.1 and Figure 1.2. Each government will approach public asset risk management in a different way and for different reasons. Many governments will have already made progress on some of the stages described herein.

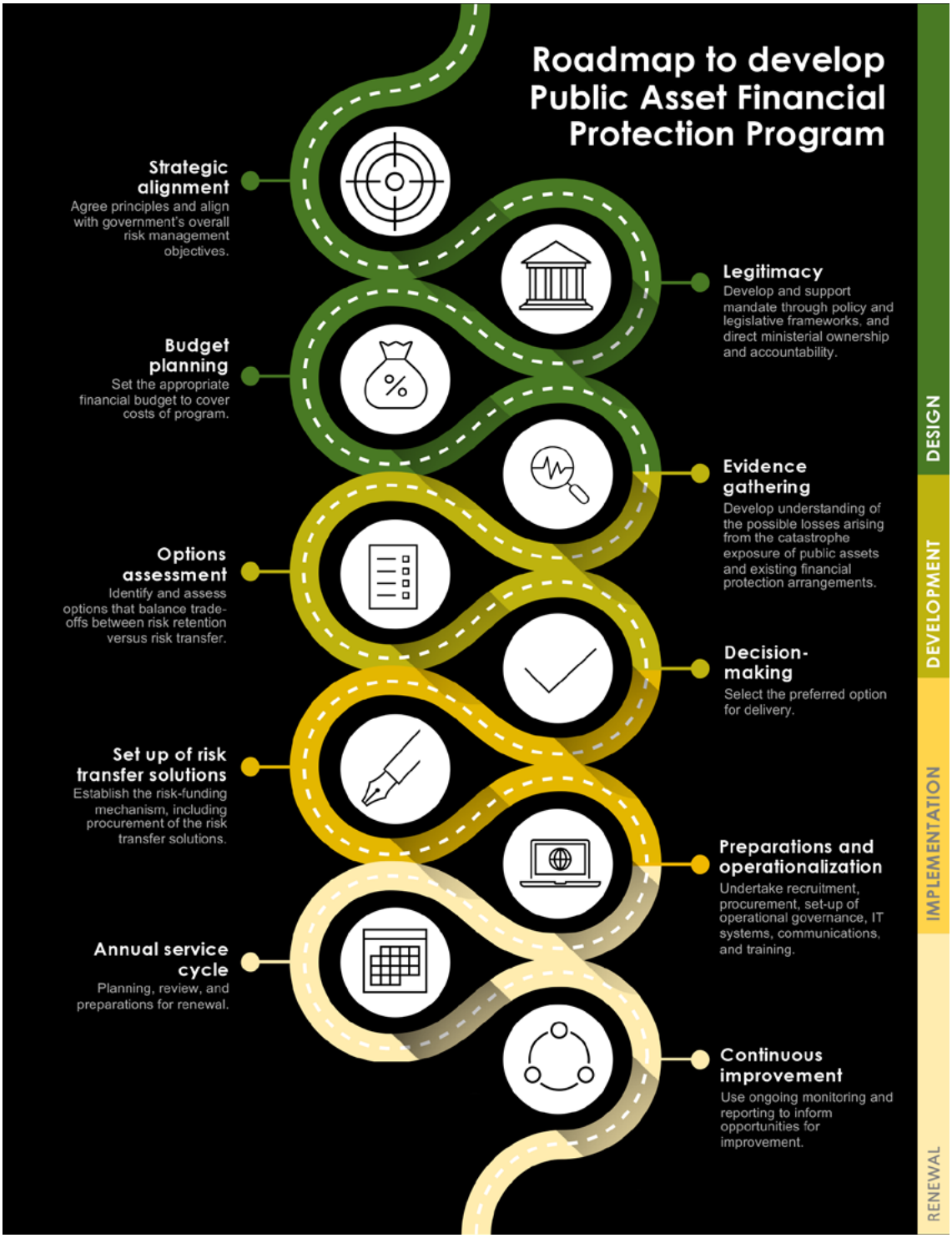
Figure 1.1.
Stages in Preparation and Implementation of Financial Protection Strategy



Source: World Bank staff.

Figure 1.2.

Public Asset Financial Protection Program Roadmap



A significant length of time is required to design and develop an effective insurance program and to make it operational. The successful development of insurance or other risk-transfer solutions requires a lead time to put in place the prerequisites of developing legislation, collating and analyzing data and information, allocate resources, and execute the risk transfer transaction. Careful planning is required at the earliest stages to ensure critical steps are undertaken in good time. If commercial insurance markets are to be used, all necessary regulatory, operational, and legal issues should be addressed. The risks to be transferred to the insurance markets need to be commercially acceptable for both the government and the insurance or reinsurance markets, which means early involvement of market players such as brokers, risk modelers or other advisors. The development of a fully functioning insurance program can span several years. An implementation plan can therefore be structured in stages, with a view of expanding or maturing the program over time.

1.2.

The Design Stage

Why Is This Stage Important?

Before a program of public assets financial protection is implemented, it must first have an established purpose that aligns with the government's common-good agendas, as well as have the authority to act and use public funds. Without those fundamental attributes, the development and implementation stages risk being challenged for legitimacy by various stakeholders with differing perspectives. Equally, by establishing a clear purpose, government officials can ensure that the roles and responsibilities of every stakeholder in each stage can be fully described and understood. (See chapter 2 for a more detailed description of key considerations.)

This stage sets the boundaries and scale for potential solutions, thereby assisting development teams to determine relevant and sustainable options. In particular, officials should fully define what the program is intended to protect. It may be that the key concerns

Figure 1.3.
Key Activities in the Design Stage

Components and Key Activities
Strategic Alignment
Agree about key principles.
Define intended benefits.
Legitimacy
Affirm mandate.
Develop a combined legislative and regulatory instrument.
Agree on an operational base.
Develop a strategic governance process.
Develop a review process.
Budget Planning
Establish core financial strategies.

are related to providing financial protection from large losses caused by extreme events (often termed *catastrophe* losses). Or there may be a need to provide compensation against more frequent losses from other causes, such as fires. If the program is to cover a range of asset types, agreement on objectives is even more critical to ensure clarity. The design and development stages of the program will be influenced by a collective view of its key objectives. (See Figure 1.3.)

Strategic Alignment

A public assets financial protection program should be founded on principles that (a) align with the government's strategic objectives, (b) reflect the risk management standards that the government wishes to create, and (c) set a consistent basis for options assessment and decision-making through the development, implementation, and renewal stages. As an example, a set of principles created for the New Zealand All-of-Government approach to the financial protection of public assets has been included in Box 1.1.

Having a good understanding of the intended benefits is also important. Benefits should be described using the specific, measurable, achievable, relevant, and timebound (SMART) approach. As key performance indicators, well-described benefits can help governments to track the progress of the program and to make timely interventions when required.

Legitimacy

A public assets financial protection program must also have a mandate that is embedded in legislation and regulation. A sound legislative basis can support a long-term approach even if governments change.

Management and administration of a program will require an operational base. Options include (a) creating a statutory authority dedicated to managing a program, (b) setting up a dedicated unit, or (c) nominating an existing business unit within an existing government entity (for example, Ministry of Finance). The decision about the type of entity and its composition should be guided by the following:

- Role of government agencies and other stakeholders in the governance and management of the vehicle
- Level of specialist expertise (such as insurance) required to provide an efficient administration
- Level of operational and administrative complexity that is acceptable to the government

Box 1.1.

New Zealand's All-of-Government Risk-Financing Actuarial Guiding Principles

1. **All of Government (AoG)**
   The primary objective of the all-of-government risk financing (ARF) is to achieve a better outcome for government as a whole.

2. **Customer Focus—Stability and Ease of Transition**
   The ARF solutions should maintain a focus on the agencies as customers. In the longer term, the solution should seek to reduce fluctuations in both the reserves and premium allocation to the extent possible. Any changes (for example, in response to emerging trends) should be communicated early.

3. **Risk Management and Data Improvement**
   The ARF will facilitate excellence in risk management. The operation of the ARF should provide incentives for agencies to manage risks. The ARF will provide a platform for a government to build and improve its knowledge and expertise over time.

4. **Insurable Risk Financing and Coordination**
   The ARF is a vehicle to pool, fund, and coordinate the management of insurable risks. The ARF is not an insurer. The ARF will coordinate the management of insurable risk on behalf of participating agencies.

5. **Long-Term Public Value**
   The ARF solution will facilitate reduced costs over the long term. In putting forward the case for change, the ARF have a preference for those solutions and paths that are expected to reduce costs over the long term and that are based on the actuarial modeling of risks, including in particular the impacts of low-frequency, high-severity scenarios such as large disasters and large claims.

6. **Equity**
   Operations of the ARF should be fair, and treatment of different participating agencies should be transparent and defensible from an equity perspective. Total contributions received for the ARF solution should reflect a reasonable contribution from each participating agency. This set of contributions should balance the agency's inherent risk where there is actuarial evidence to support it.

7. **Simplicity and Transparency**
   Simple approaches and models, where adequate, will be preferred over more complex ones. The ARF solution should be simple to explain. Participating agencies should be able to understand, both overall and for their perspective, how contributions are calculated and what the drivers of movements are from year-to-year.

8. **Prudence**
   Where there is uncertainty, the ARF should err on the side of caution. Actuarial analysis and modeling are subject to model and parameter error. The proposed solutions will have a preference to reflect risk and to err on the side of acceptable prudence.

Source: World Bank staff.

- Extent of financial segregation required from government accounts
- Level of independence or integration of the vehicle within existing public agencies

If the program involves the use of insurance products, the legislative basis will also include the consideration of legal contracts (that is, insurance *policies*) between the *insured* and *insurers*, as well as between the insured and *broker.* The procurement and compliance rules that affect all aspects of the insurance program must be carefully reviewed and determined as early in the process as possible, including the selection, as necessary, of intermediaries and insurers, the valuation of assets to be insured, and the budgeting and accounting rules for *premiums* and disbursement of insurance *claims* proceeds.

Financial and Budget Planning

Financial planning is about establishing rules and safeguards for the use of public funds, including the fiscal management of the costs of damaging events such as fires and disasters caused by natural hazards. Such considerations are not only restricted to the current fiscal period but also relevant for financial planning over a longer time horizon, for example making decisions on whether and how any unused or surplus public funds should be retained for potential future use. Separately public officials may need to commit specific high-level budget or a budget range to implement or manage the program of public asset financial protection, which is subject to refining as further details are gathered through the development stage. Key decisions that should be considered are as follows:

- How much will participants have to contribute in premiums? (contribution levels)
- How are surplus contributions accumulated over financial years? (accumulation levels)
- At what levels should accumulated funds be capped, relative to claims and costs? (funding ratios)
- Will the funds be formally separated from government accounts? (ringfencing)
- Will the funds be invested; if so, what will be the investment strategy? (investment of funds)

The setting of budgets for an insurance program is a key step in any strategic plan. Funds assigned to insurance costs can be fixed in advance and expended on the maximum cover available within the budget. Otherwise, budgets can be set after initial risk-transfer decisions have been made and can be based on premium

estimations for optimal *coverage*. In either case, all costs associated with the transaction, including premiums, taxes, administrative overheads, or third-party services (including brokers and loss adjusters), need to be included in the overall budget. The available insurance premium funds will determine the options available for coverage, including *retentions*, self-insurance, and cover exclusions. Prioritization of coverage may be undertaken in line with the objectives of the program and risk appetite (for example, choosing which assets to insure or how much *consequential damages insurance* to secure).

1.3.

The Development Stage

Why Is This Stage Important?

In this stage, as outlined in Figure 1.4, officials quantify and qualify the financial protection needed and identify the most effective and efficient means of protection. Throughout, they take a comprehensive, logical, and tried-and-tested approach as part of decision-making, including an options assessment. In practice, data gaps, political urgency, and other factors may mean that governments do not have the luxury to complete all the comprehensive steps listed within the development stage as described herein. Instead, they may need to proceed to the appropriate financial protection solutions more quickly. Even with limitations, governments can gather evidence and assess options to allow for continuous improvement and adapting of solutions over time.

Figure 1.4.
Key Activities in the Development Stage

Components and › Key Activities

Evidence Gathering

- › Confirm scope.
- › Collect data.
- › Conduct loss modeling.
- › Develop the funding gap equation.

Options Assessment

- › Conduct an assessment of drivers of change.
- › Assess the degree of risk retention versus risk transfer.
- › Define services, roles, and responsibilities.
- › Assess costs and contribution arrangements.

Decision-making and Authorization

- › Identify the preferred option of implementation.
- › Obtain the required sign-off and authorizations.

Evidence Gathering

Officials need to understand existing gaps in financial protection as they set priorities for a financial protection program for public assets. To assess this gap, they need to understand the possible losses arising from the exposure of public assets to damages from disasters caused by natural hazards, as well as how the potential losses compare to existing financial protection arrangements. The following information is required:

- **Detailed data about the location, value, and characteristics of assets (public assets database)**. The form and character of data should be suitable for insurance transactional purposes. See chapters 3 and 4 for a detailed description of data and information requirements related to various asset types and financial protection methods.
- **Access to loss and risk-modeling capabilities.** Models need to be developed to calculate the effects of disasters on the public asset base in the form of loss distribution (for single event and annual total) based on the probability (likelihood) of an event and severity of a natural hazard. Depending on existing capabilities, this modeling insight might come from government agencies (that can assess the effects of disasters), from commercial providers, or from historical damage and loss information.
- **Quantitative (ideally, probabilistic) assessment of the risk arising from the exposure of the assets to potential causes of damage.** If catastrophe risks are to be protected against, then sophisticated catastrophe models may be used.
- **Portfolio of current arrangements for financial protection of public assets.** Examples include contingent reserves, existing insurance arrangements, and secured post-event loan arrangements.
- **Quantitative comparison between existing funding capacity and the potential effects of disasters and other losses.** This comparison reveals the financial protection gap and is the starting point for assessing options, including a determination of what perils and assets should fall within the scope of the financial protection solution. Box 1.2 illustrates how to determine the financial protection gap for disaster damage.

Options Assessment

The development of options for managing the financial protection gap will focus on balancing the trade-offs between risk retention and risk transfer while accounting for internal and external influences. Table 1.1 outlines the key activities and considerations for the different types of assessments required.

Box 1.2.

Financial Protection Gap

The existing financial protection gap can be assessed through loss modeling to understand the value at risk compared to the current arrangements for financial protection.

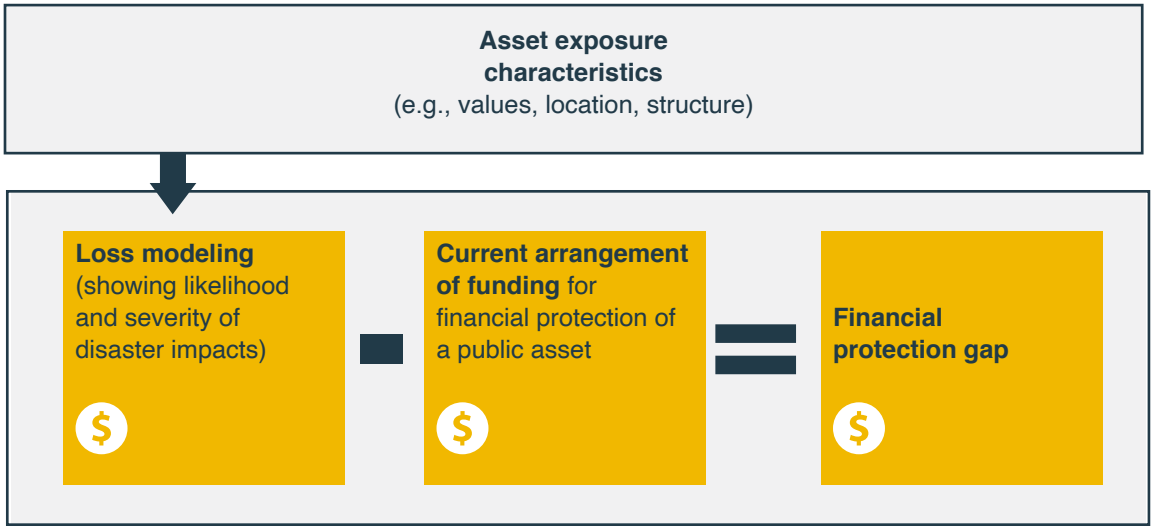


Table 1.1.
Activities and Key Considerations in Option Assessments

TYPE OF ASSESSMENT	ACTIVITIES AND CONSIDERATIONS
Assessment of Drivers for Change	Assess internal drivers, such as risk appetite, fiscal policy objectives, financial tolerance, broader risk context, and other government priorities. Assess external drivers, such as global financial conditions, shocks from earlier disaster events, and insurance market conditions. This assessment can be informed by insurance market engagement. Account for internal and external drivers that will lead to a better understanding of the opportunity cost and efficient use of capital across broader and potentially competing government priorities. Such accounting also helps the government decide how much of its budget it should retain to finance losses directly or to use as premium financing to secure insurance coverage under different loss-event scenarios.
Risk Retention versus Risk-Transfer Assessment	Develop options for optimizing the financial risk retained on government accounts with that transferred to the insurance market. The decisions will be unique to each situation depending on the influences. See Box 1.3.
Assessment of roles and responsibilities against different types of functions required	Consider the likely roles of key stakeholders, including the delivery of specific functions, for example, • What services or functions are required to manage, administer, and oversee the operational program? • Who should deliver those services, and what capabilities are essential (that is, what can be developed in house versus expertise that should be outsourced)? See Box 1.4. • What is the role of the risk-transfer market, including market operators such as brokers and insurers? • Will there be a requirement or a preference to include domestic markets, and what rules exist about state-owned insurers and reinsurers? • What is the role of procurement of services and insurance? Typical services considered in solutions for public assets financial protection include the following: • Governance and oversight functions • Insurance and reinsurance intermediary services • Insurer and reinsurer services • Loss adjustor services • Claims management services • Account management services • Actuarial services • Risk modeling services • Audit and compliance services

TYPE OF ASSESSMENT	ACTIVITIES AND CONSIDERATIONS
Cost Assessment	The previous assessments will enable a cost assessment of options through a total cost of risk (TCOR) approach and will take into account the following for each option: • **Estimated cost of retained losses.** Cost of losses retained over a predetermined period as per the risk-retention strategy (informed by loss modeling). • **Estimated cost of risk transfer.** The cost of risk-transfer fees and premiums over a predetermined period (accounting for prescribed terms and conditions of coverage). • **Estimated cost of administration.** The cost to maintain in-house services and contract outsourced services over a predetermined period. The TCOR approach can also include the cost of risk control, which is the cost of risk-management interventions to reduce likelihood and severity of loss event effects.
Cost Allocation and Contribution Assessment	After the cost estimates attached to options are accounted for, consideration needs to be given to how that cost will be allocated (that is, who will pay what proportion of the total cost). Will there be an element of centralized funding, and will there be the requirement for participating government agencies to contribute a fair and transparent share? Typical allocation approaches include the following: • **Solidarity, or unit-based, pricing.** A unit of exposure or operation is identified, and participating agencies pay a flat share in accordance with the number of units attributed to them. An example is the UK risk-protection arrangement for schools, in which schools pay a fixed per pupil amount that is reviewed annually by the Government Actuary's Department to ensure that the overall income for the scheme is adequate given its contingent liabilities. In this instance, the cover for schools deemed to have greater risk are being subsidized by those with better claims experience. This approach has the advantage of being simple and easy to implement but may not reflect individual risk. See also Chapter 6.2. • **Risk-based pricing.** With a risk-based approach, the pricing for participating agencies reflects the level of expected risk of each agency. This approach has the advantage of enabling differentiation of the cost of risk but it relies on the ability to quantify adequately and consistently the relative loss potential between asset entities, which may be a costlier and data intensive exercise.

Box 1.3.

The Role of Insurance in Financial Protection of Public Assets

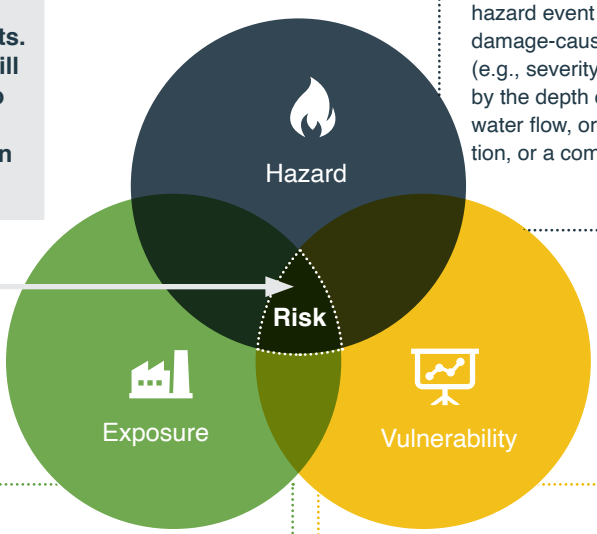
This box provides an introduction to the key features of risk from the perspective of public assets (see Box Figure 1.3.1), an overview of the role of insurance within a financial protection strategy, and an introduction to some of the key features of insurance for public assets.

Box Figure 1.3.1.

The Components of Risk

Risk can be considered as the combination of three basic components. Insurance programs will need to be designed to optimize the coverage based on consideration of these three factors.

It is the **type of peril and its causes** (e.g., earthquake, tsunami, flood, cyclone, fire, industrial accident, or operational failure) and the **probability** of that event occurring in the future. The **severity** (or intensity) of any hazard event is having one or more damage-causing features of the hazard (e.g., severity of flood can be measured by the depth of the water, the speed of water flow, or the level of contamination, or a combination of these).



It is the **type and characteristics of assets being managed and at risk.** For public assets, exposure can include buildings; roads; utility networks and their contents; or intangibles such as profits, revenue, or reputation.

The value of the asset is a critical aspect of exposure, which can be **monetary** (e.g., the costs of reinstating a damaged structure), **cultural** (e.g., the value placed on a historical or culturally important building), **societal** (e.g., the broader implications to society during failure of key services such as water supply); or other importance (e.g., the disruption of administration of key government functions). This training guide is focused on tangible assets and their monetary value.

It is the **level of damage and loss that can be expected** given a particular level of severity. Vulnerability can be physical (e.g., type of construction process and materials used), operational (e.g., use and maintenance of the assets), environmental (external factors that influence the level of damage), and economic and social (e.g., ability of the workforce to access the facilities).

A comprehensive disaster risk-financing (DRF) strategy establishes principles, objectives, and methods for financing the response and recovery costs associated with damage-causing events. There are different potential funding options: from internal sources such as budget reserves or contingency funds (also called risk-retention instruments) or from external sources, such as risk-transfer insurance or sovereign borrowing.

Depending on the level of risk, a DRF strategy could involve the following:

- A split between risk retention and transfer and
- Several different risk-financing instruments or sources so that funding is diverse and is not subject to a single point of failure.

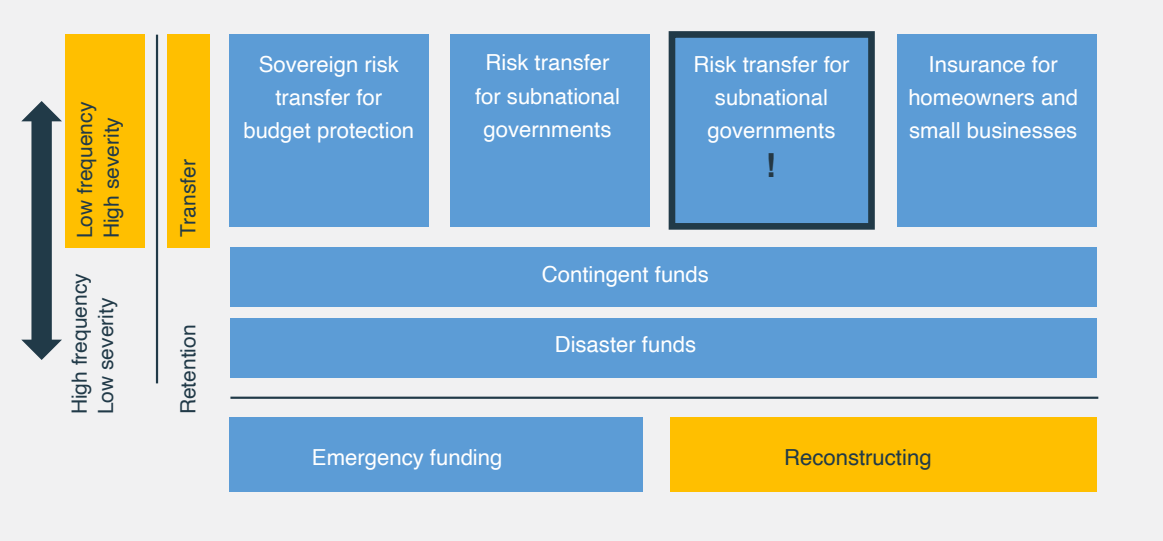
The most effective split between risk retention and risk transfer will differ for each situation, but generally the split is informed by the following:

- **Internal influences** such as the current fiscal position (a government's ability to bear financial risk and raise capital) and the longer-term fiscal objectives, as well as contingent liability obligations beyond public asset risk (e.g., additional welfare costs after a disaster).
- **External influences** such as the availability of external risk-financing capital (insurer's capacity and market participation), as well as the cost of external risk-financing capital versus self-retention.

Box Figure 1.3.2 illustrates how risk financing (retention and transfer) can be layered to provide comprehensive coverage—in the case of the Philippines (see also Case Study 2). It further demonstrates how insurance of public assets can exist alongside other instruments as part of a strategy.

Box Figure 1.3.2.

Schematic Illustration of the Philippines Disaster Risk-Financing Strategy



Source: World Bank (2014) based on information provided by the government of the Philippines.
Note: LGUs = local government units.

Public assets insurance is often one key component of a DRF strategy, with the following advantages:

- It provides the funding to replace or repair damaged public assets.
- Insurance instruments payout can provide cost-effective capital to rebuild or reconstitute services after a disaster.
- It can help to develop a risk-management culture among risk owners and stakeholders by attaching a price to the risk.
- It can encourage resilience if and when insurers offer premium discount for different risk-reduction measures.
- It can reduce the volatility and uncertainty of losses, which can enable more confident strategic planning for future investments in infrastructure.

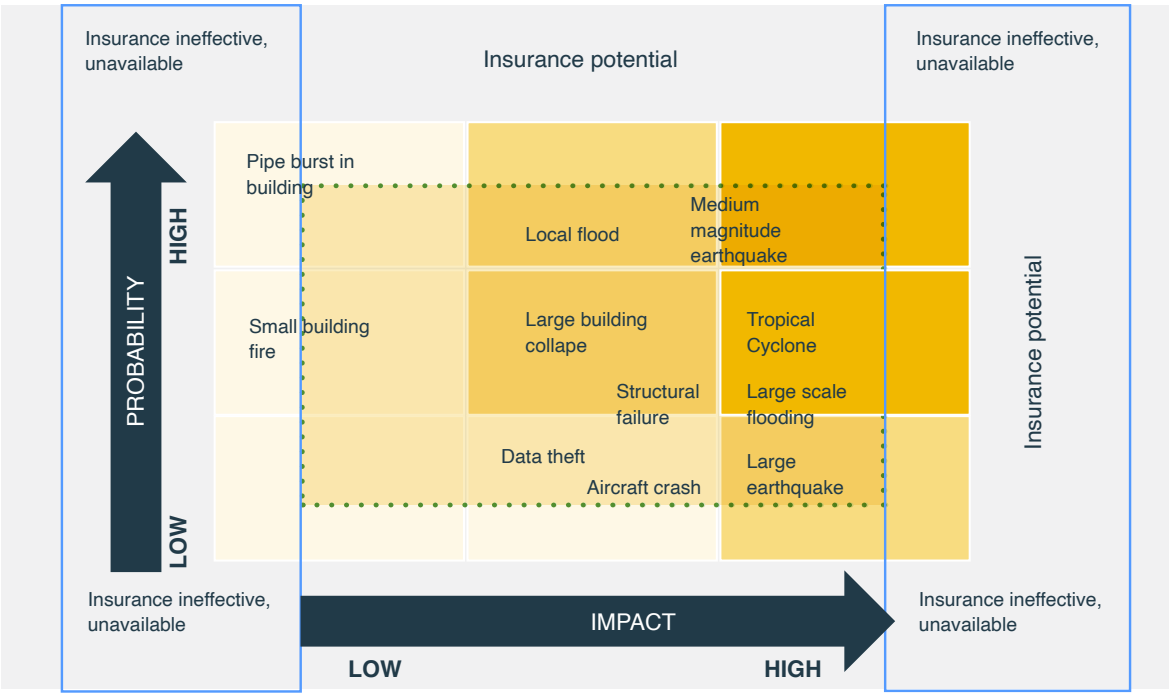
However, insurance will not be suitable for covering all financial risks. In some cases, the price for cover may not be economical against the expected return or insurance may not be available for the type of asset or peril. An agreed risk appetite—as applied within a broad risk-management strategy—will determine where, if at all, insurance is suitable.

Insurance may be suited to only part of a financial protection strategy as illustrated by Box Figure 1.3.3. Insurance can be uneconomical for both the smallest, most frequent potential losses, and losses so large they are deemed too improbable to cover for the expense involved. Even if insurance is available for smaller and more frequent losses, premiums charged may render it economical. The use of retentions and deductibles is common in assisting in the optimization of insurance coverage as part of an affordable budget, while also maximizing the amount of cover provided.

If insurance is considered suitable as part of the financial protection strategy, the choice of which product to use will also require consideration. One choice is about the use of *indemnity* and *parametric* insurance products. There are also considerations of how insurance is structured and how other sources of capital may be used as an alternative to insurance. In particular, *catastrophe bonds*, which are sometimes based on a parametric insurance agreement, are available. A DRF strategy requires a bespoke approach to optimize the balance between risk retention and risk transfer for specific needs and situations. A detailed consideration of the options available will be covered in Chapter 5.

Box Figure 1.3.3.

Illustration of the Suitability of Insurance by Risk Type and Severity



Source: World Bank.

Box 1.4.

Develop the Program In-House or Outsource It?

A government may choose to carry out some activities in house and to outsource ot her services. An in-house strategy requires (a) more internal resources, (b) ability to recruit and develop the necessary expertise, and (c) potentially considerable budget and time to develop the necessary capacity. However, the expertise is retained by the government institutions, and the government has full control over the services, and potentially this generates cost savings relative to a long-term outsourced approach.

Outsourcing can often be applied as an interim strategy that can enable the start-up of an operational program. In some cases, use of third-party expertise may be appropriate even when internal capacity has been developed (for example, use of intermediaries for marketing and transactional activities). Contracting outsourced experts allows for key lessons to be learned and positions a government to make well-considered decisions about what services it may choose to keep in house over time.

Decision-Making and Authorization

Selecting the most effective and efficient program for financial protection involves making comparisons between the available options. Some options might retain more risk than others. Other options might have differing means of service delivery and cost allocation. Each option will have unique advantages and disadvantages. Figure 1.5 provides an example of a way to collate those decisions and to see the comparison. The "do nothing" option represents the status quo and offers a benchmark for decision-makers regarding the merits of change. In some cases, the status quo already has in place some financial protection arrangements, so the proposed options should be considered relative to the existing arrangements. After decision-makers identify and approve a preference, the process of implementing the solution can begin.

Figure 1.5.
Example of Options Appraisal to Support Decision-Making

Option Characteristics	Do Nothing	Option 1	Option 2
Option description:			
Scope (perils, assets, and agencies)			
Program vehicle (standalone or new business unit)			
Risk-retention strategy			
Risk-transfer strategy			
Service or administration implementation strategy			
Cost			
Funding (allocation and implementation)			
Option attributes:			
Benefits (financial and nonfinancial)			
Disadvantages (financial and nonfinancial)			
Risks and issues			
Constraints			
Dependencies			

1.4.

The Implementation Stage

Why Is This Stage Important?

The Implementation stage turns plans and expectations into reality. Some costs may have been tentative in previous stages, but they must become fixed in this stage. Service delivery needs to be embedded as much as possible before the program commences. Moreover, the program must be prepared for the possibility that a loss event could occur on the first day of operation. Key implementation activities are shown in Figure 1.6.

Figure 1.6.
Key Activities in the Implementation Stage

Components and Key Activities

Setting the Risk-Financing Solution

- Establish the risk retention and risk transfer solutions.

Preparing for and Launching the Program

- Establish the operational governance.
- Establish the structure.
- Establish the external engagement procedures including communications and inclusion of agencies.

Setting the Risk-Financing Solution

In this component, funding availability will be established in line with the agreed-upon risk-retention and risk-transfer strategies.

Figure 1.7 illustrates some core activities and considerations under the risk-retention and risk-transfer strategies. Chapter 5 provides more details on each of the steps.

Preparing for and Launching the Program

The organizational structure needs to be set up to receive and administer the needs of all participants. Figure 1.8 shows the key activities of the risk-financing solution as overseen by an effective operational governance mechanism as in Box 1.5. Communications with external parties need to be a core consideration, including ways and processes to include new agencies to help with the solution. Training of staff members and all relevant stakeholders is also integral in developing both shared understanding and essential competencies in operating and managing a complex program. Chapter 7 covers the key steps in more detail.

Figure 1.7.
Key Activities to Set Up the Risk-Financing Solutions

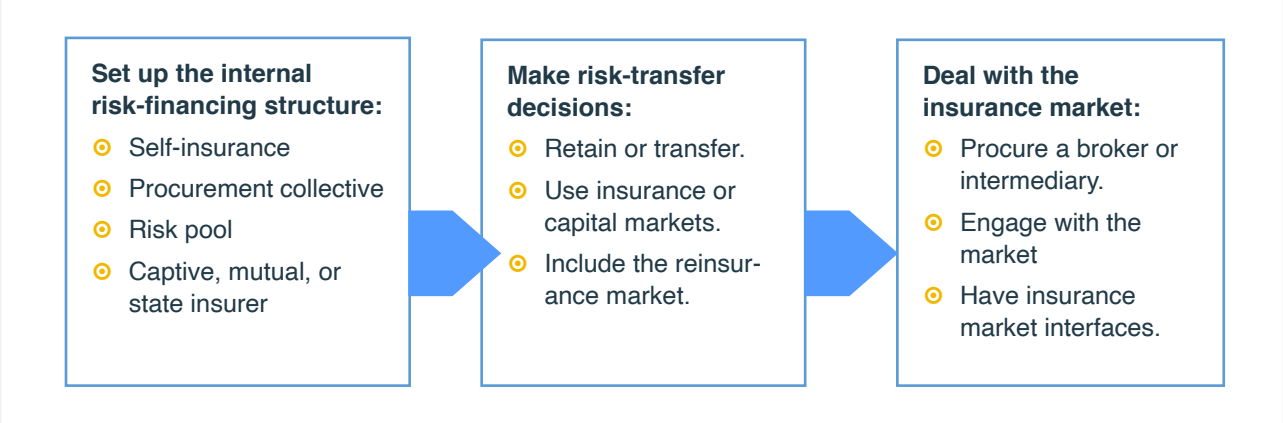


Figure 1.8.
Key Activities in the Program Implementation and Renewal Stages

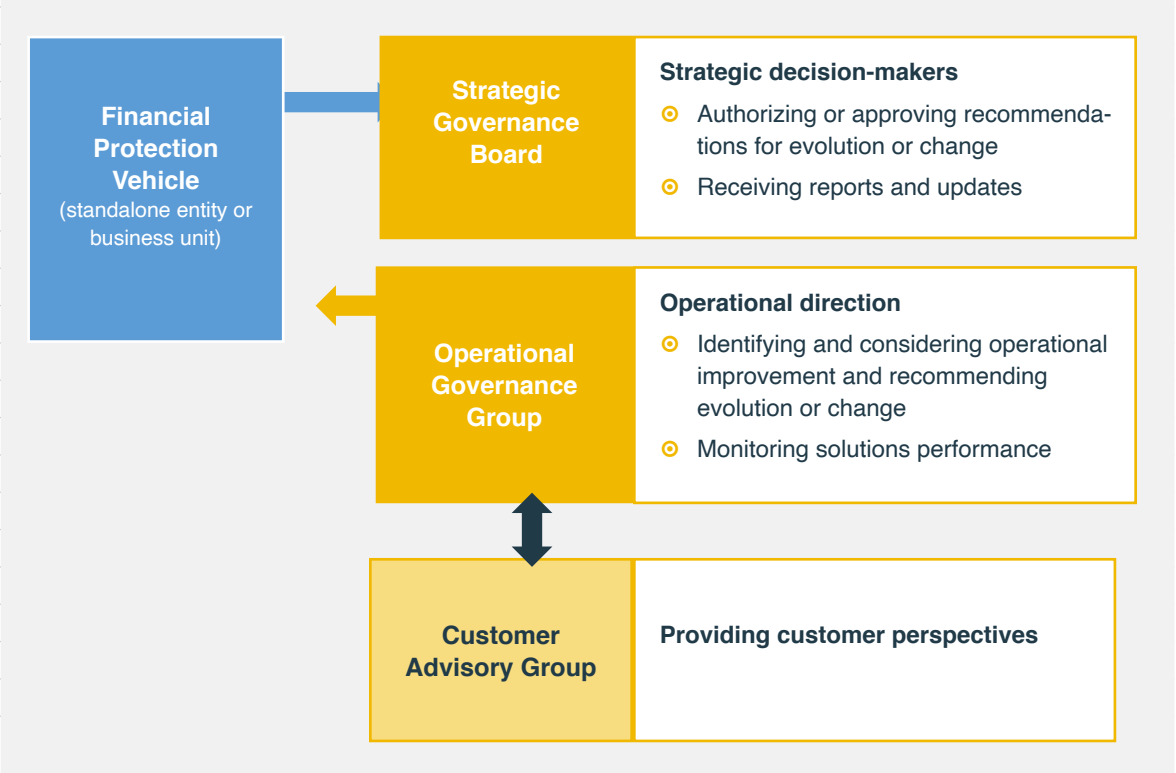
	Program Launch Checklist
	Governance
	Communications
	Recruitment
	Training
	Corporate services support
	Procurement
	IT systems
	Procedure for new members
	Risk financing

	Program Renewal Checklist
	Governance
	Communications
	Recruitment
	Corporate services support
	Procurement and contract management
	IT systems
	Data
	Member management (introduction, engagement, and training)
	Risk financing or program management
	Financial management
	Claims
	Risk management

Box 1.5.
Governance

The governance function will provide oversight and scrutiny of the program so the government can review and audit the financial processes and can make strategic decisions about the ongoing levels of coverage required. See Box Figure 1.5.1.

Box Figure 1.5.1.
Types and Roles of Governance Mechanisms



Ideally, a program should have a target program launch date (that is, the date at which the risk-financing solution is in place and the supporting infrastructure is embedded). The launch date sets the key milestone for this stage, and the implementation of each component within this stage should be dated from that milestone.

Government entities must have the technical and governance capacity to manage the insurance program over a long period. The use of insurance requires technical capabilities within the government stakeholder entities that will cover all aspects of the insurance process, including data capture, risk assessment and management, claims management, compliance and auditing, accounting, and policy management. Technical working groups, boards, and other governance and oversight functions require members with the appropriate levels of technical competency to ensure effective operations. A mix of technical, policy and institutional knowledge is also required across the team. Training, testing, and professional knowledge capacity will be key to the long-term effectiveness of the insurance program.

In the early stages, third parties, such as insurance intermediaries and risk management consultants, can provide expertise, particularly if a pilot program is undertaken to develop more robust procedures. Such specialists may be retained to support and guide internal resources. However, it is important that training and technical capacity is underpinned by robust operational, delegation, and governance procedures.

As a program develops, it is common for issues to arise that had not been anticipated at the start. Procedures required to procure and manage insurance programs—including (a) drafting appropriate decrees, (b) setting the level of deductibles and retentions, (c) budgeting (including taxes), (d) organizing third-party services including broker procurement, (e) undertaking insurance renewal activity, and (f) dealing with asset owners and claims—will require regular updating and amendment as issues are identified. It will be important to have in place the appropriate operational and governance mechanisms. A monitoring and evaluation process can be applied, especially in the early stages of the insurance process. Specifically, it could be used to record and mitigate key issues encountered. A pilot program, with limited exposure, could also be used to test processes and assumptions before extension to a larger exposure.

The processes of claims management will not have been fully tested until there is a large-scale disaster event with multiple and simultaneous claims. Such an event should be the subject of a review of the entire system, possibly by an independent external authority, to record lessons learned and to make recommendations for improvement.

1.5.

The Renewal Stage

Why Is This Stage Important?

Operating environments are fluid. Priorities change, risks evolve, and the systems and technologies that deal with them continue to advance. In addition, risk-transfer instruments are timebound. They have expiry dates, meaning they are subject to regular review and renewal cycles that need to be managed proactively.

This stage is important because financial protection needs to be continuous, and it needs to constantly reflect any lessons learned, any changing risk characteristics, and any ways to evolve in line with the strategic and operational environment. See Figure 1.9 for key activities during the renewal stage.

Figure 1.9.
Key Activities in the Renewal Stage

Components and Key Activities

Annual Service Cycle

- Manage risk-financing cycle.
- Manage service and administrative cycle.

Continuous Improvement

- Monitor and report on benefits.
- Manage ongoing risks.
- Develop lessons learned.
- Manage ongoing stakeholder engagements.

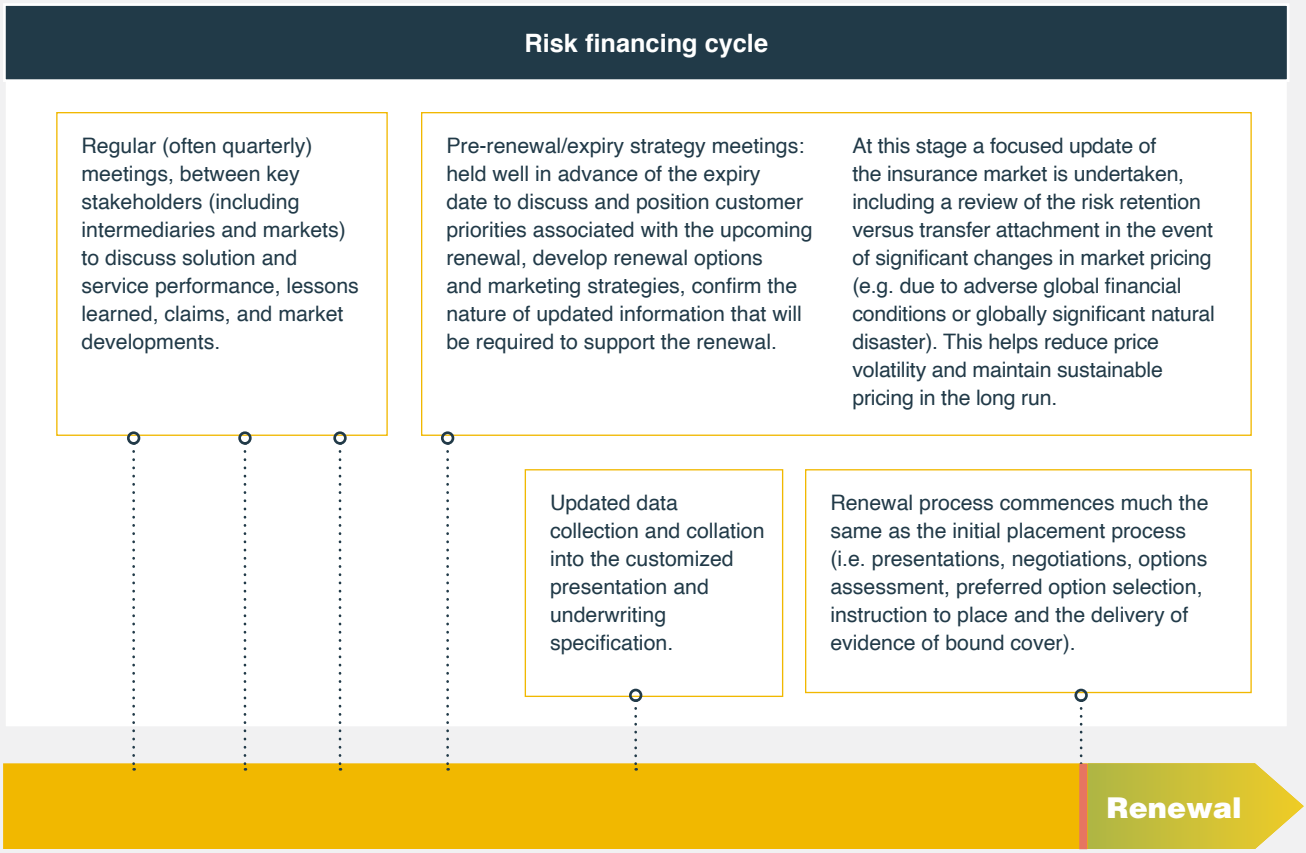
Annual Service Cycle

The annual service cycle has two aspects:

- **Risk-financing cycle.** As with the initial placement of the risk transfer instrument (the insurance policy), the insurance broker will commonly confirm and trigger much of this service cycle. The key date is the expiry date of the existing policy, so the renewed policy should be agreed upon without a gap in coverage. This annual process can be interrupted or adjusted due to a significant claim event or a mid-term change in government's risk exposures (for example, caused by including new agencies or by a large capital expenditure that is significantly changing the risk exposure).
- **Service and administrative cycle.** The structure and functions supporting the risk financing solution should also move through a regular cycle of review and delivery.

Key activities of the two aspects are shown in Figure 1.10.

Figure 1.10.
Annual Service Cycle—Key Activities



Source: World Bank Staff.

Continuous Improvement

A program as complex as a public assets financial protection should seek regular insights, both from internal learnings and external teachings, and it should constantly evolve to meet the needs of government. Any recommendation for change must be based on evidence. Ways to inject continuous improvement include the following:

- **Use benefits tracking.** Benefits should be defined during the design stage, adopting principles of SMART (specific, measurable, actionable, realistic and time-bound). Actual performance against those benefit targets should be tracked regularly. This check identifies what is working well and what may require adjustment. Reporting against those targets will form a key component of the governance function.
- **Incorporate the risk-management feedback cycle.** It is important to link risk-control interventions to the program. If a type of risk-control investment is made, and if it affects (positively or negatively) on claims experience and risk pricing, it should be included as an evidence-supporting program evolution and included in market documentation during renewal discussions. It is also important that any analytics and modeling undertaken can consider factors that may materially alter the resilience or vulnerability of the insured assets.
- **Maintain a lessons-learned register.** The register should be reviewed on a regular basis within the governance function to inform recommendations for potential changes.
- **Ensure that stakeholder training is continued even after the inception of the program.** Training should be continuous and evolve with the program.

To Recap Chapter 1:

- Four key stages underpin the process of developing a financial protection program for public assets: design, develop, implement and renewal.
- This process is often a multi-year journey and is unique within each country's context. The roadmap serves as a guide to help governments identify and fill gaps in their journey.

Worksheet for Chapter 1

Test your understanding of the chapter and record your insights through this worksheet!

Activity 1.
A list of activities that will be required in instituting a program of public assets financial protection is given below. Can you rank the activities in a sequence in which they should most likely be conducted? You can rank the activities in a sequence of 1–8.

	List of Activities	Most Likely Sequence (Activity 1 to Activity 8)
1.	Develop understanding of the possible losses arising from catastrophe exposure of public assets.	
2.	Establish operational governance and external engagement procedures such as communication.	
3.	Review and prepare for renewal.	
4.	Assess options that balance trade-offs between risk retention and risk transfer.	
5.	Manage the annual risk financing, service, and administrative cycle.	
6.	Set an appropriate budget to cover costs of the program covering public asset financial protection.	
7.	Agree on key principles, and align on the government's overall risk-management objectives.	
8.	Establish risk-retention as well as risk-transfer solutions.	

Activity 2.
Use the template to help you plan and strategize your stakeholder engagements for a specific project.

Stakeholder Engagement Planning Template

Stakeholder	Interest	Power	Key reason to engage	Frequency of communication	Communication method

Activity 3.
Pick any three public assets in your country, assess the current status of their arrangement for financial protection funding, and identify the intended benefits of the program.

Name of the Asset	Do you have any existing financial protection funding arrangement?	Identify the main intended benefit to protect this asset.
1.		
2.		
3.		

Activity 4.
Reflections

[a] My top three takeaways from this chapter are these:

[b] Three concepts or ideas I would like more information about are:

CASE STUDY

Guide to Stakeholder Mapping and Engagement

Who are your stakeholders?

Simply defined, a stakeholder is "**Anyone who has a stake in the project**" or "**Anyone who can make, or break, your project**." In the context of Financial Protection of Public Assets, this means people or groups with the power to influence and advance this agenda in our countries.

What is stakeholder mapping?

Stakeholder mapping is a process of listing all the stakeholders of your project and working through a series of steps to build a strategic engagement and communications plan. This process gives you a visual representation of all the people who can influence your project and how they are connected.

Stakeholders can be people who you work with across different levels. This includes people at a more senior professional level, such as a minister of finance or a senior member of the cabinet. Such stakeholders are pivotal to the success of a project as they can influence the project approval process and make decisions on how finance is allocated. Other stakeholders include (a) your peers such as colleagues, managers, and team members, or colleagues within other government departments, (b) members of the public, the private sector, civil society organizations, and nongovernmental organizations. Often the most important stakeholders are the end beneficiaries or project participants.

Why is stakeholder mapping important?

Stakeholder engagement is an important project management and risk management tool, and mapping is a key part of this engagement. By identifying in advance, the individuals, groups, and organizations that can influence or will be affected by your project, you can better engage them and help ensure that the project is demand-driven and progresses smoothly.

People who are engaged have a much higher chance of responding positively to the project design and outcomes. When you use your time to positively influence the opinions of your most powerful stakeholders and manage them closely, you will have more control over the direction of the project and will be better equipped for success.

By undertaking a stakeholder mapping exercise ahead of time, you can help the project team to quickly identify the key stakeholders in each area and be strategic about communication and interactions you have with them, including the technical input provided. Box Figure 1.6.1 shows a few examples of how stakeholder mapping is useful for different aspects of project management.

Figure 1.6.1.
Examples of how stakeholder mapping can support project and program management

Project design

- Helps identify who the key stakeholders are and clarifies their relationship with the project
- Ensures that there is clarity on roles and dimensions of the project and a shared vision among key players of the project
- Brings together new ideas to innovate

Support for implementation

- Brings people together to pool knowledge, experience, and expertise to co-create solutions
- Helps build and foster partnerships and new relationships that generate value

Avoidance of roadblocks

- Allows those who affect or will be affected by the project to voice their opinions ahead of time
- Helps reduce the level of risk and ensures that the project is fully demand-driven
- Provides all players in the project a sense of ownership and improves governance

Mapping your stakeholders

It is important to identify, analyze, and prioritize your stakeholders based on their professional and personal investment in the project and their ability to influence its success. Once this is done you can plan for how to engage them successfully.

Step 1: Stakeholder identification and analysis

? **Who are your stakeholders? What incentivizes them? Who are the people that influence if and how your project can be implemented? How are you connected to them? What is their understanding of Public Asset Financial Protection?**

The type and role of stakeholders will vary depending on the nature, impact, and duration of your project. The following are some key categories to consider:

- **Decision makers:** If your project needs support from senior leaders in the government, or significant buy-in and investment from the private sector, international organizations, or related partners, you should include these groups as major stakeholders, since they will have the power to influence your project's future.
- **Users:** Knowing and understanding your end user or audience is critical for building a successful project. The groups of people who will be affected by the project and whose needs it will serve could be included among your stakeholders.
- **Local markets:** For large-scale projects that involve a substantial number of players, it is imperative to include the key players in your country's local markets. In the context of financial protection of public assets, this could include local insurance companies, risk modelers and underwriters, etc.

This could also include the cabinet, government agencies, or governance boards of public agencies who will purchase insurance.

Stakeholders can be divided into internal and external stakeholders:

- **Internal stakeholders** are people on your team and your immediate colleagues who, despite possibly varying levels of involvement, have a major impact on the design and implementation of the project.
- **External stakeholders** are those who advise, facilitate, or will be impacted by your project, even though they don't directly participate in the daily work on the project.

Figure 1.6.2 shows some examples of different stakeholders, and how they are connected to different stages of a financial protection of public assets roadmap. Whether a stakeholder is internal or external might vary depending on where you sit in a project team, for example in Figure 1.6.2 there are a range of government body representatives who could be from within your own government department and others who are from different departments.

A stakeholder's interest and understanding of the topic may vary depending on their organizational affiliations and their local context. Invest time to identify and prioritize different stakeholder groups and to assess their interests and concerns and document the progress using stakeholder mapping tools suggested in this box as appropriate. Additionally, where a 'stakeholder' is a group, it may be necessary to identify stakeholder representatives that can help engagement with the broader group, such as appointed ministry or local authority representatives.

Figure 1.6.2.
Stakeholders across various stages of a Financial Protection for Public Assets program (not exhaustive)

STAKEHOLDER	INTERNAL/ EXTERNAL	DESIGN	DEVELOPMENT	IMPLEMENTATION	RENEWAL
Cabinet	Internal	Have responsibility for passing regulations.			
Steering Committee	Internal	Form a leadership subgroup to ensure that progress is aligned with expectations.			
Governance Board	Internal/ External		Have a leadership subgroup ensure progress is aligned with expectations.		Provide governance and authorize scope change.

STAKEHOLDER	INTERNAL/ EXTERNAL	DESIGN	DEVELOPMENT	IMPLEMENTATION	RENEWAL
Relevant Government Ministers (for example, Minister of Finance)	Internal/ External	Provide and confirm strategic-level risk appetite, and provide authorization for relevant legislation or regulation.	Make sure minister remains informed and provides feedback where necessary about strategic alignment with government objectives.		
Ministry or Department of Finance (or equivalent) Representative(s)	Internal/ External	Confirm alignment with fiscal policy objectives and positions, and consider the options for amending fiscal policy as may be required.	Cooperate and provide inputs into the options assessment and recommendation outputs.	Support and provide input to the preparation and launch of risk-retention mechanisms.	Cooperate and provide inputs into the renewal tasks, which primarily are regular performance reviews.
Sponsoring Agency Representative(s) (if not the Ministry or Department of Finance)	Internal/ External	Contribute to design research and discussion; collate the outputs of the design stage.	Lead the evidence-gathering and options-assessment process; control the key document outputs.	Lead the implementation project; control the key document outputs; represent government in risk-transfer market engagements and in procuring outsourced services.	Lead the operational solution; control the key processes; represent government in ongoing risk-transfer market engagements and outsourced services procurement; act as the conduit for governance reporting.
Government Agency Representation	Internal/ External	Provide customer perspective, including preferences, risks, and issues.	Cooperate with data collection requirements; provide regular customer-perspective feedback into design options.	Cooperate with updated data-collection requirements; prepare operations to receive the solution.	Cooperate with updated data collection requirements; comply with standard operating procedures.

STAKEHOLDER	INTERNAL/ EXTERNAL	DESIGN	DEVELOPMENT	IMPLEMENTATION	RENEWAL
Government Legal Office	Internal	Confirm and advise on compliance with existing legislative arrangements, and propose amended or new legislation.			
Subject Matter Expert in Government Risk Management or Risk Financing	External	Provide objective insight or lessons learned from other jurisdictions and the risk-financing industry, including the insurance market and risk-modeling sectors.	Provide technical input into the design-options assessment.	Provide technical input into the delivery process; in many cases this is a broker.	Provide technical input into the evolution of the program; in many cases this is a broker.
Catastrophe Loss Modeling Service Provider	External		Provide detailed loss modeling to help inform funding requirements.		
Risk-Transfer Markets (insurance companies)	External		Provide an early assessment of the risk-transfer market availability and affordability.	Provide terms and conditions for risk transfer.	Provide terms and conditions for risk transfer; pay claims that fall within the coverage parameter.
Outsourced Service Providers	External			Deliver services subject to service levels specified in contractual arrangements.	Deliver services subject to service levels specified in contractual arrangements.

Step 2: Analyzing your stakeholders

Once you have identified all the stakeholders related to your project, you can begin to analyze them and map them based on their **interests and ability to influence** your project. Figure 1.6.3 provides some important factors to consider and examples for each stakeholder identified in Step 1.

Figure 1.6.3.
Interest and Influence of Stakeholders

Interest:
What is important to them?

- What are their key interests and motivations?
- How are they influenced by this project?
- Which elements of the project are they most interested in?
- How does the success or failure of the project impact them?

Influence:
What could they contribute to the financial protection of public assets?

- What key decisions need to be made by them in order for the project to progress?
- Will they have a positive or negative reaction to your project, and why?
- Do they have a personal connection to the project?
- Which other stakeholders are they connected to?
- Do they influence the financing available?
- Do they influence any of the technical design?
- What risks do they pose to the project?

Mapping External Stakeholders

	DEVELOPMENT ORGANIZATIONS	DONORS	MODELING COMPANIES	MARKET PARTIES
Interest	Country's prosperity, financial and physical resilience	Improve post-disaster outcomes, protect people, reduce poverty	Access to quality data; proprietary knowledge; sale of their product	Market penetration & growth at a risk-reflective price
Influence	Provide resources, DRF know-how, experience	Raise awareness and provide start-up & operational funds	Identify risk; measure exposure; establish pricing	Provide capital; provide risk transfer and risk management expertise

Mapping Internal Stakeholders

	REGIONAL TRADE/ POLICY BODIES	POLITICIANS	FINANCE MINISTRY	OTHER MINISTRIES & DRM FUNCTIONS
Interest	Country/s prosperity; regional stability	Decision-making; benefiting citizens	Appropriate/ cost-efficient use of funds/budgets	Reconstruction; resilience
Influence	Provide resources; regional engagement and legitimacy	Provide legitimacy, accountability, decision-making power	Make a financial commitment; use resources effectively	Offer trust, decision-making expertise, on-the-ground knowledge

Step 3: Prioritizing your stakeholders

Once you have mapped all your stakeholders you will have a long list of people to engage with and influence. Not all stakeholders need the same level of communication and you might not have enough time to invest in building strong relationships with everyone. One efficient way to prioritize stakeholders is to consider how they are positioned across **Interest** and **Influence**, for example by placing stakeholders within this 2x2 matrix in Figure 1.6.4.

The four quadrants of the matrix break down as follows:

I. **High Influence, high interest ("Manage Closely"):**
You need to prioritize engaging with these stakeholders as much as possible. Your high-influence stakeholders can help you gain resources, prioritize competing demands for resources or competing timelines, and clear potential roadblocks.

II. **High Influence, less interest ("Keep Satisfied"):**
Put enough effort in to keep these stakeholders satisfied and informed, but be strategic about your communication.

III. **Low Influence, high interest ("Keep Informed"):**
Communicate regularly with these stakeholders, as they will be influential in the successful ongoing delivery of the project. Your low-influence but invested and interested stakeholders are your champions on the ground.

IV. **Low Influence, less interest ("Monitor"):**
Minimum effort is required with these stakeholders, and they can be informed as part of general briefings that you prepare for others as required.

Figure 1.6.4.
Prioritization of the Interest and Influence of Stakeholders

Source: Adapted from A. L. Mendelow, "Environmental Scanning: The Impact of the Stakeholder Concept," *ICIS 1981 Proceedings 20 (1981).*

Implementing Steps 2 and 3 will enable you to consult effectively with your stakeholder and provide the appropriate information disclosure. It will also allow you to identify opportunities for strategic partnerships that can serve common interests, especially in the context of building effective financial protection strategies.

Step 4: Engaging your stakeholders

Once you have identified and prioritized your stakeholders and their level of interest and influence, you need to plan the best way to engage them. Here are five suggestions for engaging your stakeholders:

1. **Provide (social and professional) value.** People like to feel they have a voice within the group. Demonstrate to stakeholders how their contribution adds value to your project. Also, clearly emphasize the value you provide them, such as a professional network, knowledge, etc.

2. **Build lasting relationships.** Strong relationships translate to better collaboration. People work together more easily and effectively when there is trust. Investing in relationships can increase confidence across the project, minimize uncertainty, and speed up problem solving and decision-making. Disclose relevant information with transparency and accountability and in a timely fashion but implement data confidentiality practices for sensitive information.

3. **Engage rather than manage.** Why "stakeholder engagement" and not "stakeholder management"? Stakeholders are proactive and independent individuals; by engaging with them respectfully and listening to their views, you optimize your chances of influencing their choices. When engaging with stakeholders, seek to maximize the impact and cost-effectiveness of the issue or solution, but with an open mind and a willingness to engage and to reach agreement.

4. **Consult, early and often.** The purpose, scope, risks, and approach of technical projects may sometimes be unclear to your stakeholders, particularly in early project stages. Early and regular consultation (where possible) helps to ensure that the final project is demand-driven and enjoys the support of most of the stakeholders. Plan the process for different consultations, and document your progress and decisions; follow up post-consultation. Adopt structured methods and functions for stakeholder management over the long term, including ongoing monitoring and reporting processes.

5. **Communicate.** The best way to engage and influence stakeholders is to communicate well. It is crucial to understand the people you will be working with, their mindsets, and the best way to effectively garner their support. Not everyone responds to the same style of communication. Communicate information in meaningful and accessible formats. Figure 1.6.5 shares some tips on how to communicate effectively.

Figure 1.6.5

Tips on stakeholder communication

1. **Use what you know:** Few things are as engaging and authentic as a personal or real-life story. Hook your audience by speaking about your personal experience and how it relates to the project.
2. **Create a shared experience:** The best way to engage people is to talk about things they care about. If possible, find a shared idea or experience that you can use to connect with your audience. Identify opportunities for strategic partnerships that can serve common interests, especially in the context of risk pooling.
3. **The art of storytelling lies in listening:** While it is important to be prepared in order to communicate effectively, it is equally important to be able to read the room and audience and adjust your narrative accordingly. A good rule of thumb is 80 percent preparation, allowing for 20 percent flexibility; this ensures that you can quickly pivot from your prepared narrative to maintain or build your audience's interest.
4. **Be clear and concise:** When planning your narrative, ensure that it has a clear start and end and ask for feedback from those you are engaging with. Changes in the content and the pace of the narrative should be easy to follow and understand. Powerful stories always have an arc and powerful hook which draws people into the narrative.
5. **Remember why you are engaging:** Your narrative should include a clear takeaway, offer concrete next steps, and allude to the actions required to complete these steps that are easy to comprehend and remember. Be clear as well on what do you *need* versus *want* out of the stakeholder engagement.

2.

Policy, Institutional and Regulatory Requirements

What You Will Learn

This chapter will outline the considerations on policies, institutional frameworks, and governance mechanisms in the establishment and operation of a public asset financial protection program.

2.1.

Introduction

Critical first steps in developing a public asset insurance program are the following:

- Careful consideration on the need for the program plus the policy choices and objectives the program is intended to address (section 2.1).
- After policy and program objectives have been determined, the second step is to consider how the program will work, which involves choices about program structure, mandate, powers, and governance (section 2.2), as well as how the program can fit within government regulatory frameworks (section 2.3).
- The third step is to determine the program's financial structure and funding parameters (section 2.4).

This chapter identifies the design questions and issues relevant to the choices in Figure 2.1.

Although countries commonly face such considerations, policy and implementation choices will inevitably differ because of regional, political, and jurisdictional factors. To illustrate the types of choices made by other countries, throughout the guide there are case studies from different countries, including Australia, New Zealand, Indonesia, and the Philippines.

2.2.

Strategic Alignment and Policy Design

Public asset protection programs are one element of a government's risk financing strategy. This in turn supports and align with many of a government's policy objectives, as shown in Figure 2.2. The design of a public asset protection program therefore needs to take into account these complementary objectives.

It may be necessary to prioritize and make trade-offs between policy goals. For example,

- Should short-term relief and reconstruction expenditure take priority over long-term consolidation and protection of the government's balance sheet?
- Should the program prioritize transport, energy, or social infrastructure?

Table 2.1 shows the types of policy choices that governments often need to consider when deciding on the nature and extent of a program covering public asset protection.

Figure 2.1.
Considerations on Strategic Alignment, Legitimacy and Budget and Financial Planning

Public Asset Insurance Program

Why is there a need?

Strategic alignment

(1) Policy design

How will the program align with the government's overall risk management strategies and objectives?

What does the program cover? What are the priorities?

How will the program work?

Legitimacy

(2) Program design

How will the program work?

Who will it apply to?

What are the obligations on program participants and the program manager?

What governance and regulatory mechanisms?

Where should the program be located?

Who pays for what costs?

How will the claims payout be disbursed and to whom?

(3) Legislative process

How will it be set up?

What institutional frameworks and tools are available to establish and support the program?

What is the program's financial structure

Budget and Financial planning

(4) Financial parameters

How much will participants have to contribute in premiums? (contribution levels)

How are surplus contributions accumulated over financial years? (accumulation levels)

At what levels should accumulated funds be capped, relative to claims and costs? (funding ratios)

Will the funds be formally separated from government accounts?

Will the funds be invested and if so, what will be the investment strategy?

Source: World Bank staff

Figure 2.2.
Disaster Risk Finance and Other Policy Objectives

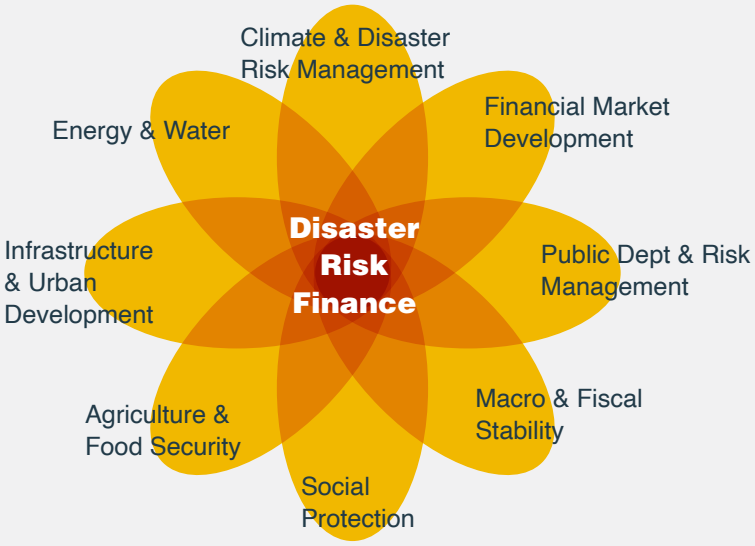


Table 2.1.
Potential Policy Considerations about Financial Protection of Public Assets

POLICY OBJECTIVES	CONSIDERATIONS
Core objectives: Fiscal and risk management	
Protect balance sheet (assets and liabilities).	Disasters simultaneously affect both sides of a government's balance sheet. Governments assume a significant proportion of the recovery and reconstruction costs, particularly for uninsured publicly owned assets. At the same time, disasters disrupt and reduce economic activity and the resulting government revenues. Taken together, those factors can slow the process of economic recovery and can increase the duration and scale of the effects on the economy, businesses, and households.
Improve economic resilience to shocks.	A common program goal is to retain and build government financial capacity to better withstand sudden and unexpected shocks, in turn reducing the physical, human, social, and economic consequences.
Strategically align with overall risk-management objectives.	The public assets financial protection programs should align with the government's risk-management principles and the whole-of-government risk-management objectives, including considerations of disaster risk management policies or practices.
Improve financial management.	Public asset protection programs are also consistent with government policies that drive more effective expenditure of public money and more efficient management of public assets.

POLICY OBJECTIVES	CONSIDERATIONS
Improve the understanding of the government's overall challenges and its risk appetite in relation to those challenges.	Governments increasingly need to understand the whole-of-government challenges before them, particularly the gaps in financial protection when disasters damage public assets. Doing so enables governments to develop agreed positions, strategies, and risk appetites to manage and mitigate such challenges.
Complementary objectives: Economic growth and social resilience	
Align with social objectives for poverty reduction and service provision.	Government assets are commonly used to deliver key social objectives such as reducing poverty, improving employment outcomes, enhancing community connectivity, and creating economic stimulus. Improving the protection and longevity of those assets can deliver improved social benefits.
Support the growth of local insurance and capital markets.	In domestic insurance markets with sufficient capacity and capability, the medium- to long-term nature of asset protection programs provides opportunities to promote the growth of those markets, which in turn supports economic growth.
Complementary objectives: Improved risk- and cost-allocation efficiency	
Improve efficiency in national and subnational funding arrangements across different sectors.	National governments are often the primary funders of subnational government activity, particularly public-facing infrastructure (transport, energy, and social services) and any relief-and-recovery efforts. Asset protection programs should complement and be consistent with existing arrangements.
Develop clear incentives for risk reduction and disaster preparedness.	Some governments may not allocate sufficient expenditure for operation and maintenance works before disaster events, which may mitigate the resulting impacts and disruptions and may provide potential future savings in relief-and-recovery expenditures. Clear understanding on how much risks to retain or transfer helps to inform these decisions.
Improve government and community incentives.	Public asset financial protection programs can lead to improved policies related to infrastructure and other expenditure decisions. For example, programs could incentivize the planning for and location of public infrastructures and recognize local risks, their proximity, and their probability, to avoid inefficient resource allocation and replacement.
Increase transparency in allocation of resources during disaster events.	Funding toward disaster recovery is often allocated by governments, the private sector, and nongovernmental organizations through different mechanisms. Government choices include direct funding and indirect funding through subnational governments or third parties, as well as direct and indirect grants and social service supplements. The funding methods are often reactive (post-event) and potentially allocated inefficiently with inconsistent, overlapping eligibility criteria and with limited transparency and accountability. Improving financial protection of public assets could reduce those inefficiencies and could improve resource prioritization and accountability.

Source: World Bank staff.

The process of assessing locally relevant policy choices should involve consultations with the following key stakeholders (see also Box 1.6):

- Across government, priority stakeholders that include key financial government agencies (that is, ministries of finance and treasuries) and departments or agencies responsible for infrastructure and social service delivery
- With subnational governments, especially in relation to any proposed or potential changes in disaster risk and cost-allocation settings
- The financial and insurance industry and community groups, which will account for wider technical and on-the-ground support mechanisms

The consultation process requires a dedicated investment of time and effort to engage across government and other stakeholders to clarify the key program objectives, principles, and scope. Through the consultation process, governments need to do the following:

- Decide on the key drivers, objectives, and principles of the program.
- Understand the choices and trade-offs that are being made (that is, what the priorities are, what the program is expected to do, and what it will not do).
- Clarify risk ownership of public assets and develop a clear understanding across all levels of governments and government agencies on their responsibilities on the public assets
- Communicate its decision to stakeholders to set and limit expectations about the program and its objectives.
- Consider how the program will be implemented.

2.3.

Legitimacy and Program Design

After policy and program objectives have been determined, the next step is to consider how the program will work, which involves important choices about:

- **Participation of government agencies and asset owners.** Is participation mandatory or voluntary? What is the implementation time frame and approach to bring on new participants (a process sometimes known as “onboarding”)? What are the program obligations on participants and the program manager?

- **Governance.** What should the governance arrangements be? Where should the program be located—in a government department or a separate independent agency?

When the program is being designed, it is important to allow sufficient time and resources to accomplish these:

- Gather evidence and develop an understanding of the risks facing the government and the extent of possible financial exposure.
- Identify available options, and assess their suitability to meet the identified challenges.
- Consider the budgetary ramifications of each option (for example, the anticipated size of the fund and the potential costs of each option).

Program Participation

Relative Merits of Mandatory and Voluntary Participation

In many countries, there are degrees of decentralized ownership of public assets, whether at the government agency level or by geography (with regional governments and municipalities). A national program of public asset protection will need to consider the extent to which it will involve such entities. This involvement can be done through a top-down mandate whereby all entities are included through legislation or a voluntary opt-in approach and whereby each agency has the autonomy to decide whether to participate within the scheme. Relative benefits and disadvantages of each approach are discussed in Table 2.2.

Table 2.2.
Relative Benefits and Disadvantages of Mandatory versus Voluntary Participation

MANDATORY PARTICIPATION

Benefits

Including all relevant agencies by design makes it is easier for the program to achieve a level of scale because risks are well-diversified and because operational economies of scale are achievable. A larger program should attract better negotiating and buying power in the private market.

There is less adverse selection risk under a mandatory scheme, which avoids a concentration of higher-risk participants.

Confirmed participation allows more accurate forecasting of revenue and expenditure, resulting in less-volatile contribution costs.

Program reporting requirements will lead to making the resource allocation and expenditure decisions of participating agencies more visible, and to improving transparency and accountability of the public expenditure.

The accumulated information and expertise within a mandatory scheme are a public good. That data should be shared among the program participants and more broadly across government to improve whole-of-government decision-making.

Disadvantages

Common program processes may lead to inflexibility and a one-size-fits-all mentality. This approach may limit or inhibit consideration of individual agencies and their specific risks and challenges.

Agencies may resent the loss of control and may withdraw support for the program by failing to meet program reporting requirements or by lobbying the government to leave the program.

VOLUNTARY PARTICIPATION

Benefits

Government agencies retain a strong perception of individual accountability and autonomy in risk management.

There is greater flexibility for government agencies to customize their financial protection to their specific needs.

If government agencies test alternative approaches, this testing can create a competitive environment and can encourage cross-learning and continuous improvement.

Disadvantages

Without broad participation, the program may not capture the potential economies of scale across government, and the program will likely have weaker negotiating power with insurers.

Voluntary participation presents adverse selection risk where government agencies with less mature risk-management practices are more likely to join the program, thereby resulting in higher claims per contribution or premium input.

Inconsistent participation can make it difficult for revenue and expenditure forecasting and for determining the most cost-effective split between risk retention and risk transfer.

There may be insufficient incentives to overcome a reluctance to allocate resources to important, nonessential assets.

Source: World Bank staff.

Implementation Time Frame: A Phased Approach

One option for program implementation, even for programs with mandatory participation, is for a phased implementation approach. A phased approach allows program participants to join the program in smaller groups that are staggered over a period of time, thereby allowing each adequate time to adopt its systems and processes to the program. This approach would allow the program manager to develop and test program services over time and to build the program's capacity, scale, and expertise.

If a phased approach is to be adopted, the program design should explain how groups are selected and when each will join the program. This decision could be based on group or participant exposure by asset category, entity, expenditure type or by type of risk, technical capacity, and participant risk maturity.

Program Obligations of Participants and Program Managers

For a program's success, it is essential that the program manager builds and maintains strong and effective relationships with program participants. Key to this success is the need to clearly set out the obligations and duties expected of both the program's participants and its program manager. The nature of the obligations will vary depending on a range of factors:

- The program's mandate
- The level of choice as to participation (mandatory or voluntary)
- The level of the participant's government employment (national or subnational)
- The timing of the participant's entry into the program (early or late)
- The types of requirements imposed by reinsurers
- The approaches to managing liability from financial and legal perspectives
- The mechanisms to enforce program policies

Those policies often set out how the program will operate, what it will and will not cover, and what expectations and conditions apply to the program and its participating entities. The obligations are likely to include those set out in Table 2.3.

Table 2.3.

The Obligations on the Participants and Program Managers

PARTICIPANT OBLIGATIONS

Initial obligations include these:	**Duty of care throughout the programs (in other words, the types of behaviors expected), for example:**
Information collection and disclosures	A duty to disclose information that is material to a participating entity's risk profile (for example, a duty to provide up-to-date and relevant information about all of the entity's assets)
Participation and disclosure as part of the risk transfer to private markets (for example, cooperating with reasonable requests for further information from the program manager and reinsurers)	A duty to disclose or notify about damage as soon as reasonably possible
Contributions, as required, to market-facing presentations	A duty to take reasonable steps to minimize further damage after a loss event occurs
Implementation of risk-management frameworks, plus the meeting of other expenditure accountability and reporting arrangements by governments	A duty to exercise reasonable care to protect against losses before they occur
	Compliance with the terms of coverage set out in insurance policies
	An obligation to ensure that staff members are aware of their responsibilities under relevant legislation, regulation, and instructions

PROGRAM MANAGER OBLIGATIONS

Act as government's representative in risk-transfer market engagements.	Establish service-level agreement criteria, key performance indicators, and a service charter against which a program manager's services are measured. An important aspect is how the program manager will respond to and manage claims.
Represent the participant in market negotiations with utmost good faith.	
Ensure that risk-transfer protection is effective and continuous.	

Source: World Bank staff

The extent to which such obligations are communicated, understood, and adhered to by both participants and the program manager will be critical to the program's effectiveness. For example, if relevant information about the location, value, and condition of key assets is not included in an asset register or is withheld from the program manager, that lack of information will affect the program manager's ability to insure that asset, to manage any claim, or to undertake any effective risk-management strategy in relation to that asset.

Risk Management

Asset protection programs can play an important role in driving fundamental improvements in risk-management behavior, especially because such programs often require government entities to implement robust enterprise risk-management frameworks. Those frameworks include (a) establishing risk-management policies, (b) undertaking training for all relevant staff members, (c) developing risk registers, (d) identifying risk owners and the mechanisms for identifying and escalating emerging risks, and (e) regularly reporting and monitoring risks through appropriate tools. The processes are aimed at improving the management of government assets and liabilities through a more consistent, measurable, and maturing approach to risk management.

Ultimately, improved risk-management practices can contribute to greater resilience within government agencies. It can also help reduce negative financial impacts from disasters and support the longer-term financial viability of the program.

Data Sharing

The importance of data to the program cannot be overstated. Data inform every stage of program design, development, and implementation. It also informs a whole-of-government risk analysis, thus enabling improved risk profiles as well as better allocation of resources and mitigation expenditure. The ongoing updating and reviewing of data are essential to ensuring cost-effective renewal and reduction of operational risks as a result of potential underinsurance or poorly priced insurance costs from inaccurate data. Chapters 3 and 4 will explore the role of data in more detail.

Governance

Strong oversight and governance mechanisms enhance accountability and responsibility, encourage trust between the program and participants, improve reporting, and help realize potential program benefits. Key elements of program oversight can include external parliamentary and governmental scrutiny and internal program governance, which are discussed in Figure 2.3.

Figure 2.3.
Potential Governance Mechanisms

Governance of a Public Assets Financial Protection Program

Internal governance

- Audit Committee oversight
- Internal review
- Stakeholder advisory committees
- Consider purpose of committee, powers, meeting frequency, reporting and resources required

External audits

- External audits by private sector

Governmnet Review

- Ministerial oversight – meetings/reports
- Periodic independent review of the program's objectives, roles, functions and performance to test whether the program remains fit for its purpose.

Parliamentary scrutiny

- Parliamentary scrutiny of program performance
- Annual reports tabled in Parliament
- Regular attendance before Parliamentary committees
- Auditor-General review of financial reports and occasional audits

Regular points in a financial year | **Typically once every financial year** | **Typically every 3 – 5 years**

Source: World Bank staff

Organizational Set-up

The program design needs to consider how and where the program is set up from an organizational perspective. Options could include one or all of the following:

- Keep the program within an existing government department.
- Set up a program manager or unit within an existing department with limited independence (meaning separate bank accounts and increased decision-making capacity).
- Establish an independent government agency to manage the program.

Each option would again be informed by the policy and program designs and jurisdictional practices. For example, if there is a strong desire to closely manage funding flows, keeping the program within government, such as within the finance department, might be preferred. If agency independence and transparency are key drivers, an agency independent of government departments may be required.

2.4.

Legitimacy and the Legislative Process

Once participants agree to the key aspects of program design, the next step is to consider how the program can be activated and given legitimacy under existing government regulatory and institutional frameworks.

Governments usually operate under frameworks that control how public monies are appropriated, expended, and accounted for. Those frameworks often include national constitutions, parliaments and parliamentary committees, independent auditors-general, administrative tribunals, and courts. The mechanisms and tools used by the institutions to ensure that the government and its agencies comply with such frameworks will usually include legislation, regulations, ministerial directions, rules, and by-laws.

In some cases, basic elements of the program may have already been created through legislative processes (such as establishing the initial mandate for the program) before developing an understanding of all relevant policy and program choices. Once the choices have been determined, consideration then turns to choosing the right process to fully establish the program.

If a government expects the program to have a long-term focus, the government may prefer to establish the program within frameworks requiring that modifications be done in a transparent manner. For example, if the program is established through legislation or an act of parliament, then the same legislative process should be used to ensure transparency when future governments seek to change key aspects of the program (for example, change the use or allocation of money). If this approach is adopted, the proponents of such a program needs to consider what aspects of the program may be affected. These aspects include: the guiding principles of the program such as the policy design objectives, the major goals of the fund, the powers of the program manager, and the mechanisms to review the exercise of programmatic authority and reporting obligations. Amending or changing such features would fundamentally alter the purpose and intent of the program. All of the features constitute the bare-bones structure of a program to which further operational details can be added on separately.

Indeed, operational aspects of the program, which are likely to require regular change over the short to medium term, should not be included in the primary legislative process because the relative inflexibility of amending such legislations can lead to noncontentious program changes being unnecessarily delayed, thus having a negative impact on the program and its operational needs. For operational matters, subordinate processes (regulations, ministerial directions, rules, by-laws) tend to be more appropriate because they can be amended relatively easily but can still offer both transparency and accountability, particularly when combined with other governance and reporting mechanisms referred to in section 2.3.

Ultimately however, the approach taken in each jurisdiction will depend on the regulatory institutions that are in place and on the existing laws, rules, and practices. Whichever approach is taken, converting choices into a legitimate framework will always be time-consuming.

2.5.

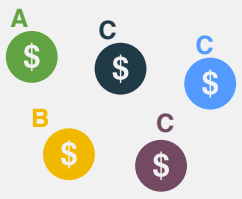
Budget and Financial Planning

From the point of central government or the administrating government agency, key considerations for the program's financial parameters include identifying the individual contribution levels of risk units or participating agencies, whether the program is set up to accumulate funds, and if so, the accumulation levels and funding ratios. Those aspects will collectively determine the size of the program and its ability to respond to larger disaster events.

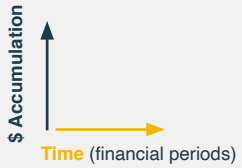
Depending on the structure of the program, other financial management issues include deciding whether fund monies will become ring-fenced (separated from government accounts) or will sit within general government expenditures, as well as deciding whether or how surplus funds and deficits will be invested. Those decisions determine the extent to which the program is protected from political and market changes.

All the parameters are interlinked to some extent, so they must be considered together. Their interrelationships are illustrated in Figure 2.4.

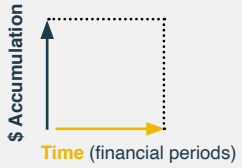
Figure 2.4.
Considerations of Financial Parameters



Contribution levels
How much does each entity have to contribute in premiums?



Accumulation levels
How are any surpluses in contributions accumulated over financial years?



Funding ratios
At what levels should accumulated funds be capped, relative to claims and operating costs?

Ringfencing of funds
Will the funds be formally separated from government accounts?

Investment of funds
Will the funds be invested and if so, what is the investment strategy?

Source: World Bank staff.

Contribution Levels

If the program is to be at least partly funded through premium contributions from participating entities, the contribution levels need to be based on a number of transparent, pre-agreed rules and defensible factors. Because most government agencies are funded from government budget allocations, the contribution levels will form part of the agency's overall budget. Consequently, the introduction of agency contributions or any increases to current agency contribution levels will have to come from existing agency funding, unless additional government funding is obtained.

Participating agency contributions are usually determined by one of the following methods (see also Table 1.1):

- **Risk-based pricing.** Pricing reflects the type of risk a participating agency introduces to the program (that is, the agency's risk profile). Those factors include the type of assets introduced; the age, quality, and location of those assets; the claims history; and the organizational risk-management maturity.
- **Solidarity or unit-based pricing.** When one uses this method, a unit of exposure or operation is identified, and participating agencies pay a flat share in accordance with the number of units attributed to them. For instance, a unit of exposure could be a measure of property size (for example, square meter).

Ring-Fencing of Funds

How program funds are held within government is another critical issue. Formally separating program funds from general government funds (ring-fencing) is a strong endorsement of the program's mandate to build national resilience by (a) limiting the ability of future governments to use program funds for non–program-related activities, (b) providing public transparency and accountability, and (c) giving stakeholders confidence that the program will function as intended, thereby encouraging their ongoing participation and support.

Alternatively, ring-fencing may result in an opportunity cost of not being able to use program funds for more pressing national priorities. One option that maintains program transparency while still making program funds available would be to identify the program risk as a line item in the government's contingency reserve fund.

Accumulation Levels

If the program is constructed in a way where annual contributions are made to a fund, decisions will need to be made as to whether contributions will be accumulated and, if so, the rates at this fund will accumulate over time.

Key considerations attached to accumulation decisions include these:

- The trade-off between building an accumulated financial resilience within the program versus the opportunity cost associated with funds that are not being used for other government priorities
- The amount of risk to be transferred to insurers and reinsurers, a high level of which will reduce first the retained risk exposure and therefore influence the actual or perceived requirement to accumulate funds over time
- Broader legislative settings that may prevent or limit the accumulation of public monies over multiple financial years
- The level of confidence in asset data-and-loss modeling integrity, which would allow governments to better target the amount of funds required to manage foreseeable events versus an open-ended accumulation approach

If a form of funds accumulation is permitted, it is important that the legislation or regulation supporting the program clearly and concisely defines (a) the purpose of the fund, (b) the fact that it is reserved for a specific reason, and (c) the exceptional circumstances under which the fund can be tapped for any other reason. This definition is important because it supports sustainability of the fund through changing administrations and government priorities.

Funding Ratios

The funding ratio of a program is the ratio of revenue (participating entity or central government contributions, plus reinsurance claims payments) to expenses (retained claims and operating costs). A 100 percent funding ratio means that the fund is breaking even and that the incoming revenue equals the outgoing expenditures and claims.

A reasonable approach will be to determine an acceptable range for the funding ratios, known as the target operating range. The program manager will need to take specific actions as agreed within the program's policies and approved by the governance mechanisms, which could include either injecting additional capital when financial resources fall below the range or reducing contribution levels when they go above.

Investment of Funds

If program funds are ring-fenced, a further consideration is how program funds are managed before being spent under the program. This approach is likely to depend on the prevailing government policies for managing government income, which dictates whether and where money can be invested, for how long, what the level of liquidity is, and what the expected rates of return are.

To Recap Chapter 2:

- The journey to design and build a public asset insurance program is a long one. Its key initial design steps are government consideration of why a program is needed, how the program is expected to address those needs, and how the government will establish and operate the program.
- Informed choices need to be made on the following:
  - The policies and objectives that the program is intended to address
  - Program structure, program mandate, participation obligations, and program governance
  - Financial structure and funding parameters
  - Once the policy, program, and regulatory framework is prepared, a foundation is set for developing and delivering a customized and sustainable program for public assets financial protection.

Worksheet for Chapter 2

Test your understanding of the chapter, and record your insights through this worksheet!

Activity 1.
A successful program of public assets financial protection depends on clearly set out obligations and duties of the different stakeholders or team members. Use (✓) to identify the obligations of participants and program managers.

	Action	Program Participants	Program Manager
1.	Represent the participant in market negotiations with utmost good faith.	☐	☐
2.	Ensure that risk-transfer protection is effective and continuous.	☐	☐
3.	Establish service-level agreement criteria.	☐	☐
4.	Accept as a duty to exercise reasonable care to protect against losses before they occur.	☐	☐
5.	Report or notify damage as soon as it is reasonably possible.	☐	☐
6.	Maintain compliance with the terms of coverage set out in insurance policies.	☐	☐
7.	Be a government representative in risk-transfer market engagement.	☐	☐
8.	Contributions (as required) to market-facing presentations.	☐	☐

Activity 2.
Strong governance mechanisms help the intended beneficiaries of the program realize the potential program benefits. Select the ideal frequency of governance review that needs to be conducted by different governance bodies.

	Governance Body	Ongoing (specify frequency below)	Annual (specify details below)	Once every 3–5 years (add notes below)
1.	Internal Governance			
2.	External Governance			
3.	Government Review			
4.	Parliamentary Scrutiny			

Activity 3.
Public asset protection programs are a means to meet a number of policy objectives. List three core and three complementary objectives for your program of public asset protection.

#	Core Policy Objectives	Complementary Objectives	List the Next Step(s)
Objective 1			
Objective 2			
Objective 3			

Activity 4.
Reflections

[a] My top three takeaways from this chapter are these:

[b] Three concepts or ideas I would like more information about are these:

CASE STUDY

Australia's Experience

Background

This Australian case study will consider one national self-managed insurance fund and three subnational (state and territory) funds in Australia. A managed fund is a form of self-insurance that operates by collecting premiums from participating fund members, by accumulating reserves, and by meeting future losses from those reserves.

Comcover is the Australian government's self-managed insurance fund that was established in 1998.[4] The three subnational state and territory funds considered are in the jurisdictions of the Australian Capital Territory, New South Wales, and Victoria.

Australian Capital Territory (ACT). The Australian Capital Territory Insurance Authority (ACTIA) is a government agency established in 2005 as the ACT government's captive insurer. It also insures ACT risks with reinsurers, and it develops and promotes risk-management practices within ACT government agencies.

New South Wales (NSW). In 1989, the NSW government established its own managed fund (now called icare, for "insurance and care") to compensate government agencies for any loss or damage to public assets from unexpected events including disasters from natural hazards. NSW's icare also reinsures its risks through the private market.

Victoria. In 1996, the Victorian government established the Victorian Managed Insurance Authority (VMIA) to provide risk management and insurance to government agencies. VMIA also reinsures its risks through the private market.

4 *Source*: "About Comcover," https://www.finance.gov.au/government/comcover/about-comcover.

Strategic Alignment

How will the program align with the government's overall risk-management strategies and objectives?

Comcover was established following a 1997 independent review, which recommended that the Australian government needed to consolidate the management and insurance of its assets. Comcover came into being on July 1, 1998, and replaced the policy of noninsurance that had existed since the early 1900s. That establishment left each agency to manage its own risks independently, which did not aggregate risks or liabilities in a transparent way and which did not incentivize agencies to manage their risks effectively. Liabilities were simply managed on an ad hoc basis through increased budget allocations.

The key business objectives of Comcover are to promote best-practice risk management for its 170 government-fund members, which will enable them to improve policy formulation and service delivery. It also provides a comprehensive insurance fund to protect against negative impacts of insurable losses. Those objectives were reaffirmed by the Australian government in 2007, 2011, and 2014. Comcover initially obtained reinsurance from the private market between 1998 and 2002. However, since then, it has preferred to entirely self-insure because of its ready access to funds, its ability to increase funds through taxes, and its wish is to avoid private-sector insurance costs.

Comcover's mandate extends only to Australian government assets and does not include state and territory assets, because those assets are owned and managed by each state and territory, primarily through their own self-insurance fund. The Australian government's expenditure on natural hazards (primarily floods and bushfires) is not managed by Comcover but through separate Australian government arrangements with the states and territories—primarily through the National Relief and Recovery Arrangements.

The state- and territory-managed funds were created for reasons similar to the reasons for creating Comcover, which are (a) to undertake a whole-of-jurisdiction approach to risk assessment and management and (b) to improve their overall risk-management and risk profile to obtain better terms and conditions from the private market. The state and territory funds all reinsure their risks to some extent as a result of their increased asset base (schools, hospitals, roads, energy infrastructure, etc., that are almost entirely owned by the states and territories), and because of their more limited ability to raise taxes to meet expenditure shortfalls.

What does the program cover? What are the priorities?

The Australian funds (including Comcover) generally follow the classes of insurance cover offered by the market, which consist of liability, including general liability; professional indemnity and directors' and officers' liability; property, including property-in-transit, fraud, and business interruption; motor vehicle; and personal accident and travel, including personal effects and medical emergencies.

Legitimacy

To whom does it apply?

Comcover mandates fund participation for all government agencies that are budget-funded within the government sector (departments of state and noncorporate entities) but not within government corporate entities or government businesses. ACTIA, icare, and VMIA generally follow this approach, with some local variations. VMIA has the broadest remit of Australian jurisdictions (4,600 entities) covering all state government agencies with $AUD200 billion of state assets including the road and rail systems, hospitals, schools, cultural institutions (art galleries and museums), cemeteries, and national parks.

What are the obligations on program participants and the program manager?

The Comcover Statement of Cover (SoC) sets out the obligations of Comcover and entity fund members. The SoC is a policy statement that is "insurance-like" and that requires fund members to comply with insurance-like obligations of full disclosure. It provides up-to-date information regarding asset registers, claims, major changes in risk profile, and so forth. Comcover in return has a range of service obligations to fund members relating to information management, confidentiality, handling of claims, timeliness, and provision of a range of risk-management services.

ACTIA, icare, and VMIA have a similar arrangement with their fund members, both through their own versions of an SoC, which springs from the requirements of their reinsurers.

Since 2014, Comcover fund members have been required by the Australian government to comply with the government's risk management policy, which requires fund members to implement a range of enterprise risk-management practices.

As part of its services, Comcover annually undertakes a benchmarking survey of fund members to assess their overall risk maturity. Since 2014, the survey has assessed maturity against the nine elements of the Australian government's risk management policy. Survey questions relate to the content of an organization's risk-management framework and policy, extent and use of risk appetite, types of information gathered and how it is assessed, risk accountabilities and responsibilities, risk culture, and ongoing system review. Although survey results are provided only to Comcover members and are not made public, an annual government publication[5] provided an overview of the 2017–2018 Comcover survey. The overview noted "a consistent increase in risk-management maturity in the four years since the Risk Policy was introduced. Data from 2018 found modest improvements against all of the policy's nine measures. Entities scored best in establishing risk management policies, embedding systematic risk management, and defining responsibilities for managing risk."

Similar risk-management obligations on government fund participants also apply in the ACT, NSW, and Victoria.

What governance and regulatory mechanisms were put in place?

Comcover regularly reports to the finance minister and reports twice a year to parliament on its financial performance, but Comcover does not publish a separate annual report. Comcover is subject to audits by the auditor-general. The Australian government commissioned independent reviews of Comcover in 2007, 2011, and 2014, all of which supported continuing the Comcover fund in its present form. ACTIA reports to the ACT treasurer, icare to the NSW finance minister, and VMIA to the Victorian minister for finance. The three all publish annual reports.

Where is the program located?

Comcover is located within the Australian government's Department of Finance and uses a dedicated government account to manage its financial transactions. ACTIA, icare, and VMIA have all existed as separate agencies independent of the finance and treasury departments. Moreover, all have separate financial accounts, but all have close reporting links to those departments.

What institutional frameworks and tools are available to enhance any initial government mandate and to establish and support the program?

Comcover's framework is a combination of a government's decision to establish the fund, which is a ministerial determination from the finance minister to set up a special account that administratively manages Comcover funds, plus administrative arrangements within the Department of Finance to manage the fund.

ACTIA was established as an independent statutory agency under the ACT Insurance Authority Act 2005. In 1989, icare was established by legislation and was substantially amended in 2015 both by acts

5 Australian Public Service Commission, "State of the Service Report, 2017–18," https://www.apsc.gov.au/state-service-report-2017-18.

of the NSW parliament and ministerial regulations. In 2012, the NSW Treasury issued a circular requiring all agencies other than electricity generators and suppliers to use icare for all their insurance requirements and to comply with icare's insurance requirements. VMIA was established by the Victorian Managed Insurance Authority Act 1996. The Victorian minister for finance has also issued risk-management and insurance standing directions under the Financial Management Act of 1994, which requires Victorian agencies to comply with VMIA insurance requirements.

Budget and Financial Planning

? What is the appropriate financial structure of the program?

Comcover's current policy is that it should be fully self-funded (that is, no external risk transfer) with budget funding to be sought if assets fall below zero and with funds returned to the budget when assets exceed $AUD150 million. ACTIA has a target funding ratio of 100 percent and manages its capital position between 100 percent and 120 percent. icare maintains net assets between 105 percent and 115 percent of liabilities. VMIA prefers a funding range of 82.5–117.5 percent.

The Comcover fund has a special account to administratively manage Comcover funds and expenditure. The account funds, while administratively separate, sit within the government's overall consolidated revenue fund and are subject to the Australian treasury's overall investment strategy. Other Australian states and territories largely follow this approach as governed by their specific legislative and regulatory mandates.

Lessons Learnt

The overall structure and design of the program reflects Australia's administrative structure with differentiated responsibilities at the federal and state level. This leads to nuanced differences between states in how public assets are managed and financially protected, which can lead to potential inconsistencies across states and between state and government. However, the flexibility also allows each state to tailor their solution to their local context and the different natural hazard risks that they face. This approach could be relevant to countries with very different subnational government structures, or where risks are substantially differentiated across regions.

The national program Comcover has evolved its support to members and its financial structure over time, catering to the members' needs and its own financial status. At the time of writing, Comcover is a fully self-funded scheme, without utilizing any reinsurance cover. This highlights the importance to continually review and adjust the program's mandates and financial protection strategy.

3.

Information Requirements for Public Asset Disaster Risk Financing and Insurance

What You Will Learn

- What information and data are required to design and implement a disaster risk-financing program supported by insurance.
- How to prioritize information and data collection to make best use of limited resources.
- How to compensate for gaps in data.

3.1.

Introduction

Every stage of the disaster risk-financing process requires data, information and analysis. Those data and analyses provide the evidence base needed to support decision-making throughout the design, development, implementation, and renewal stages of a process of public assets risk financing.

The regular updating and review of data are essential to reduce the risk of underinsurance, to ensure cost-effective renewal of annual insurance, to inform claims management, and to support broader asset- and risk-management processes. Procedures are required to capture data needed for insurance transactions, including collecting data at the asset-owning levels, as well as having centralized data management and validation.

Obtaining and using the right data and information for a risk-financing program are often challenging and costly. Data capture frequently requires sophisticated analytical platforms, and information can sometimes be hard to gather in a consistent and effective way to meet insurer needs. There may also be subtle differences in the data requirements from insurers between indemnity and parametric insurance solutions. Parametric solutions place emphasis on measuring the likelihood and scale of well-defined disaster scenarios, while indemnity insurance places focus on the assets exposed to risk and to the assets' values. Both, however, will require robust analysis of the entire pathway of impacts of disaster scenarios upon assets and the economy.

This chapter is structured as follows:

The use of data and information throughout the four stages of public asset risk-financing programs. This section identifies what data are required and why, as well as how they can be used across the four stages introduced in previous chapters: design, development, implementation, and renewal. This section gives an overview of how risk modelers and underwriters use the data provided.

Types of public assets data required. This section focuses on the types of data that government officials will need to collate, especially exposure and claims data.

Fitness for the purpose of collecting data. This section discusses how to prioritize data collection efforts in an environment of limited resources and data gaps.

Data are also helpful when choosing to retain some risk. In the same way that good data support insurer confidence, they also support well-informed decisions about how much risk to retain and how to accurately fund any retained losses. The decisions about program design can be further improved by accounting for broader information sources, such as public expenditure reviews and other records providing valuable historical context and lessons learned.

This approach means that it is difficult to create a single definition of data quality because the definition will change with relevance to risk, as well as with how critical the quality is to decision-making. Thus, adequacy and relevance, rather than quality, are better measures for data.

3.2.

How Data and Information Are Used for a Program of Public Assets Financial Protection

Introduction

Structuring and implementing the most appropriate disaster risk-financing instruments depend on obtaining data that are both readily available and that adequately represent the risks being addressed. Information derived from data underpins each stage of the roadmap, thus enabling effective decisions about the strategic alignment, the collective agreement of objectives, and the optimal balance between risk retention and risk transfer. Stakeholders have varying degrees of responsibility to collect data during the risk-financing process, but they gain corresponding benefits from the information provided by themselves and others.

Design Stage

For the design stage, the level of detail required will be low compared to other stages, as summarized in Figure 3.1. However, the data provided should accomplish the following:

- Provide a suitable indication of the overall risk profile.
- Be adequate to enable structured engagement with stakeholders and to reflect the scale and character of the risks being considered.

Figure 3.1.
Data Requirements during the Design Stage

WHAT DATA?	FOR WHAT PURPOSE?
Overview and general insights about these:	**Build the case for change, including the following:**
Historical impacts of natural hazards on public assets (e.g., academic research or hazard reports or both)	Develop a general understanding of the scale of disaster risk exposures from natural hazard.
The financial or budget impacts of such events (e.g., government financial statements, donor aid reports)	Identify the potential scale of financial impacts on government and the economy from disaster events and the benefits of financial protection.
Other significant social and economic impacts (post-disaster needs assessments, academic research)	Provide an early benchmark of the adequacy of existing funding arrangements.
Current contingent funding arrangements (e.g., existing funded and unfunded reserves)	Facilitate a structured stakeholder engagement.
Existing legislative or regulatory constraints or dependencies (i.e., fiscal management or procurement legislation)	
The approaches adopted by other jurisdictions as a benchmark	

HOW ARE DATA USED?	WHAT IS THE BENEFIT?
Data are often collected and collated by government officials to develop a problem or opportunity definition for senior leaders to consider.	Support informed discussion.
Better information leads to an improved understanding by senior leaders about arrangements for public assets financial protection, and those data help develop a government appetite statement about the likely nature and extent of arrangements.	Support agreement on strategic priorities, objectives, and benefits.
	Support a tailored approach to solution development.

Source: World Bank staff.

Development Stage

In the development stage, more detailed data are required, as summarized in Figure 3.2. However, the quality of data needed will vary depending on the approach used to assess the level of risk, the type of assets, and the ability of insurers to incorporate the data into underwriting and analytical models that will derive outputs of adequate accuracy.

At this stage, *risk analytics* approaches can be used to assess the relative materiality and scale of the financial impacts of various hazards. Analytics can include historical loss or damage data (often termed "experience" data) or the use of loss-estimation models, most particularly *catastrophe models* that forecast impacts for one or more of the most material hazards.

Catastrophe models form a core component of risk calculation both for traditional insurance and reinsurance transactions, and for parametric or catastrophe bond transactions, as illustrated in Figure 3.3. Therefore, it is important to check regularly about whether the model used (and the underlying assumptions) are up to date, particularly the exposure data used to represent assets at risk. For traditional insurance and reinsurance, brokers will often provide catastrophe modeling services during the development, implementation, and renewal stages.

Box 3.1.

Materiality and Its Application

Materiality relates to how relevant or significant particular data or information is in influencing the true representation of risk. Materiality determines how much data detail is required when making risk-based decisions. "Material" means of such a nature as to influence the judgment of a prudent insurer in determining whether he or she will take the risk, and, if so, at what premium and on what conditions. For example, if a collection of government properties is at risk from a significant earthquake, but those properties are not in a flood plain, then the material hazard will be earthquake and not river flood, even though the properties may still be at risk of excess rainfall flooding. Therefore, data about earthquake strengthening of buildings will be material but the height above ground of first-floor levels will not.

Source: World Bank staff, with extracts from UK Road Traffic Act, 1960

Figure 3.2.
Data Requirements during the Development Stage

WHAT DATA?	FOR WHAT PURPOSE?
A detailed public asset register (see next section and chapter 4)	**Options development and assessment for a tailored solution. Data modeling and information are used for the following:**
Catastrophe modeling analysis showing the physical and financial impacts on public assets under different disaster scenarios	Develop a detailed risk profile and central register of public assets.
Analysis of the government's explicit and implicit disaster contingent liabilities (i.e., funding obligations entrenched in legislation or non-entrenched moral obligations or both)	Identify and estimate the financial gap faced between the modeled impacts of disaster events and currently available funding.
Analysis of legislative and regulatory constraints or dependencies	Assess the appropriate retention-transfer options available.
Analysis of approaches adopted by other jurisdictions including lessons learned	Assess the costs and risk allocations most appropriate to each asset risk owner.
	Identify which hazards are most material to the loss potential (see Box 3.1 about materiality).

HOW ARE DATA USED?	WHAT IS THE BENEFIT?
The data represent the values and types of assets at risk, including critical assets of higher strategic, economic, and social priority.	Establish a well-informed basis to develop options that are more likely to be relevant and viable.
The public asset register is provided to catastrophe-loss modelers who run computer simulations of disaster events of varying severity to assess the financial impact on the asset portfolio (see Box 3.2 about risk modeling).	Provide a greater degree of certainty for senior leaders, thus enabling a more defensible and transparent explanation of the preferred option.
Government officials can use the outcomes of these simulations to accomplish these: ⊙ Assess risk appetite (i.e., the desire to retain a proportion of the risk). ⊙ Assess risk tolerance (i.e., how much risk to retain). ⊙ Identify the scale of risk-transfer requirements. ⊙ Account for or plan for the design of solution-specific legislation or regulation or both.	

Source: World Bank staff.

Box 3.2.

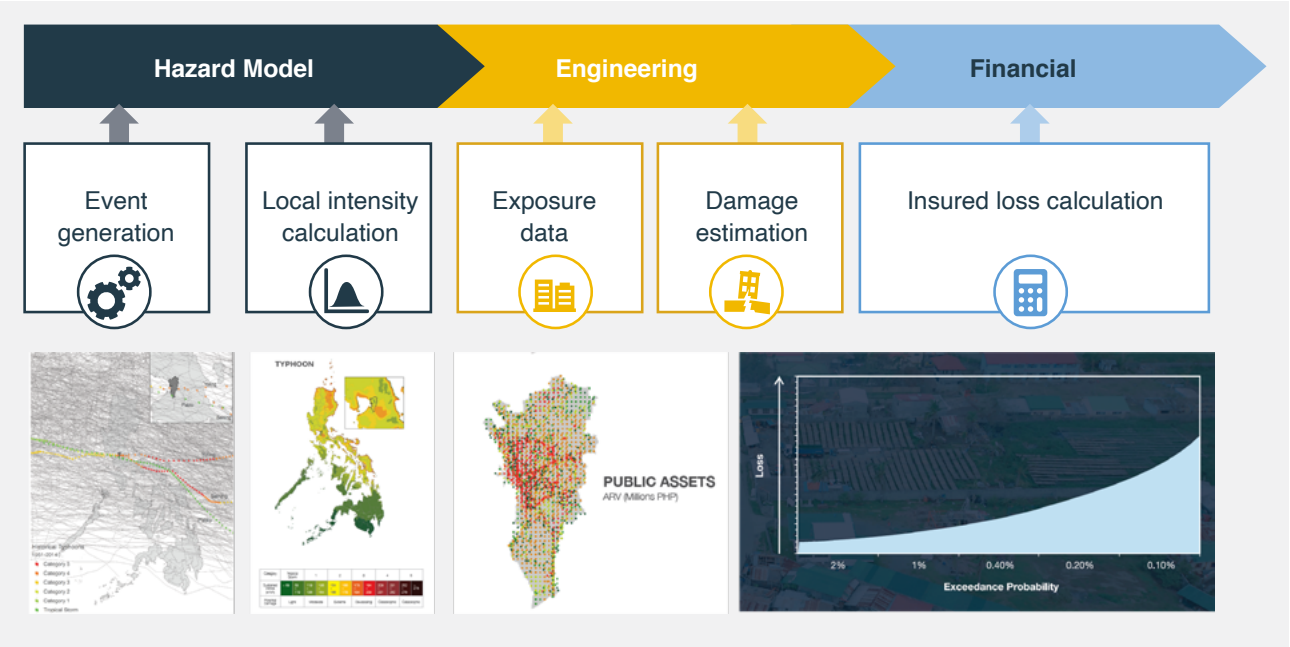
Catastrophe Risk Modeling

Often historical data are inadequate to accurately estimate the severity and probability of future events. To deal with this lack of actual data, catastrophe models have been developed to bridge the data gap when considering risk-transfer options for future events. Catastrophe models attempt to build a best-estimate view of the frequency of potential events, their severity, and their financial impact. Catastrophe models are often sourced from external providers such as specialist catastrophe modelers, insurance brokers, academic institutions or strategic partners such as the World Bank. On occasion, governments have established a specific risk modeling function to cater for their requirements (for example, the New Zealand Earthquake Commission's earthquake hazard model titled "Minerva").

Source: World Bank staff, based on interviews with the New Zealand Earthquake Commission

Figure 3.3.

Core Components of a Catastrophe Model



Source: Images from Province Risk Profile: Metropolitan Manila, Philippines Catastrophe Risk Assessment and Modeling, January 2018

Implementation Stage

After a risk-transfer solution has been designed and agreed to, the data and information provided should meet the ongoing needs of private sector participants who have accepted those risks (for example, traditional insurers and reinsurers; parametric insurance and catastrophe bond investors). Figure 3.4 summarizes the data requirements at this stage.

The confidence that market participants have in the data and risk information supplied will significantly affect the availability and price of the financial protection offered. Although data collected for the development stage could be adequate to allow the transaction to proceed, additional information may be required to support the transaction. For instance, additional evidence about the resilience of key assets to the insured perils can help improve the assessment of insured risks. To support this, governments will need to identify appropriate data management and service providers, and technology platforms. Chapter 4 looks at other considerations relevant to data management for public assets.

Ongoing needs will also include data and information related to claims activity:

- For indemnity insurance products, data requirements are likely to include damage reports and images, claims surveys and loss adjuster reports, and payment settlement details. Claims will need to be linked to the original asset record in a central database about public assets.
- For parametric insurance products, the data required to trigger the payout will need to be validated and agreed to (often by an independent third party) before payment is made. Parametric solutions are chosen when the insurance payout will be used primarily for the swift financing of emergency response efforts as opposed to repairing or replacing assets that have been damaged or destroyed. In the case of public assets, the solution could include installing urgently needed temporary infrastructure (for example, bridges or portable water treatment facilities), or to provide short term compensation to uninsured parties. Therefore, in this context, the emphasis on asset-level data is less strong, and it is possible to approximate the values and distribution of assets to some extent (for example, by using the population density in a given district or country).

The increased complexity and rigor needed for these data, particularly as an input to analytical models and outputs, may require outsourcing the task to specialists. If so, the outsourcing should be included as part of the procurement and budgeting processes when appointing third-party service providers.

Figure 3.4.
Data Requirements during the Implementation stage

WHAT DATA?	HOW ARE DATA USED?	FOR WHAT PURPOSE?	WHAT IS THE BENEFIT?
A detailed public asset register	The collated data requirements will form a detailed submission to risk-transfer markets (i.e., the insurance industry) (see Box 3.3).	Secure a tailored and cost-effective risk-financing program, thus:	Insurance market certainty will likely improve coverage and cost outcomes.
A catastrophe modeling analysis showing the physical and financial impacts on public assets under different disaster scenarios	Collated data will support content for a presentation to insurance companies and are designed to emphasize risk-management capability.	Establish a detailed basis of the risk profile being transferred into the private sector.	Services delivery will be tailored and well-prepared.
Engineering or resilience surveys for key or critical assets	The data will support procurement processes, including insurance and reinsurance, intermediary, and outsourced services requirements.	Support decisions regarding the scale of funding required to meet solution costs (i.e., retained losses, risk-transfer premiums, and administrative expenses).	Cost allocation will be equitable, transparent, and defensible.
A summary of asset risk-management practices	The data may also assist with the design and customization of insurance and reinsurance policy terms and conditions.	Drive decisions on the level of participating agency contributions.	
A summary of planned infrastructure or asset upgrades	Data will drive actuarial calculations for costs allocation.	Support decisions around the type and scale of services required, in turn supporting decisions regarding the in-housing versus outsourcing of different services.	
A record of past natural hazard claims or losses (if available)		Assist in setting specifications for any required procurement.	

Source: World Bank staff.

Box 3.3.

What Insurance Underwriters Expect

Insurance underwriters are the specialists who evaluate, analyze and price the risks associated with insurance policies issued by the insurance company for which they work. Because underwriters receive thousands of insurance submissions every year, they often manage those submissions through a preselection process involving three distinct categories: (a) best practice, (b) minimum requirement, and (c) more information required or decline the submission.

The more appropriate the data are to the risks identified, the greater the confidence an underwriter has in the submission. A low-quality submission can lead to increased uncertainty, which usually results in one or more of the following: a refusal of coverage, additional exclusion and subjectivities, and a significant increase in the premium. Importantly as part of the data submission, data formats need to be accessible to underwriters and insurers so that they are able to understand and interpret the risk profiles appropriately.

The following outlines the information underwriters expect in a submission:

1. **Submission Pack**
   Preferably, submissions include an overview document of the program, which sets out these:
   - Overview and description of company or institution applying for insurance
   - Insurance program overview and goals
   - Key contacts
   - Summary of the program including summaries of total values
   - Maps of asset locations to show spread of risk
   - Desired specifications and coverages required
   - Desired deductibles for each peril
   - Renewal timeline showing important milestone dates

2. **Schedule of Values**
   This client inventory identifies each asset to be insured under the program and details critical characteristics of each location.

3. **Loss Experience**
   This 5-year (minimum) history describes the nature and extent of any losses suffered in relation to the proposed schedule of assets. It also helps the underwriter to evaluate the likely profitability of an insurance proposal over time.

4. **Valuation Method**
   Underwriters are usually concerned about the accuracy of property valuations, particularly the appropriate value of the replacement costs. Much scrutiny will go into the methods of value calculations.

5. **Proposed Policy Form**
   Many insured parties appoint different intermediaries (like agents, brokers, or risk managers) to advise about the coverage that is required under the policy. After this information is collated, a proposed policy form can be presented with the submission to underwriters.

6. **Additional Information**
   Other useful information that can support the underwriting process includes these:
   - *Engineering reports*—risk engineers are often appointed by insurance companies, who will report in detail about the practices and conditions of the larger locations of the schedule.
   - *Maximum foreseeable losses or probable maximum loss (PML)*—Larger locations may be unlikely to have a total loss (there may be multiple buildings at the premises). Reporting such data to underwriters can have a favorable impact on rating.
   - *Catastrophe Reports*—These reports are produced to outline the resiliency of assets to natural catastrophes.

The quality submissions can vary significantly. Box Figure 3.3.1 provides an indication of best practice and minimum standards typically expected by underwriters.

Box Figure 3.3.1.
High-Quality and Minimum-Standard Submissions to Underwriter

Notes: The list is indicative only. For example, some underwriters may require longer loss history and claims experience

Source: World Bank staff.

Renewal Stage

As a risk-transfer program evolves, the need for data is not reduced. Ongoing development and quality management of data are required to ensure that data continue to accurately represent the risks being covered. Relevant considerations include the following:

- Changes to assets due to construction, renovation, and decommissioning
- Updated or improved scientific understanding of material hazards
- Updated or improved data collation and modeling technologies
- Claims experience over the previous period, which can influence the future price and terms of coverage and can be used to refine vulnerability data and to calibrate loss estimates
- The need for a revaluation if asset valuations are found to have been significantly underestimated (following a claim)
- Changes to analytics approaches (for instance an update of the version of a catastrophe model) that may also impact the future risk profile

The renewal process should be supported by data quality management system that is clear, documented and reported, which enables continual assessment, reporting, and remediation of the data used, as summarized in Figure 3.5. Preferably, this process would involve the following:

- Establish minimum data standards against which the asset-owning agencies that contribute data are benchmarked.
- Use information technology solutions to automate data collection as much as possible.
- Cross-utilize the data to support multiple policy agendas.
- Adapt data needs for emerging risks.
- Supply data- and information-reporting options that support governance and improved risk-management practices.
- Continued engagement with insurance companies and intermediaries enables an up-to-date awareness of changing data trends, which can lead to improved protection and pricing outcomes.

Figure 3.5.
Data Requirements during the Renewal Stage

WHAT DATA?
An updated detailed public asset register
A catastrophe-modeling analysis showing the physical and financial impacts on public assets under different disaster scenarios. This analysis should be updated regularly, especially if the nature of agency participation or covered assets has changed.
Engineering or resilience surveys for key or critical assets
A summary of asset risk-management practices
A summary of improved resilience investments
A summary of planned infrastructure or asset upgrades
A record of past claims or losses

HOW ARE DATA USED?
Data will form the core of updated submissions and presentations to insurance companies.
Data will become part of an annual anniversary review.
Government officials will review the on-going performance of the solution and will make relevant adjustments where necessary.
Data will assist government officials in reviewing their risk-retention appetite.
The data will inform intermediaries to make best use of market pricing cycles and to introduce new insurance companies.

FOR WHAT PURPOSE?
Maintain and evolve a tailored and cost-effective risk-financing program:
Update the risk profile being sold into the risk-transfer markets.
Support decisions regarding scope change (e.g., add new government agencies or public assets or both).
Use to assess or validate service performance standards.
Use to assess the effectiveness of resilience investments (e.g., in the form of reduced catastrophe-modeled impact values or claims).

WHAT IS THE BENEFIT?
Effective governance and change management
Evolution in a secure and controlled way
Market attraction and competitiveness that does not wane

Source: World Bank staff.

3.3.

The Types of Public Assets Data Required

Concepts of Risk and Overview of Data Requirements

The concept of *utmost good faith* is one of the fundamental doctrines of insurance. That principle legally obliges all parties within the transaction not to withhold information that could affect the representation of the scale or characteristics of any risks being faced. Utmost good faith can be contrasted with the buyer beware position in most jurisdictions, under which a seller need not disclose to a potential buyer anything not asked about. Data disclosure underpins utmost good faith because it is in the interests of each party to build an in-depth understanding of the risks being transferred.

Primary data requirements derive from the components that define risks, namely hazard, vulnerability, and exposure. Their definition and use are summarized in Figure 3.6.

Figure 3.6.
Risk Components and Data Requirements

Risk = Probability of Loss = Hazard x Vulnerability x Exposure

	HAZARD	VULNERABILITY	EXPOSURE
Definition	Data describing the types and intensities of the various perils that might negatively affect the assets	Data quantifying the expected level of damage and loss to the assets from the hazards	Data describing and quantifying the elements at risk, which will be the public assets in the context of this chapter
Use of Data	Characteristics of the peril are defined, such as depth, velocity, and duration of a flood, as well as the spatial and temporal variations in the intensity of those features. In many cases, the estimated probability of the hazard event occurrence (e.g., a 1:100-year return period flood) will determine the probability of the loss.	Often these uses are represented as the relationship between a measure of the hazard intensity and the expected level of damage, or the likely range of damages. For financial risk, the damage function will usually be converted to a suitable value of potential monetary loss or a damage ratio of a percentage of insurable value of the asset.	Exposure data are often described as COPE (construction, occupancy, protection, and exposure), and they reflect the key underwriting characteristics used when evaluating insurance risk. The exposure data will represent major features of those assets (where, what, and how much), which together will characterize their value and expected resilience.

Source: World Bank staff, adapted from Understanding Risk (UR) website, https://understandrisk.org/vizrisk/what-is-risk/

In most cases, hazard and vulnerability data will be provided by third-party specialist organizations such as academic research agencies, modeling companies, or engineering consultancies. As a record of the insured assets, the responsibility for collection and quality of exposure data will usually rest with the insured. In the context of a government's public assets approach, obtaining data will generally be a collective activity between asset-owning entities and centralized surveying and administrative functions, using public assets registries, a process that is further elaborated in chapter 4.

Other data sources can be used to support the insurance negotiation and transaction process, such as engineering or survey reports of key assets, infrastructure statistics (for example, power network output), and data captured on claims and damage experience. All of these can be used to improve the representation of the key risk components and to support increased confidence in the quantification of risk.

Exposure Data Required from Asset Managers

Although third parties will usually provide the hazard and vulnerability elements, responsibility for the capture and management of exposure data will most often rest with the asset-owning entity or an administrative agency that manages collection from the asset-owning agencies. In some cases, a centralized public asset registry holds all asset records and is the source of exposure data: a snapshot of the asset records from the registry reflecting the extent and status of those assets at a given point in time. Chapter 4 will discuss this use of a registry in more detail, as well as the broader benefits of a public asset registry.

A typical insurance transaction process will use an exposure snapshot created some months before the inception date, so that by the end of a typical annual insurance or reinsurance contract, data could be more than 18 months old. In many countries, data could be even older or incomplete. Nevertheless, the insurance transaction process can form an important catalyst to improve data about public assets.

Exposure data can be used to reflect risk for the following:

- Stand-alone (e.g., an individual building or structure)
- Aggregate (e.g., one of a collection of other assets that are distributed geographically or spatially
- Time-varying (e.g., changes over time or an entire lifetime) risk

Key data elements (*attributes*) will reflect the most important construction, occupancy, protection, and exposure (COPE) information: where the assets are located, how close they are together, their construction materials, their primary use, and the year they were constructed, plus any information that identifies any key resilience features (roof bracing, window and door covers, flood defenses, etc.). The collection of COPE data is important because it is used by catastrophe modeling programs to generate an accurate assessment of risk and to provide a basis for insurance premiums. Without COPE data, underwriters will tend to assume the worst, which would lead to higher insurance premiums.

Because insurance underwriters will often use risk models, the structure of the exposure attributes will often be in the format of, or converted to, model data schemas. Modeling companies often call these primary modifiers, as shown in Table 3.1; they include the COPE characteristics of the assets that influence the assumed vulnerability or resilience of an asset to the perils being covered. Therefore, they help identify the estimated damage and loss expectations. Annex 2 gives a more detailed explanation of each of the primary modifier attributes. Other features, called secondary modifiers, may also be captured. For example, a structure may have additional risk-mitigation features such as extra roof bracings that could reduce vulnerability.

Estimation of Total Insured Value

In public asset systems, there is a range of potential valuation estimates that can be recorded, depending on the use of such data. These estimates are often termed the “bases of value.” For example, market value (value that an asset will have for open sale at that time), rental value’(leasing rate), fair value, book value, and acquisition value are commonly captured for uses ranging from taxation through to asset sales.

However, none of these is suitable for insurance because the principle of insurance is to provide financial compensation to support repair or replacement of an asset or for financial losses after the termination or disruption to the asset’s function as a result of damage.

Table 3.1.
Common Primary Modifier Attributes

CHARACTERISTIC	KEY USE	EXAMPLES OF COMMON APPROACHES	CONSIDERATIONS
Location	Hazard-exposure overlay, proximity, and spatial correlation	Latitude and longitude coordinates plus the address	Geographic accuracy (real-world position) is shown.
Construction	Resilience and vulnerability assumptions	Applied Technology Council (ATC-13) codes, Global exposure database for all (GED4ALL)	Variations exist in construction codes and non–building codes.
Use or Occupancy	Resilience and vulnerability assumptions	Applied Technology Council (ATC), Standard Industrial Classification (SIC), North American Industrial Classification System (NAICS) codes—industrial, commercial, residential types	Descriptions may be inaccurate.
Age	Building codes applied, resilience, and vulnerability assumptions	Year built or retrofit date	Age of construction, not acquisition, is listed.
Floor Area	Resilience and vulnerability assumptions	Building footprint or survey of floor area	Area may be inaccurately estimated.
Height	Vulnerability and structural response	Number of stories (building) and height	There may be a metric error (e.g., feet vs. meters); and whether structures such as basements are included.

Source: World Bank staff and contributing authors.

Insurers often refer to the total insurable value (TIV), which will include all monetary costs that the insurance policy will cover in the event of damage or loss. TIV will often be reported using three or more columns, depending on whether the policy includes these items in its coverage:

a) Buildings and contents TIV

Buildings TIV is the reinstatement or rebuild costs to replace the structure if it is totally destroyed. Contents TIV is the total value of all nonstructural assets contained within the structure.

For both buildings and contents, the specific form of insured value estimation will depend on the type of insurance coverage being sought.

- **Full rebuild cost.** In some cases, the coverage will be for full rebuild costs of the asset. For example, for a school building the costs associated with full rebuild including materials, labor, and all other fees and costs including land and debris clearance, legal and other professional fees, taxes, etc. would be added into the TIV. The extra costs can be significant (for example, debris removal can add 15 percent or more to an overall cost for replacement).
- **Actual cash value (ACV).** Where assets are older and are perhaps in poorer condition as a result of wear and tear, or where it is not essential to replace the structure exactly as was, the depreciation is taken into account; this is called an ACV estimate. Care should be taken when considering depreciation because the value used to depreciate may not reflect the actual costs to rebuild or replace the asset, especially if those assets are considered to be critical to the service provision or are otherwise of high priority. In addition, it may be that actual rebuild or replacement costs would be higher either if the original structure requires reconstruction using more modern materials or if the new structure needs to conform to higher building standards at the time of rebuilding.
- **Historical or specialist buildings.** Another common consideration for government asset owners will be in the valuation of historical buildings and other nationally important structures. Those structures may require specialist materials and reconstruction approaches that can be more expensive. Equally, nonstructural assets, including important contents such as works of art, may be difficult to value. In those cases, specialist valuations can be provided by insurance intermediaries or by the asset owners. Assets with cultural, heritage, or artistic value can be insured under agreed value conditions, which provide for the certified value of the asset to be paid in the event the item is damaged or destroyed. An artwork that is not insured under such conditions will be covered by the policy only for the value of the materials of which it consists.

c) Consequential damages TIV

Here the total insurable value is related to loss of profit or other defined financial gain over a specified period; where such a loss is due to the disruption from damage to the structure. A separate "increased cost of working" figure could also be included for situations where income could be maintained but at an increased cost (for example, by temporarily using older machines or other premises).

If consequential damages is covered, the period of coverage (the *business restoration period*), which for example could be six months, will be stated, and the premium will reflect this period.[7]

It is important that care is taken when determining the insurance value at risk. Incorrect estimations of full rebuilding values, stock and content inventory values, or potential downstream liability costs such as those related to service interruption, can significantly impact the overall level of exposure; in the event of a loss, such estimations may dictate the level of payment received from the insurer. Common errors include those listed in Box 3.4.

Averaging is an insurance principle designed to protect the insurance company from underinsurance. Asset owners may insure their assets for a value that is less than the replacement value of the asset in order to save premium costs (and to accept the risk that the asset will be damaged to a higher extent than the insured amount will compensate for). By applying the average clause, the insurer may reduce its claims payout by the same percentage shortfall in the full value of the asset. For example, if a property is underinsured by 30 percent (that is, the sum insured is 70 percent of the actual replacement value), and the property incurs damage costing $100,000 to repair, the insurance policy will pay $70,000, even if the sum insured is greater than this figure.

In some countries (for example New Zealand), averaging can be applied only if there is a specific clause in the policy. In other jurisdictions, insurance companies may apply average as a general principle to insurance claims and without any notification in the policy.

Insurance policies that legitimately have a sum insured that is less than the full value of the asset are called first-loss policies. Under the utmost good faith principle described earlier, asset owners must disclose that they are not insuring for full value, and this fact will be reflected in the premium, effectively charging for removing the average condition.

7 While this context focuses on consequential damages and losses as a result of disasters caused by natural hazards, there are other reasons which could lead to disruptions to the normal course of business, as exemplified by the COVID-19 lockdowns around the world. Other risks include cyber-attacks, civil unrest, or terrorisms. Therefore, when considering consequential losses cover, the government may wish to identify other potential risks that are relevant as part of the cover.

Box 3.4.

Common Errors in Valuation and Exposure Data

- **Undervaluation of assets.** This error can lead to a coinsurance or average provision (see herein) being applied in the event of loss.
- **Underestimating full rebuilding costs.** Underestimation may be due to missing out factors such as debris removal, mandated code improvements, and a projected demand surge that causes inflation in the construction industry after a major disaster event.
- **Inconsistency in currency reported.** This error is when there is a lack of clarity as to what currency the values are declared in or values are declared in multiple different currencies.
- **Frequency of asset valuation.** Valuation needs to be carried out on a 3- to 5-year cycle and must consider yearly inflationary factors to keep the values up to date. The length of time between valuation and coverage can compromise the insurance valuation. Cost inflation can affect all aspects of reconstruction costs; if ACV has been cho**sen, depreciation can also vary over time.**
- **Unclear or inconsistent data formats.** Use of abbreviations or inconsistent recording of address information may be present.

Source: World Bank staff and contributing authors.

3.4.

Fitness for the Purpose of Data for Public Assets Risk Transfer

Data Quality and Data Adequacy

In the insurance and reinsurance industry, data quality is often defined in terms of the needs for capital adequacy reporting and regulatory approvals. For instance, the European Union's Solvency II Directive requires firms to assess and report the accuracy, completeness, and appropriateness of data used to estimate capital requirements and to manage their operational risk. In the United States, the Sarbanes-Oxley Act (2002) adopts a similar approach.

However, the meaning of the term *quality* will differ, depending on several factors:

- **The criticality of the decision to be made using the information provided.** For example, if the data are to support a decision on the level of insured value for a critical or high-valued asset, the data-quality requirements are likely to be higher.

- **The standard practices applied.** For example, insurance industry expectations about data quality will differ across countries and asset classes, depending on the relative materiality of the risk to the industry's business. For example, a chemical storage facility may require higher data integrity than does an office building.
- **The regulatory demands placed on insurance markets.** Again, the level of materiality will be a key driver of reporting requirements.

The required *accuracy* of risk-financing data will be driven by a combination of market expectation and pragmatism, which makes it difficult to create a single definition of data quality. The definition will depend on the risk materiality, as well as the criticality of decisions made using that definition. Rather than quality, a more suitable term to use when considering the appropriateness of data for risk assessment is *adequacy*.

As with many other activities, the adequacy of data for risk transfer will tend to follow the *pareto principle* (the 80/20 rule), with the priority for risk-based information on those characteristics that reflect the most material aspects of the risk faced. This activity implicitly recognizes that the creation of perfect data is not possible and is in fact impractical.

So, for example, if an insurance policy covers thousands of individual assets, the insured values of those assets will vary. The priority for obtaining detailed information would be toward the most valuable assets, thus ensuring that most of the value at risk is adequately represented in the risk assessment. Of course, there may be other reasons for some assets to be considered of higher importance—such as being critical to the provision of a service—which may also influence data capture priority. In general, however, data adequacy will be dictated by the level of confidence deemed necessary in the risk assessment.

Data Accuracy and Data Precision

One common mistake made when considering the adequacy needs for obtaining risk data is to confuse accuracy with precision. For example, an asset registry database may hold records for all sites, including a geographic coordinate to a very high level of precision (e.g., to the nearest meter). However, it may be that the coordinate is not for the actual location on the ground but for another site such as a town center that may be some distance away from the real position. In this (very common) situation, the precision of that data would be high, but the accuracy may be low, resulting in spurious precision and misplaced confidence in the quality of the risk representation. (See Table 3.2 for examples.)

Managing Data Gaps over the Longer Term

As noted in the introduction to this chapter, data management can be complex. It is expected that the quality and consistency of data will improve over time and will be subject to the following:

- Lessons learned
- Requirements of insurance companies
- Improved data collection technologies
- Governance reporting needs
- Recognition of the value of new and different data sets

Box 3.5 shares the experience of the New Zealand government in collecting and improving its data management, which will feed into insurance valuations.

Table 3.2.
Examples of Data Accuracy Requirements

DATA TYPE	ACCURACY LEVELS
Hazard data: for example, flood-event database	Calibration to historical events including flood perimeters
	Elevation data accuracy (depth and flood extent positions)
	Rainfall duration, intensity, and area affected
Vulnerability data: for example, earthquake ground motion and loss function	Calibration of damage and loss estimates to intensity
	Calibration to local asset characteristics
Exposure data: for example, asset inventory COPE data	Geographic location accuracy: for example, percentage of locations with a coordinate position falling within the structure footprint
	Value at risk: within X percent of actual reconstruction cost
	Construction type: reflecting actual structure
	Age: since year of construction

Source: World Bank staff and contributing authors.

Box 3.5

Lessons Learned from the New Zealand Insurance Valuation

Commercial insurance customers (including government agencies) have learned important lessons attached to insurance valuations versus accounting (book value) valuations. Insurance brokers have also contributed significantly to educating their customers about the importance of fit-for-purpose valuations in the sense of the following:

- Valuations for insurance purposes focus on the costs to replace a building, while accounting valuations tend to include depreciation and are not typically a reflection of the cost to rebuild a building. The book value approach most often results in under-insurance and a loss of confidence by insurers in the accuracy of valuations.
- Valuations should be revisited or renewed on a regular basis. Typically, new valuations should be undertaken every 3 to 5 years—more often for organizations with a dynamic asset profile.

Insurance valuations in New Zealand include the following components:

- **Indemnity Value.** This component represents the estimated current book value of the property and accounts for age, condition, and market forces.
- **Indemnity Inflationary Allowance.** A monetary allowance recognizes that inflation will change the current book value over the course of a year (i.e., a building may be worth more in a year's time simply by way of market forces driving prices up; this rise is usually achieved through a simple consumer price index).
- **Replacement Value.** This value represents the cost of replacing old with new. It can be an estimate only and does not account for betterment or exceptional inflation that may occur after a significant disaster event and a change in building standards that could not be foreseen at the time of the valuation.
- **Replacement Inflationary Allowance.** As with Indemnity inflation, this allowance relates to natural shifts in values caused by inflation over a set period of time (usually per year).
- **Demolition or Removal of Debris.** This component estimates the cost to demolish a building and to remove the debris, thereby placing the land in a position to rebuild.

By having valuations broken down this way, a customer can make coverage decisions tailored to each situation and to strategies. For instance, if customers foresee that they would not rebuild a particular building if it were destroyed, they might choose to insure only for demolition and removal of debris.

The replacement value estimates are designed to include the professional fees (such as design and consenting costs) but those estimates are typically not shown independently. Generally, New Zealand's commercial customers, including government agencies, take the traditional COPE approach to asset exposure data collection.

The asset exposure data sets a base for loss modeling of different disaster scenarios. In the instance of New Zealand's all-of-government approach, the services of the national geoscience agency called GNS Science were used. In applying their modeling, GNS Science add to the exposure database by overlaying other exposure factors, such as these:

- Sub-soil type (and thus the likely shaking intensity or liquefaction impact in modeled earthquake events)
- Vulnerabilities to failures in public utilities
- Potential impacts on accessibility
- Vulnerabilities to secondary risks, such as fire following an earthquake

Those combined insights also assist customers to better determine their consequential damages exposures. Besides listing building exposure data and contents, plant and equipment data per location are also collected.

Source: World Bank staff.

Risk-financing programs are subject to regular renewal and review cycles. The key review points should also encompass data management practices and should focus on continual improvement. A government may establish a project within the program that will target specific and incremental data management improvements over multiple years. Those increments should be realistic, relevant, and achievable so that practices mature over time. Depending on a government's starting point, the improvement objectives may include the following:

- Develop a metadata standard for quality and consistency.
- Plan for a shift from manual collection to automated collection through a suitable software solution.
- Use data as a tool to better identify critical assets and vulnerabilities.
- Use data to link claims and losses to specific assets, thus supporting future resilience investment decisions

Data management planning should involve different stakeholder perspectives, including these:

- **Asset managers.** What data collection is realistic and how can improved data collection support other asset management objectives?
- **Governance members.** What data and reporting capabilities will better inform decisions regarding program performance or scope change?
- **Brokers.** What data will better position the brokers to effectively sell your risk profile into the risk-transfer market at best coverage terms and price?
- **Loss modelers and actuaries.** What data will provide greater certainty in modeling outputs and cost allocations?
- **Insurers.** What data are expected as a minimum standard, and what additional data will add value to the insurers' considerations?

To Recap Chapter 3:

- Data and information are integral to a successful program of public asset risk financing. Any journey toward an effective and efficient risk-financing program must account for building data capture and analysis capability. The rewards for doing so are numerous, key among them being greater certainty that you are focusing on the right priorities and that you are making cost-effective and defensible choices about what risk to retain and what to transfer.
- Better data also will incentivize better early warning and better risk management of public assets. The next chapter discusses how data and information can be captured and maintained within a broader asset- and risk-management context.

Worksheet for Chapter 3

Test your understanding of the chapter, and record your insights through this worksheet!

Activity 1.
From the types of data listed below, use (✓) to identify data that are a minimum requirement and data that are considered high quality by underwriters in pricing of a public asset insurance program.

	Type of Data	Minimum Requirement	High-Quality Data
1.	List square footage of location.	☐	☐
2.	Identify mitigation steps taken by client to prevent future losses.	☐	☐
3.	Include the 5-year average claim made by year.	☐	☐
4.	Add information about major renovations.	☐	☐
5.	Explain the catastrophe zone of each location.	☐	☐
6.	Show occupancy at each location.	☐	☐
7.	Have a detailed description of losses incurred and an outline of sequence of events.	☐	☐
8.	Estimate the net loss payable by insurers.	☐	☐
9.	Add basement and parking information.	☐	☐
10.	Show evidence that inflation is being considered year-on-year.	☐	☐

Activity 2.
Can you describe the benefit(s) of using high-quality data across different stages of financial protection in the public asset program.

Stage	Benefit(s) of High-Quality Data
Design	
Development	
Implementation	
Renewal	

Activity 3.
Review your current understanding of data available in your country. Try to identify whether you have these data and how adequate it is in implementing financial protection of the public assets program.

	Type of Data	Do we have this data? How adequate is it?
1.	Current contingent funding arrangements that use existing funded and unfunded reserves	
2.	Analysis of the government's explicit and implicit disaster contingent liabilities	
3.	Approaches adopted by other jurisdictions as a benchmark	
4.	Engineering and resilience surveys for critical assets	
5.	A record of past natural hazard claims and losses	
6.	Analysis of legislative and regulatory constraints or dependencies	
7.	An updated, detailed public asset register	
8.	A summary of asset-risk management practices	

Activity 4.
Reflections

[a] My top three takeaways from this chapter are these:

[b] Three concepts or ideas I would like more information about are:

4.

Public Asset Management

What You Will Learn

This chapter discusses the benefits and challenges of a public asset registry (PAR) to support a program of public asset financial protection, insurance, and wider government needs. Key topics include:

- The key components of a PAR
- How to set up and manage a PAR
- How some countries keep accurate records of their public assets

4.1.

Introduction

Chapter 3 highlighted the importance of data and information to support the process of designing, developing, and delivering a program of public asset financial protection. An important and effective way to hold and use the data and information gathered about assets is through a public asset registry (PAR). More broadly, however, a PAR can also support an improved, whole-of-government approach to asset management. This chapter focuses on PAR, its benefits, and its concepts—all of which draw on the experience of several global projects that are being managed by the World Bank and that supported the development of asset management strategies and PARs. Developing a functional PAR is an extensive endeavor that would likely take many years, as is an operational public asset insurance program. For many countries, a pragmatic path would involve continuous development and improvement of both the PAR and the insurance program, based on lessons learnt and their local context and needs.

The chapter is structured as follows:

- **Key concepts and benefits of asset management.** This section provides a brief overview of the benefits of better asset management and associated concepts in line with international standards.
- **Key components of a PAR.** Each country must consider its local context in designing a PAR system. This section provides an overview of a conceptual PAR, along with brief descriptions of its core components and summaries of the PAR's development experience in different countries.
- **Implementation of a PAR.** Developing a PAR presents significant design challenges, so a phased approach to implementation can be used to address each country's circumstances. This section provides a guide to potential implementation processes, key challenges, and potential mitigation measures.

4.2.

Overview of Public Asset Management and Its Benefits

In many countries, the government is the most significant asset owner, particularly when it comes to infrastructure assets that are vital to the socioeconomic functions of the country. The International Monetary Fund estimates[8] that nonfinancial public assets such as buildings, infrastructure, and land are valued at 120 percent of GDP in some countries sampled.[9] A World Bank review of governments in 52 countries[10] found that despite the significant value of existing assets, 98 percent of the governments surveyed focused on new investments rather than on tracking the existing stock of physical assets.

Assets are often managed in separate government departments. Data about the assets are often outdated, incomplete, and stored on systems in formats that are incompatible with and inaccessible from other systems.

Amid the challenges of (a) rising population growth, (b) increasing risks from climate and disaster incidents, (c) increasing rapid infrastructure development and replacement, (d) rising expectations of service levels from assets, and (e) growing government fiscal constraints, it is vital that governments efficiently and effectively identify, monitor, and manage their assets as important national resources.

The benefits of implementing better practices of asset management include the following:

More effective and forward-looking decisions.
Decision-making can be more effectively supported through these:

- More robust information and evidence
- More comprehensive consideration of viable options
- Integration of all life cycle costs of the assets in decision-making processes

8 IMF estimates are for a broad sample of 31 countries.
9 IMF, Fiscal Monitor Reports, "Managing Public Wealth," October 2018. https://www.imf.org/en/Publications/FM/Issues/2018/10/04/fiscal-monitor-october-2018.
10 See World Bank Blog, June 14, 2019, https://blogs.worldbank.org/governance/where-have-all-public-investments-and-infrastructure-assets-gone.

Improved financial efficiency.
Spending effectiveness can be improved through these:

- Better decision-making that is based on the costs and benefits of alternatives
- More informed prioritization of investments, interventions, and asset protection activities
- Greater recognition of all costs of owning and operating assets over the life cycle of an asset
- More effective procurement
- Greater risk-transfer market attraction, which results in better pricing
- The ability to benchmark the conditions and performance of asset use

Improved governance and accountability.
Effective asset management can accomplish these:

- Allow the government to demonstrate to owners, customers, and stakeholders that services are being delivered effectively and efficiently.
- Develop a transparent and auditable basis for making trade-off decisions between service, risk, and price.
- Improve accountability for the use of scarce resources through performance and financial indicators.
- Provide the ability to compare results with similar organizations.

More effective risk management.
A broader, whole-of-government approach to asset management can accomplish these:

- Improve legal and regulatory compliance.
- Provide a better understanding of the risks to assets.
- Improve cross-government relationships and interrelationships among different assets and networks.

- Improve the prioritization of improvements to the resilience of critical assets.
- Improve business continuity practices.
- Support investments in risk reduction, prevention of loss, and preparedness for rapid restoration of service.
- Inform efficient financial protection to ensure access to funds for rapid rehabilitation of assets and restoration of service.

Improved customer service.
Enhanced monitoring of asset performance and services and the development of multidisciplinary management teams can accomplish these:

- Improve the overall understanding of service requirements, options, and delivery.
- Monitor the performance and control of service delivery to the required standards.
- Improve service delivery to the population.

Since the 1980s, many organizations and practitioners have published guidance about asset management standards and practice. The International Organization for Standardization's ISO 55000 has now become an international consensus-based standard for implementing, maintaining, and improving an asset management framework. A summary of the key elements of asset management as presented by ISO 55000 is provided in Box 4.1.

Improved asset management can help make an organization's infrastructure and building stock more resilient, thereby reducing the risk of damage and destruction. Improved asset resilience overall is critical for a sustainable financial protection program, which helps reduce the risk of loss over time.

Box 4.1.
ISO 55000:2014 Asset Management

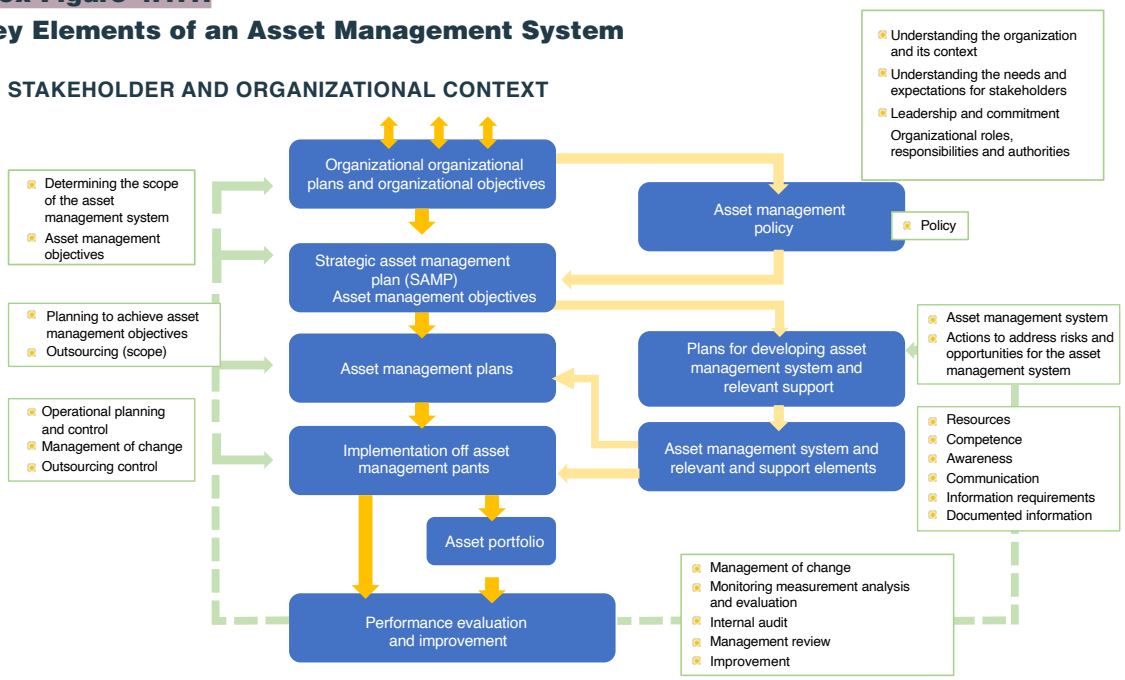
ISO 55000:2014 is the internationally recognized standard that provides an overview of asset management, its principles and terminology, and the expected benefits from adopting asset management. ISO 55000:2014 can be applied to all types of assets and by all types and sizes of organizations.

There are many definitions of *asset management*, and ISO 55000 defines an asset as something that "has potential or actual value to an organization." It defines asset management as something that "enables an organization to realize value from assets in the achievement of its organizational objectives." An asset *management system* is used by the "organization to direct, coordinate, and control asset management activities."

The asset management system for an organization includes (a) an asset management policy; (b) a set of asset management objectives; (c) a strategic asset management plan; (d) an asset management plan(s); (e) a number of supporting activities; (f) an operational planning and control system, including the processes and procedures used to manage assets in the asset portfolio throughout their life cycle; (g) a performance evaluation system; (h) a set of designated improvement activities; and (i) a guidance plan describing how it relates to or interfaces with other relevant policies, processes, and management systems.

The asset management system, the activity of asset management, and the asset portfolio should be aligned with and should support the achievement of organizational objectives and the organizational plan. Box Figure 4.1.1 shows the relationships among the key elements of an asset management system.

Box Figure 4.1.1.
Key Elements of an Asset Management System



Sources: ISO 55000:2014(en), "Asset Management—Overview, Principles, and Terminology" at https://www.iso.org/obp/ui/#iso:std:55088:en. ISO 55002:2018(en), "Asset Management—Management Systems—Guidelines for the Application of ISO 55001" at https://www.iso.org/obp/ui/#iso:std:iso:55002:en.

4.3.

Public Asset Registries and Their Core Components

A public asset registry is a digital database that assists effective whole-of-government business planning by providing a single source of information about all nonfinancial government assets, along with their geolocations, physical characteristics, asset value, and asset life.

A PAR can be used to achieve the following:

- Maintain a central repository of information about government assets across the asset life cycle (information can include data about asset creation, capitalization, valuation, depreciation, repair and maintenance, transfer, split, decommissioning, and retirement).
- Conduct an annual physical inventory of all assets.
- Maximize the value of public assets by optimizing the way the assets are allocated, used, leased, and sold.
- Conduct risk assessments of assets while recording historical data about disaster events and post-disaster assessment or by using advanced tools to assess the asset's exposure to different types of risks.
- Prioritize assets for operational and financial protection, including for the purposes of risk transfer and insurance on the basis of varied parameters such as asset value, location, condition, strategic importance, and risk.

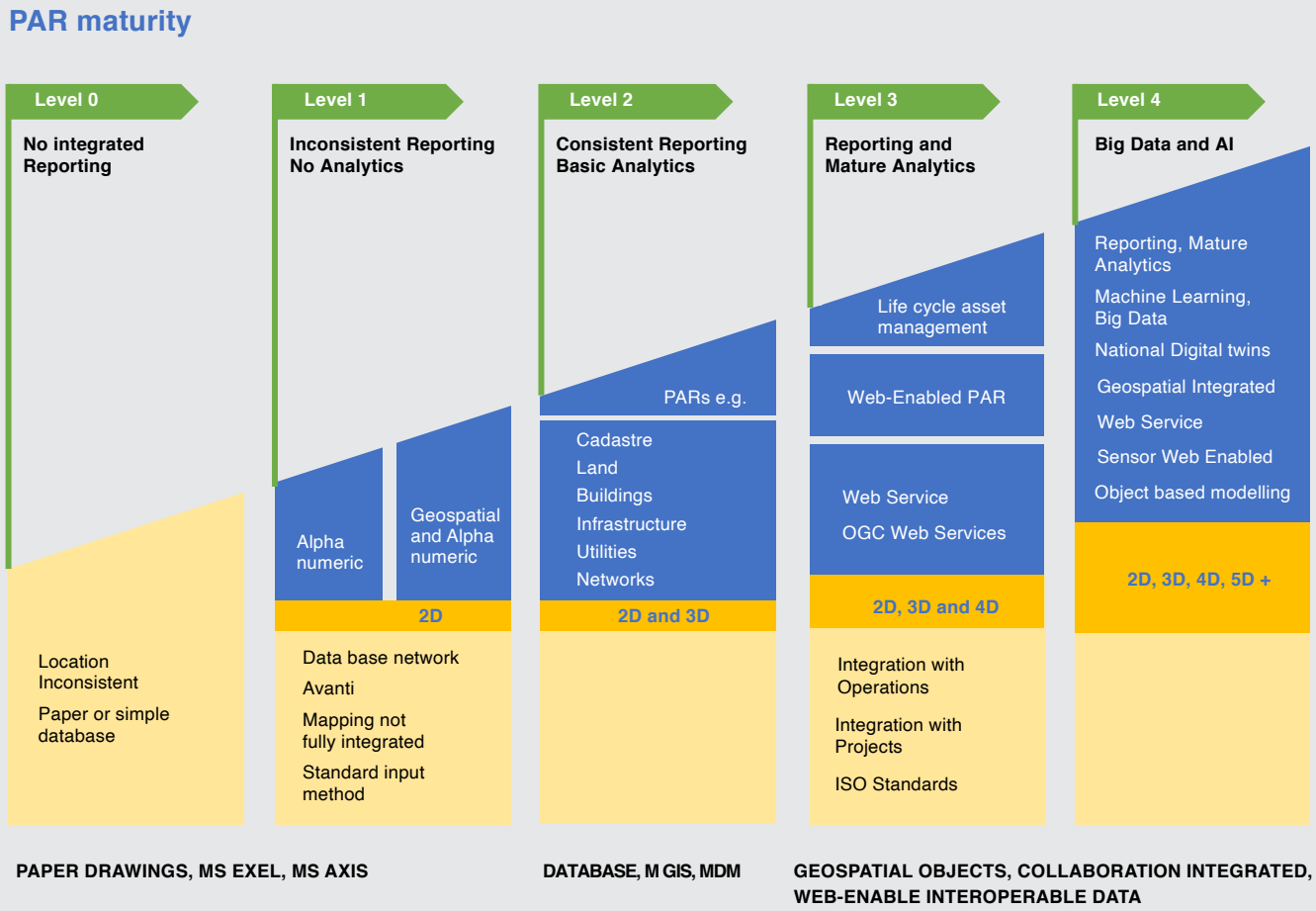
Within the context of this guide, a PAR can support the development of a program of public asset financial protection as a source of asset information; it can also inform the risk assessment and the risk-transfer strategy. In addition, evidence of a sophisticated approach to asset management earns the favor of insurers, who often reward the asset holders with competitive pricing.

International experience with PAR implementation shows that it is time-consuming and must evolve by using experience and by tailoring each system to reflect local conditions. To inform a program of public asset insurance, a PAR may need to go through multiple iterations, updates, and upgrades. This approach is illustrated conceptually in Figure 4.1, which shows the evolution of PAR from the perspectives of both usage and technological capability. The purpose of this diagram is to show progression; it is not intended to be neither a *prescriptive* definition nor a definitive one. It is based on common characteristics of public asset registries and strategic enterprise asset management systems.

Broadly speaking, as a government's PAR evolves, the registry entries comprise the following characteristics:

- **Level 0—Mainly paper-based asset records.** This is the situation where there is either no digital system (asset records are only on paper) or where there is a simplistic data storage (e.g., Excel) with paper and manual data inputting from paper still a key part of the process. This approach can be inefficient with double-data-handling; it has inherent risks of transcription errors and resilience of the information.
- **Level 1—Paper and computer-based, with no clear system or standards.** This level is where a digital system is in place as the main system. There may be paper use at some stage (for example, data collection), but this is not the main data storage for the system of records. There may be inconsistent reporting capabilities; although basic analytics may be undertaken in Excel, for example, there are no analytics tools linked to the PAR. The datasets and database structure remain mainly alphanumeric, with potentially some ad hoc use of a geographical information system (GIS), mapping, or geospatial capabilities combined with alphanumeric data.
- **Level 2—Computer-based, systemized with a mapping element integrated.** As a system evolves further, the PAR is location-enabled, which is where a GIS or location-based solution is a core element of the PAR. Datasets are captured in formats and are maintained in ways that enable map-presentation, including location, proximity, and other forms of spatial analyses. This approach enables many types of spatial analyses about the relationships of assets, asset systems, and networks of systems-of-systems for resilience and risk planning. Master data management principles are typically used and widely understood—a comprehensive method to consistently define and manage the critical data of an organization to provide a single point of reference. Additionally, more than one source of data managed by the most relevant data owner or custodian are linked or federated together (for example, cadastre, land, buildings, infrastructure, utilities, and other networks).
- **Level 3—Computer-based with system, GIS, and web services.** At this stage, an approach of whole life asset management is undertaken, following the principles and guidance of ISO 55000. There is good integration of the PAR with operations and with projects, plus the use of sophisticated reporting and mature analytics. The PAR is likely web-enabled—where a web service (such as OGC Web Services) is capable of being consumed and will publish information from the system. International, national, and industry best-practice standards will be used and established where needed, such as property

Figure 4.1.
Conceptual Evolution of a PAR



Source: World Bank staff, and inputs from contributing authors.

data standards. Extra dimensions of asset modeling are likely to be captured including 2D, 3D, 4D (time), and 5D (costs), plus the use of the Internet of Things (including sensors and monitoring technologies) is supported.

- **Level 4—3D asset objects as standard, web services, and federated management.** The next level will see the ability to handle data models, geospatial objects, and web-enabled interoperable data at more sophisticated levels. Big data, artificial intelligence, and machine learning are being used to assist decision-making.

Selected country experiences are shared in Table 4.1.

An effective PAR addresses the specific requirements of its end users and typically develops in line with a country's priorities. This approach means that the functionality of a PAR can differ and evolve depending on its context. In New Zealand, for example, the policy evolution led to separate systems for roads, buildings, bridges, tunnels, and transportation systems. Currently, there are considerations of how to integrate those different systems. In the United Kingdom, the e-PIMS system was developed as a central repository for all property and land assets, and it is now being replaced with a new, custom-built, digital, national asset registry system. The nature and extent of PAR usage will strongly influence its ongoing development. (See Box 4.2.)

For a PAR to support the whole-of-government asset management, planning and design of a PAR must consider the following:

- **Asset management modules.** The ability to support the management of all public asset categories and subcategories across the entire government (including its agencies and sectors) for a variety of different purposes
- **Interfaces.** The use of features that support asset management across its life cycle and the ability to link to existing systems that manage finance and procurement and that accomplish these:
  - Allow any agencies without information and communication technology (ICT) systems for asset management to leverage PAR for all asset management functions.
  - Support the efforts of agencies with mature systems of public asset management to collect public asset data from their systems for centralized planning and monitoring purposes at a whole-of-government level, while day-to-day asset management functions are carried out in such independent systems at respective agencies.
- **Functionalities and data collection.** The ability to support various tools for asset data collection and maintenance including web portals and short-term mobile applications and to leverage remote sensing technologies, drones, satellites, and other emerging technologies in the long term (including other PAR functionalities such as analytics, visualization, and reporting).
- **Security and system administration.** The governance of the use of PAR, including security systems and user rights and administrations.

Those design components are presented in Figure 4.2, which shows how they fit together to form the elements of a PAR. A brief description of each component is provided in Table 4.2.

Table 4.1.

Selected International Experiences with PARs

COUNTRY APPROACHES TO ASSET MANAGEMENT AND DEVELOPMENT OF PARS	
United Kingdom The United Kingdom started recognizing the importance of "good" asset data, data systems, and data management more than 30 years ago. The UK government has undertaken considerable research and publication to track its own path in developing leading asset management practices, including the development of a national asset registry and an electronic property information mapping service (e-PIMS), which is a government-wide property database. The in-house National Asset Registry was developed in association with the private sector, and it covers all central government departments together with their executive agencies. The e-PIMS system, which has been in existence for more than 20 years, is being replaced with a modernized system called the Digital National Asset Register (d-NAR). A review on e-PIMS in 2014 concluded that the system was considered more as a static record rather than a dynamic system because it produces reports (backward-looking) rather than analytics (current or future-looking). Government departments continued to operate their own separate property management information systems. The d-NAR project being implemented will initially include land and buildings (defined as property) owned by the central government and later phased out to include local government assets. The modernization project will look at more than technology and will incorporate data analysis capacities and capabilities. A more ambitious program, the National Digital Twin, is under development as the next evolutionary step up from the Public Asset Register in the sense that it can consume real-time data. A digital twin is a digital representation of physical assets and infrastructure that unlocks value principally by enabling better decisions about how the physical asset is built, operated, maintained, or used. The UK government aims to use the National Digital Twin program to increase infrastructure resilience, to reduce disruption and delays, to optimize use of resources, and to boost quality of life for citizens.	**New Zealand** Asset management practice in New Zealand has been evolving since the first asset management plans were developed in the late 1990s. Asset management is decentralized and gives autonomy to local government entities in their policy and planning. The new innovative approaches have stimulated a high degree of private sector participation and of private sector principles usage in asset management. New Zealand Asset Management Support (NAMS) was formed in 1995 as a response to the increasing desire within industry to embrace a more professional, long-term approach by adopting more efficient and sustainable practices for the management of public infrastructure. The group was established as a nonprofit industry organization with representation from INGENIUM (Association of Local Government Engineers, New Zealand), the Society of Local Government Managers, the Local Government New Zealand, the Office of the Auditor General, the New Zealand Water and Wastes Association, and the New Zealand Recreation Association. It was set up to promote infrastructure asset management practices, policies, and systems. In 2004, the NAMS Group was restructured as a company to better carry out its strategic focus. In 2008, it was organizationally realigned to be managed by a team of four board members, with support of its parent company, Institute of Public Works Engineering New Zealand, which provides the ongoing tools to help NAMS grow. NAMS has developed guidelines for best-practice asset management in the form of five manuals, with New Zealand's local government sector being the primary purchaser. The different government entities in New Zealand use a range of IT systems for asset management, ranging from simple spreadsheets to advanced data management systems with functionalities for life cycle modeling that is based on staff capacities and asset criticality. In general, land transportation demonstrates the most advanced asset management systems in New Zealand, followed by water sector assets.

COUNTRY APPROACHES TO ASSET MANAGEMENT AND DEVELOPMENT OF PARS

Japan

Japan's government assets are defined according to the National Government Asset Act and include land and properties, as well as movable assets such as transport, equipment, stocks, and other securities. In January 2010, the government asset register was digitalized through the implementation of the Government Asset Comprehensive Information Management System.

Japan has a three-tier governmental system that consists of the national government, 47 prefectures, and 3,230 municipalities. The Ministry of Finance (MoF) maintains the consolidated asset register, and each ministry and agency is responsible for updating its respective assets. Each agency and its subordinate offices must maintain a government asset register that records asset category (land, trees and bamboo, buildings, structures), application (land for buildings, land for housing, unused fields), quantity, value and price, and date of acquisition or transfer or loss (with explanatory notes). The head of each ministry and agency then prepares reports about the changes in asset value every fiscal year for submission to the MoF.

In addition, the MoF annually audits each ministry and agency to examine its management and use of government assets, after which the MoF recommends improvements to correct any identified inefficiencies.

The cross-ministerial Strategic Innovation Promotion Program has been established to realize scientific technology innovations in Japan, specifically to achieve Society 5.0 (first super-smart society) in infrastructure management. Its areas of innovation include (a) appropriate infrastructure asset management that covers inspections and monitoring, (b) asset life modeling, and (c) maintenance plans that use modern technology such as satellite synthetic aperture radar and such as robotics technology.

Australia

The Australian approach to asset management has been driven more by the introduction of regulatory requirements and accounting standards. Asset management was included within public works in 1993, when the Australian Accounting Standard Board issued Australian Accounting Standard 27, which required government agencies to capitalize and depreciate assets rather than expense them against earnings.

There is no integrated governance of assets at the federal level. Devolution of power to state and territorial governments means that each government has developed its own property asset management policies and methodologies. Although this approach did not result in nationally consistent frameworks, Australia's states and territories have enacted legislation and regulation to varying degrees that require councils to adopt strategic, corporate, workforce, financial, and asset management plans. Within those frameworks, councils must create and maintain their own asset data, information, and asset management systems.

The Australian National Audit Office published its *Asset Management Handbook*, which lays out strategic asset management principles and approaches, and the *Better Practice Guide on the Strategic and Operational Management of Assets by Public Sector Entities*. The latter guide provides a framework for an asset register that (a) captures asset information, (b) maintains historical records of financial and nonfinancial information during each asset's life cycle to help with asset planning, (c) assists with meeting accounting standards and legislative compliance, (d) monitors performance, and (e) provides accountability.

At the federal level, the Department of Finance maintains the Australian Government Property Register for leased and owned commonwealth property. It contains a list of landholdings owned by noncorporate commonwealth entities, including title and address information, along with a geospatial link to each site. Each department or agency is required to keep its data up to date in the system.

Box 4.2.

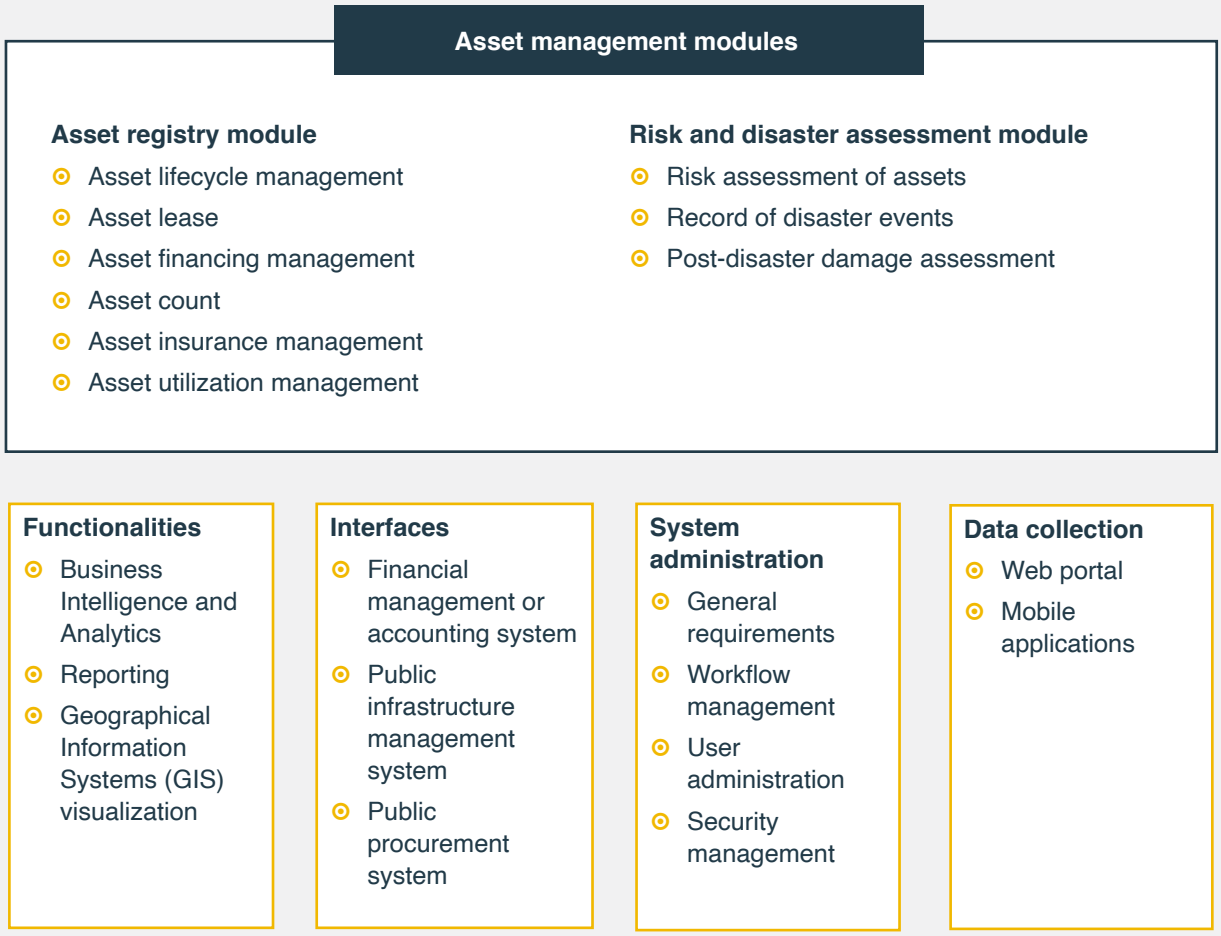
Implementation Options

A key consideration for countries developing a PAR is whether to adopt a commercial off-the-shelf solution, to develop a custom-made model, or to collaborate with another government system. The relative benefits and challenges of each option are outlined next.

IMPLEMENTATION OPTIONS	BENEFITS	CHALLENGES
Commercial off-the-shelf solution	Quicker implementation time frame with a ready product Low risk of system failure with a tried-and-tested solution and with adequate support for future enhancements, operations, and maintenance	Limited ability to customize because it is based on an existing solution Limited ability to create an interface with existing systems
Custom-made solution	Retention of full rights over the application and future enhancements by the government Tailored to country's specific needs	Requirement of substantial time for development of a fresh solution, including extensive testing and pilot phases
Hybrid solution	A mixed solution whereby both the commercial off-the-shelf solution is the focus with some customization, thereby bringing benefits from both options	The ownership of the solution elements needs to be clearly laid out and intellectual property rights (IPR) of the work needs to be established
Government-to-government transfer of a suitable solution from other countries	Quicker implementation time frame if solutions are likely to be comparable, also subject to the extent that customization is needed	Operational risk, because the government that developed a system is likely unable to provide full operational support or does not have full Intellectual Property Rights (IPR) or ownership of the system

Source: World Bank, based on review conducted on global good practice and technology trends for Public Asset Registry.

Figure 4.2.
Conceptual Design of a Public Asset Registry System



Source: World Bank, based on review conducted on global good practice and technology trends for Public Asset Registry.

Table 4.2.

Core Components within a Public Asset Registry System

ASSET MANAGEMENT MODULES: ASSET REGISTRY
This module supports the oversight and executing agencies in life cycle management of public assets from the planning of a new asset to the asset's retirement or disposal. Submodules include these functions: ⊙ **Asset life cycle management** stores, manages, and updates asset-related information throughout its life cycle, including general, technical, financial, legal information, costs of construction, capitalization, repair and maintenance, depreciation, computation of book value, replacement value and fair value of the assets, and records of third-party valuation. ⊙ **Asset lease** manages and tracks different types of asset leases in accordance with the requirements of financial management or accounting manual. ⊙ **Asset financing management** maintains essential data for assets collateralized with financial and other institutions and helps identify the financing arrangements of assets. ⊙ **Asset count** supports periodical physical inventory checks of assets while using barcode technology for asset count and generating inventory reports. ⊙ **Asset insurance management** supports the prioritization of assets for insurance and valuation on the basis of parameters such as strategic importance, value, location, condition; it also records details of insurance policy and claims. ⊙ **Asset utilization management** records and analyzes data about occupancy and vacancy of properties and about asset uses that support space management.
ASSET MANAGEMENT MODULES: RISK AND DISASTER ASSESSMENT
This module supports the assessment of the risk rating of assets based on asset condition and risks attributable to their geographical location. It also maintains information about the risk profile and historical information about disaster events, damages, and negative impacts on the public assets or on their services.
OTHER COMPONENTS OF A PAR
⊙ **Functionalities.** Specific functionalities should be built into the PAR. Basic functions include business intelligence analytics, reporting, and GIS. In addition, other advanced functions such as the use of artificial intelligence or other visualization functionalities can be explored. ⊙ **Interfaces.** The proposed system should support appropriate interfaces with existing systems including financial management, accounting, and public procurement systems. Where there is a varying existing data infrastructure, the PAR will need interfaces with agencies with pre-established ICT systems. Over time, there may be a potential to scale or integrate toward a national PAR for whole-of-government needs. ⊙ **System Administration.** This module captures the general requirements to support all the modules of PAR including user administration, user access and user rights, workflow management, and information security management. ⊙ **Data Collection Tools.** Secure and easy-to-use data collection and maintenance tools such as web portals and mobile applications need to be deployed at a minimum. Newer and emerging technologies such as satellite and drone imagery can also be integrated.

Source: World Bank, based on review conducted on global good practice and technology trends for Public Asset Registry.

4.4.

Implementation Approach to Develop a PAR

The challenges of establishing a PAR include the need to tailor it to specific country conditions. Although some governments may already have a robust, pre-existing asset management or records system, many will be considering a whole-of-government approach for the first time. Although the benefits are clear, governments may also face challenges such as the following:

- **Development of new legal frameworks and harmonizing policies about asset management and data provision.** This development may include new policies related to open data laws and information transparency, development of government regulations for asset management, and risk management and procurement processes.
- **Implementation challenges including appropriate timelines for design, procurement, data collection, implementation, and (most importantly) the change management within public asset management.** The challenges include developing the appropriate PAR framework that is best suited to the country's context and asset ownership structure, undertaking extensive data collection and procuring or building the appropriate and secure digital solution architecture. In some countries, data collection can be labor-intensive, paper-based, and localized, so the transition toward a digital database is likely to be a significant change to the management process.
- **Implementation of a PAR also requires institutionalizing its functionalities to support its use.** Such implementation will allow relevant government agencies to adopt consistent procedures for data provision and to feed into asset management policies, strategies, and planning. Training and capacity-building are also needed to design and operate a PAR, thereby ensuring adequate staffing readiness for future changes and modernizations. A change management and communication strategy will be required to ensure sustainability as the whole of government moves toward more effective management of public assets.

An assessment of the current situation is needed as the first step in developing a new PAR, which should include these:

- The legislative environment
- The institutional environment

- The ICT environment in relation to public asset management
- Potential implementation options, with their costings, benefits, and disadvantages, which would include a comparison of commercial off-the-shelf solutions, custom-made solutions, or transfers of a suitable solution from other country governments
- Behavioral changes that will likely be required by all potential users and data contributors within government, which will include activities such as communication, stakeholder engagement, transition, and change management

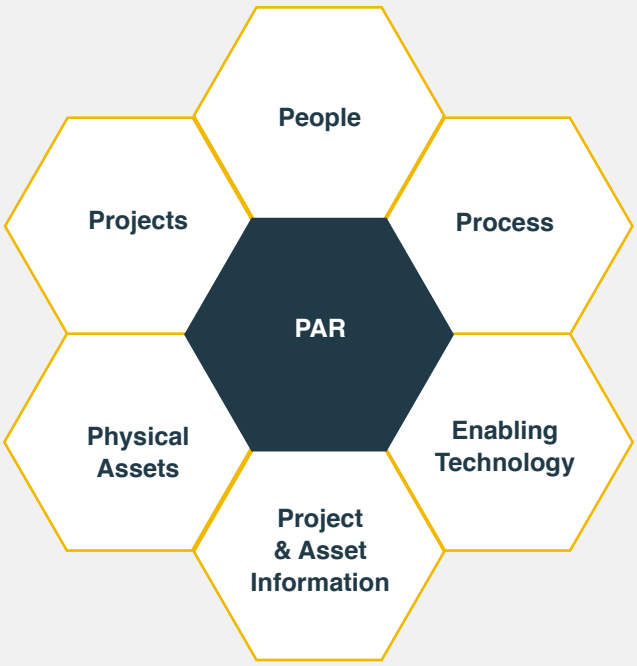
The implementation of a PAR is likely to be phased in gradually, first of all covering the assets that are most critical, that have the best data availability, and that are owned or managed by stakeholders who support the initiative.

The approach laid out in Table 4.3 is necessarily generic and simplified; nevertheless, it captures the key required elements of an implementation plan. Often a three-to five-year time frame can be expected to move through the following stages, depending on the solutions chosen and the existing barriers to implementation.

A successful PAR relies on more than technology and data alone. There are wider challenges to establish the correct policies, governance, skills, and basic asset management and asset information management concepts and principles that must be addressed to sustained value for the PAR. ISO 9001, ISO 55000, and ISO 19650 address many of those wider challenges and inform this wider, holistic approach. Public asset management must be more than just a technology-based register, and it should incorporate other factors, as illustrated in Figure 4.3.

As emerging technologies make sophisticated approaches to monitoring public assets increasingly possible, those technologies can be integrated into the PAR either from the start or along the way. For example, building information modeling, which involves digital visualization and models of the physical assets, is increasingly recognized as an effective tool to support the ability of PARs to define, procure, obtain, and manage information for the whole life of a physical asset. Other emerging technologies include the use of satellite and drone imagery in capturing real-time spatial data, artificial intelligence in collating relevant information from large databases, and the internet of things in capturing or managing asset performance and use. Some of those innovations will be discussed in chapter 8.

Figure 4.3.
The Supporting Framework around Public Asset Management



Source: World Bank staff, and contributing authors.

To Recap Chapter 4:

- As part of the broader strategy of public asset management, a PAR is an important tool for governments to use in collating and analyzing public asset data for informed decision-making. This chapter has provided an overview of a generic PAR with a broad range of functionalities and interfaces, as well as with a high-level implementation plan.
- To develop an effective PAR requires involvement from a broad range of stakeholders. These stakeholders include: relevant end users from the design stage onward; dedicated program developers; a delivery team and governance personnel to manage this registry, and to coordinate and lead the implementation process and data collection; and finally change management personnel to support the rollout of the PAR.

Table 4.3.

Key Elements of a Generic Implementation Plan

STAGE 0.	STAGE 1.	STAGE 2.	STAGE 3.
Pre-implementation Current State and Feasibility Assessments	**Preparatory Activities for a Comprehensive PAR**	**Customization, Development, and Implementation of Procured IT System**	**Implementation of Advanced Functions of PAR**
Assessment of legislative set-up, including identification of the acts, rules, and regulations about asset management and accounting	Establishment and strengthening of the current policy and institutional framework	Development of customization of IT systems to reflect core modules including asset life cycle management, asset insurance and valuation, asset utilization management, basic risk assessment features and risk categorization for public assets, interface with external systems, and integration with GIS	Following successful initial rollout of the PAR, the implementation can proceed toward integration of advanced functions of the PAR such as advanced features of risk assessment for assets, disaster event recording, post-disaster damage assessment for public assets, and planning improvements and repairs for damaged assets
Assessment of institutional set-up, including the identification of the roles and responsibilities of all public asset oversight organizations, executing agencies, and implementation teams	Formulation of a technical working group and a project implementation team	Continued capacity building and change management initiatives	Rollout to other assets or agencies
Assessment of the information and communications technology (ICT) environment, including identification of existing systems, their functional coverage and technical architecture, and development of feasibility assessment of existing ICT systems for enhancement into the PAR	Capacity building and change management initiatives	Migration of data from existing sources	
	Implementation planning, including proposed phasing-in of assets or agencies		
	Procurement of a comprehensive IT system for PAR, including assessment of the following options: commercial off-the-shelf solutions, custom-made solutions, and purchase of a suitable similar solution from another country's government		
	Initiation of data collection and digitization for pilot assets or government agencies		

Source: World Bank, based on review conducted on global good practice and technology trends for Public Asset Registry.

Worksheet for Chapter 4

Test your understanding the chapter, and record your insights through this worksheet!

Activity 1.
Match the different functions to the core components within the public asset registry system.

Asset Management Modules	Functionalities
Asset insurance and prioritization	Manages and tracks different types of asset leases in accordance with the requirements of financial management or accounting manual
Risk and disaster assessment module	Supports periodical physical inventory checks of assets while using barcode technology for asset count and for generating inventory reports
Asset count	Supports the prioritization of assets for insurance and valuation on the basis of parameters such as strategic importance, value, location, and condition; it also records details of insurance policies and claims
Asset utilization management	Captures the general requirements to support all the modules of PAR including user administration, user access and user rights, workflow management, and information security management
Asset lease	Records and analyzes data about occupancy and vacancy of properties and about asset uses that support space management
System administration	Supports the assessment of the risk rating of assets on the basis of asset condition and risks attributable to the geographical location of the asset

Activity 2.
Drawing on the type of data available and record keeping, rank the maturity level of the public asset registry.

Data or Records	Least Mature ⟷ Most Mature				
PAR is location-enabled (uses GIS) and is able to conduct many types of spatial analyses.					
Basic analytics may be undertaken in Excel, but there are no linked analytics tools.					
PAR uses simplistic data storage (e.g., Excel) and manual data entry from paper-based records.					
Whole Life Asset Management is used, and the PAR can handle data models, geospatial objects, and web-enable data.					
Whole life asset management is used, and the PAR can handle data models, geospatial objects, and web-enabled data. Big data, artificial intelligence, and machine learning are also being used to assist decision-making.					

Activity 3.
Assess what type of formats for collecting public asset data are being used in your country. List the benefits and challenges in your existing format.

Type of Public Asset Data Collection	Benefits	Challenges

Activity 4.
Reflections

[a] My top three takeaways from this chapter are these:

[b] Three concepts or ideas I would like more information about are these:

CASE STUDY

The Philippines' National Disaster Risk Finance and Insurance Strategy

Context

The main natural hazards faced in the Philippines are typhoons, earthquakes, flooding, and volcanic activity. Between 2015 to 2018, the Government spent on average US$ 1.9 billion (0.6 percent of GDP) every year on disaster-related response, recovery, and reconstruction.

There are several key milestones in the approach of the Government of the Philippines (GOP) to disaster risk finance: in 2010, the GOP enacted the Disaster Risk Reduction and Management Act; in 2011, the World Bank approved the first contingent credit line for the Philippines; and in 2015, the GOP adopted its national Disaster Risk Finance and Insurance Strategy.

In 2014, with the assistance of the World Bank, the GOP completed its first nationwide catastrophe risk assessment. The assessment provides an overview of potential disaster losses to public and private assets, which allowed the GOP to analyze the costs and benefits of various risk financing instruments and the efficiency gains from combining different instruments for different types of risks. Over the next several years, the World Bank and GOP invested further in the catastrophe risk model used, improving the asset exposure database and the historical loss database, and adding local government assets and their associated loss data.

The World Bank further supported extensive capacity building for both national and local governments to evaluate their exposure to earthquake and typhoon risk, understand DRFI concepts and options, and design and select an insurance program.[11]

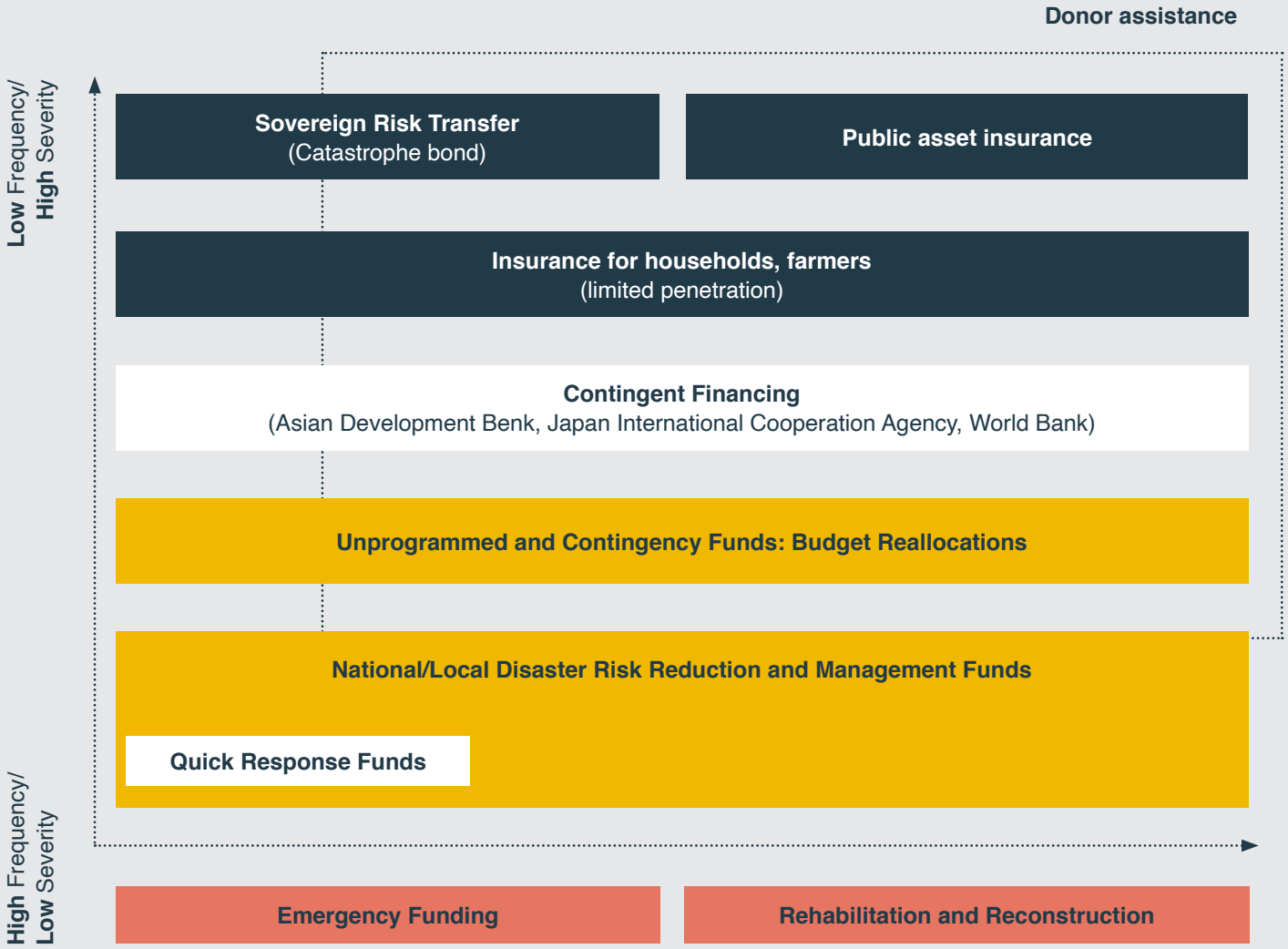
DRFI Strategy and structure

The Philippines adopted a risk-layering approach, combining different instruments to protect against events of different frequency and severity (Case study Figure 2.1). Risk layering ensures that less expensive sources of money are used first and that the most expensive financial instruments are used only in exceptional circumstances. For the GOP, the strategy secures funds for recurring disaster events through budgetary sources (National Disaster Risk Reduction and Management Fund [NDRRM Fund]; and Local DRRM Funds [LDRRMF]) and contingent credit. It then utilizes risk transfer instruments for low-frequency, high-cost events.

11 Lessons Learned: The Philippines Parametric Catastrophe Risk Insurance Program Pilot

Case Study Figure 2.1

The Philippines' Risk-Layering Strategy



Source: World Bank staff

By the end of 2020, the Philippines had established, or is in the process of preparing, several types of risk transfer mechanisms to support its risk-layering approach:

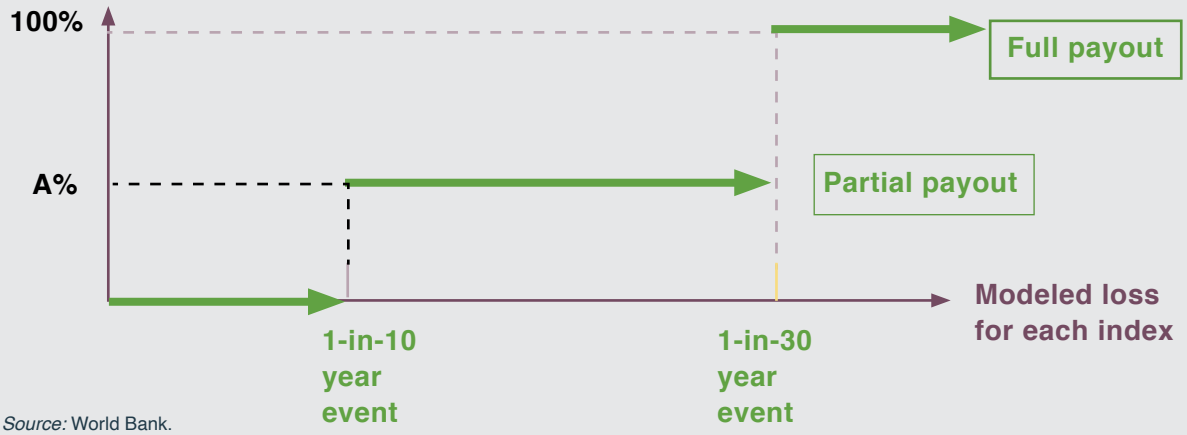
1) **Sovereign risk transfer for budget protection:** Through the Philippine Parametric Catastrophe Risk Insurance Program, the GOP had access to parametric insurance to provide budget support to both NGAs and LGUs during large-scale disaster events. This program ended in 2019, and rather than renew it, the government placed a catastrophe bond in December 2019 to protect against the most severe events and launched preparation of the National Indemnity Insurance Program to insurance public assets and infrastructure (below).

2) **Indemnity-based insurance of public assets:** The World Bank is working with GOP and GSIS to establish the National Indemnity Insurance Program (NIIP) a comprehensive national program of insurance for critical public assets. This is expected to be placed in2021. GSIS already offers various non-life insurance product lines to both NGAs and LGUs. All LGUs are mandated by law to insure their public assets and any insurable interest with the GSIS, however noncoverage of assets and underinsurance persist.

3) **Catastrophe risk insurance pool for homeowners and small businesses:** The establishment of a catastrophe risk insurance pool for households and small businesses is under preparation. This initiative is led by the Philippine Insurers and Reinsurers Association (PIRA), the National Reinsurance Corporation (NatRe), and the Insurance Commission. In January 2020, PIRA, NatRe, and the Insurance Commission signed a memorandum of understanding to establish the Philippines Catastrophe Risk Insurance Facility. It is targeted to be launched by April 2022.

The rest of the case study will provide further background of the first two mechanisms, reflecting their progress at the end of 2020.

Case Study Figure 2.2.
Stepped payout structure of the Philippines' parametric insurance



Source: World Bank.

(1) Sovereign risk transfer for budget protection

The Department of Finance, the Government Service Insurance System (GSIS) and The World Bank worked and piloted for over two years to design a risk transfer product, to provide rapid liquidity for some portion of emergency response costs following a disaster. To meet the needs of both NGAs and LGUs, the product was designed as a parametric insurance policy with several key features:

- Fast payouts (two to four weeks after an insured event)
- A simple structure with predefined payouts and payout trigger points
- Clear rules and process for determining and settling payouts
- The ability to leverage finance from the international reinsurance and/or capital markets.

As the Philippine catastrophe risk model had already been developed on a modeled loss basis, the GOP decided to use modeled loss as the basis for the triggers in the policy, combined with third-party reported hazard parameters. The GOP chose a stepped payout with two attachment points based on the modeled losses equivalent to a one-in-10-year event and one-in-30-year event, respectively. The partial payout was set to equal 40 percent of the full payout. The GOP chose this structure because it was simple and easy to explain, but also because—compared to a binary structure with only one level of payout—it allowed for more efficient coverage of medium (one-in-10-year) events and more severe (one-in-30-year) events (see case study Figure 2.2).

Following a detailed review of the risk profiles and potential coverage options of individual provinces, the GOP selected 25 individual provinces most at risk to typhoons and earthquakes to participate in the program. The selected payout structure was the same for all 25 provinces to keep the design and approach simple.

For the first placement, five reinsurers across three continents subscribed: Nephila Capital, Swiss Re, Munich Re (via its subsidiary NewRe), Axa, and Hannover Re. In the second year, these same reinsurers were joined by Hiscox Re, Allianz, and SCOR, as well as Swedish state pension fund AP3 (Tredje AP-fonden). Due to the strong demand from reinsurers, the price achieved was comparable to other parametric programs that have been placed in the international market.

In the pilot spanning more than two years, the following lessons were learnt:

- Premium funds flow and the payout process worked as planned.
- The transaction successfully navigated complex procurement laws regarding reinsurance.
- The renewal process from Year 1 to Year 2 was delayed due to significant changes in the policy coverage and the guidelines surrounding the flow of funds to the LGUs
- The pilot provided rapid liquidity to the policyholder, the Bureau of the Treasury, demonstrating the effectiveness of the insurance program. There were bottlenecks in the allocation of funds in the government, highlighting the importance of appropriate public financial management measures to accompany any risk transfer instrument.
- The program significantly advanced GOP knowledge on DRFI, and this parametric program has led the GOP to think more strategically about managing its disaster risk, paving the way for other instruments that may be more suitable for the GOP's needs.

(2) Indemnity-based insurance of public assets

Established in 1951, the Government Service Insurance System (GSIS) has the mandate to provide insurance to all national government agencies and local government units.

Local governments are obliged to purchase insurance for public assets from the government-owned insurer GSIS. Over the years, however, this has suffered from numerous inefficiencies, including lack of insurance and widespread underinsurance. According to government estimates in 2014, about 70 percent of

local government properties were not insured against disasters, or were underinsured by on average 15–20 percent of their replacement value.

The new National Indemnity Insurance Program (NIIP), which is under preparation as of the end of 2020, seeks to improve insurance protection for strategic high-risk national government assets, such as roads, bridges, schools, hospitals, health centers, dams, irrigation facilities and welfare centers. To implement the program, the government adopted the first ever *Philippine Government Asset Management Policy* in September 2020 and established the first comprehensive public asset registry, the *National Asset Registry System* (NARS), which has already brought together information on over 500,000 assets.

Since financial protection of public assets is an important objective of the NARS, the development and scaling of the NARS took into consideration the inclusion of appropriate hazard and risk information about the assets and the use of information about the location, relationship and real-world context of the assets as a key factor for decision-making. Both risk assessment and the location of assets will be enabled through geospatial or Geographic Information Systems (GIS) core abilities within the NARS, to be developed gradually as part of a phased implementation. The phased approach aims to mitigate risks in the transition to a new system.

The national indemnity insurance program for public assets under preparation will transfer risk to international insurance markets. In the preparation of these and similar programs the government leverages private sector expertise on insurance placement, reinsurance, and financial planning.

Lessons Learnt

The Philippines government has continually worked on improving their disaster risk strategy, policy and programs over a decade. This included adopting different risk transfer instruments to address different layers of risks. In the context of public assets, the focus has been on improving and using better data about risks and public assets to inform the risk transfer, which is also addressed in a phased approach. Their experience reinforces the need to be pragmatic and iterative in the development of a robust disaster risk financing program.

5.

Use of the Domestic and International Insurance and Capital Markets

What You Will Learn

This chapter discusses the following practical considerations:

- How to choose the best internal structure and institutional settings to prepare for insuring public assets
- How to make risk-transfer decisions that align with the government strategy
- What best practice is for the procurement of insurance coverage and the services it requires
- How to best use different insurance products
- How to ensure that insurance coverage meets expectations

5.1.

Introduction

Programs of public asset financial protection are generally large and complex enough to warrant specialized structures and set-ups. First, for an all-of-government approach, government departments need first to coordinate themselves internally—as an insurance customer. Second, drawing on this internal structure, the government as the insured needs to identify and develop the appropriate way to engage effectively and efficiently with the insurance market. Third, the government may obtain specialized services like those offered by intermediaries (e.g. insurance and reinsurance brokers) and other ancillary services (e.g. claims management). Governance of the insurance program requires that clear responsibilities and oversight functions must be in place. In some cases, governance will be through a board supported by technical working groups that are overseeing key aspects, including data, claims, and procurement regulations. Audit and compliance oversight are also key factors in covering all aspects of procurement, operations, and management of the insurance program.

5.2.

Set Up the Internal Risk-Financing Structure

To maximize the opportunities and to minimize the risks associated with a cross government approach to disaster risk financing and insurance, government departments should coordinate as an insurance customer.

This approach means setting up internal structures and institutions that accomplish the following:

- Align with any existing disaster risk-financing and insurance strategies.
- Present an administratively efficient interface with the insurance market.
- Reflect the intended economies of scale.

Table 5.1 to 5.4 explain some commonly used structures, but the list is not exhaustive. Moreover, structural variations and combinations exist outside those explained here. Risk pools, mutuals, and captives are also explored in more detail in chapter 6.

Table 5.1.
Self-insurance (or funded retention)

TYPE	SELF-INSURANCE
What is it?	Self-insurance is a risk-management technique in which a government or an agency sets aside a pool of money to fund an unexpected loss. This technique is different from non-insurance, which is the absence of any provision for funding unexpected losses.
How does it work?	A government or agency establishes a contingency budget to pay for unexpected losses associated with events that could be insured. The budgets can be actual cash (a funded reserve) or a nominal or accounting fund (an unfunded reserve). A self-insurance arrangement could have its own quasi-insurance policy document that details matters such as (a) which types of loss or damage are covered and which are not, (b) what monetary limits and excesses exist, and (c) which requirements exist for the reasonable protection of assets and for making claims.
Best suited for	Self-insurance is most appropriate for management of smaller, more frequent losses (e.g., regular minor repairs). The more predictable and smaller the loss is, the more likely it is that self-insurance is an effective solution.
Benefits	Self-insuring against certain losses may be more economical than buying insurance from the commercial insurance market.
Disadvantages	It is unlikely to be a cost-effective approach to managing mid- to large-loss events. Relying solely on self-insurance can often result in budgetary shortfalls. There is an administrative cost to establishing and maintaining a self-insurance system, including record-keeping for statistical purposes.

Source: World Bank staff.

Table 5.2.
Procurement Collective

TYPE	PROCUREMENT COLLECTIVE
What is it?	It is a collective procurement arrangement whereby insurance availability and pricing are agreed to in advance with selected insurers or reinsurers and where government agencies participate on the basis of individual agency need and appetite.
How does it work?	The procurement collective can be arranged and administered by a responsible government entity or an intermediary (e.g., an insurance broker). Government agencies participate in the arrangement for their individual insurance needs. Such arrangements usually do not require supporting legislation or regulation. The binding contract is the contract for services with the broker and insurer(s). This contract could include pre-agreed insurance policy wording, which may contain options such as claims excess amounts. Normally, individual policies are issued to each participating agency. The collective structure may consist of a broker and a panel of insurance companies, each of which would be invited to quote terms for a participating agency's insurance. Once insurance is arranged, an insured agency may deal direct with the broker or insurance company about claims and other coverage matters, or the agency may be required to pass any enquiries or claims through the government procurement agency.
Best suited for	A procurement collective is most appropriate for circumstances where the central government does not want to or is not ready to pool agency risk formally with a self-insurance format, but it does want to use the government's economies of scale to leverage good procurement outcomes as a ready-made option for agencies.
Benefits	It requires only a procurement function and a monitoring agency to ensure that obligations are being met and that contract renewals are administered (often this is a procurement function). It also allows for centralized collection of some agency insurance information for oversight and continuous improvement of government insurance arrangements.
Disadvantages	Uncertain agency participation means the solution may not act as a reliable mechanism for financial protection. Especially if it is a voluntary scheme, the procurement collective does not position government to take a fully coordinated approach to all of government risk financing (i.e., maximizing the opportunities associated with a consolidated risk-retention and risk-transfer strategy).

Source: World Bank staff.

Table 5.3.
Risk Pool

TYPE	RISK POOL
What is it?	A risk pool is a cooperative group of government entities joining together through a written agreement to finance their similar risks, which could be material damage or liability. A risk pool can be thought of as combined self-insurance for a number of asset owners. Because there are several owners (e.g., different government agencies), more formal agreements may be needed than for self-insurance arrangement by a single owner.
How does it work?	Government may establish the internal legislative and policy framework for the risk-pooling vehicle, or several government agencies may agree formally to set up a pool. Member agencies typically pay a contribution into the risk pool to fund retained claims, administration expenses, and insurance premiums (if insurance is required). Although they are not considered insurance, such pools extend nearly identical coverage through similar underwriting and claim activities, as well as provide other risk-management services. If risk transfer is required, a pool can act as a vehicle through which to access insurance markets as a single insured entity.
Best suited for	A risk pool is suitable for governments with a qualified and quantified understanding of cross-agency risk exposures. It suits governments with diverse risk profiles (operationally and geographically) within its members.
Benefits	Pools tend to protect their members from insurance rate volatility, to offer loss-prevention services, and to offer cost savings (because they are nonprofit organizations). Pools are usually less legislatively bound than are captives (see Table 5.4). Pools can be a vehicle for access to the global reinsurance markets, which are covered in chapter 6. This vehicle could be particularly beneficial to protect natural hazard risk.
Disadvantages	Potential lack of diversification either because of geography or because of the nature of risks can result in significant exposure to catastrophic losses (although an excess layer of insurance or reinsurance can mitigate this lack). Pools can involve a complex, time-consuming set-up.
Examples	In the United States, joint pooling arrangements are a common means for local public service organizations to pool insurance and reinsurance requirements. Those pools are not fully mutual because they do not return all profits to members. However, they have common services and a joint reinsurance program.

Source: World Bank staff.

Table 5.4.

Captive, Mutual, and State Insurer

TYPE	CAPTIVE, MUTUAL, AND STATE INSURER
What is it?	A captive is a licensed insurance company established by a firm, a group of firms, or a government to provide insurance for its shareholding owners. A mutual is similar but is based on a co-operative structure rather than on a limited liability company, so is owned by its policyholders. Some mutuals raise capital, but others do not and raise funds external to their own surpluses by issuing debt instruments such as investment bonds. A mutual applies greater formality and structure to a plain self-insurance fund. A state insurer is formed by legislation and is owned by the government in some way (e.g., it is a government department, agency, state-owned enterprise, or wholly owned company).
How does it work?	A captive insurance company or mutual operates in a similar way to a traditional company that provides commercial insurance. A captive or mutual will issue policies, process claims, follow all applicable regulations, file an income tax return as an insurance company, and have profits or surpluses—if profitable—that are available to the insurance company's owners or to co-operative members. The difference is that captive or mutual owner(s) decide whether to retain surplus to manage future losses or to reduce premium costs of member agencies, or both. A government legislates into existence a state insurer, and it operates in accordance with that law (e.g., to insure the assets of government departments and to arrange reinsurance protection for this portfolio of risk).
Best suited for	A captive, mutual or state insurer can be appropriate when a particular risk profile (e.g., usage of a building) is not insurable at acceptable pricing in the traditional insurance market. An example would be a nuclear power plant. They are also appropriate for governments that have actual or potential large premium costs, who will have a strategic approach to managing their risk exposures and are prepared to increase their share of risk in order to retain underwriting profits (as opposed to simply buying insurance from the market). They are also well suited in conditions where a solid claims history and an extensive process of formal risk-management exist will ensure a loss experience that is better than the market, thus allowing the government to benefit from reduction in cost of risk.
Benefits	Cost savings can accrue through reduced overheads such as sales commissions, administration costs, and profit margins. Those structures can mitigate the volatile pricing that can be present in commercial insurance markets, as they can control their own premiums and profit margins (subject to reinsurance requirements). Insurance can be specially tailored (subject to reinsurance requirements) and can be extended to other hazards as surpluses accumulate. By creating its own insurer, a government can reduce its long-term costs, can insure difficult risks, and can have direct access to reinsurance markets.

TYPE	CAPTIVE, MUTUAL, AND STATE INSURER
Disadvantages	It requires the raising of initial capital or member contributions (to meet both retained losses and insurer solvency regulations within the jurisdiction). A captive or mutual requires additional time and resources for a government to set up and manage, which contributes to its cost. The entity may need to bring on additional expertise that will manage the day-to-day operations. Captive cells have been designed to mitigate those disadvantages and could be considered as part of the options. Captive insurance arrangements can be more difficult for government agencies to join and exit compared to purchasing insurance on the open market or through a risk pool. Setting up a state insurer requires the full legislative process, with all its checks and balances. A state insurer exposes the government to liability when claims exhaust the premium pool (if one is established) or budget. Thus, a government has a direct interest in the reinsurance program negotiated by the state insurer. The legislation that created the state insurer may place limits on payouts to departmental asset owners in order to control overall liability.
Examples	The Australian Capital Territory Insurance Authority is a government agency established in 2005 as the ACT government's captive insurer. See case study 1 for further details. The United Kingdom's local government mutual pools risk across local authorities and provides financial protection of assets. Local Government New Zealand has set up Civic Insurance to insure local authorities' property (including infrastructure) and liability. Oil Insurance Limited is a mutual insurance company that insures more than US$3 trillion dollars of global assets for its 50+ members who are engaged in energy operations. The company is registered in Bermuda. The Government Service Insurance System (GSIS) in the Philippines is set up as a monopoly to insure the government's assets. GSIS is a state-owned enterprise that is the government's pension fund, and it has an insurance unit.

Source: World Bank staff.

Each government will be at a different stage of its public asset financial protection program, will be subject to different legislative and policy constraints, and will have unique priorities driving its objectives and requirements. For those reasons, proposed government structures should be reviewed carefully to ensure that they suit the overarching strategies. Additionally, within these structures, government agencies should consider how these structures can build up expertise on risk management and financial management within government.

5.3.

Risk Transfer Decisions

Deciding on Risks to Retain or Transfer

This subsection covers the fundamental considerations for a financial protection program and the potential risk-financing options.

Constructing an insurance program, including catastrophe losses, requires the following:

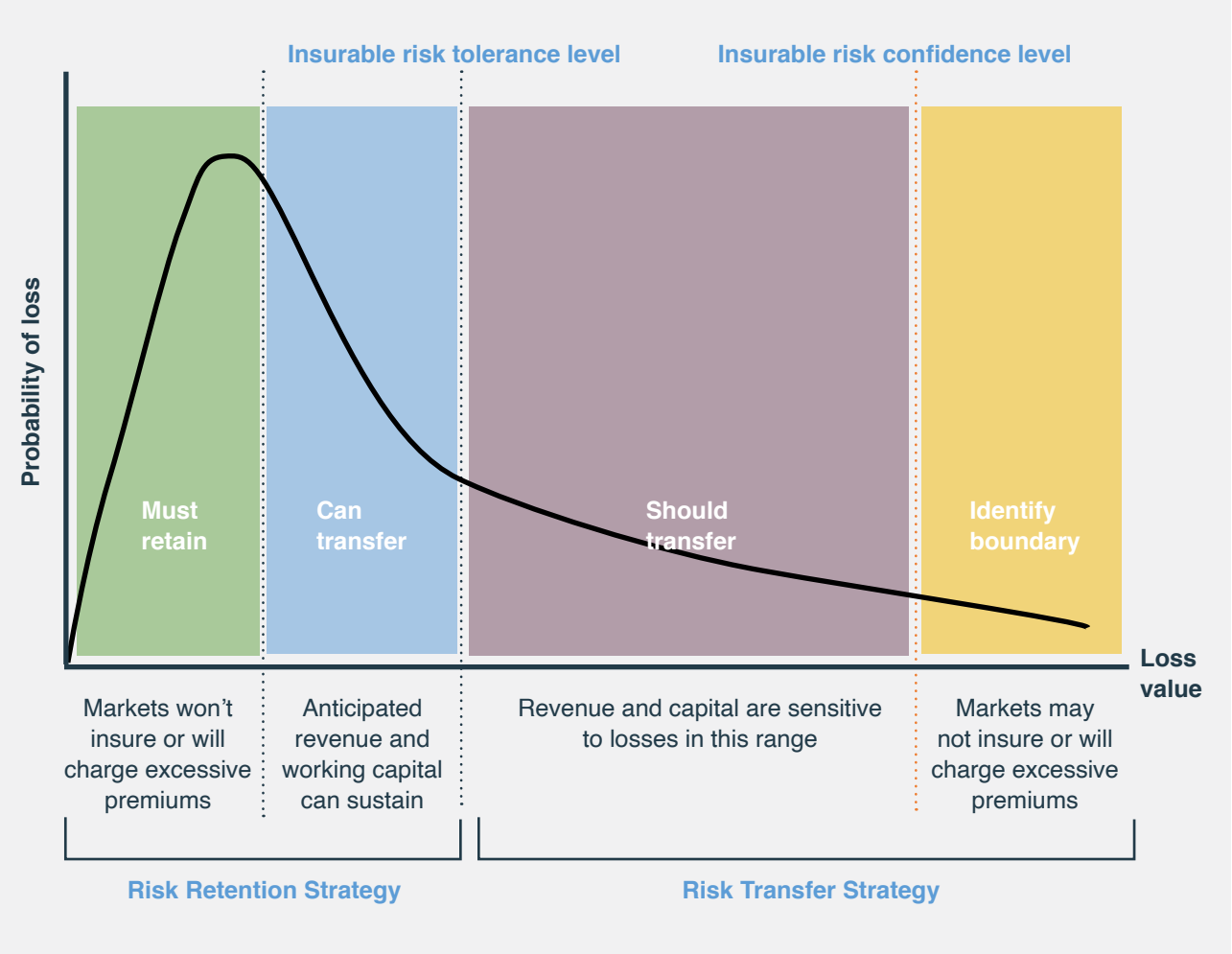
- Valuation for insurance purposes of the assets to be insured
- Enumeration of risk tolerance (e.g., that the financial loss from an unplanned event must not exceed a stated percentage of operating expenses of a department)
- An estimate of the probable maximum loss, on a per event of aggregated basis, from disaster events

Figure 5.1 shows the value of risk costs that could be retained or transferred (X-axis) against the probability or frequency of such events (Y-axis).

There are generally four segments of risk types:

- **Must retain.** The first segment (in green) represents multiple small losses. Those losses are within the risk-tolerance limit, and insuring them would cost more than budgeting for and meeting the costs directly. If they are insured, the insurance company will charge the cost of expected claims plus overhead costs of the administrative and claims departments, plus a desired profit margin. An annual aggregate excess loss insurance (see annex 3) could relieve concerns about variability in those costs. For example, this form of insurance could cover graffiti and petty vandalism (i.e., non-arson) that cause damage to schools.

Figure 5.1.
Insurance Program Construction Considerations



Source: World Bank staff.

- **Can transfer.** The second segment (in blue) could be covered by indemnity insurance to smooth out damage expenses, even though those costs are sustainable within revenues. Alternatively, the risk could be retained and managed within the overall risk-management program (see self-insurance).
- **Should transfer.** The third segment (in purple) covers events that are infrequent and that would exceed the risk-tolerance limit. Indemnity insurance could be used, but excess loss insurance could be more economical. Having to pay only the excess and not the full amount of the damage could reduce the loss value to within the second segment of the curve. Asset owners with property spread over different locations (and possibly insured by separate

policies) could purchase catastrophe insurance up to the probable maximum loss for all their properties combined.

- **Identify boundary.** The upper-most segment (in gold) covers highly improbably events with a high loss value. Insuring highly improbable events through a traditional insurance company may not be an economical approach. If protection against the possible financial impact of a particular rare event is desired (such as a violent typhoon making landfall), a catastrophe bond could be investigated. Risk swaps are an option if there are two parties with risks that can be equated (such as a 1-in-200-year event) and if they wish to protect themselves against such a financial impact.

The various types of risk transfer instruments mentioned previously are explained in the next section.

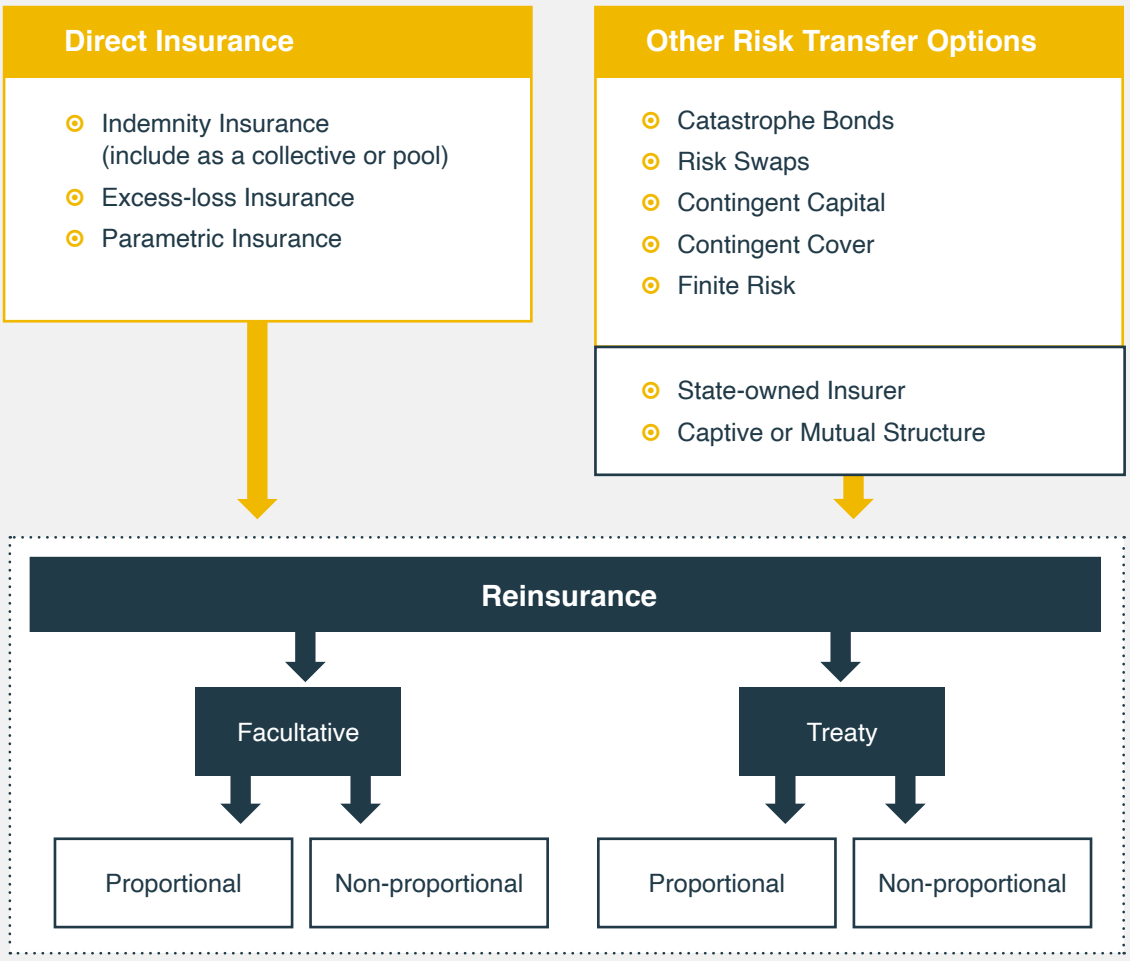
Different Types of Risk-Transfer Instruments

Risk can be transferred to the insurance or capital markets. Such transfer is spreading risk over time (i.e., exchanging a known annual expense to avoid a larger cost being incurred at an unknown time in the future). Thus, some practitioners define insurance as the exchange of a certain and small payment (premium payment) for uncertain and potentially bigger losses (risk materialization). However, the insurance market is not the only way to transfer risks; such risks can also be transferred by using the global capital market, which gives access to different and greater capital providers than does the insurance market. Other forms of risk transfer also include contractual arrangement to provide mutual assistance (see Chapter 6 for examples of these).

Figure 5.2 shows the range of risk-transfer options, and each option is explained in further depth in 0. Such options can be combined in a hybrid arrangement, for example, an indemnity insurance that includes a parametric element or a catastrophe excess loss section. Different instruments could also be used at different points in time, for example parametric coverage could be used if there is insufficient data on detailed exposure of individual assets, but the coverage can transition towards other indemnity or hybrid structure as more asset-level information becomes available. Additionally, when structuring a risk transfer strategy, appropriate risk capital should be matched with the appropriate risk types. Neutral risk advisors such as brokers is well-placed to provide a broad perspective of different forms of risk capital and how they can best match the risk profile and local context of the government. Box 5.1 shows how New Zealand uses such instruments to protect against disaster risks for its schools caused by natural hazards.

In addition to the use of instruments, a government can set up its own insurance structure, such as a captive, an entity, or a state-owned insurer; it can use that structure to transfer some risk to the reinsurance market, just as insurance companies do. This arrangement gives access to more financial capacity, forms of risk transfer, and specialist expertise.

Figure 5.2.
Types of Risk-Transfer Instruments for Governments



Notes: If the government sets up a state-owned insurer, captive or mutual, it is likely to interact directly with the reinsurance market

Source: World Bank staff.

5.4.

Dealing with the Insurance Market

Procurement plays a key role in enabling governments to transfer risk to the insurance market in a way that attracts market participation and encourages competition. When the government puts out its risk profile to tender, the government will want many potential bidders to find the opportunity attractive and compete for the tender. Open competition will lead to better terms and conditions, including pricing, for the government.

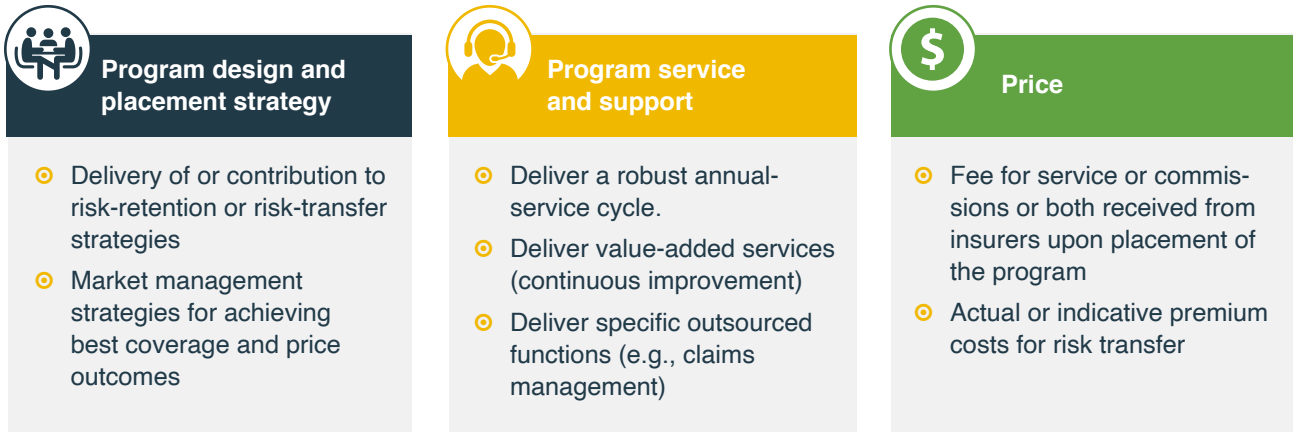
Procuring an Insurance Broker or Intermediary

A common initial step to risk transfer is the engagement of an insurance broker. A broker (often also referred to as an intermediary) is necessary because insurers will often deal with customers only through brokers. The intermediary's roles are as follows:

- Provide advice to customers on the optimal design and development of their risk-financing program.
- Provide services to support that program and sell the customer's risk-transfer requirements to insurers, with the intention of driving market attraction and competition.
- Provide on-going services to support the ongoing management of the insurance program, such as claims management or adding or removing assets to the program.

Three key considerations are set out in Figure 5.3 for the government's choice of an intermediary.

Figure 5.3.
Intermediary Procurement Considerations



Box 5.1.

Case Study: New Zealand Ministry of Education

The Ministry of Education manages a portfolio of more than 2,000 schools throughout New Zealand. Those schools have a replacement value for the 17,000 buildings of NZ$15 billion (about US$10 billion).

The ministry insures its buildings against all damage, with special provisions for disaster damage and for damage to buildings in the course of construction or renovation.

For all risks of loss or damage, there is an annual policy covering aggregate excess loss.

- Any damage that exceeds NZ$2,500 cost of repair is reported to ministry's head office.
- The ministry pays the schools directly for such damage. If damage is estimated to exceed NZ$10,000, a professional insurance claim loss adjustor is appointed to manage the claim.
- Damage costs reported to the ministry are aggregated over one year.
- If this aggregate exceeds NZ$12.5 million for the year, future damage can be claimed by the ministry under the annual aggregate excess loss insurance, but there is an excess of NZ$25,000 for each claim.
- There is an upper limit of NZ$260 million for claims on the insurance.
- The coverage excludes damage caused by earthquake, tsunami, volcanic eruption, hydrothermal activity, flood, or cyclone (i.e., the catastrophe perils).
- The coverage also excludes damage to buildings under construction or undergoing substantial renovation.

For disaster damages caused by natural hazards, there is catastrophe excess loss insurance.

- Insurance is against the catastrophe perils excluded by the annual aggregate excess loss insurance.
- All damage caused by a single event is covered, with an excess of NZ$12.5 million. For example, more than 200 schools were damaged by the Canterbury earthquakes in 2010–2012, only one of which caused damage of more than NZ$12.5 million. For that event, the ministry was paid NZ$200 million after deduction of the excess for damage to all the schools affected.
- The limit for claims is NZ$260 million for any one event, but that amount can be paid out twice in one year (if there are two events). The limit was set after a scientific calculation of the ministry's probable maximum loss from an earthquake on the Wellington fault, with a return period of 840 years.

For buildings under construction or undergoing substantial renovation, there is construction material damage insurance.

- Recording of building projects and management of claims is subcontracted to an insurance broker.
- Building projects to be covered by the insurance are registered by the school on the special website administered by the broker.
- Insurance covers the ministry and the plant, machinery, and materials owned by building contractors working on the site.
- The insurance covers projects commenced during the policy year, even though they may extend beyond that year.

- There is a limit of NZ$10 million of insurance on any project registered on the website, but larger projects can be insured after a special application to the broker.
- There is an excess of NZ$5,000 on any one claim, but there are much higher excesses for disaster damages caused by natural hazards.
- The ministry pays a deposit premium at the beginning of each year on the basis of the value of projects it expects will be undertaken during the year. At the end of the year, the value of all projects registered on the website is computed, and the deposit premium is adjusted by a further payment or refund.

Source: World Bank staff, based on the New Zealand Ministry of Education's website, https://www.education.govt.nz/school/funding-and-financials/insurance/

The intermediary's fee or commission price can be a percentage of the insurance premium or a fixed fee. A quality intermediary, with program design expertise and experience, and an effective strategy for market engagement can achieve premium savings to cover those costs. During the procurement of an intermediary, a government needs to balance the criteria attached to the intermediary fees against the quality of service expected and the potential premium savings.

A three- to five-year contract-term arrangement is common, possibly with an interim right of extension, such as three years plus a right to extend without tender for another two years. Any arrangement will be subject to the procurement laws and regulations within each country. A three- to five-year arrangement offers the benefit of continuity over several renewal negotiations and helps to achieve longer term goals. (See Figure 5.4).

Engaging with the Insurance Market

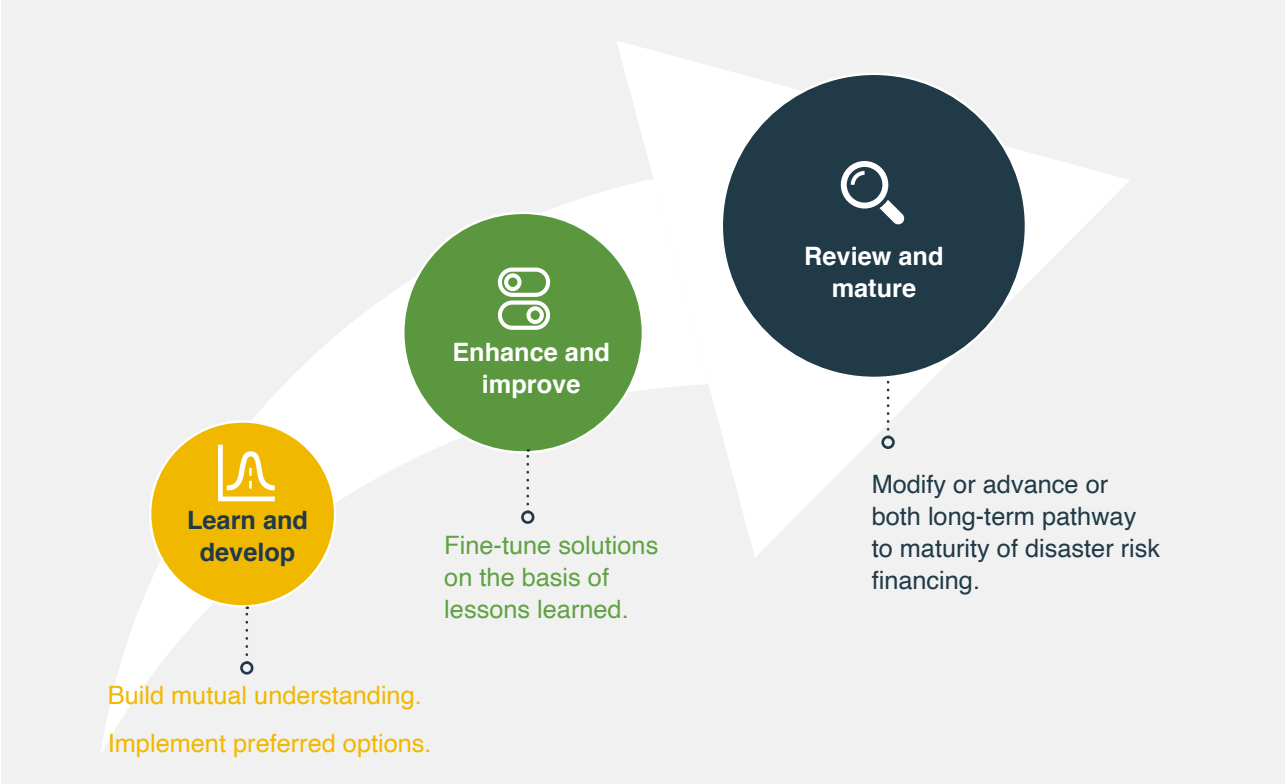
Governments and intermediaries need to conduct a range of preparatory activities as part of engaging with the insurance market to accomplish the following:

- Obtain a fit for purpose insurance over an extended period.
- Sustain the fit for purpose insurance through continuous improvements and in the face of large losses and adverse financial conditions.

Figure 5.5 illustrates the key market engagement activities, and each of the activities is briefly described.

Figure 5.4.

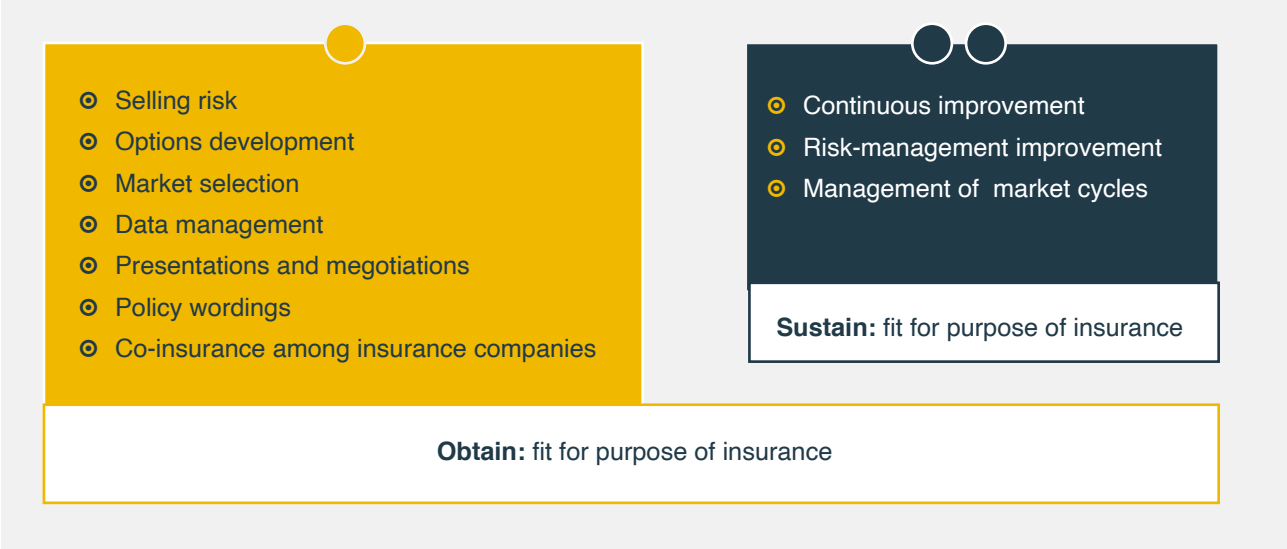
Progression of Intermediary or Customer Engagement Maturity



Source: World Bank staff.

Figure 5.5.

Activities to Engage the Insurance Markets



Source: World Bank staff.

Box 5.2.

The benefits of engaging with insurance or reinsurance brokers

Insurance and reinsurance pricing and capacity can be volatile, depending on global and regional market conditions. This volatility can be greater in regional contexts, with market conditions highly sensitive to both global trends, as well as more localized catastrophe coverage, particularly for less standard lines of business such as public assets, where reinsurance markets may be less experienced, and where there may be limited historical claims records to support pricing.

The advantages of utilizing a reinsurance broker will include both their ability to access a wide range of global markets, including specialty markets such as Lloyd's of London where admitted brokers are required to enable transactions.

Brokers can also provide specialist advisory and operational services in support of the insurer. This will include catastrophe modelling and analytics, structure optimization, contract wordings, and claims management services.

There are a number of large brokers in the global reinsurance broking market such as Aon, Guy Carpenter and Willis Towers Watson, and a wider group of smaller, often regional or specialist reinsurance brokers.

Using brokers can offer the following benefits:

1) Market Reach

- Knowledge of the global reinsurance and insurance market and their current competitiveness, and what is achievable at any given point in time
- Access to the international reinsurance market; particularly for those with multiple overseas offices
- Strong relationships with major insurers and reinsurers, both financial and personal
- Significant trading relationship with insurers and reinsurers providing valuable leverage

2) Transactional

- Ability to negotiate on behalf of the government and use leverage, knowledge and relationships where and when necessary in order to achieve the most cost-effective deal
- Provision of advice in terms of capacity available at the various terms and conditions quoted, and comparison of the final program costs and terms and conditions against similar programs
- Knowledge of the financial security of insurers and reinsurers worldwide, and their willingness to pay following request for payment of a claim. If necessary, major brokers also have the financial trading relationship with an insurer or reinsurer to encourage payment
- Provision of advice on the most appropriate and cost-effective insurance structure

3) Technical

- Provision of catastrophe modelling, including access to different global catastrophe risk models, thus saving the costs of licensing and running the different models
- Provision of analytical and financial modelling, including access to pertinent market data and information that can be used to refine the model and produce more relevant and accurate outputs
- Provision of risk management services at a cost to be negotiated

4) Claims Support

- Provision of claims management services can be provided at a cost to be negotiated
- Insurance/reinsurance claims collection would be included as part of the standard service
- Brokers have vast experience of reinsurance claims collection

While intermediaries such as brokers offer the benefits described above, the use of brokers adds a layer of costs to the development and management of the program. Additionally, to ensure that these services are fully accessed, it is important that the Terms of Reference and service contracts with the broker are explicit in defining the required supply of transactional and advisory services.

Obtain Fit for Purpose Risk Financing

a. Positioning of Risk Profile

A core consideration of the procurement process is positioning the government's risk profile and the government as an insurance buyer. The process involves a considered and coordinated means to differentiate your government in the eyes of insurers. A good intermediary is valuable for preparing material and presenting it to insurers.

b. Presenting the Scope (or Options) of Coverage

Governments need to have a clear understanding of the scope or options they want insurance companies to consider. The scope consists of a combination of the following:

- What hazards are included?
- What agencies are participating?
- What assets are included?
- What is the desired sum insured or the policy limit? There may be different policy limits for different assets as well as a further limit for each site.
- What is the desired level of risk retention (i.e., the excess) that applies before insurance contributes to a loss? Several different excesses could apply per asset, per site, or per disaster event.
- What are the policy coverage terms and conditions?

c. Selection Criteria for the Insurance Provider

Governments should consider the desired characteristics of insurers or reinsurers for its risk-transfer program. The types of criteria to be considered include technical (such as price, capacity, and coverage terms and conditions), behavioral (such as claims management and payment practices or relationship and loyalty practices), and security-based (such as financial strength).

Most important, governments need to be certain that their insurance providers have the financial resources to pay claims. An intermediary can often assist with setting a standard for acceptable mandatory financial security.

Box 5.3.

Insurance for public assets under a Public-Private Partnership (PPP) – Example of Colombia

Colombia has the highest rate of recurrent disasters due to natural phenomenon in Latin America with more than 600 disasters per year. During the heavy rainfall during the 2010-11 La Niña season, losses to the transport infrastructure sector totaled approximately US$1.7 billion, placing significant financial burden on the Government of Colombia.

In 2012 the Ministry of Finance and Public Credit (MoF) in Colombia requested technical assistance from the World Bank (WB) to improve the catastrophic insurance requirements for the protection of public investment. The WB delivered to the Government of the country technical guidelines for the National Concession Infrastructure Agency or Agencia Nacional de Infraestructura (ANI), based on the best practices in the international markets adapted to the national context. The dual objective was to protect the new road infrastructure to be built through Public-Private Partnerships (PPPs) under the fourth generation of concessions (4G), as well as to manage the government fiscal risk by transferring it to the traditional indemnity insurance.

As a result, the ANI developed three insurance policies with tailor-made clauses for the country, providing a minimum quality condition to approve 4G projects, in accordance with provisions established for the technical and economic conditions for infrastructure projects under the PPP scheme. These policies facilitate insurance of the infrastructure throughout its lifespan (existing, rehabilitation, construction, improvement and operation). Under this insurance scheme the claims are paid to the trust managing the PPP resources; this approach guarantees that this resource will be assigned exclusively to reconstruction activities. Given the levels of risk ceded to the international markets, it is important to set high standards for the reinsurance coverage to be bought by local insurance companies. ANI also established requirements for the reinsurance of 4G concessions, both for automatic and facultative contracts, considering the reinsurers' ratings.

By July 2020, the indemnity insurance of the 4G concessions amounts to more than US$ 40 billion reducing consequently the fiscal exposure of the GoC related to road infrastructure and disasters due to natural phenomenon.

Source: World Bank. 2021. Colombia - Reduction in Fiscal Risk by Insuring 40 Billion Dollars Road Infrastructure under Concession (English). Washington, DC: World Bank Group.
http://documents.worldbank.org/curated/en/235241614150261707/Colombia-Reduction-in-Fiscal-Risk-by-Insuring-40-Billion-Dollars-Road-Infrastructure-under-Concession

The two primary means to achieve the necessary degree of certainty are as follows:

1. As part of a country's regulatory environment for the financial sector, a government will often set, regulate, and monitor minimum solvency standards for local insurers and reinsurers and, in some cases, for offshore insurers and reinsurers who can underwrite risks in the country.

2. Internationally recognized standards and credit ratings agencies (such as A.M. Best, Fitch, Kroll Bond Rating Agency (KBRA), Moody's and Standard & Poor's) regularly monitor and rate the financial strengths of individual insurers and reinsurers. These ratings represent forward-looking opinion about an insurance organization's ability to pay out claims. Each rating agency has its own rating scale, so it is prudent to consider a company's rating from two or more agencies. Generally, the agencies work in derivatives of A (e.g., A++) when denoting high ability to pay claims through to C (e.g., C– –) when denoting substantial concerns about an ability to pay claims.

Governments might also consider, at this stage, how they want to interact with the market. Box 5.4 shows some special market interfaces that can be used.

d. Providing and Presenting Data

Insurers require a necessary degree of confidence about the risk being presented. Quality data promote market attraction and competition because the data provide a basis of risk-pricing certainty and are a positive indicator of the customer's organizational risk awareness.

Data are typically delivered to the insurance market as part of the underwriting submission, which also includes preferred coverage terms and conditions and options for pricing consideration.

Further details regarding data needs and characteristics are provided in chapters 3 and 4. (See also Figure 5.6.)

e. Handling Presentations and Negotiations

Presentation events are an opportunity to meet insurers (either individually or collectively) and to deliver key messages that identify the organization as a preferred customer by highlighting issues such as these:

- Organizational priorities and objectives
- Risk-management objectives and intentions

Box 5.4.

Special Insurance Market Interfaces

Using a Binder Facility

A government and one or more insurers or reinsurers agree in advance to the preferential terms and conditions for insurance coverage (often through a broker). The conditions are held available for a specific customer type (in this case, defined government agencies) for a specified period. If and when a defined agency decides to use the facility within the specified period, the preferential conditions will be automatically applied. This interface structure tends to link well with the structural arrangement of procurement collective but can also apply to other options such as the consortium and state insurer approaches.

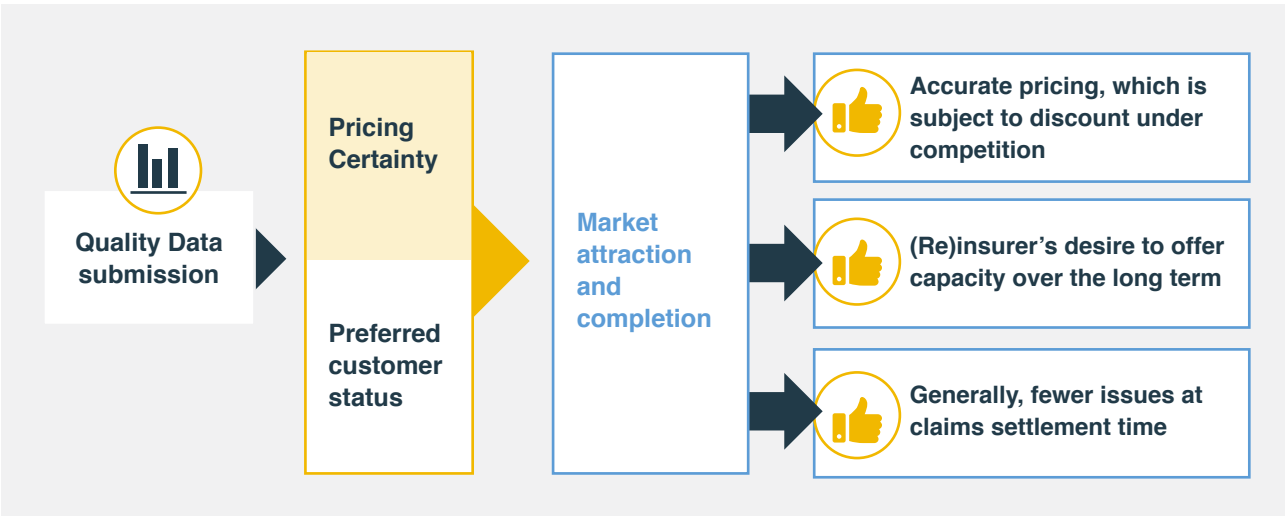
Fronting

A government's self-insured vehicle (e.g., a risk pool or a state insurer, party A) contracts with another insurer (party B) to issue an insurance policy that exactly matches the risk taken on by the government vehicle. The risk of loss remains with the government's vehicle but such risks are fully indemnified by the insurance company. To external parties, party A appears as the government vehicle, but it is party B that is liable to cover claims under its policy. This policy is different from reinsurance, where the reinsurer is liable to pay only if its insurance company client (the ceding company) has met its claim.

Source: World Bank staff.

Figure 5.6.

The Importance of Quality Data



- Risk-management practices (focusing on risk reduction, preparedness, governance, and continuous improvement projects)
- High-level hazard, asset, and risk insights
- High-level insights into the coverage options being sought
- Insights into the type of relationship envisaged with insurers and reinsurers (potentially based on relationship and loyalty principles)

The customer should, if possible, lead the presentations, because each customer is best positioned to describe and demonstrate its own organizational settings and risk profile. Doing so can help create a more direct, face-to-face relationship.

In many contexts, the scale of public assets means that the monetary exposure associated with public asset insurance will be large. A country's prudential supervision regulations tend to have limits covering the maximum amount that any single insurer is permitted to retain, which limits each company's capacity. Such limits often mean that no single insurer can provide the total cover needed. Therefore, multiple insurers could participate on a co-insurance basis, with each accepting an agreed proportion of the overall risk and premium.

Negotiations generally occur after the initial presentations. For large and complex insurance placements, these negotiations will encompass multiple, even dozens, of potential insurers. Where there is competition among insurers, individual insurers may compete for a share of the risk through better pricing, greater capacity, and better terms and conditions for policy coverage.

A common practice is for a lead insurer to be identified and confirmed as soon as possible (the other insurers being termed *followers* or the *following market*). The lead will be an industry cornerstone insurer with a longstanding record of prudent underwriting and financial security practices. The lead usually takes a sizeable proportion of the risk (though this proportion may be less than a majority share and may even be less than a follower's share), and the following market fills the balance of the insurance placement. This arrangement forms an insurance consortium, under which the lead acts on behalf of the following market in such matters as claims settlements and policy wording changes. The lead issues the policy document and is first to sign the schedule that contains details of all the insurers and their shares. After all insurers' signatures are obtained, the policy document may be issued.

f. Determining Policy Wordings

The policy wordings approach will be dictated by customer size, complexity, and negotiation leverage, which will vary in the case of programs of public asset financial protection.

Policy wording negotiations usually are with the lead insurer first. Subject to lead insurer acceptance, this wording is presented to potential following markets as the basis of coverage.

Major insurers are increasingly recognizing and approving intermediary wordings as a basis of customer coverage. A key advantage of this approach is that policy terms and conditions have already been drafted with the customer and therefore should be a customized reflection of customer requirements and expectations (subject to market realities). Box 5.5 shows a number of insurance contract considerations.

Box 5.5.

Insurance Contract Considerations

Insurance contracts and policies can be complex documents to understand. This box summarizes what some of the common negotiable components are within insurance policies and how they may be used in negotiations.

Risk-Retention Options

Insurers will often require customers to carry a degree of self-retention (called an excess or deductible) before the insurer's liability for a loss commences. This approach serves to accomplish the following goals:

- Reduce administration on low-value, high-frequency claims (that are best managed at the customer level).
- Incentivize customers to apply prudent practices for risk management.
- Reduce the insurance premium, especially at times of high market pricing.

The government may have a layer of formal self-retention, possibly in a self-insurance arrangement. Within an insurance policy, there are different forms of risk retention:

- **Deductible:** the fixed amount that the insured pays regardless of the scale of the loss
- **Co-insurance (or co-payment or relative deductible):** the fixed percentage of the sum insured that the insured pays.
- **Excess:** the first portion that the insured pays
- **Franchise:** the threshold above which the insurer pays

Examples of the such risk retention mechanisms are shown in Box Table 5.3.1. A retention arrangement can be negotiated to reflect the customer's preferences and to offer better control of premium costs during different stages of market cycles.

Box Table 5.3.1.
Deductible, Excess, and Franchise

TYPE	DEDUCTIBLE	EXCESS	FRANCHISE
Sum Insured	$1,000	$1,000	$1,000
Risk Retention	Deductible = $100	Excess = $100	Franchise = $100
Scenario 1: Loss Incurred = $500	The insurer will pay out $400, because the customer always must retain $100.	The insurer will pay out $400, because the customer retains the first $100.	The insurer will pay out $500, because the loss is above the threshold.
Scenario 2: Loss Incurred = $1,500	The insurer will pay out $900, because the customer always must retain $100, and the insurer has to pay out up to the sum insured.	The insurer will pay out $1,000, because the customer retains the first $100, but the insurer pays out up to the sum insured.	The insurer will pay out $1,000, because the loss is above the threshold, but the insurer pays out up to the sum insured

Asset Valuation Provisions
Underinsurance is usually a consequence of one or more of the following:

- Inaccurate asset descriptions or valuations in advance of a loss
- Inaccurate loss-modeling assessments in advance of a loss
- Unforeseen costs after a loss event
- Deliberate understatement of asset values to save premium costs

To manage the risks of undervaluation of assets, insurers often include an average clause in their policies. By applying an average, the insurer may reduce its claims payout by the same percentage of shortfall in the full value of an asset. For example, a property is underinsured by 30 percent (that is, the sum insured is 70 percent of the actual replacement value). So if the property incurs damage that costs $100,000 to repair, the insurance policy will pay $70,000.

The impact of an average clause can be mitigated using margin clauses that allow for a small percentage shortfall in the amount insured without penalty. In soft markets, an average can be negotiated to a manageable level. Brokers can assist and advise with such arrangements.

Policy Limit Reinstatement Provisions
Insurance policy limits are often set as aggregate limits, as well as the limit for any one claim. This arrangement means the policy limit is the total of the insurer's or reinsurer's liability for the entire period of the contract. The funds can be expended in a single claim for total loss or as part of several smaller claims. This limit can cause issues if a significant loss occurs early in the insurance's contract period. The result is that the policy limit is eroded, leaving a much-diminished or even non-existent limit available for new claims.

A means to manage this risk is to include or negotiate into the insurance policy a provision for the automatic reinstatement of the policy limit. This approach reinstates the policy to its full limit after a claim has been paid out. Thus, effectively the policy has an aggregate limit that is double the single claim limit. In soft market conditions, an automatic reinstatement provision may be negotiated into policy coverage at minimal cost (or even free). In hard market conditions, insurers may decline the option to include automatic reinstatement of limit provisions.

Source: World Bank staff.

Sustain Fit for Purpose Risk Financing

g. Planning for Continuous Improvement and Risk-Management Maturity

The risk exposures that an organization faces are not static, and the risk-financing program mitigating those risks must learn and evolve with the changing environment. More detail about the components of continuous improvement will be covered in chapter 7.

Insurers appreciate customers who continually monitor their risk profiles through regular stakeholder engagement and updated data or information insights. Delivering evidence of well-considered and justifiable program adjustments will assist not only in convincing insurers to accept the changes, but also in supporting pricing certainty.

Continuous improvement in risk management can attract new markets that may not have considered your organization previously.

h. Managing Market Cycles

The insurance market is subject to cyclical pricing patterns. When disasters of global significance or when sudden global financial crises occur, insurance markets can become harder where premiums become more expensive. As the market moves between a soft and hard market (or vice versa), a customer can take some practical steps to maximize the opportunities and to mitigate the risks, as shown in Figure 5.7.

Figure 5.7.
Managing Market Cycles

Source: World Bank staff.

5.5.

Roles and Responsibilities

Many parties are involved throughout the process of developing and implementing an insurance program. Figure 5.8 and Table 5.5 provide a hypothetical structure and a summary of the typical roles and responsibilities involved in the process, respectively. Each country has its own unique circumstances that could deviate from the descriptions within the summaries. One such consideration would be the extent to which governments want to interact with domestic versus international insurance providers. Box 5.6 provides some guidance about issues to consider when engaging with domestic and international insurers.

Table 5.5.
Summary of Roles and Responsibilities

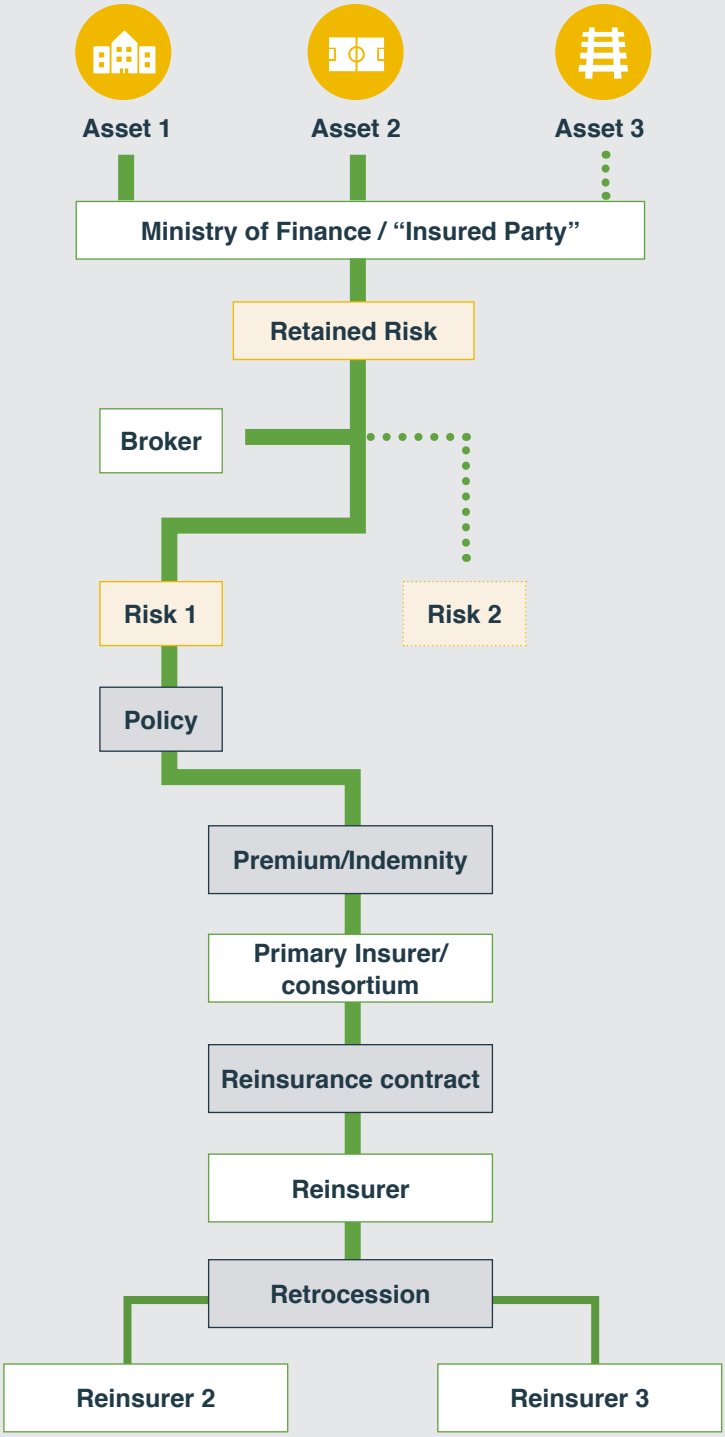
Asset-Owning Agencies and Line Ministries	⊙ Provide data to represent the assets being insured, at an adequate level of accuracy and completeness, including a schedule of asset locations and values. ⊙ Agree on program aims and objectives. ⊙ Adher to defined governance and management procedures. ⊙ Pay premium as allocated by risk assessment. ⊙ Notify and manage claims, including: initial notification of claim, provision of details and evidence related to the damage; engagement with loss adjusters, contractors and claims managers; and recording of claim amounts paid and completion of works.
Policy holder, for example, Ministry of Finance (or asset-owning agencies and line ministries)	⊙ Own and develop the strategy for public assets, including defining risk appetite and risk tolerance in relation to the design of an effective approach. ⊙ Engage with internal stakeholders including asset owners, auditors, compliance officials and regulators. ⊙ Be the lead government representative for the insurers and final accepter of terms and conditions. ⊙ Coordinate relationship with policy-issuing insurers, including obtaining approvals ⊙ Engage with brokers and other third parties in line with government procurement regulations. ⊙ Provide systems and operations to support insurance management across government agencies.

continued: Policy holder, for example, Ministry of Finance (or asset-owning agencies and line ministries)	⊙ Document and manage of the insurance process and procedures. ⊙ Determine and agree on the level of exposure to be retained by the government (for example, by asset-owning agencies and line ministries), or deductibles. ⊙ Provide aggregated data (if multiple asset-owning entities) to the insurers at an appropriate level of accuracy and completeness. ⊙ Manage of the claims process with insurers.
Lead insurer (as the policy issuer)	⊙ Develop insurance pricing and rating of the assets as notified in the schedule of assets provided by the policy holder. ⊙ Provide policy wording and contract to provide cover as agreed with policy holder. ⊙ Be the contact point for claims notification and settlement. ⊙ Organize loss adjustment and other claims services for the policy-holding Ministry. ⊙ Ensure appropriate governance and compliance actions to guarantee cover and payouts in line with the policy.
Reinsurers	⊙ Provide reinsurance against largest potential maximum losses including natural catastrophes. ⊙ Ensure payment of claims by insurers according to the reinsurance policy.
Brokers or intermediaries	⊙ Provide transactional advisories and marketing to ensure cost-effective coverage ⊙ Provide analytical services to support pricing and structuring of risk transfer and selection of coverage to ensure effective coverage in support of objectives. ⊙ Provide ongoing services to support renewal of coverage as necessary.
Regulators and supervisory organizations	⊙ Determine capital and operational rules for the provision of insurance and reinsurance, with respect to the participation of domestic insurers, or admission of international insurers and reinsurers. ⊙ Determine tariff structures as necessary for public asset risks. ⊙ Approve or supervise special purpose entities such as fronting captives, state-owned insurers, mutuals or consortia.
Government audit and compliance agencies	⊙ Provide oversight and validation of insurance processes against procurement and internal accounting rules. ⊙ Validate asset values (insured values) to be appropriate to the type of coverage being provided (for example, rebuilding/ reinstatement or Actual Cash Value (ACV).

Source: World Bank Staff.

Figure 5.8.

Structure for a Hypothetical Risk-Transfer Approach for National Public Assets



Source: World Bank Staff.

Types of public assets
Not all public assets necessary benefit from insurance. Other forms of self-insurance could be more cost-effective

Insured party
Based on their risk appetite, an organization takes out insurance for certain risks and/or assets.

Retained risks
The proportion of losses that the Ministry of Finance decide to retain.

Broker
In some cases, brokers are commissioned to represent and advise the buyer to see coverage.

Exclusions
Some types of risks are excluded in insurance coverage to increase its cost-effectiveness.

Policy
Insurance policy is a legal document which sets out the agreed term of the payment and coverage. This can be originated by either the broker or the insurer which is then negotiated and agreed.

Premium and indemnity
Premium is the agreed amount paid to insurers in return for compensation of an agreed amount based on the loss incurred. This is called an indemnity.

Insurer
Insurer can be mutual companies owned by the policyholders or (domestic or forgeign) stock companies owned by shareholders. The company structure will determine their risk appetite and organisational and governance structure.

Reinsurance
Reinsurance is a process where insurers transfer (cede) excess risk, taking into account their own risk appetite, to other parties in order to spread the risks with other capital providers.

Reinsurers
Reinsurers provide insurance for insurance companies or other reinsurance companies.

Retrocessional reinsurance
Reinsurance can also use secondary reinsurance to further spread excess risk.

Box 5.6.

Domestic or International Insurance Markets?

When a government seeks for insurance or reinsurance providers, they have options to work with or engage with domestic or international insurance and reinsurance companies, as well as other ancillary services such as brokers or risk modellers. Typically, in the context of insurance, due to regulatory supervision, the insurer would have to be licensed to operate in the jurisdiction and can be a domestic or a subsidiary of an international insurer. If engaging with reinsurers directly, this would typically involve opening up to the international reinsurers, to increase choices and options.

The choice of whether and how much to engage with domestic or international insurance market participants is often driven by a combination of the following considerations:

- **Pricing.** Cost is almost always a motivator. Governments or their brokers will often seek terms from a wide range of markets (domestic and international) to test market-pricing options. This approach can result in a combination of both local and international insurers and reinsurers being used for the same program and can be based on the price offered for certain proportions of the insurance risk-transfer arrangement.
- **Available capacity and expertise.** Insurers and reinsurers often have limits on how much risk of a certain kind they can accept. In many emerging economies, this capacity to accept risk is relatively low compared to international markets. The capacity results in a tendency toward international markets while domestic markets develop their capacity over time.
- **Domestic market development aspirations.** As part of a broader strategic direction, some governments aspire to support and mature the domestic insurance market. By including local insurers in the process of insuring public assets, can contribute to building capacity, compiling data for better risk pricing locally. It also contributes towards increased premiums underwritten in the local market, which increases the domestic capital for investments, and in turn help to develop the overall local economy and society. A strong local market, which supports domestic business and private customers, can also reduce social impacts after the loss event, thus reducing the government's contingent liabilities. For this reason, some governments may lean toward favoring domestic markets.
- **Potential economic advantage.** Conversely, governments may recognize the value to the country's economy of incoming funds from overseas insurance following a disaster event and may prefer to place its insurance predominantly or wholly offshore.
- **Legislation or regulation compliance.** Different jurisdictions may be compelled by legislation or regulation to use or to avoid using certain markets.
- **Risk-transfer diversification.** Governments may elect to use a combination of local and international markets to diversify their insurance portfolio. A diversified portfolio allows government to hedge pricing over time as different geographic markets shift through different pricing cycles.

- **Solvency of insurers and reinsurers.** Governments can (and should) set minimum standards for financial security on the insurers and reinsurers with which they are prepared to deal. A financially strong insurer is necessary for protection from disaster events when insurance reserves are placed under strain. For that reason, a government may choose markets that can evidence necessary financial standards, irrespective of domicile.

Source: World Bank Staff.

To Recap Chapter 5:

- **Governments can use different structures to coordinate and interact with the risk transfer providers. This process is typically supported by intermediaries who can provide advice and supporting services to the insurance program.**
- **Some of the key considerations as part of the risk transfer include: whether and how to engage with domestic and international insurers; understand the types of risk transfer instruments most appropriate to the context; and how to sustain the fit for purpose of the risk financing over time.**

Worksheet for Chapter 5

Test your understanding the chapter, and record your insights through this worksheet!

Activity 1.
Match the different structures for the financial protection of public assets with the conditions they are best suited for.

Structure	Best Suited for...
Self-Insurance	Governments with actual or potential large premium costs, which are pursuing a strategic approach to managing their risk exposures and costs of risk, and willing to increase their share in their risks and to retain underwriting profits.
Procurement Collective	Governments with a qualified and quantified understanding of cross-agency risk exposures and with diverse risk profiles of member agencies.
Risk Pool	The management of smaller, more frequent, more predictable costs (e.g., regular minor damage)
Captive	The central government that does not want to, or is not ready to, formally pool agency risk, but that does want to use the government's economies of scale to leverage good procurement outcomes as a ready-made option for agencies

Activity 2.
Identify the market cycle and determine whether the pricing patterns indicate a soft or hard market.

Trends	Soft Market	Hard Market
The cost of insurance may make it financial sensible to retain more risk.		
Market prices have bottomed out, and there are indications of premium increases.		
The cost of insurance may make it financial sensible to transfer more risk.		
The insured looks to lock in low rates and seeks a long-term agreement of up to five years at a time.		

Activity 3.
Drawing on your understanding of the content in this chapter, select whether the following statements are true or false.

	Statement	True	False
1.	In choosing which insurance or reinsurance markets to engage, price is almost always a motivator.	☐	☐
2.	An insurance consortium is a group of insurers or reinsurers that join together to provide insurance coverage.	☐	☐
3.	In procurement, a quality intermediary that has program design experience and an effective strategy of market management can positively influence the cost of the insurance program.	☐	☐
4.	The insurance market does not recognize, consider, or approve intermediary policy wordings as a basis of coverage.	☐	☐
5.	Insurers will often require policyholders to retain some of the risk to incentivize them to apply prudent risk-management practices.	☐	☐
6.	To maximize the opportunities and to minimize the risks of losses due to disasters, governments themselves need to insure.	☐	☐
7.	Risk pools provide a diversification in terms of geography or nature of risks, thus reducing significant exposure to catastrophic losses.	☐	☐

Activity 4.
Reflections

[a] My top three takeaways from this chapter are these:

[b] Three concepts or ideas I would like more information about are these:

CASE STUDY

Indonesia

Context

Indonesia is located on the confluence of three major tectonic plates, the Indo-Australian, Eurasian and Pacific plates which are prone to collisions that can lead to earthquakes. Indonesia is also located in the Pacific Ring of Fire, a series of lines of active volcanoes. The country is also exposed to flooding, storms and other perils. To improve the financial resilience to these risks, the Ministry of Finance adopted a National DRFI Strategy in October 2018. Engagement with local and international insurance and reinsurance markets is a key part of this strategy.

The Government of Indonesia launched its state asset insurance program in 2019 covering buildings owned by the Ministry of Finance. This has been expanded to over 20 national government agencies by early 2021 and will be scaled up to all ministries by 2022. Risk is transferred from the national government to a consortium of the domestic insurance market, the Consortium of State Assets Insurance, or Konsorsium Barang Milik Negara (KABMN), organized under the Indonesian Insurance Association. The consortium consists of 52 General Insurance Companies and 6 Reinsurance Companies. Within the KABMN, PT. Asuransi Jasa Indonesia (JASINDO, a state owned insurance company) acts as the policy issuer, and is responsible for the administration of policy and claims issuance with the insured. Another consortium member, PT. Reasuransi Maipark Indonesia (an industry owned specialty reinsurer for catastrophe risk), serves as the pool administrator, managing the internal administration of the Consortium. Maipark also manages transfer of excess risk to international reinsurance markets.

All of the consortium members have fulfilled the requirements by the Ministry of Finance and the Otoritas Jasa Keuangan (OJK, the monetary regulator), having a minimum of Rp150 billion as own capital, having a minimum RBC of 120% and a minimum liquidity ratio of 100%.

This insurance program was preceded by significant work to build the enabling environment and required institutional, legal, and regulatory steps.

Between 2017 and 2019, the Government of Indonesia updated its inventory of fixed assets including buildings and infrastructure, such that the data presented is up to date and the data quality has been validated. The Government also conduct a regular valuation of all fixed assets including buildings and infrastructure, so that the value of the assets presented is the latest value.

A series of policy and implementation decisions paved the way for the insurance program (see also Case study Figure 3.1), which include:

- Issuing regulations that established the requirements to obtain insurance for state assets.
- Setting out the procurement process for insurance,

11 Lessons Learned: The Philippines Parametric Catastrophe Risk Insurance Program Pilot

to be implemented at the individual ministry level. This was enabled using an 'umbrella contract' procurement method as a single contract between the government and the consortium covering all future policies to be signed by individual ministries

- The decision on the approach to market through a consortium of local insurance companies. All interested insurance companies in Indonesia are able to participate in the consortium, with one company as the policy issuer.
- Determining the policy, to cover Property All Risk (PAR) with expansion of guarantees including earthquakes, volcanoes, tsunamis, floods, typhoons, landslides and risks of sabotage and terrorism
- The tariff structure is a simple flat rate, for all types of perils in all regions of Indonesia, as a means to navigate the difficulties in determining individual asset premiums based on different risks in its 17,000 islands. The flat rate, which effectively pools risks across risk types and geographies, is also considered to be relatively cheaper than buying individual covers for each type of risks. This single rate will be reviewed regularly as more assets are entered into the program.

The decision to procure insurance through a consortium of the domestic market reflects the following objectives:

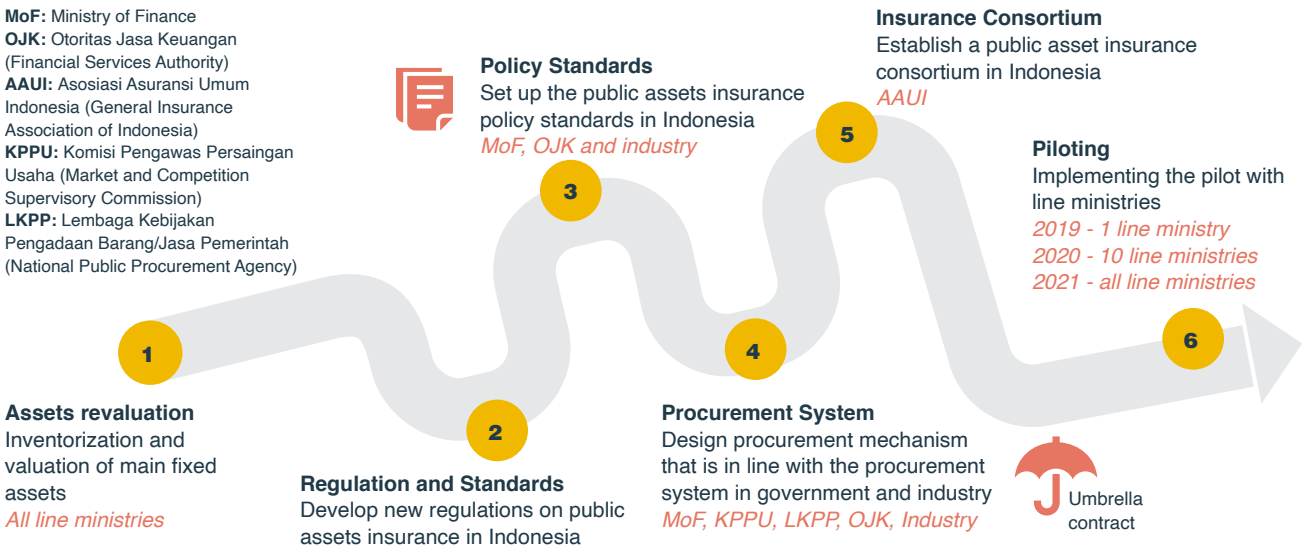
- Provide the economies of scale required to cover risks which are difficult to place and specific to the geographical location and to cover the overall large scale of the sum insured.
- Foster the development of the domestic insurance market in Indonesia through cooperation and joint interests.
- Promote highest service standards
- Improve the partnership and relationship between the government and the insurance industry, and raise the level of understanding of insurance within the government
- Reduce volatility and promote greater budget certainty as a result of frequent claim events.

Lessons Learnt

The Government of Indonesia has opted for an approach that places the insurance policy with a consortium of many insurers and reinsurers. While this approach requirement more work at the beginning to establish all the required structures, it has enabled the economies of scale and cooperative behaviour amongst its domestic insurance industry. This approach can provide a helpful source of reference to governments facing a fragmented insurance industry on the one hand and a complex suite of risks on the other.

Case Study Figure 3.1.

Key steps to developing public assets insurance in Indonesia



6.

Pooling and Mutual Options for Public Assets Insurance

What You Will Learn

This chapter provides practical examples of risk pools and mutuals within the context of public sector insurance, drawing on examples from around the world.

6.1.

Risk Pooling and Mutualization

For governments looking to develop programs of financial protection for their significant portfolio of public assets, risk pooling can deliver material financial and nonfinancial benefits. Along with chapter 5, this chapter describes the concepts of risk pooling, its benefits, and its challenges.

What Are Risk Pooling and Mutualization?

Risk pooling is the practice of sharing all risks among a group of risk exposure units. It rests on the theory that if a large number of risk-exposure units (e.g., buildings) are grouped together and, if they are less than perfectly correlated, there is some diversification across the full portfolio, such that consequently the overall likely losses will be less volatile over time. The aggregated risk can then be spread across participating pool members. Aggregating risks will allow members to collectively accomplish the following:

- Pool risks into a diversified portfolio.
- Retain some risk through joint reserves or capital.
- Where relevant, transfer excess risk to the reinsurance and capital markets.
- Obtain more affordable prices through diversification and economies of scale.

Not every type of event is suitable for risk pooling. For risk pooling to be effective, the risk should have some form of diversification and uncertainty in terms of when or where that risk can occur. If the event is certain, then tailored resources can be set aside to manage the impacts. Also, if the event is too frequent, setting aside sufficient reserves to manage or to pay for the event can potentially be less costly than managing it through a risk pool (which would incur transaction costs to manage and disburse funds).

In general, insurance companies act as commercial risk pools, thereby facilitating risk transfer by charging entities and individuals an insurance premium. The insurance companies will pool those premium earning risks by aggregating risks from many individuals or organizations, which apart from the exposure to risks are unrelated to each other. However, in some circumstances where there is a sufficiently large number of entities with common risk exposures and organizational alignment, those entities could form a risk pool before going to the insurance markets or, in some cases, not going to the insurance markets at all.

One common approach is creating a mutual organization that serves the same purpose as an insurance company but that focuses only on the risks agreed to by the organizations that have formed the mutual. In such a case, the mutual is owned entirely by its policyholders. Any profits that a mutual earns can be (a) retained within the mutual, (b) rebated to policyholders through dividends, or (c) contributed toward future premiums.

What Are the Benefits of Risk Pooling?

In the context of public assets, pooling the assets as part of a risk-financing strategy can deliver economic benefits such as the following:

- **Financial efficiency, risk diversification, and economies of scale.** Pooling risks across multiple assets or multiple regions or both can increase the structural and geographical diversification of risk. Doing so also enables economies of scale through a shared fixed-cost base and through reduced transaction costs of the procurement of related services such as brokers or claims management services. Additionally, because pools are often underwriters of member risk, they may have more flexibility in drafting terms and conditions of coverage that are tailored to members' needs.
- **Increased budget certainty and price stability.** Risk pools are typically long-term arrangements to retain some risk within the pool. Doing so decreases the amount of reinsurance required, which in turn assists in smoothing costs over insurance market cycles. This smoothing improves budget predictability and reduces pricing volatility. Pools can also have the scale to withstand moderate losses with minimal effect on ongoing member costs. Conversely, one potential downside is that if any one member experiences a proportionately very large loss, in some cases that experience could lead to increased premiums the following year for everyone (all else being equal).
- **Access to insurance markets and insurance affordability.** If a portion of risk is transferred to insurance markets, a diversified pool of assets can be more attractive to insurers and thereby can lead to lower premiums. The greater the diversification, the cheaper the reinsurance protection. Risk pooling can provide an insulating layer between individual member deductibles and an insurance risk-transfer layer. The insulation layer is often attractive to insurers because it reduces insurer risk exposures to lower-value, higher-frequency losses, which results in lower and less-volatile premium costs. If pool members have mature risk-management practices and a better loss history than the general insurance customer has, then collectively they are in a better position to influence premium costs, as well as the coverage terms and conditions.

- **Improved risk ownership and innovation for participating members.** Because a portion of the risk and uncertainty is retained within the pool, members have a greater incentive to strengthen their collaboration with each other and to share information and new ideas about risk management. Those behaviors also promote longer-term risk-management maturity and pool sustainability.

What Are the Challenges?

Key challenges to risk pooling involve the following:

- **Moral hazard and adverse selection.** Moral hazard refers to the situation in which there is imperfect information about the scale of risk-exposure and risk-management practices of potential members. There is a risk that members with substandard risk-management practices or risk-prone assets may join the pool, but such practices or risk exposures are not fully factored into the risk pool and are not reflected in those individual members' premium contributions. This condition is known as adverse selection, and it can result in higher-than-expected claims, which can cause financial difficulties for the pool. A successful pool involves diverse membership. In addition, pool members need to have acceptance and confidence (a) that the pool membership will include not only their own risk profile but also all their counterparties' profiles—including their loss histories, loss controls, and safety and claims management processes—and (b) that they are unlikely to be able to fully influence or control the underlying risk and claims management of other pool members.
- **Allocation of premium or member contribution.** Pool members will always be conscious of cost. When contributions are allocated across membership, there will be an expectation of fairness and transparency. Any smoothing of costs across the membership base will need to be carefully explained and justified to prevent or minimize members' concerns about subsidizing the contributions from other members. Contribution allocations are often made more complex after a large loss has affected some members but not others. Smoothing the cost over time, through hard and soft markets (see chapter 5), is also important to avoid volatile pricing.
- **Continued commitment and financial contributions from stakeholders.** Risk pools require strong and ongoing commitment from key stakeholders—from design to implementation and day-to-day operation. Lessons learned from the World Bank's involvement in risk pools around the world indicate that successful risk pools have continued government and political support as well as ongoing member commitment to the pool. To help achieve this success, stakeholders should be involved in designing the pool and should commit

to its rules and to their responsibilities as pool members. Those aspects could include taking into account the two aforementioned challenges through coordination among participating entities.

- **Time and resources to develop effective pooling design.** If an effective risk pool is to be developed, the time and resources to design an appropriate risk-pooling structure should not be underestimated. As with all major government initiatives, the costs of time and resources to design and develop a risk pool will need to be compared with the status quo and the incremental benefits those changes offer. Poorly designed risk pools may not deliver the intended benefits to members.

What Are the Different Types of Risk Pooling Structure?

As part of designing and developing a government's financial protection of public assets, key considerations are the scope and scale for risk pooling across public assets.

To begin with, government officials need to identify the main purposes and drivers of risk pooling, such as the following:

- Is risk pooling being considered to drive cost efficiency through economies of scale?
- Is it being considered because affordable and available existing solutions for risk transfer are lacking at the individual entity level?
- What are the commonalities and differences of the entities and their risk profiles? Although diversification of risk profile is good for risk pooling, entities also need to share common principles in risk management, in addition to other common identifying features.
- What additional intangible benefits can members derive from the risk-pooling structure? Some examples are training and capacity building, mutual assistance, common and improved risk management, risk reduction, and preparedness planning.

Previous chapters have discussed the main stages to consider: design, development, implementation, and renewal. Figure 6.1 presents a summary checklist of the key considerations for risk pooling within each of those key stages, most of which are common to topics in previous chapters.

Because risk pools are established for different reasons and with different anticipated benefits and challenges, it is useful to consider an overview of the different risk pools in the context of the public sector (see Table 6.1).

Figure 6.1.
Summary Checklist of Key Considerations for Risk Pooling

Source: World Bank staff.

Table 6.1.
Types of Public Sector Risk Pools

	MUTUAL OR MEMBER-DRIVEN POOLS	POOLS OF LAST RESORT	NATIONAL RISK POOLS	REGIONAL CATASTROPHE RISK POOLS
Description	Member-driven. Different members create and run an insurance pool for mutual benefit.	Programs can maintain insurance availability for specific risks or members, either self-insurance or backed by government.	State-driven. Programs to insure multiple public assets or infrastructure under one large facility as part of fiscal and risk management	The pool provides coverage to multiple countries and access to international reinsurance markets with a joint portfolio.
Administrator	Members	Government Members	Central or subnational government or independent authority	A dedicated facility and insurance company
Structure	Operates like a commercial insurance company but the shareholders are also the policyholders, therefore profits can be redistributed to members, and these members can also influence the strategy and decisions of the organization.	The government becomes the insurance provider through a new entity or program/special vehicle. The overall customer profiles are typically 'riskier' than a commercial insurer.	Structural arrangements vary but typically this involves some form of bundling or aggregation across multiple public assets. This can be self-insurance or transferred to the insurance or re-insurance markets through contracts.	Typically, an entity is set up to deal with the administration, premium collection and payouts to the different jurisdictions. In some existing regional pools, donors provide seed capital to capitalize the company.
Advantages	Members are typically similar and like-minded about risk-management practices. The pool can benefit from economies of scale. Proceeds and surplus of the pool are typically reinvested back into the members.	Pool can provide insurance in areas that a private market does not cover or that are too costly. Data can be collated to inform future policy decisions. Standardized pricing and policy terms and conditions can be developed.	Economies of scale with centralized data collection and analysis, ease of procurement, and placement. Ability to cover all relevant public asset and infrastructure risks, including risks that are considered uninsurable or that will attract very high premiums	Regional pooling allows for even greater risk diversification, particularly for natural catastrophes. It also provides access to insurance in new markets.

	MUTUAL OR MEMBER-DRIVEN POOLS	POOLS OF LAST RESORT	NATIONAL RISK POOLS	REGIONAL CATASTROPHE RISK POOLS
Disadvantages	Smaller mutuals may lack sufficient diversification and economies of scale The mutual needs to retain long-term membership.	Higher risk profiles can potentially lead to large budget deficits.	Potential lack of diversification owing to either geography or nature of risks Shared liability limits	It involves complex, time-consuming, international set-up. It often requires donor seed capital.
Examples	**United States: Washington Cities Insurance Authority** ➡PG. 178 **Australia: Statewide Mutual** ➡PG. 179 New Jersey Schools Insurance Group	**United States: Texas Windstorm Insurance Association (TWIA)** ➡PG. 181 US: National Flood Insurance Program UK: Flood Re and Pool Re	**Australia: Comcover** ➡PG. 182 **Mexico: FONDEN** ➡PG. 184 **United Kingdom Risk Protection Arrangement for Schools** ➡PG. 187 **Israel: State assets** ➡PG. 188 Indonesia: State assets	**Caribbean Catastrophe Risk Insurance Facility** ➡PG. 189 **Southeast Asia Disaster Risk Insurance Facility** ➡PG. 191 African Risk Capacity

Source: World Bank staff.
Note: Case studies are in boldface.

The next section provides several case studies of each type of risk pool. Earlier chapters have provided guidance about considerations in design and development of a financial protection program. The next chapter will focus on implementation and renewal of a program.

Although the focus of this chapter is on financial risk-transfer mechanisms, risk pools of a physical and more tangible nature are also common in some infrastructure sectors (which can be state owned or privately owned), particularly in the form of mutual assistance networks. In those cases, organizations from within the same sector provide support to each other during disaster events. Such support is discussed further in the final section of this chapter.

6.2.

Case Studies of Public Sector Risk Pools

Mutual or Member-Driven Pool #1:
Washington Cities Insurance Authority Municipal Risk Pool[12]

Context

Washington Cities Insurance Authority (WCIA) is a self-insured, municipal risk pool that was formed in 1981 and that focuses on public entity business in Washington state, which is on the West Coast of the United States. It offers liability, property, and specialty insurance programs as well as risk-management services.

Structure

The co-owners of the pool—local government entities and their related regional entities— have increased from 9 members to more than 160 members. The pool currently covers US$10.3 billion in assets within its property program, and other insurance lines include auto, cyber, pollution, liability, and crime.

Because WCIA is a member-owned risk pool, a strong and inclusive governance structure is core to its success. Each member appoints a delegate representative to the WCIA board of directors. Delegates elect pool officers and executive committee members on a merit basis. The membership maintains control over every pool function, including claims administration, fiscal stability, coverage parameters, and member services.

12 Source: WCIA website, https://www.wciapool.org/

To join the WCIA program, participating members must be approved by WCIA's Executive Committee and pay an annual assessment according to their reported worker hours and scheduled property values. The contribution funds the first layer of the risk (Washington Cities Self-Insured Retention), as well as funding operational costs such as underwriting, claims, actuarial, risk management, finance expertise, reinsurance, and educational and knowledge-sharing programs among members. Each member retains low-level losses in the form of deductibles. Washington Cities Self-Insured Retention acts as the pool-funded primary layer and pays the first compensations for non-catastrophe losses. The premium is allocated accordingly to each member on the basis of actuarial calculation, while factoring in total values, exposure to riskiest perils, loss experience, time in the program, and deductibles. There is a further portion of risk transfer to the private insurance market, which will support all members in the case of property losses over $750,000, liability losses over $4 million and all major floods and earthquakes.

Evolution over Time

As WCIA evolves over time, the pricing of its scheme to members is core to its long-term sustainability. If insurance pricing becomes too high, WCIA can lose membership because members may be able to secure a better deal directly in the insurance market. WCIA has managed to keep relatively stable pricing since 2007 and therefore has managed to grow membership: minimal loss experience has allowed this stability, which has kept the surplus high. The surplus can also be used to smooth the insurance cycle and to keep the budget manageable for all members.

Mutual or Member-Driven Pool #2: Australia's New South Wales Councils—Statewide Mutual[13]

Context

At the time of Statewide Mutual's formation in 1993, few underwriters in Australia were willing to underwrite local government insurance. Individual councils with poor claims records were being heavily penalized, and many had difficulty obtaining coverage. Both claims and premium costs were rising and volatile. Statewide Mutual was established with 96 councils in New South Wales (NSW) in its membership as underwriters withdrew their support for local government in public liability and professional indemnity coverage. In 2020, there are 117 member councils across NSW, across its various schemes including property and other insurance schemes, which were introduced over time.

13 Sources: Statewide Mutual Annual Report 2019 and Statewide Mutual website, https://www.statewidemutual.com.au/

Structure

Statewide Mutual, a largely self-insurance mutual, is further backed by reinsurance placed through local and international underwriters. Members own the schemes and benefit from building equity that results from surplus contributions. Its board is elected by members and includes senior-level management from member councils from regions across NSW. JLT, an Australian insurance broker and service provider, is the contracted scheme manager.

Within the property mutual scheme, each member has an agreed self-insured retention (SIR) amount that is fully funded and capped. Once this SIR amount is exhausted, an excess-layer coverage takes effect, up to an overall limit of AU$1.2 billion across all members, for any losses arising out of one event. Claims in excess of the SIR are paid by underwriters, thereby reducing risk to members. Surplus contributions generated in a fund year are fully rebated to members after all claims have been finalized.

Other Benefits to Members

Key benefits claimed by Statewide Mutual are its consistent price stability and value for money to its members over time, which it accomplishes by smoothing the market's peaks and troughs. As a member-led program, the mutual provides some additional benefits typically not available in a traditional insurance offering (for example, making advanced payments to members that have been worst hit by the 2019 bushfires or by the 2016 northern NSW floods so it enables the rebuilding of affected communities).

Evolution over Time

The mutual runs a risk-management program to help members implement tailored risk-management solutions to improve community safety, to promote best practices in risk management, and to reduce claim incidence. The program has evolved over time as it responds to members' maturity and develops advanced programs for more mature members. At present, it also runs annual risk-management conferences as well as award initiatives to incentivize risk-management excellence.

Pools of Last Resort: Texas Windstorm Insurance Association[14]

Context

The Texas Windstorm Insurance Association (TWIA) was established in 1971 by the Texas legislature to provide wind and hail coverage to applicants unable to obtain insurance in the private market. As a result of commercial insurance markets that limited coverage along the Texas coast after several hurricanes, the legislature created TWIA with the intention of providing an adequate market for windstorm and hail insurance in certain designated portions of the seacoast territory of Texas where windstorm and hail insurance is not reasonably available. With this set-up, TWIA is a residual insurer of last resort and therefore does not compete directly in the private market. TWIA is 1 of 36 residual market property insurers in the United States. Those residual markets are created by state law to provide consumers with an alternative source of insurance when coverage is unavailable through traditional insurance carriers in the private sector.

Structure

TWIA operates as an insurance company to residential and commercial property. It provides coverage only for wind and hail losses. The applicants need to meet several criteria. For example, they must have been denied coverage by at least one insurer in the private market, and the properties must be located in the designated catastrophe area and be certified as having been built to applicable building codes. Premiums are calculated on the basis of standard rating factors, including amount of insurance, type of construction, deductible amount, and optional additional coverages.

TWIA is required by law to transfer its net gain from operations each year into the Catastrophe Reserve Trust Fund (CRTF), an account that is maintained by the Texas comptroller and that is dedicated to paying for future TWIA catastrophe losses. TWIA losses and operating expenses are funded from the CRTF, TWIA premiums and other revenue, public securities, and reinsurance. TWIA has in place reinsurance or alternative risk-financing coverage “in an amount sufficient to achieve total funding for not less than the probable maximum loss for a 100-year hurricane season.” For the 2020 hurricane season, TWIA secured access to US$4.2 billion in total aggregate funding reserves, including deposits of US$177 million in the CRTF and US$2.1 billion in reinsurance.

14 *Source:* TWIA website, www.twia.org

Evolution over Time

A residual insurer such as TWIA takes on a high degree of loss exposure. TWIA's policy count grew by 2.5 times from 2005 to 2012, but its loss exposure increased threefold. Managing loss exposure over time is therefore critical for residual insurers. Through the 2015 Texas legislature, TWIA has since been implementing a series of depopulation programs in participating private insurers so they can make voluntary offers to assume, or transfer, TWIA policies. This approach enables the voluntary transfer of more viable policies to private markets and reduces the overall loss exposure of TWIA.

National Risk Pool—Central Government #1: Australia Comcover[15]

Context

Comcover was established on July 1,1998, following an independent government review in 1997 that recommended that the Australian government consolidate the management and insurance of that government's assets. Comcover replaced the previous noninsurance arrangements under which agencies were not incentivized to manage their risks effectively (liabilities and risk events were managed and funded on an ad hoc basis through increased budget allocations) and under which the government could not effectively aggregate or assess risks or liabilities across all government activities.

Comcover's key objectives are to promote best-practice risk management for its fund members and to provide a comprehensive insurance fund to protect against the impact of insurable losses. The Australian government reaffirmed those objectives in 2007, 2011, and 2014.

Structure

The Comcover fund applies to budget-funded government agencies (170 departments of state and noncorporate entities) but not to government corporate entities or government businesses, which obtain commercial cover. In 2018–2019, Comcover insured assets worth AU$90 billion, collected AU$136 million in premiums, and paid AU$75 million in claims.

15 Sources: Comcover website, https://www.finance.gov.au/government/comcover; Rob Antich (co-author, general manager of Comcover, 2014–2017).

Comcover generally follows the classes of insurance coverage offered by the market, which include liability (public and professional, directors, and officers), property, fraud, business interruption, motor vehicle, personal accident, and travel. Comcover fund members are required to comply with insurance-like obligations of full disclosure and to provide up-to-date information about asset registers, claims, and major changes in risk profile.

Other Benefits to Members

Comcover offers services to fund members, including insurance and indemnity advice, claims management (including the provision and payment of legal services in relation to claims), data analysis, and risk-management training and assessment. The centralization of those expenses through a combination of public servants and outsourced specialist service providers enables considerable efficiencies and economies of scale. The costs are entirely funded from premium contributions and therefore are provided to fund members at no additional cost. Services also include a comprehensive risk-management program with training, online learning, and a program of executive professional development.

Comcover's management of almost all legal liability cases against the Australian government, together with other risk data, also provides the government with a big-picture view of liability issues. It enables more targeted and focused risk-management responses to both current and emerging issues.

Evolution over Time

Between its 1998 establishment and 2007, Comcover transferred some of its risks to the private market through reinsurance. In 2008, the government decided to entirely self-insure because of its ready access to funds (through the budget) and so it could avoid private sector transaction costs.

Comcover's current policy is that it should be fully self-funded (i.e., no external risk transfer) with budget funding to be sought if assets fall below zero and with funds returned to the budget when assets exceed AU$150 million.

Since 2008, self-insurance has led to relatively small and stable annual premium increases (5–10 percent per annum) because premiums are not subject to market fluctuations and to reinsurance transaction costs of tens of millions of dollars. From 2014, Comcover fund members were required (under the Australian government's risk-management policy) to implement a range of enterprise risk-management practices. Since 2014, Comcover has conducted regular surveys of fund members, benchmarking their risk-management maturity against

the risk-management policy (e.g., the extent of an agency's risk-management framework and policy, its risk appetite, the risk data gathered, the risk culture, and an ongoing system review). A 2017–2018 survey report indicated that there had been a consistent increase in risk-management maturity over the four years since the risk-management policy had been implemented.

National Risk Pool—Central Government #2: Mexico FONDEN[16]

Context

Because of its diverse geography, Mexico is exposed to a wide variety of geological and hydro-meteorological hazards, including earthquakes, volcanoes, tsunamis, hurricanes, wildfires, floods, landslides, and droughts. Starting with a major earthquake in Mexico in 1085, the government has undertaken a series of reforms to strengthen disaster risk management in the country.

In 1996, the government established the Fund for Natural Disasters (FONDEN). It was initially set out as a budget line to provide adequate financial resources for federal and state reconstruction efforts without compromising committed government spending. In October 2020, the Mexican senate voted to reform public funding across a range of funds, which led to the closing of FONDEN's trust fund. At the time of writing, the future restructuring of FONDEN was still ongoing.

Structure

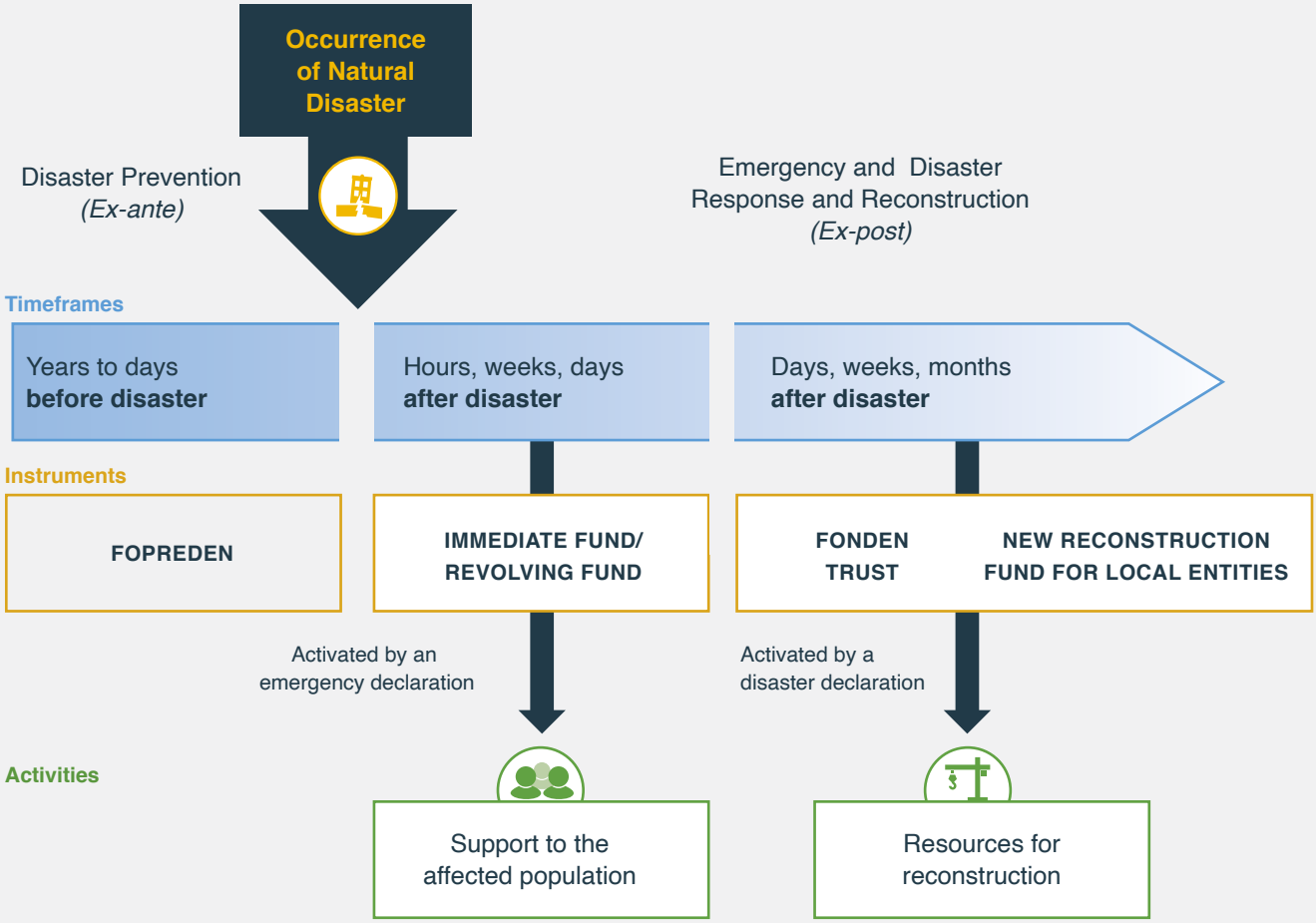
Strictly speaking, the FONDEN Program for Reconstruction is not an insurance mechanism because Mexican states do not pay an insurance premium. However, it uses the principles of risk pooling and good practices within the insurance industry to provide reconstruction finance. Those principles and practices include (a) a transparent damage reporting system, (b) a set of clear rules for how funds are disbursed, (c) a clear plan for how money is spent, and (d) a credible monitoring system for expenditures.

FONDEN comprises both preventive (ex ante) and ex post instruments (Figure 6.2).

16 Sources: World Bank, *Sovereign Climate and Disaster Risk Pooling* (Washington, DC: World Bank, 2017); "FONDEN, Mexico's Natural Disaster Fund—A Review," Working Paper (Washington, DC: World Bank, 2012).

Figure 6.2.

Role of FONDEN's Instruments in Mexico's National System of Civil Protection



Source: World Bank, FONDEN Mexico's Natural Disaster Fund – A Review, 2012.
Note: FOPREDEN = Fund for the Prevention of Natural Disasters.

- **FOPREDEN.** A fund that focuses on preventive actions, including (a) identification and assessment of hazards, exposure, and vulnerabilities; (b) ex ante disaster risk-reduction and mitigation; and (c) local community capacity building for disaster prevention.
- **Program for Reconstruction.** FONDEN's primary budget account that provides resources for the rehabilitation and reconstruction of uninsured or underinsured public assets. It channels resources to the FONDEN Trust and the Revolving Fund, which in turn creates specific financial accounts for each reconstruction program.
- **Revolving Fund.** A small, flexible, financial instrument that supports emergency activities immediately—prior to or upon occurrence of a disaster—and that is financed by the FONDEN Trust. Such assistance may include food and medical supplies, articles for temporary shelter, search and rescue equipment, and other relief items.
- **FONDEN Trust.** A trust that holds federal resources for specific reconstruction programs and for emergency relief in the revolving fund. The FONDEN Trust—through its fiduciary agent BANOBRAS, the national development bank—also acts as a financial vehicle to purchase risk-transfer instruments such as insurance and catastrophe bonds and to receive any loss payments.

Other Benefits to Members

FONDEN provides an example of how a collaborative approach to financing can instill financial and operational discipline across multiple entities. FONDEN resources can be used to finance the reconstruction of eligible federal infrastructure, which is to be carried out by the relevant federal agencies. FONDEN funds can also be used to pay for up to half of the reconstruction costs of local infrastructure in the 32 Mexican states, with the state-level entities financing the remaining activities. If states do not purchase insurance for their reconstructed assets, they are penalized under FONDEN by a reduction in the percentage of reconstruction costs deemed eligible for funding.

Evolution over Time

FONDEN has evolved significantly since its creation. The government of Mexico has revised FONDEN's operating rules and procedures to improve its overall efficiency and has created a budget account for disaster prevention. In 2010, for example, major reforms to FONDEN simplified its procedures and streamlined reconstruction activities by concentrating responsibility for FONDEN-funded reconstruction within the federal agencies rather than spreading costs across both federal and state agencies.

National Risk Pool—Central Government #3: UK Risk Protection Arrangement for Schools[17]

Context

The Risk Protection Arrangement (RPA) was launched in 2014 as an alternative to commercial insurance for schools.[18] It was initiated to help reduce the cost to the public purse of protecting schools against property damage and business interruption, public liability, employers' liability, and domestic travel. The financial risk of schools' claims is pooled and absorbed into the government's central budget in return for an annual per pupil fee.

Structure

Schools' participation in the RPA is voluntary, and commercial insurers continue to offer competing products and services. The RPA was set up to address the market failure of elevated premiums but does not seek to replace or crowd out the private sector. Currently, participation is around 60 percent of eligible schools. In the spirit of solidarity and simplicity, all schools pay the same per pupil amount, which is set actuarially for the whole portfolio. This simple pricing structure carries the risk of adverse selection: low-risk schools could potentially get lower quotes from insurers, leaving the RPA with the highest-risk schools. The initial RPA premium was set based on survey results about schools' past damage and claims experience and about industry benchmarks on similar risks. As the RPA has developed its own direct claims experience, actuaries have increasingly used that direct data to provide more confident estimates of future claims and to set premiums.

Other Benefits to Members

Participating schools are required to maintain a minimum standard of risk management, such as complying with construction regulations. Schools are supported with access to expert risk-management advice as part of the RPA—a service that participants value highly. It carries out ad hoc surveys of the highest-risk schools to identify potential risk-reduction investments. The RPA has also invested surplus from the scheme into physical resilience measures, such as local flood defenses that protect schools in high-risk areas.

17 UK Department for Education, "Guidance: The Risk Protection Arrangement (RPA) for Schools," https://www.gov.uk/guidance/the-risk-protection-arrangement-rpa-for-schools.
18 Initially, those covered were academies, academy trusts, and free schools.

Evolution over Time

Following favorable claims experience, the RPA has reduced its premium to £18 per pupil in 2019–2020 from an initial rate of £25 (compared with an average commercial insurance rate of £50), thus providing good value for schools and putting pressure on commercial market rates. Despite initial concerns, there is no evidence of adverse selection within the RPA, perhaps because of the large difference between RPA and commercial rates. The risk of adverse selection could increase in the future if commercial providers reduce their rates.

National Risk Pool— —Central Government #4: Israel's government asset insurance program[19]

Context

Israel's government assets under an insurance program are valued at approximately US$24b, with a vast majority of that comprising the health system, public housing, and ministry offices and buildings. The Ministry of Finance is responsible for the risk financing of the government assets and as part of this holds an internal fund that function as a Captive for the different government ministries. A state-owned company, Inbal Insurance Co. Limited, is tasked with managing the Captive, and will procure through an insurance broker to purchase a property insurance policy for the government assets.

Structure

Within the government of Israel, there are two parts to the risk financing on government assets, corresponding to the retention and transfer of risks respectively. First, there is an internal government self-insurance fund (Captive), which is a not-for-profit cash fund owned by the government and managed by Inbal Insurance. The fund is held by the Accountant General Department at the Ministry of Finance, and the main coverage provided by the Internal Fund is for costs and damages on:

- Government property (including vehicles) and related unit property.
- Government liabilities to the public.
- Government liabilities to employees.

19 Based on inputs provided by the Ministry of Finance, Government of Israel.

In 2021, the fund stands at approximately $430m.

Second, insurance is purchased for all properties covered by the fund. Property insurance is taken out on a 12- or 18-month cycle through an insurance broker, based on the Ministry of Finance policies in terms of criteria on insurers' rating, geographic distribution, and portfolio distribution.

The current policy is an 'All-risk' coverage (which includes earthquake coverage and loss of revenue), up to a limit of USD 1.5 billion, and with a retention of USD 15 million for each and every loss. Loss of revenue is further covered up to USD 100 million.

The retained risks through the self insurance fund at $430m and the property insurance cover of up to US$1.5b brings overall coverage to US$1.93b. This combined coverage corresponds to the risk assessment undertaken regarding earthquake damages for the government property under a 1:1000 year scenario.

Evolution over Time

Over the years, alongside with government asset growth and maximum probable losses (MPL) surveys that was taken, the limit of the property insurance plan has been raised.

One of the captive main challenges is the asset value assessment over time. To address this, the Ministry of Finance is working on a more streamlined approach to continually update the asset value for every ministry.

Regional Risk Pool #1: Caribbean Catastrophe Risk Insurance Facility[20]

Context

In 2007, the Caribbean Catastrophe Risk Insurance Facility (CCRIF) was formed, making it the first multi-country risk pool in the world. It offered parametric earthquake and tropical cyclone insurance policies to the 20 Caribbean community member and associate member states. It also offered the first parametric policies backed by both traditional and capital markets. The parametric insurance mechanism

20 *Sovereign Climate and Disaster Risk Pooling* (Washington, DC: World Bank, 2017); CCRIF SPC website, www.ccrif.org.

is focused on financial liquidity; it provides rapid payouts to help members finance their initial disaster response and maintain basic government functions after a catastrophic event. Since 2007, the facility has made 43 payouts to 14 member governments on their tropical cyclone, earthquake, and excess rainfall policies, totaling almost US$156 million.

Structure

Participating countries pool their risks into a single, more diversified portfolio. The pooling makes the overall risk more stable and therefore more attractive to the reinsurance market. As a risk aggregator, CCRIF can therefore provide insurance coverage to participating countries at a lower cost than individual governments could obtain on their own. CCRIF's pricing is based on the quantum of risk transferred (measured by expected losses and variability of those losses). Some limitations are put in place to target that portion of the risk profile where such insurance is cost-effective. Generally, this approach means providing coverage for events of about 1-in-10-year up to the 1-in-200-year range. Losses below or above those figures are retained by the country.

In its early stages, CCRIF relied extensively on technical and financial support—through technical leadership of the World Bank and a grant from the government of Japan—and was capitalized through contributions to a multi-donor trust fund by several donors and by membership fees from participating governments. Donor funding (a) allowed early financing of CCRIF expenditures, (b) enabled CCRIF to offer cheaper catastrophe coverage options to its members, and (c) helped CCRIF build capital reserves for the longer term.

Evolution over Time

In 2014, the facility was restructured into a segregated portfolio company (SPC) and was renamed CCRIF SPC, thus enabling the establishment of separate underwriting pools with differentiated capital. CCRIF SPC is registered in the Cayman Islands and operates as a virtual organization. It is supported by a network of service providers that supplies risk management, risk modeling, captive management, reinsurance, reinsurance brokerage, asset management, technical assistance, corporate communications, and information technology.

Regional Risk Pool #2:
Southeast Asia Disaster Risk Insurance Facility[21]

Context

SEADRIF has been set up as a regional platform for all Association of Southeast Asian Nations (ASEAN) countries. As the first regional risk-financing facility in Asia, SEADRIF was established by participating ASEAN+3 countries and is owned by those countries. It receives financial support from donor partners, technical support from the World Bank, and administrative support from the ASEAN secretariat in partnership with regional and other institutions.

The intended benefits of SEADRIF are:

- Provide rapid and predictable relief funding, thus reducing reliance on disruptive budget reallocations and dependence on uncertain humanitarian aid.
- Create a transparent, rules-based facility to provide post-disaster financial support to participating countries, thereby allowing governments to plan ahead.
- Mobilize international support, including donor financing and technical assistance.
- Enable improved access to international reinsurance and capital markets through regional risk pooling and a collective approach to markets.
- Offer access to public goods such as a flood risk-assessment model backed by state-of-the-art technology.
- Build regional leadership as a facility established and owned by ASEAN+3 countries.

Structure

The SEADRIF Insurance Company is established in Singapore to provide insurance products to members. SEADRIF's first financial product is a parametric catastrophe risk cover for Lao People's Democratic Republic (Lao PDR). The policy offers finite and parametric cover to provide financial liquidity during severe floods

21 SEADRIF website, https://www.seadrif.org; authors.

and other disaster events, disbursed through clear and transparent prior-agreed rules. The SEADRIF Insurance Company retains some risk through joint reserves made of country premium contributions and donor capital contributions, and transfers excess risk to international reinsurance markets. Participating countries pay a contribution based on their risk profile and their desired level of coverage.

Evolution over Time

The catastrophe risk cover for Lao PDR is the company's first product, more products are under preparation. In response to demand from SEADRIF members, the focus of the second product under development is on public assets. The overall SEADRIF program is also providing capacity-building support to ASEAN+3 members for financial risk protection of public assets. Such support includes (a) delivering a webinar and a knowledge series (which was the basis for this publication); (b) developing tools and technical assistance for financial protection of public assets in countries; and (c) developing options for further technical support and regional risk-pooling for public assets.

6.3. Case Studies of Mutual Aid and Assistance Groups

US Electric Utilities: Regional Mutual Assistance Groups and Emergency Management Assistance Compact

Context and Structure

In the United States, electricity is generated and delivered by nearly 3,000 utilities that consist of investor-owned utilities (IOUs), publicly owned utilities, and cooperatives.

Many IOUs belong to one of seven regional mutual assistance groups (RMAGs) across the United States. Those RMAGs have mutual assistance agreements in place to offer support to each other during emergency events. The agreements outline specifics for obtaining or lending resources during an emergency event, including equipment and trained personnel. The actual amounts of assistance and compensation are determined during an actual emergency. The requesting utility will first indicate the type and size of equipment needed and the number and job functions of employees desired; the responding company will reply with the supply of resources.[22] The utility requesting assistance is then financially responsible for all costs and any liability associated with that assistance.

Additionally, the Emergency Management Assistance Compact (EMAC) is a national disaster-relief compact that facilitates the sharing of resources, personnel, and equipment across state lines. The EMAC includes all 50 states, the District of Columbia, Guam, Puerto Rico, and the US Virgin Islands and is managed by state emergency response agencies. Under EMAC, the negotiation process operates on a bidding system. First, the affected utilities identify the amount of assistance they need. Next, their request is broadcast to all supporting utilities, which identify their availability and quote the price for their assistance. Finally, affected utilities consider available offers, analyze costs, and select the best option.

Evolution over Time

Although both RMAGs and the EMAC are available to utilities during a disaster event, they have different trade-offs. RMAGs, which are exclusive to IOUs, offer flexibility because utilities can negotiate and revise the terms of mutual assistance with other utilities over time. They also offer expert crew assistance and specialized equipment that are suitable for the region, because utilities within a RMAG tend to face similar emergencies given their geographical proximity to one another (e.g., snowstorms in the Northeast; hurricanes in the Southeast).

However, RMAGs have more limited assistance capabilities during region-wide emergencies because utilities retain their own resources to deal with their own emergencies. During Hurricane Sandy, several small RMAGs in the Northeast limited their ability to properly spread risk and to effectively share resources among group members. In September 2013, Mid-Atlantic Mutual Assistance, New York Mutual Assistance Group, and Northeast Mutual Assistance Group merged into the North Atlantic Mutual Assistance Group, thereby reducing the total number of RMAGs from nine to seven.[23] The merger increased the pooling of the new RMAG and its ability to provide self-sustaining support.[24]

As private sector agreements, the utilities are subject to interstate bureaucracy when moving resources across state lines. Hurricane Sandy led to the creation of new guidelines to deal with a National Response Event (NRE).[25] The activation of an NRE enables multi-RMAG coordination and allows for the pooling of all emergency restoration resources from RMAG members across the country. Those resources—such as maintenance crews and heavy equipment and machinery—can then be distributed in a safe, efficient, and equitable manner to all affected utilities.

22 Edison Electric Institute, "Mutual Assistance," https://www.eei.org/issuesandpolicy/electricreliability/mutualassistance/Pages/default.aspx.
23 Edison Electric Institute, "Understanding the Electric Power Industry's Response and Restoration Process" (2016): 5, https://www.eei.org/issuesandpolicy/electricreliability/mutualassistance/Documents/MA_101FINAL.pdf.
24 Ibid.
25 Department of Energy Electricity Advisory Committee, "2017: Historic Storms, Historic Responses" (2018): 9, https://www.energy.gov/sites/prod/files/2018/02/f49/1_Mutual%20Assistance%20Agreements%20-%20David%20Bonenberger%2C%20EEI.pdf

The costly 2017 hurricane season led to the development of resource management tools to streamline response-coordination efforts. One such tool, the Resource Allocation Management Program for Utility Personnel (RAMP-UP), subsequently became the standard platform for resource allocation for all seven RMAGs.[26]

The EMAC provides a standardized process for mutual assistance across all 50 states. It covers all issues related to mutual assistance, including workers' compensation, tort liability, license reciprocity, and reimbursement. This standardized process helps eliminate the need for individual utilities to negotiate terms of mutual assistance and reduces the prospect of disputes related to the costs and responsibilities associated with mutual assistance. However, it limits the scope for utilities to change specific terms of the assistance agreement or to adapt its provisions to a specific circumstance. As a nationwide compact, the EMAC reduces red tape and facilitates the moving of resources across the country, thus ensuring that equipment and crews can cross state lines with little bureaucracy.

CARILEC Disaster Assistance Program

Context and Structure

The Caribbean Electric Utility Services Corporation (CARILEC) is a regional association of electric energy solutions providers and other stakeholders in the Caribbean countries. The CARILEC Disaster Assistance Program (CDAP) was set up by CARILEC to enable mutual assistance between member utilities to restore power post-disaster. CDAP was developed in response to the high restoration costs and financial constraints of its members, especially when members are faced with the potential of extensive damage to their transmission and distribution systems. With 27 active subscribers, CDAP focuses mainly on providing personnel in response to disaster-recovery needs, with the CARILEC secretariat responsible for coordinating the dispatch of restoration crews to disaster-affected utilities.

Disaster restoration assistance through CDAP is financed by the CARILEC Disaster Fund, a mutual fund that receives annual contributions from member utilities and that ensures timely reimbursement to the assisting utilities. Subscription to the mutual fund is voluntary; however, only subscribed members are eligible to receive restoration support. The *CARILEC Disaster Response and Restoration Manual* details the roles and responsibilities of the utilities receiving and providing assistance,

26 Edison Electric Institute, "From Superstorm Sandy to Today: Lessons Learned and Applied" (2017): 2, https://www.eei.org/issuesandpolicy/electricreliability/mutualassistance/Documents/From_Sandy_to_Today_Lessons_Learned.pdf.

as well as the coordination function of the CARILEC secretariat. The manual is reviewed and updated annually to reflect lessons learned from implementation.

Evolution over Time

CDAP operates in a dynamic fashion in which lessons learned during one year are applied in the succeeding years. The current program design has two parts: (a) an annual contribution made by member utilities to the CARILEC Disaster Fund and (b) coordination of regional efforts to respond to disaster-assistance requests from disaster-affected utilities.

The CARILEC Disaster Fund has a simple financing mechanism that relies on annual member subscriptions and additional investment income. This mechanism ensures timely replenishment of the mutual fund to meet the spending requirements related to mutual restoration assistance. By instituting an affordable annual contribution requirement and maintaining sufficient funds in the mutual fund, the fund has inspired member confidence in the program and encouraged participation. By setting a maximum payout per utility per disaster at US$50,000, the program limits the size of reimbursement and promotes a fairer use of the mutual fund.

Furthermore, the program has incorporated incentives for disaster preparedness and risk mitigation that will help minimize moral hazard and reduce the overall program costs. Participating utilities are required to update their disaster plans, have an emergency response standby crew, maintain close communication with local government entities and the CARILEC secretariat, and conduct an annual simulation of disaster response. Those efforts help to enhance the utilities' capacity for disaster response and recovery, thereby decreasing the need for peer assistance for small-scale, less-severe events. This approach in turn reduces the overall costs incurred by mutual recovery assistance activities.

To Recap Chapter 6:

- Governments can use different risk pooling structures to increase its economies of scale and diversify its risks. The preferred structure will depend on the risk profile and context and the intended benefits.
- Different risk pools around the world have evolved in response to the implementation challenges, market conditions and needs of the members. An adaptive and continuous improvement approach is essential to maintain long term sustainability of a program.

Worksheet for Chapter 6

Test your understanding of the chapter, and record your insights through this worksheet!

Activity 1.
Drawing on your understanding of the content in this chapter, select whether the following statements are a benefit or a challenge to risk pooling.

	Type of Data	Benefit	Challenge
1.	Risk pools allow more flexibility in terms and conditions of coverage tailored to members' needs.	☐	☐
2.	Risk pools can allow members that are more prone to risk to join the risk pool.	☐	☐
3.	Risk pools require strong and continued government and political support as well as ongoing member commitment.	☐	☐
4.	Members are incentivized to strengthen collaboration, share information, and learn about risk management.	☐	☐
5.	Risk pools can provide a layer between individual member retention and risk transfer to insurance markets.	☐	☐
6.	Risk pools are typically long-term arrangements to retain risk within the pool.	☐	☐

Activity 2.
Match the different risk pools discussed to their descriptions or explanations.

Type of Risk Pool	Description or Explanation
Mutual or Member-Driven Pool	It provides coverage to multiple countries to access international reinsurance markets with a joint portfolio, and it allows for greater risk diversification.
Pools of Last Resort	It is state-driven and covers multiple public assets or infrastructure under one large facility.
National Risk Pools	It is a risk pool where different members partner and where proceeds and surplus of the pool are shared by the members.
Regional Catastrophe Risk Pools	It provides insurance in areas that the private sector market does not cover, or it charges unacceptably high premiums and helps to maintain insurance availability for specific risks or members.

Activity 3.
Identify the stages in which each of the following key considerations need to be examined.

Key Considerations	Design	Develop-ment	Implemen-tation	Renewal
What is the scope and scale of pool members and assets?				
What types of data are required from pool members?				
What types of risks are suitable for risk pooling?				
How can a risk pool achieve better price stability over time?				
What are the primary objectives or drivers to risk pooling?				
What is an effective pricing structure?				

Activity 4.
Reflections

[a] My top three takeaways from this chapter are these:

[b] Three concepts or ideas I would like more information about are these:

7.

Launching and Managing Insurance Programs

What You Will Learn

This chapter covers how to set up, operate, and maintain a public program of financial protection, including the management of claims. The chapter includes two checklists on the launch and management of insurance programs to support practitioners to cover major aspects of the project launch and implementation.

7.1.

Introduction

Setting up and maintaining a public asset program about financial protection require a combination of well-considered, interrelated, and timebound actions.

The previous chapters in this guide described the fundamental elements and considerations involved in designing and developing a program for public asset financial protection. Chapter 7 focuses on the operational activities required to launch such a program and to renew it annually.

The chapter is structured around a checklist format, which provides a user-friendly guide for governments to complement their own implementation and renewal planning, as well as to ensure the governments have accounted for key steps required in prudent activation and renewal processes. It is important to note that the checklists presented in this chapter relate to an idealized roadmap for program implementation and renewal. The checklists itemize different activities so that program managers can use them to develop program implementation plans and task lists. In reality, however, each government will apply a sensible variation of the checklist to suit its situation and requirements. Additionally, as part of the implementation plan, program managers should also consider how the different items need to be integrated. This is particularly important in the context of the collection, management, storage, security and use of data and its associated IT systems.

The chapter has two checklists: one for initial implementation and one for the ongoing renewal of the program's risk-financing product and service arrangements. A summary of the checklists is provided in Figure 7.1. Although the nature of many activities is similar, there are important distinctions and differences, which are explored further in the content that follows.

In addition, section 7.4 presents considerations about claims management, with emphasis on the types of practices and protocols that governments need to consider when dealing with claims under the program.

Figure 7.1.
Checklist Summary Content

Source: World Bank staff.

7.2.

Preparing for and Launching the Program

Introduction

Having undertaken the design and development activities for a program of public asset financial protection, a government will arrive at a position where it has qualified and approved a program design that suits its own specific requirements. At this point, preparations must begin so the program can be launched or activated.

Box 7.3 at the end of this chapter provides a checklist for key actions throughout the activation or Implementation stage. The items listed are indicative only and represent common actions undertaken through that stage. Each government will have unique program specifications; therefore, some items may be redundant while additional actions may need to be included.

This process can be a complex environment and will require rigorous practices and resources for project management. It will also require having dedicated project management specialists, tools, and techniques. Early mapping of the concurrent milestones and action dependencies will drive effective priorities and, ultimately, a successful outcome.

Key Considerations for the Launch Stage

The following content complements the Box 7.3 checklist.

Governance

The Implementation stage involves a concentrated series of actions occurring in a specific order. It is important to ensure that structured governance layers are in place to direct, guide, correct, and advocate for the launch of the program. Governance layers can include these:

- **Public.** Oversight through parliamentary or governmental procedures will hold the governance board accountable and are assisted from time to time by independent reviews.
- **Strategic.** Senior stakeholders or sponsors may (a) set up a governance board and will set targets and monitor performance against the targets, (b) receive progress tracking reports, and (c) make key decisions regarding scope

and direction. They will also monitor benefits realization to ensure that delivery is being set up to achieve the desired objectives.

- **Operational.** Implementation project team leaders will manage project delivery progress, risks, issues, constraints, and dependencies (i.e., time, cost, and quality), and report these to the governance board.
- **Client advisory.** A group of government agency representatives will provide customer perspective feedback to the governance board. These representatives can also form a risk unit or risk coordination team, to coordinate and aggregate risk expertise across different government agencies.
- **Technical subject matter expertise.** Relevant and qualified specialists will peer review and validate the technical aspects of the solution and will advise the governance board.
- **Internal and external audit.** An objective review of progress toward the desired financial and nonfinancial objectives will supply information to the governance board.

Communications

In the time leading up to the program's launch, it will be especially important to revisit and update communications with stakeholders to ensure that each party is aware of the purpose of the solution and of each party's respective roles and responsibilities within the solution. Ongoing communication with all key stakeholders is vital to maintain their focus and the trust.

Communications should be relevant, clear, and concise and should deliver key messages to various audiences included in a stakeholder engagement and communications plan. Additional considerations include identifying which communications channels to use and deciding whether tailored branding is required (e.g., if a new government entity is being established).

Recruitment

The level of staff recruitment will depend on which functions or services will be delivered internally versus which are being outsourced. Private sector involvement in service provision is usually necessary for reasons including expertise and the ability to scale up when disasters occur. At the very least, some management and administration functions will likely remain internal. Irrespective of the arrangement, recruitment needs can be confirmed early through the creation and approval of an organizational structure that identifies necessary roles and provides role descriptions.

Figure 7.2.
Governance Considerations for a Program

Governance of a Financial Protection Program for Public Assets

Internal Governance

Internal regulatory oversight can include governance and audit committee oversight, client stakeholder advisory committees, and other internal reviews.

Committees can become a useful conduit to include stakeholders, improve governance and operational processes, and broaden the thinking and approaches taken by the program. However, careful thought should be given to the purpose and operational nature of committees, their powers (purely advisory?), the number and terms of members, the reporting and resource impost, the frequency of meetings, and the links to senior management and to ministers.

Regular points in a financial year

External Audits

In addition to external audits by government agencies such as an auditor-general, external audits can be regularly undertaken by private sector organizations.

Parliamentary Scrutiny

Parliamentary approval of government-supported programs usually results in regular parliamentary scrutiny of how that program is performing. This scrutiny is often through a combination of annual reports tabled in parliament, regular attendances before parliamentary committees, and auditors-general signing off on financial reports and undertaking occasional audits.

Typically once every financial year

Government Review

The responsible department or minister for the program can also have a duty to monitor the program regularly. Periodically, either the minister or the government may commission an independent review of the program's objectives, roles, functions, and performance to test whether the program remains fit for its purpose.

Typically every 3–5 years

Source: World Bank staff.

Some flexibility with employment conditions (pay, hours worked, etc.) is likely to be needed because the program is likely to require staff members with skill sets and expertise not usually found within the government (e.g., insurance-qualified staff members).

Not all roles may need to be filled immediately. It is best to identify which roles are necessary in early stages of activation and which ones can be part of a phased recruitment process. Phasing recruitment can also relieve some early budget constraints.

Training

Training of stakeholders and staff members should be approached on the basis that a significant loss event could happen soon after the program becomes operational, which means having a significant portion of the training complete before the program commences.

As with the communications advice, considerations here will include the following:

- Who is the audience? Stakeholders often involved in training exercises include these:
  - Government officials and elected members, including those with emergency management responsibilities
  - Participating agency staff members
  - Program management and administration staff members
- Who are the outsourced service suppliers (if they are required)?
- What are respective roles and responsibilities?
- What is the training content?
- How will training be delivered?

Training should be designed with the particular audience in mind and can include running simulated scenarios of disaster responses, conducting workshops and seminars, compiling training manuals or computer-based material, and placing the roles and responsibilities in a relevant context that tests and corrects processes in advance of a real-life event. Providers of training could include academic institutions, professional service firms, development agencies, brokers, insurers and reinsurers. Such collective training opportunities also highlight key dependencies and create valuable networks.

Corporate Services Support

The program may require support services including these:

- Procurement of accommodation, office equipment, and other property services
- Human resources to support recruitment and ongoing people management
- Legal services to support contract management or claims interpretations or both
- Finance services to support administrative cost management or compliance, as well as to monitor risk-financing performance
- Information and communication technology (ICT) support for relevant IT systems for both corporate services and for the program

Early identification of needed support services is important because those services may require significant lead-in time to ensure that the right ones are delivered through correct channels.

It should also be borne in mind that some degree of control may be needed to access systems and to make decisions outside of regular working hours, particularly in times of crisis.

Procurement

Alongside recruitment, corporate support services, and risk-financing considerations, the procurement requirements will depend on the underpinning of internal versus outsourced strategies. Key factors to consider are as follows:

- **Alignment.** Alignment must exist with overarching government procurement legislation, regulations, and rules for government expenditure. It is important that those rules are understood early so that any constraints or obstacles are managed in the design and development stages.
- **Procurement process.** Procurement processes can take a long time. They include (a) planning and approvals, (b) market engagements, (c) requests for proposals or contract documentation development and issuing, (d) proposal evaluations, (e) negotiations, (f) provider selections, (g) contract awards, and (h) debriefs. Working the timing backward from the targeted service or solution activation date can provide insight into timings to commence the procurement process. It is also important to bear in mind that some services will need to be in place long before the official program activation date to allow for necessary customization, familiarization, and improvement of service delivery.

- **Contract terms.** Deliverables under the contract should be specified initially, be clear to all parties, and provide a range of incentives and penalties appropriate to the contract's performance. Ideally, a well-written contract should include these:
  - Meaningful key performance indicators or service-level agreements or both to ensure that the services paid for are delivered and meet members' needs
  - Scheduled strategic and operational meetings to discuss contract performance
  - A focus on improved performance and relationships with members and with the program manager
  - Effective management of contract expiry cycles or extension options or both (including timing considerations for complementary services)

- **Contract management.** After services or solutions have been procured, the relationships require ongoing development and monitoring, as illustrated in Figure 7.3. Setting up contract management processes and resources to ensure that contracts and contractors are delivering to expectations will be key to achieving longer-term benefits.

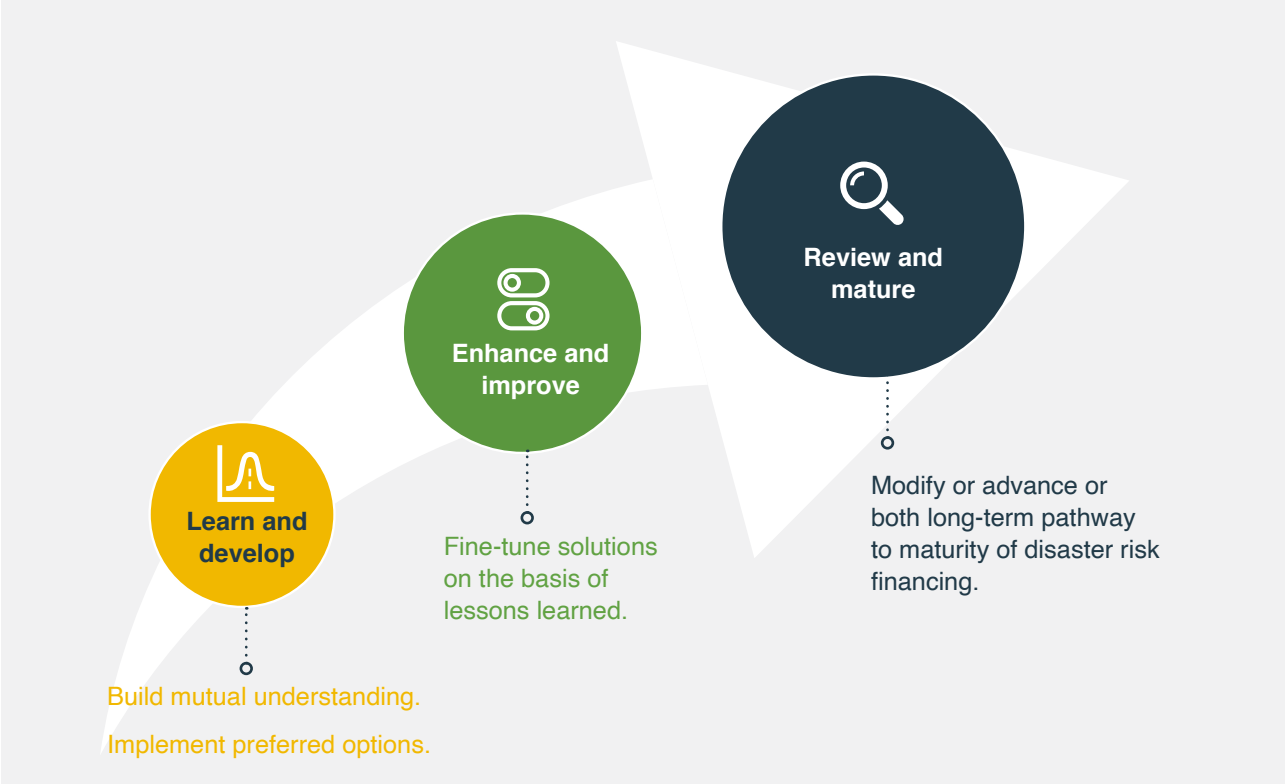
IT Systems and Data Integration

As noted in previous chapters, good data are another key element of effective program management. Quality data will provide the government with an informed overview of its risk profile and will provide reinsurers with a necessary degree of confidence about the risks being presented. In turn, good data will also promote market attraction and competition because the information provides some risk-pricing certainty and is a positive indicator of the program's organizational risk maturity. The relationship between data and insurance (as noted in chapter 5) is set out in Figure 7.4.

Data challenges are likely to include these:

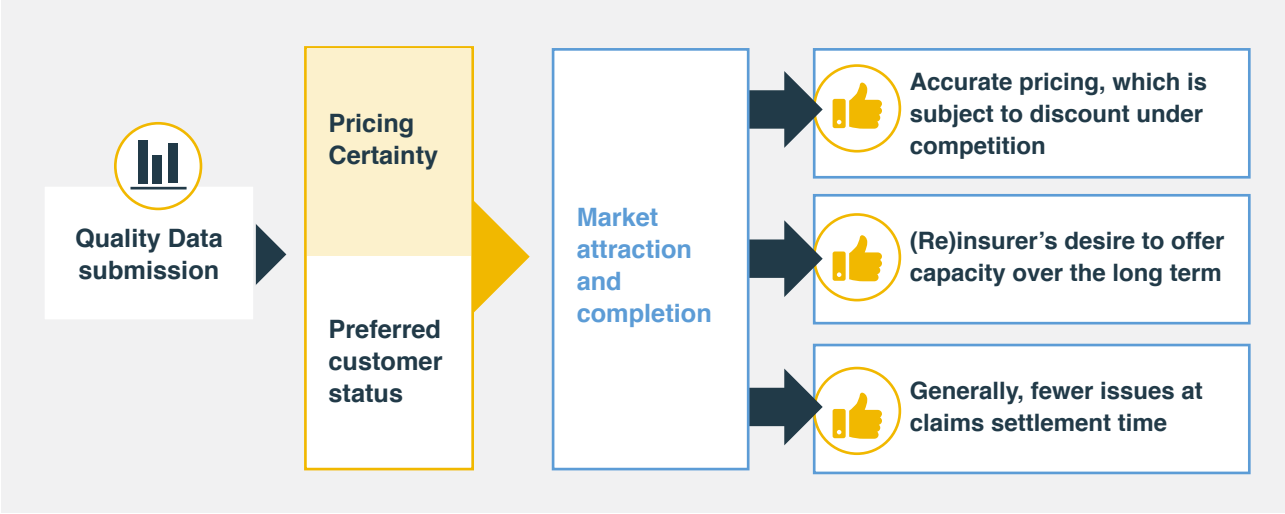
- Identifying key datasets
- Making member commitments to provide the data within expected timeframes
- Having data collation, analysis, and presentation, including for submission to insurers
- Monitoring or tracking of significant asset additions, deletions, changes, etc.
- Linking of program data more broadly to other aspects of government decision-making in order to leverage information benefits

Figure 7.3.
Contract and Program Development over Time



Source: World Bank staff.

Figure 7.4.
Relationship between Data and Insurance



Source: World Bank staff.

Management of data nowadays requires an IT system. Such systems may be procured through an outsourced arrangement, or they may be developed and tailored for a government. Either way, there will be some procurement involvement, and additional complexities associated with IT procurement should be accounted for. The complexities may include these:

- **Review international experience.** It is helpful to seek and understand the lessons learned in other jurisdictions. IT systems can be expensive and, if sub-optimal, can be difficult to change or disengage from.
- **Involve IT expertise.** The IT world is full of jargon and technicalities. It is important to involve people in activation of the IT system subproject who understand such complexities. Their involvement will bring greater certainty of a successful outcome.
- **Account for any overarching security standards for the government's IT systems.** Cyber-risk is a growing concern for state actors. Many governments now have specific security standards for government IT systems. The IT systems must meet those standards, and incorporate the costs and time associated with the compliance and approval processes. Insurance against losses caused by cyber attack could also be necessary.
- **Have user-acceptance testing and training.** A robust process for IT system implementation involves having the customer (in this instance, participating government agencies, administration staff members, and contractors) test iterations of the IT platforms in advance of activation. This testing assists with necessary user-friendliness customizations. The processes can take time, especially where significant customizations are required. Once a final iteration is agreed upon, there will be a requirement for training stakeholders so they can use the systems.

During and after the IT system's acceptance process, the data captured during the design and development stages must be integrated into the IT solution. This integration may be managed centrally, may be through an outsourced service contract, or may be set as a per agency obligation to input the agency's relevant data (such as asset data). If there is a time lag between data collection for the design and development stages and the activation process, the data may need to be updated and validated before integration.

IT system concerns that must be managed over time are likely to include these:

- User interoperability between members and the program manager, which is likely to also involve third-party contractors and their systems.

- Evolving government IT systems and hardware.
- Evolving government IT and information management policies and practices—use of confidential information, IT security, cyber policies, privacy, and data storage.

Claims Management Systems and Protocols

Claims management systems and protocols must be set up so that they are practiced and ready to use from the first day of program activation.

Key factors and considerations to account for will include the following (see also section 7.4):

- A set of guidelines and information necessary to call on loss-assessment services as soon as possible after a loss event
- A set of clear and concise guidelines for participating agencies about how, to whom, and when to notify claims
- A set of clear and concise guidelines for participating agencies about their obligations in the event of a loss (e.g., prevent further damage where possible)
- The drafting and approval of claims management documentation (either paper-based or encapsulated within a claims management IT system), including information about what is covered, what is excluded, and what excess levels are, as well as about claim forms.
- A set of processes and systems for claims payment transactions, including rigorous financial management and audit processes.
- A means to track and trend the claims experience over time in order to learn lessons and to continuously improve risk-management

Participation by the member participation agency can include different dynamics such as these:

- Is participation mandatory or voluntary?
- Is participation phased (government agencies join in tranches at set intervals), or will they all join at the same time when the service commences?
- Will new participants be introduced at set dates, such as quarter days or the anniversary date of the service, or can they join at any date?

Irrespective of the strategy, the process itself must be considered and coordinated. Failure to manage and administer the process carefully can result in both insurers and government agencies losing confidence in the solution. A considered and coordinated approach will account for the likes of the following:

- A clear stakeholder engagement
- A process of data collection and analysis
- An assessment of the risk being incorporated into the solution as a result of each agency's participation
- A contractual process governing participation (e.g., a memorandum of understanding)
- A method of induction and training
- A set of contribution payment processes

As mentioned at the outset of this chapter, each government's circumstances will be unique, which affects each activation component. The participation process should reflect the operating environment and the broader strategies of disaster risk-financing of each government. Box 7.1 demonstrates considerations about key participation in New Zealand's proposed program of financial protection for public assets.

Risk Financing

This component is about money and the strategy for managing risk-financing. Core elements of those activities are described next.

Money Management

Key activities involve preparations for receiving monies, which may include agency contributions, central government or donor organization capitalization, or both. Activities can also involve managing insurance claims payout. Preparations need to account for spending money. The expenses will likely include the following:

- In-house management and administration costs
- Outsourced services costs
- Insurance premiums
- Retained or self-insured losses

As with previous activation components, it is important to prepare funding channels as if a significant loss event will happen early. Activities will focus on (a) setting up formal accounts to receive and distribute funds, (b) making sure the correct

accounting standards are used, and (c) testing the transaction channels in advance. This approach helps ensure a smoother process when a real-life event occurs. An efficient transaction of funds is critically important to responding and recovering effectively from a loss event.

Depending on the government's financial and investment infrastructure, money management may also include establishing an investment vehicle for the accumulated funds or creating an alignment with a government's existing investment vehicle.

Box 7.1.

Proposed Government Approach in New Zealand to Agency Participation

The following staged approach to participation is now part of the New Zealand government's considerations for a public asset program. The New Zealand proposal involves agencies voluntarily joining in tranches over time.

STAGES	ACTIVITIES
Stage 1: Agency Viability Pre-assessment	Desk assessment is undertaken by Ministry of Business Innovation and Employment (MBIE) with cooperation from the relevant agency. **Risk Profile Compatibility** a. Spread of risk b. Quality or type of assets c. Type of operations d. Evidence of robust risk management e. Availability of data f. Impact of additional risk profile on the aggregate solution
Stage 2: Agency Viability Formal Assessment	**Data Collection** Data collection and collation are undertaken. Insufficient data at an early stage may preclude participation. **Data Analysis** a. Relevant data analysis for purposes of disaster loss-modelling b. Relevant data analysis by actuaries for purposes of loss forecasting and contribution setting c. Review of the data by commissioned insurance brokers for purposes of marketability assessment

...

STAGES	ACTIVITIES
Continued: Stage 2: Agency Viability Formal Assessment	**Analysis Review** MBIE reviews the analysis in the context of these: a. Loss modelling or loss forecast impact on the solution b. Risk-sharing impact (i.e., can additional risk be accommodated at a crown financial risk tolerance level?) c. Financial contribution impact (i.e., will the additional agency unbalance or adversely affect the way contributions are allocated across the solution?) **Assessment Report** MBIE will report back to the relevant agency, noting these: a. Acceptance or non-acceptance b. The contractual obligations of participation, include the following: 1. Period of participation 2. Data availability 3. Claims protocols c. Financial and reporting protocols d. Duties of disclosure e. Deductible setting options f. Contribution options g. Agency acceptance agreement
Stage 3: Induction	**Induction Package** a. Provision of induction package, includes these: 1. Agency guidance 2. Frequently asked questions 3. Statement of cover or placing slips 4. Claims protocol handouts 5. Calendar of key activities 6. Access to risk management information systems 7. Key contacts b. Contribution confirmation (invoicing) c. Confirmation payment instructions d. Education session
Stage 4: Confirmation	**Confirmation Collateral** a. Payment tracking b. Payment received confirmation c. Certificates of currency

Source: World Bank staff.

Risk-Financing Strategy Management

Considerations during the design and development stages will have included the creation and approval of a tailored risk-retention and risk-transfer strategy. (See Box 7.2.)

Key actions in this component will include the following:

- Establish any risk-retention vehicles as part of the risk-retention strategy (e.g., self-insurance, risk pools, captives).
- Use procurement practices to engage with insurance and capital markets (often through a pre-selected broker).
- Confirm the coverage terms and conditions that will apply to retained and transferred losses (through a statement of coverage or an insurance or reinsurance policy).
- Confirm the preferred insurance options, and instruct placement of those options in alignment with the activation date.
- Receive and review evidence of the confirmed insurance program.
- Process payment of any premiums and associated costs.

Summary of Program Launch Stage

This section has outlined key actions for activating a public asset program of financial protection. Many of the actions will be run concurrently, with some being critical prerequisites to subsequent actions.

A well-considered and coordinated activation will reward the government with a clear and concise basis for ongoing, operational management of the program. This approach includes management of important and regular review and renewal opportunities (as covered in the next section of this chapter).

Box 7.2.

Reminder—Risk-Retention and Risk-Transfer Strategies

Risk-Retention Strategy. Having analyzed the likelihood and severity of future losses to public assets and of emergency response costs, and having assessed the premium costs associated with transferring risks at different financial layers, a government defines how much risk it chooses to retain, as well as what vehicle it will use to manage those retained costs.

Risk-Transfer Strategy. Having analyzed what potential future losses sit above the government's financial risk tolerance, and having assessed the premium costs associated with transferring risks at different financial layers, a government defines how much and what type of risk it chooses to transfer (i.e., insure), as well as what transfer instruments to use.

Source: World Bank staff.

7.3.

Program Renewal
Actions Required to Maintain and Enhance a Public Asset Program of Financial Protection

Key Considerations for the Renewal Stage

The anniversary or renewal of the program is an opportunity to review all aspects including governance, communications, staffing, training, corporate services support, IT, claims data and outcomes, and membership rules. Reviews could cover the following:

- Whether the process is still fit for purpose
- What lessons have been learned during the year and how they have been implemented
- What suggestions for improvement have been submitted by staff members
- Which, if any, changes to government rules and regulations will affect the program
- What the claims experience is and whether steps are needed to improve it (e.g., higher excesses or premium contributions, or exclusion of certain causes of damage or asset type)
- What other changes to terms and conditions of cover exist, whether internal or emanating from insurers
- What problems emanate from some members (e.g., abnormally high claims) and how to address them
- How to attract new members, if applicable
- What the adequacy is of staffing levels and administration budgets
- What IT developments could bring efficiencies
- Which recommendations from previous reviews have yet to be implemented

Member Introduction and Management

Introduction processes can continue during the life of the program as participants are added individually or in batches. This expansion requires careful planning to

ensure that new members are ready, that the program can scale up its resources (staffing, communications, training, data, financials, etc.) so it manages the increased workloads, and that the program will not suffer decreased service standards. Failure to manage this process can result in risk-transfer markets and government agencies losing confidence in the program.

Programs need to be consistently focused on demonstrating the program's value in both supporting the government's objectives and supporting program members to develop and enhance a strong risk-management culture. This focus is relevant whether the program is mandatory or voluntary because, in both cases, demonstrating strong service delivery and value for money will generate member support and—in the case of a voluntary program—will limit the loss of members from the program.

Opportunities to engage members include through face-to-face meetings, briefings, newsletters, reports, seminars, webinars, and other online activities such as education and responsive processes for claims management. All of the activities should be aligned with the program's stakeholder engagement and communications plan (see earlier).

Programs must continually show how they add value in an environment of close external scrutiny (by governments and the wider community) and where member participation is mandatory and new members are regularly being added.

Risk-Financing and Program Management

For indemnity insurance, which is normally procured on an annual basis (i.e., the insurance policy has a term of one year), a new policy is required to be negotiated and placed at the end of each annual term to ensure that risk-transfer financing remains fit for purpose. Each year's data and reports must be collated and prepared for annual discussions with the insurance market. Program requirements are also likely to change over time as a result of differing government policies, changes in membership or asset holdings, catastrophe events, or other changing risk factors. Those changes will affect the amount of coverage sought and its premium cost, the types of coverage, and the amount of risk retained through excesses or self-insurance.

Additionally, numerous member-facing activities can be undertaken, such as discussions with members about the following: program services, enhanced risk-management procedures, claims experience, invoicing and other administrative details, and future premium levels (which should be based on actuarial assessments).

How members are expected to comply with program requirements is also important. Many programs use policies or statements of terms and conditions of cover to set out how the program will operate, what types of damage are and are not included, and what expectations or obligations apply to the program and its members. Factors affecting any reassessment of those statements and policies include the age of the program, the requirements of insurers and reinsurers, the jurisdictional approaches to liability, and the political and administrative willingness to enforce compliance with the statement of coverage.

Financial Management

Effective management of program finances is critical. The significant cashflows and expenditures within the program must be transparently dealt with in a manner consistent with relevant government and accounting procedures. The formal accounts established during activation to receive and distribute funds will need to be monitored and audited. Failure to set up effective systems and to provide regular reports about the financial performance of the program will lead to financial instability and loss of stakeholder support.

Claims Management

Claims management is another key part of the program (see the next section for a more in-depth discussion). Having a system that deals quickly and efficiently with claims builds stakeholder confidence and trust and helps deliver the economic and social benefits of the program. An effective claims management framework is built around a combination of factors: (a) strong contract management (because most claims management processes are outsourced), (b) clear statement of what types of damage are or are not covered, (c) transparent but relatively simple claims processes, (d) good data, (e) claims analysis capability, and (f) member training and communications.

Risk Management

Program objectives are closely tied to more effective (risk) management of government assets and financial resources to better prepare for or mitigate the effect of disaster events. Improved risk-management practices within government agencies can contribute to greater national resilience to disasters, can reduce their negative financial impacts, and can improve longer-term financial viability of the program.

The program needs to assist members continually to improve risk-management practices, not just in relation to the assets subject to the program but to improve overall government risk management. This approach draws on a number of program aspects: communication, education, member management, statement of cover conditions, and regular benchmarking of agency risk-management frameworks.

Current government risk-management policies may also support a risk-transfer program. For example, since 2014, Australian government agencies have had to comply with the government's risk management policy, which requires fund members to implement a range of risk-management practices including establishing risk-management policies and risk registers, staff training, and regularly reporting and monitoring risks.

Summary of Renewal Stage

This section outlines the key ongoing actions required for maintaining a public asset program of financial protection. As can be seen, such actions accomplish the following:

- Build on the earlier steps of activation.
- Seek to improve program management and effectiveness over time.
- Require a holistic, whole-of-program strategy rather than a piecemeal approach.

7.4.

Claims Management Considerations

A core purpose of a public asset program covering financial protection is to have effective and efficient processes, protocols, and funding available to manage claims. It therefore makes sense to dedicate sufficient time and energy to preparing claims processes. The rewards for doing so will be reduced contention, greater coordination between stakeholders, and swifter disbursement of funds to beneficiaries at a time when the availability of funding is critical. Additionally, strong governance and management around claims assessment and management can help better asset management and enhance fraud prevention.

Among the actions required to establish effective claims management, the items in Table 7.1 are regarded as key factors and considerations.

Table 7.1.

Key Considerations for Effective Claims Management

WHERE CLAIMS ARE RETAINED (SELF-INSURED)	WHERE CLAIMS ARE TRANSFERRED TO INSURERS AND REINSURERS
KEY FACTOR OR CONSIDERATION : **How will claims be assessed?**	
Loss assessment, also called loss adjustment, is a specialist skill. It may require outsourcing through a procurement exercise. Considerations include ensuring that the loss adjuster firm has the capacity to scale up adequately and immediately after a large loss event, as well as to set up a priority service arrangement (meaning government will secure services as a priority customer). Scenario modeling to estimate the resources needed to assess claims from large-scale disasters will inform the request for proposals issued in a procurement exercise.	Insurers and reinsurers typically have contractual relationships with professional loss-assessment firms. As a significant customer requiring substantial support after a disaster event, governments may be able to negotiate preferred loss adjuster arrangements with the insurers and reinsurers (often with the support of an insurance broker).
KEY FACTOR OR CONSIDERATION : **What is the allocation of roles and responsibilities**	
Stakeholders in the claims process will include these: • Participating agency management and staff members • Loss adjusters • Management and staff members from the agency that is administering the program • Occupiers of the damaged property • Outsourced providers of claims management service, including potentially the contractors that will support reconstruction activities	There should be designated operational and strategic claims-management points of contact with insurers and reinsurers. Operational layers will provide a liaison for claims matters, for tracking progress, and for alignment within expected processes and outcomes. Strategic layers will get reporting from operational counterparts and will step in to manage complexities or differences of opinion about damage assessment, policy coverage, and settlement value.

WHERE CLAIMS ARE RETAINED (SELF-INSURED)	WHERE CLAIMS ARE TRANSFERRED TO INSURERS AND REINSURERS
Continued: What is the allocation of roles and responsibilities	
The program should develop a flow chart that demonstrates the type, order, and content of interactions between key stakeholders through the claim-management lifecycle. Those interactions will include the following: • Claims notification protocols • Appointment of loss adjusters • Adjuster's liaison and reporting • Adjuster's recommendations for acceptance and sign-off • Appointment of repair or reconstruction contractors • Financial delegations and actions such as progress or full and final requests for claim payment, acceptance, and disbursement • Claims closure protocols, including sign-offs	The involvement of insurance brokers in claims processes should be established in the contract with the broker. For example, for claims up to a set amount, dealing direct with the insurers is stipulated. Above that amount, the broker is notified and acts in an advisory capacity. Another example is to have the broker involved only in catastrophe claims (i.e., claims involving multiple properties and made under the catastrophe provisions of the insurance policy). It is also possible to contract for all handling of claims to be outsourced to the broker.

KEY FACTOR OR CONSIDERATION :

How do you develop or confirm key stakeholder obligations?

A program should allocate specific obligations that promote good risk and claims management behaviors from the outset. The behaviors may include a duty on the agencies to do these: • Disclose material changes to their risk exposures. • Make staff members aware of their requirements under the program. • Take reasonable care to protect against loss. • Do everything practicable after a loss event to minimize the extent of loss. • Do everything practicable to investigate the cause of loss. • Ensure the asset register is kept up to date. The behaviors will also include a duty on the agency administering the program to do the following: • Act reasonably and promptly in the management of claims. • Manage funding for self-insured claims in an efficient and timely manner and in compliance with government legislation and regulation.	An insurance policy will include several requirements relating to the risk, any breach of which may affect or even invalidate a claim, such as the following: • An obligation to disclose material facts about the risk exposures being insured (Note: a material fact is information about loss exposures that may influence an insurer's decisions about risk acceptance or risk pricing). An example is a change of occupation or use of a building. • An obligation to notify the insurer about a loss as soon as reasonably practicable. Some policies have a set time limit during which insurers must be notified about claims. • An obligation to pay the premium within a predetermined period • An obligation to take all reasonable steps to safeguard property, including after a claim event has occurred

WHERE CLAIMS ARE RETAINED (SELF-INSURED)	WHERE CLAIMS ARE TRANSFERRED TO INSURERS AND REINSURERS
KEY FACTOR OR CONSIDERATION : **What are claims-management guidance and documentation?**	
The program should consult with key stakeholders and develop acceptable guidelines to be used as key reference material and instructions when a claim occurs. This guideline should use clear and concise language to avoid confusion and to encapsulate the agreed protocols and processes. Documentation, whether in paper form or through an IT deliverable, should be designed, tested, and approved to facilitate the flow of relevant and timely information throughout the claim management lifecycle.	Often insurers will have established processes for claims documentation and even a claims-management IT solution for use. Points of note include these: • All member agencies should familiarize themselves with the insurer's claims-management systems and expectations. • Governments, as significant customers, can seek customizations of a process that will better suit their circumstances. • Insurance brokers are often employed to assist with familiarizing customers with insurer's claims requirements, as well as for negotiating customizations.
KEY FACTOR OR CONSIDERATION : **What are claims-payment transaction processes?**	
Claims payment disbursement channels should be clearly identified and tested in advance of a real-life event. This testing is to ensure that stakeholders are aware of the transaction protocols and of how monies will be transferred from one party to another. There may also be obligations to ensure that the monies are used for agreed purposes.	There should be a clear understanding between the agency administering the program and the insurers regarding the means and protocols attached to claims payouts. Are the insurer payouts to be made through the administering agency or direct to the affected agencies (subject to agreed notifications and protocols)?

WHERE CLAIMS ARE RETAINED (SELF-INSURED)	WHERE CLAIMS ARE TRANSFERRED TO INSURERS AND REINSURERS
KEY FACTOR OR CONSIDERATION : **What are claims tracking and trending?**	
The agency administering the program should consolidate claims experience information over time. This information should include losses resulting in a claim payment but may extend to include losses that fall below a payout threshold. This information should be regularly reviewed to identify loss trends that could be minimized or reversed with improved risk-management interventions.	A relationship with insurers should include regular reporting of claims experience. Some insurance brokers or insurers can offer benchmarking information about claims, whereby the client can see anonymized versions of claims experience from other customers. This benchmarking can help governments better understand lessons learned in other jurisdictions.

Source: World Bank staff.

Here is a final important point: it is highly recommended that governments regularly test their claims-management plans by running realistic and relevant scenarios about loss events. Those scenario exercises will test the suitability of existing practices and protocol and will confirm resource requirements. Governments can thus identify important shortcomings that, with remedial action, can prevent significant issues when a real-life claim occurs. More broadly, these scenario exercises could also consider recovery scenarios, to understand how to utilize and prioritize government's contingency funds and claims payouts in the reconstruction processes.

A systems dynamics model is a general representation of a complex system such as an organization's disaster response. It shows the optimum balance of different resources. For example, the New Zealand Earthquake Commission has a model it calls Logjam, which takes details of resources such as the numbers of loss adjusters, claims clerks, accommodation rooms, motor vehicles, etc., plus the average time taken to accomplish site visits and to complete various steps in the administration of a claim. Logjam then balances the resources so that the optimum can be achieved.

In this way, for example, the Commission can ensure that it has sufficient office support (both in the field and at administration centers) to service loss adjusters adequately, and it can efficiently manage tours of duty for personnel brought in specifically for the response while maintaining a sufficient work force. By regularly using a systems dynamics model during a response and by inputting actual resource numbers and timings, the balance of resources can be adjusted during the various phases of the response (activation, ongoing, and winding down).

To Recap Chapter 7:

- This chapter provides description and itemizes different activities for program managers to develop program implementation plans and task lists.
- In reality, however, each government will apply a sensible variation of the checklist to suit its situation and requirements.

Box 7.3.

Checklist for Activation of a Public Asset Financial Protection Program

The following checklist includes common actions associated with activation of a public asset financial protection program. It is not exhaustive, and each government may have requirements in addition to those shown herein.

	1. GOVERNANCE
☐	Establish governance layers (e.g., strategic, operational, or client advisory).
☐	Establish reporting basis (e.g., what information is reported, how, to whom, and how often).
☐	Establish audit plan (i.e., external and internal audit protocols).
☐	Confirm, draft, and approve the standard operating procedures (i.e., user manual).

	2. COMMUNICATIONS
☐	Draft, approve, and implement stakeholder engagement and communications plan.
☐	Create user manuals and guides.
☐	Develop a resource for frequently asked questions.
☐	Develop ministerial and media briefings (if required).

	3. RECRUITMENT
☐	Define recruitment needs (i.e., organizational structure, roles, and responsibilities).
☐	Develop job descriptions, salary banding, and delegations.
☐	Confirm necessary order of recruitment (i.e., prioritize roles).
☐	Involve recruitment expertise (as required).

4.	TRAINING
☐	Define audience, channels, and content.
☐	Develop content and channels.
☐	Implement internal staff training.
☐	Implement training for the participating agency's staff members.
☐	Implement staff training for the outsourced provider (if required).

5.	CORPORATE SERVICES SUPPORT
☐	Define any required corporate services, which will depend on location choice (i.e., new government entity versus business unit in existing entity).
☐	Link with existing or procure human resources (as required).
☐	Link with existing or procure legal services (as required).
☐	Link with risk and audit services (as required).
☐	Link with existing or procure a financial management resource (as required).
☐	Link with existing IT systems or procure IT systems for support (as required).
☐	Link with existing property and property services (e.g., office equipment, security) or procure such services (as required).
☐	Link with existing procurement expertise or obtain such expertise (as required).

6.	IT SYSTEMS AND DATA INTEGRATION
☐	Review relevant options for international systems, and receive preliminary demonstrations.
☐	Develop IT systems requirements and specifications (accounting for data type, data collection, reporting, hierarchical user settings, claims management, and security compliance standards).
☐	Undertake procurement (using support from IT expertise).

- [ ] Undertake user acceptance testing and necessary customizations.
- [ ] Undertake security compliance testing.
- [ ] Commission the IT systems.
- [ ] Provide initial and ongoing service and support (including system-user training).
- [ ] Arrange or monitor and validate input of required data into the accepted IT systems.

7. CLAIMS MANAGEMENT

- [ ] Build capability for loss-assessment. Outsource services under contract.
- [ ] Run claims scenarios (especially disaster events) to estimate resource requirements.
- [ ] Develop clear and concise claims roles and responsibilities.
- [ ] Develop clear and concise obligations for claims management.
- [ ] Draft and approve relevant templates for claims-management documentation.
- [ ] Design and confirm disbursement processes and protocols for claims payments.
- [ ] Develop a means to track and trend the loss experience.

8. PROCUREMENT

- [ ] Define and develop service requirements, including specific, measurable, achievable, realistic and time-bound (SMART) key performance indicators and service-level agreements.
- [ ] Undertake the planning and approvals for procurement and evaluation processes.
- [ ] Develop requests for proposals (RFPs) and contract documentation drafting and approvals.
- [ ] Issue RFPs and briefings; clarify and process responses from bidders.
- [ ] Evaluate, shortlist, and negotiate RFP responses.
- [ ] Award the contract and provide debriefs.
- [ ] Plan and undertake reviews of performance and benefits.

9.	MEMBERSHIP
☐	Set the strategy for introducing new members (e.g., phased over the medium term to the long term or phased during an initial commencement date for all founding members).
☐	Design and approve the initial mechanisms and requirements (e.g., data collection, contractual or documentation processes).
☐	Undertake the necessary stakeholder engagement (i.e., familiarization of processes and assistance).
☐	Commence a membership program that includes tracking of agency progress through the process.

10.	RISK FINANCING
☐	Establish fund accounts (for retained risk or for receipt of the agency's premium contributions or for both).
☐	Establish and test transaction and disbursement channels.
☐	Confirm protocols for accounting and financial management (e.g., fund accumulation, funding ratios, and accounting standards).
☐	Administer any early, central-government, capitalization requirements (as necessary).
☐	Prepare to administer receivables (e.g., agency contributions and insurance claims payments).
☐	Prepare to administer payment of expenses (e.g., corporate services costs, outsourced services costs, retained losses, and insurance costs).
☐	Activate any agreed investment vehicles.
☐	Activate the statement of coverage (i.e., the insurance coverage terms and conditions relating to retained and transferred risk).
☐	Having reviewed risk-transfer options, instruct placement of the preferred options.

Box 7.4.

Checklist for Renewal of Public Asset Financial Protection Program

1.	**GOVERNANCE**	
☐	Review and adjust governance layers (e.g., internal and external).	
☐	Review and adjust reporting (e.g., what information is reported, how, to whom, and how often).	
☐	Review and adjust audit plan (i.e., external and internal audit protocols).	
☐	Establish review timetable.	
2.	**COMMUNICATIONS**	
☐	Regularly review and update the stakeholder engagement and communications plan.	
☐	Regularly review and update user manuals and guides.	
☐	Develop ministerial and media briefings (if required).	
3.	**RECRUITMENT**	
☐	Regularly review workforce planning (i.e., current mix of needs, skills, staffing levels, and key positions).	
4.	**CORPORATE SERVICES SUPPORT**	
☐	Link with existing human resources or procure new ones (as required).	
☐	Link with existing legal services or procure new ones (as required).	
☐	Link with risk-and-audit services (as required).	
☐	Link with existing financial management resources or procure new ones (as required).	
☐	Link with existing IT systems support or procure new IT support (as required).	

- [ ] Link with existing property and property services or procure new services (as required) (e.g., office equipment, security).
- [ ] Link with existing procurement expertise or procure new expertise (as required).

5. PROCUREMENT AND CONTRACT MANAGMENT

- [ ] Hold regular meetings with service providers to review performance against service requirements (including SMART key performance indicators and service-level agreements).
- [ ] Effectively manage contract expiry and renewal cycles.

6. IT SYSTEMS

- [ ] Regularly review user interoperability, government IT policies, systems, and hardware.
- [ ] Provide ongoing service and support (including system user training).

7. DATA

- [ ] Regularly review data policies and requirements.
- [ ] Regularly review and analyze data.

8. MEMBER MANAGEMENT—INTRODUCING NEW MEMBERS

- [ ] Regularly review new member strategy and implementation, including program capacity to increase member numbers.
- [ ] Continue stakeholder engagement (i.e., familiarization of processes and assistance) and tracking.

9. MEMBER MANAGEMENT—ENGAGEMENT

- [ ] Regularly review and update interactions with members and with the stakeholder engagement and communications plan.

10. MEMBER MANAGEMENT—TRAINING

- [ ] Regularly review and update training needs and packages for members.
- [ ] Link member training to stakeholder engagement and communications plan.

11. RISK FINANCING AND PROGRAM MANAGEMENT

- [ ] Regularly review and update accounting and financial management protocols (e.g., fund accumulation, funding ratios, and accounting standards).
- [ ] Regularly review and update requirements for central government capitalization (as necessary).
- [ ] Regularly review and update the statement of cover (i.e., the insurance coverage terms and conditions relating to retained and transferred risk).
- [ ] After reviewing risk-transfer options, instruct placement of the preferred options (as necessary).

12. FINANCIAL MANAGEMENT

- [ ] Regularly review and update payment processes (as necessary).

13. CLAIMS MANAGEMENT

- [ ] Regularly review and update the claims-management framework (tied to contract management).

14. RISK MANAGEMENT

- [ ] Regularly review and update the risk-management activities.

Worksheet for Chapter 7

Test your understanding of the chapter, and record your insights through this worksheet!

Activity 1.
Can you identify which of the activities from the checklists require consideration in the activation stage, renewal stage, or both.

	Activity	Activation	Renewal
1.	Establish external and internal audit protocols.	☐	☐
2.	Review program ability to increase member capacity.	☐	☐
3.	Commission the IT system(s).	☐	☐
4.	Confirm the necessary order of recruitment.	☐	☐
5.	Establish a review timetable.	☐	☐
6.	Establish the fund accounts for retained risk.	☐	☐
7.	Design risk management training for members.	☐	☐
8.	Establish reporting bases.	☐	☐
9.	Undertake the necessary stakeholder engagement.	☐	☐
10.	Develop ministerial and media briefings.	☐	☐

Activity 2.
Identify whether the following considerations are an advantage or challenge in the overall program management, including the activation, renewal, and claims stages.

	Key Considerations	Advantage	Challenge
1.	Quality data provide a government with an informed overview of its risk profile.	☐	☐
2.	The quality of data depends on identification of key datasets.	☐	☐
3.	Quality data collection requires close monitoring of additions, deletions, and changes to underlying assets.	☐	☐
4.	Quality data provide pricing certainty.	☐	☐
5.	Quality data that are provided at the underwriting stage assist subsequent claims settlement.	☐	☐
6.	Quality data require member commitment to provide that data in an expected time frame.	☐	☐

Activity 3.
Identify whether the following statements regarding key considerations for effective claims management are true or false.

	Activity	Activation	Renewal
1.	Loss assessment can be done internally by the finance ministry officials and does not require a specialized skill.	☐	☐
2.	Key reconstruction contractors can be relevant stakeholders in the claims process.	☐	☐
3.	An insurance relationship is governed by pre-agreed obligations, usually listed in the policy document.	☐	☐
4.	Disbursement channels and stakeholders for claims payments should be identified only at the time of claim.	☐	☐
5.	A relationship with insurers and reinsurers should include regular reporting of claims experience in the risk-transfer program.	☐	☐
6.	Governments should regularly test their claims-management plans to check the suitability of existing practices and protocols.	☐	☐
7.	In an insurance program, governments can seek customizations of the claims-documentation process.	☐	☐

Activity 4.
Reflections

[a] My top three takeaways from this chapter are these:

[b] Three concepts or ideas I would like more information about are these:

CASE STUDY

New Zealand's Experience

Background

The New Zealand government is currently considering the establishment of a managed fund to protect and insure public assets. Options that may be considered include variations of government and private market cover.

Strategic Alignment

Current considerations for creating the New Zealand fund include these:

- Improved national resilience during disasters caused by natural hazards, particularly earthquakes
- Improved fiscal and risk management consistent with the government's current fiscal and budget agenda
- Clear linkages to the four key priorities in the government's living standards framework (natural capital, human capital, social capital, and financial and physical capital), all of which are underpinned by a requirement for resilience
- A need to provide central government decision-makers with a clearer understanding of government residual risk and with improving risk-management maturity and practices within and across government

Current considerations in the proposed New Zealand approach include a participation mandate that is strongest for central government agencies (that is, ministries and departments). The obligation for participation would be lower for agencies that are farther away from the central government, as illustrated in case study Figure 4.1.

New Zealand is considering onboarding agencies in a staggered process (that is, groups of agencies are transitioned into the program at annual intervals). Initial groups would focus on agencies with the following attributes:

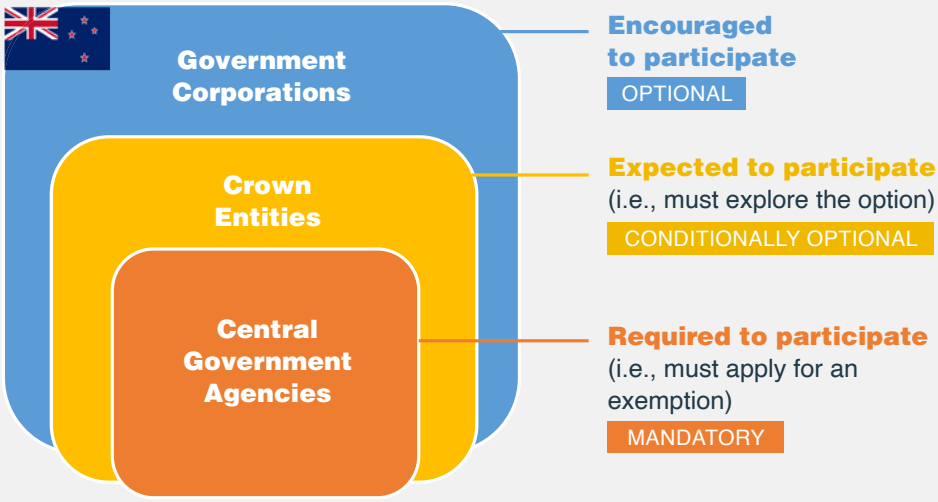
- Geographic spread of risk
- Assets of reasonable resilience
- Collective scale that enables prudent self-insurance
- An already relatively mature approach to risk management
- An ability to deliver data that support measurement of risk

This transition approach is designed to accomplish the following:

- Manage change over time, thus minimizing change shock for agencies.
- Allow the accumulation of better risk-management data.
- Develop greater certainty through improved data.

Case Study Figure 4.1.

Participation Obligations in New Zealand Public Asset Financial Protection Program



Source: World Bank staff.

- Use the principle of prudence in the sense that the solution accepts risks only within acceptable certainty tolerances.
- Shift in a coordinated fashion toward the point of greatest value.

The following staged approach summarizes the New Zealand government's considerations for a public asset program.

In the short to medium term, New Zealand is considering a proposal to establish an interim or initial business unit within an existing central government agency, as shown in case study Figure 4.2. This initial business unit allows for an expedient implementation. As the New Zealand government considers its broader, strategic risk-management objectives, this operational location may transition to a dedicated, standalone, risk-management functional lead, thereby acting as a center of expertise for government.

Budget and Financial Planning

The New Zealand government is currently considering its approach to program surplus or deficit management through a funding ratio lens. Case Study Figure 2.3 outlines the framework of those considerations. No funding ratio decisions have yet been made as of end of December 2020.

Lessons learnt

The New Zealand government has opted for an ambitious 'All-of-Government' approach in their financial protection of public assets, however, has phased their implementation over a period of time, for example on the inclusion of agencies and on organizational set-up. Their experience shows that setting a high ambition does not have to compromise the pragmatism of implementation, and structured planning at the start can help manage progress and stakeholders' expectations.

Case Study Table 4.1.

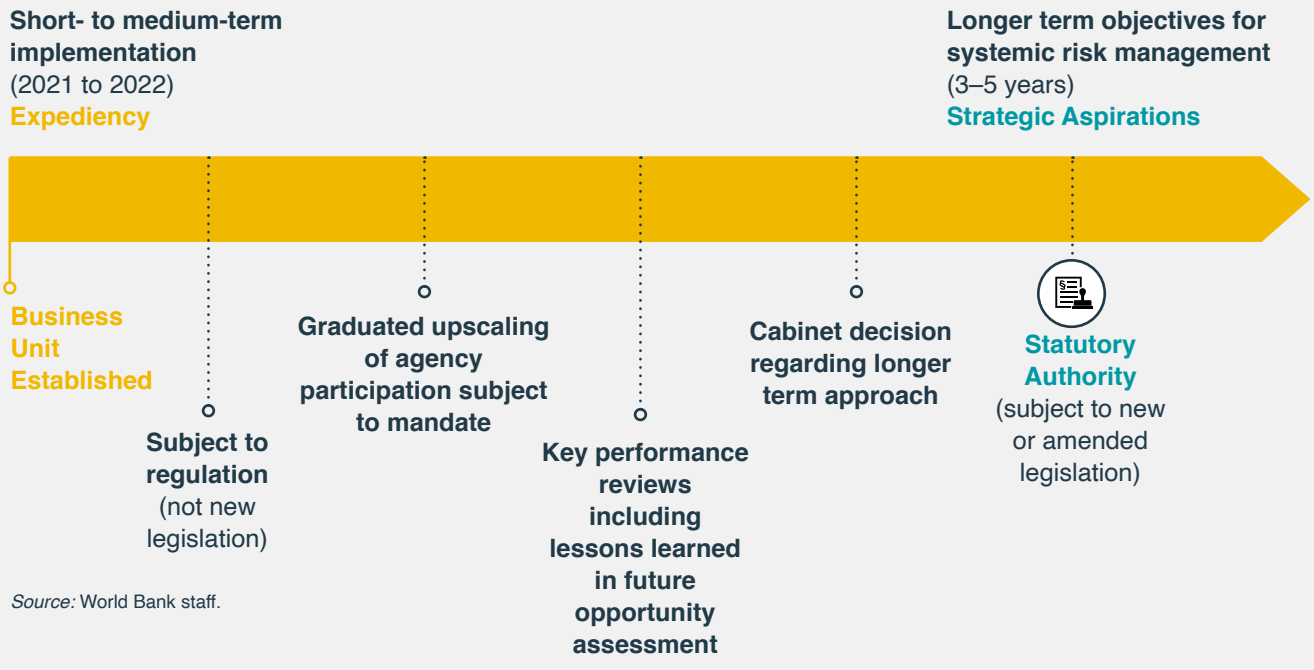
Activities undertaken for onboarding agencies in New Zealand

STAGES	ACTIVITIES
Stage 1: Agency Viability Pre-assessment	Desk assessment is undertaken by Ministry of Business Innovation and Employment (MBIE) with cooperation from the relevant agency. a. Risk Profile Compatibility b. Spread of riskw c. Quality or type of assets d. Type of operations e. Evidence of robust risk management f. Availability of data g. Impact of additional risk profile on the aggregate solution
Stage 2: Agency Viability Formal Assessment	**Data Collection** Data collection and collation are undertaken. Insufficient data at an early stage may preclude participation. **Data Analysis** a. Relevant data analysis for purposes of disaster loss-modeling b. Relevant data analysis by actuaries for purposes of loss forecasting and contribution setting c. Review of the data by commissioned insurance brokers for purposes of marketability assessment **Analysis Review** MBIE reviews the analysis in the context of these: a. Loss modeling or loss forecast impact on the solution b. Risk-sharing impact (i.e., can additional risk be accommodated at a crown financial risk tolerance level?) c. Financial contribution impact (i.e., will the additional agency unbalance or adversely affect the way contributions are allocated across the solution?) **Assessment Report** MBIE will report back to the relevant agency, noting these: a. Acceptance or non-acceptance b. The contractual obligations of participation, include the following: Period of participation, Data availability, Claims protocols c. Financial and reporting protocols d. Duties of disclosure e. Deductible setting options f. Contribution options g. Agency acceptance agreement

STAGES	ACTIVITIES
Stage 3: Induction	**Induction Package** a. Provision of induction package, includes these: a. Agency guidance b. Frequently asked questions c. Statement of cover or placing slips d. Claims protocol handouts e. Calendar of key activities f. Access to risk management information systems g. Key contacts b. Contribution confirmation (invoicing) c. Confirmation payment instructions d. Education session
Stage 4: Confirmation	**Confirmation Collateral** a. Payment tracking b. Payment received confirmation c. Certificates of currency

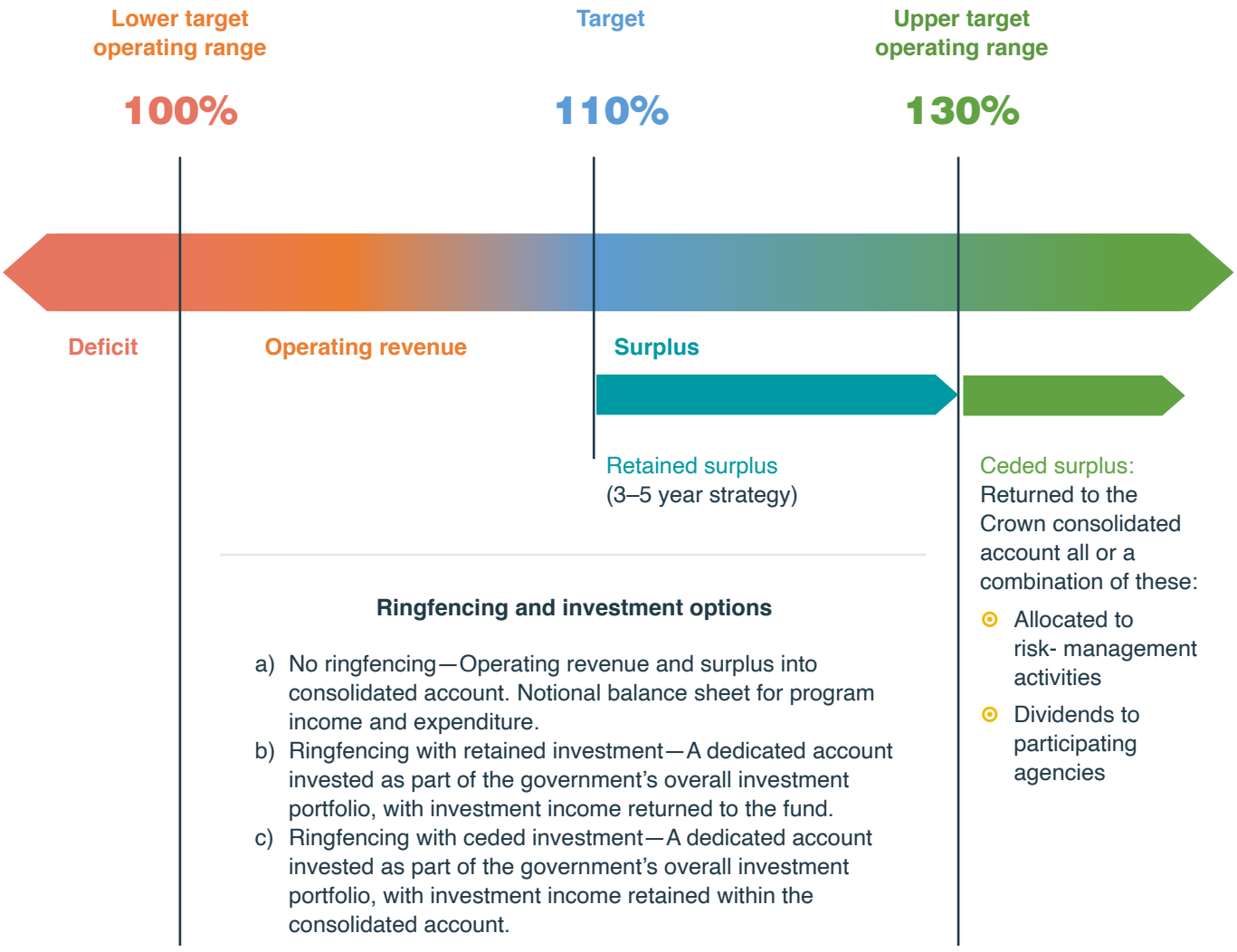
Case Study Figure 4.2.

Organizational Set-Up Plan for New Zealand's Program



Source: World Bank staff.

Case Study Figure 4.3.
Options for the Financial Structure of New Zealand's Program



8.

Emerging Technologies for Public Asset Financial Protection

What You Will Learn

This chapter, based on a set of articles curated by industry practitioners, provides a discussion on the relevant technologies for public asset financial protection programs including these:

- Risk management
- Damage assessment after a disaster event
- Catastrophe modeling
- Systems mapping

It also describes new trends in the context of public asset protection and insurance, including

- The importance of privacy protection and the role of technology
- The future outlook in relation to climate change and other threats

8.1.

Introduction

Even before the COVID-19 pandemic, we lived in a transformative age with rapid technological innovations globally. The acceleration of digital transformation across many industries is coupled with continued market pressures on the insurance industry to streamline processes, cut costs, and refresh the types of services they can offer. In addition, the current global economy is facing increased awareness, pressure, and regulations that manage climate- and disaster-related risks and their impacts on people and livelihoods. The nature of risks faced by governments and organizations are changing, both in terms of the types of risks and the nature of existing risks.

Insurtech is a recent development within the insurance industry and refers to the use of technology innovations to gain more savings and efficiency from the current insurance industry model. Many insurers and other capital providers have been embracing Insurtech and have adapted their business models in response to emerging technologies and shifting consumer preferences. Moreover, across many governments, financial managers are looking at ways to enhance transparency and to improve financial management of their assets. Many countries, for example, are increasingly adopting public-private partnerships in the management and operations of their assets, as well as undergoing digital transformation.

The current COVID-19 pandemic reinforces all the trends just mentioned—trends that can support (or hinder) the development of public asset management and insurance programs. This chapter considers recent trends and innovations in public asset insurance programs, and it highlights some opportunities for governments to embrace new innovations or to react to existing trends.

This chapter is structured as a series of articles covering a range of innovations in technology, data, and analytics, and it responds to regulatory changes and dynamics. The articles listed have benefited from the contributions of authors and experts in the respective areas (See Table 8.1, which lists articles and authors). Box 8.1 outlines key takeaways.

Table 8.1.
Article Titles and Authors

	ARTICLE	SECTION	CONTRIBUTORS
1.	**Emerging Technologies to Support Risk Management and Disaster Prevention: Internet of Things, Big Data Analytics, and Building Information Modeling**	**8.2**	Lit Ping Low, World Bank, with contributions from Julie Dela Cruz, Arcadis
2.	**Damage and Loss Evaluation Using Remote-Sensing Data**	**8.3**	Anirudh Rao, Global Earthquake Model Foundation
3.	**New Generation Catastrophe Modeling and Implications on Insurance Products**	**8.4**	Matt Foote and David Simmons, Willis Tower Watson
4.	**Systems Mapping and Criticality Analysis of Infrastructure Systems**	**8.5**	Nicola Ranger and Lit Ping Low, World Bank
5.	**Privacy Preserving Analytics of Aggregated Data to Support Risk Management and Disaster Prevention**	**8.6**	Sally Sfeir-Tait, RegulAItion
6.	**Future Outlook—Rising Risks from Climate Change and Increased Focus from Regulators on Reporting Climate, Environmental Risk, and Disaster Risk**	**8.7**	Lit Ping Low, World Bank, with contributions from Matt Scott, former head of Green Finance, UK Department of Business, Energy and Industrial Strategy

Box 8.1.

Key Takeaways

The articles in Table 8.1 reveal a range of emerging technologies and regulatory shifts that affect the future of public asset insurance and financial protection. Looking forward, financial managers of public assets can expect the following:

- Insurers and asset managers will use technology and data to enhance their operations and business functions, to improve efficiency, and to automate processes. Those who are not embracing this approach will be penalized through higher operational and financing costs, including for insurance. (See **article 1**.)
- Insurers and risk modelers will leverage new and existing data to generate deeper risk insights, as well as to gather more insightful and higher-quality outputs. Better data and processing of those data will mean that insurers are starting to shift from risk-transfer models to more sophisticated, risk-prevention models. (See **articles 1**, **2**, and **3**.)
- This development means more tailored solutions are likely to emerge, leading to a potentially more diverse range of solutions. This approach could include solutions to new coverage or risks. (See **articles 3** and **4** and chapter 5 for a range of emerging solutions for alternative risk transfer.)
- More data may bring challenges (for example, concerns about cyber security and data privacy). Many technological solutions are emerging in response to such concerns. (See **article 5**.)
- In addition to the use of data to inform risks, asset owners and regulators are under increasing pressure to disclose and publicly report those risks. This disclosure will mean increased scrutiny about prudent and effective management of public assets. (See **article 6**.)

8.2.

Article 1:
Emerging Technologies to Support Risk Management and Disaster Prevention: Internet of Things, Big Data Analytics, and Building Information Modeling

Overview

Increasingly across the world, governments and industries are developing smart cities and infrastructures, and they are drawing on applications of the Internet of Things (IoT) and big data analytics. Those developments are further used through building information modeling (BIM) and other processes that offer significant opportunities to manage public assets in a smarter way. They are also used in real time across a wide range of applications, including asset usage, performance service-level management, maintenance and repair schedule management, and potentially even for tracking damages or service interruptions during disaster events.

- IoT is the concept that objects (in this case, public assets) may be embedded with smart devices and data connectivity to allow them to be monitored or controlled remotely—typically through the internet.
- The term big data refers to the process of gathering, storing, organizing, and analyzing very large data sets, such as those collated from smart and other IoT devices.
- BIM is a revolutionary set of processes involved to create digital representations of physical and functional characteristics of any smart building. The models form a collaborative way of using and sharing outputs in the architectural, engineering, and construction industries; they provide documented, accessible, and usable information during each step in a building's life cycle—from design to demolition.

Although the integration of BIM with real-time data from the IoT devices is still in nascent stages, this approach presents significant opportunities to improve construction and operational efficiencies, as well as to include effective and timely risk management. In the context of public asset insurance programs, benefits of incorporating smart asset management include these:

- Provide up-to-date and accurate data to inform insurance pricing.
- Demonstrate robust risk-management procedures through (a) optimization of safety checks, (b) maintenance and repair operations, and (c) preventive routine checkups—all of which can lead to savings in insurance premiums.
- Conduct simulations using BIM on buildings' structural performance and resilience, and use those simulations to estimate damages to the building and to assess the damage cost and environmental impacts on a damaged building as a result of events such as earthquakes. The simulations can lead to better customization of insurance programs.
- Minimize losses and claims by incorporating early warning signals and sensors that will enable preventive actions during disaster events or that will both shut down certain critical assets and minimize damages.

Case Studies

Motor Insurance Application

One of the first applications of the Internet of Things within the insurance sector is in motor insurance.[27] Car insurance premiums are typically set according to the type of vehicle and the demographics of the driver, rather than being based on the driver's ability. By using low-cost in-car sensors, massive amounts of information about vehicles and about how people drive will provide insurers and underwriters with a greater ability to judge risk on a much more individual basis than ever before.

In some countries, insurers offer drivers the option of installing a small telematics device into a car's diagnostics port. The telematics device records data such as the vehicle's speed, distance traveled, time of day, and rate of acceleration and braking. By analyzing those data, the insurer can determine the driver's style and can adjust the premium as necessary. Other similar devices can help to locate the car in the event of theft, thereby increasing the likelihood of recovering the car. In many cases, such a device may prevent theft in the first place.

In a US survey of 1,135 drivers in 2015, the results revealed that 56 percent of the participating drivers reported that they had changed their driving style after installing a telematics device on their vehicle; 82 percent of respondents received information about their driving behavior from their insurance company. The vast majority (88 percent) of this latter group found the information helpful.

27 IoT for all website, https://www.iotforall.com/use-case/usage-based-vehicle-insurance; see also Insurance Research Council, "Auto Insurance Telematics: Consumer Attitudes and Opinions," 2015.

5D BIM

A common BIM terminology is dimension, which refers to how different kinds of data are linked to an information model. By adding dimensions of data, you can start to get a fuller understanding of the construction or building. Furthermore, 3D BIM refers to graphical and nongraphical information, 4D adds the time dimension, and 5D adds the cost dimension. This information might include capital costs (the costs of purchasing and installing a component), its associated running costs, and the cost of renewal or replacement down the line.

Traditionally, the design consultant hands over fragmented data consisting of 2D and 3D models, as well as schedules and specifications documents, to the cost consultant once the design is complete. In the 5D BIM approach, the design team and the cost and programming consultants coordinate before the design stage, and the objects in the building model are developed according to requirement in the cost information document, which assigns cost codes to the modeled objects, thus allowing automated takeoff and pricing.

In general, the use of 5D BIM during the design and costing phase can result in a savings of 30 percent to 40 percent in terms of efficiency in time. The 5D BIM can also generate other benefits during the project's life cycle. For example, the data used could be reused later in the project. Having all data inside a common data environment enables teams to collaborate on a single-source document.

Japan

In Japan,[28] the federal government launched an emergency warning system in February 2007. Japan's disaster resilience solution was developed with support from a technology vendor, and it includes observation systems, information gathering capabilities, data analysis and decision-making aids, and an intelligent warning system—all of which are linked in an interoperable manner. During the Great East Japan Earthquake in 2011, which was followed by a 9-meter-high tsunami, the warning system prevented the tsunami from having an even greater impact.

The system uses seismometers to detect the first shockwave (primary waves, or P-Waves) caused by an earthquake. In 2011, computers analyzed the wave and estimated how powerful the second one (secondary waves, or S-Waves) would

28 GSMA and Japan Meteorological Agency, "Smart City Resilience: Learning from Emergency Response and Coordination in Japan," Tokyo, Japan, 2013, https://www.gsma.com/iot/wp-content/uploads/2013/02/cl_SmartCities_emer_01_131.pdf.

be. The waves were estimated to be above a certain threshold level so a warning alert was transmitted, and a series of preventive actions came into action. The Shinkansen bullet trains automatically stopped when the first tremors from the earthquake were felt. No trains derailed and no elevated bridges collapsed. Tokyo's subways were evacuated, surgical operations ceased, gas was disconnected, and nuclear reactors received an order to enter the shutdown process. Japan was also able to rapidly deploy its recovery support, and it dispatched nearly 28,000 members of the National Police Force and of the Fire and Disaster Management Agency in the tsumani's immediate aftermath; recovery personnel were supported by the telecommunications networks.

Implications

Asset and infrastructure development are increasingly incorporating smart features, many of which are becoming more affordable. Those features can support better risk management and prevention of disaster impacts for the assets, as well as provide real-time feedback. They can greatly improve initial response-and-recovery efforts. Governments can also explore partnerships and business models with the insurance providers to embed IoT and big data within the insured assets, which should improve insurance pricing and risk management.

8.3.

Article 2: Damage and Loss Evaluation Using Remote-Sensing Data

Overview

The availability of affordable and rapid risk financing in some nations is still a challenge and limits the ability to rapidly deploy funds toward the reconstruction-and-recovery process. One reason for this lack of financial coverage is that traditional insurance policies or national mechanisms for financial compensation often require local inspections of damaged properties, which can be quite resource-intensive and time-consuming. Alternative financial instruments such as parametric products have gained traction because of their relative simplicity, transparency, and promptness. However, imperfect correlations between the triggering criteria and the actual damage have demonstrated limitations within past events. Improvements in the assessment of damages and losses of a disaster event are critical to address this challenge.

The increasing number of satellite remote-sensing missions and the tremendous improvements in remote-sensing data processing and interpretation techniques have made it possible to acquire and process earth observation (EO) data for disaster events within a few hours of their occurrence. Across EO data, three types of sensors are especially amenable to damage detection: optical sensors, LiDAR sensors, and radio detection and ranging (radar) sensors—particularly synthetic-aperture radar (SAR).

a. Optical Sensors

Optical sensors are a type of passive sensor, meaning that the sensor records the signal that is either emitted or reflected by objects on the ground on earth. Optical EO data are currently available at submeter spatial resolution from several satellites, making it particularly appealing for building-level damage detection. Optical imagery is also conducive for applications involving visual interpretation, such as crowd-sourced damage.

Presently, a few services to rapidly map disaster damages are in operation. They use primarily optical EO data as the basis for damage assessment such as the Operational Satellite Applications Programme of the United Nations Institute for Training and Research (UNITAR) and the Copernicus rapid damage-mapping service supported by the European Commission. However, the damage assessments from UNITAR and Copernicus need significant manual effort to scan the raw optical imagery that covers the affected area for collapsed buildings, signs of debris or other visible damage, and cracks in bridges and other infrastructure elements. Larger events may involve manual inspection of several thousand houses or buildings for signs of damage, and the process might take many days—and often weeks—to complete.

Automated detection of building damage by machine-learning algorithms that compare optical imagery of the affected area before and after the event has improved in recent years, but some other drawbacks arise with such methodologies. Because the pre- and post-event optical images might have been captured (a) in differing light conditions and cloud cover, (b) on different days, or (c) even by different sensors, comparing corresponding pixels in the two sets of images is beset with many issues regarding alignment of the images. In the case of floods, pervasive cloud cover usually limits or precludes altogether the use of optical imagery.

b. LiDAR Sensors

LiDAR is an active sensor that illuminates the target with laser light and measures the reflection with a sensor. Differences in laser return times and wavelengths can then be used to make digital 3D representations of the target. LiDAR-based approaches are less developed compared to SAR and optical imagery-based approaches, but they are promising in detecting damage types that may be missed by the SAR-based and optical imagery–based approaches, such as pancake collapses of buildings. However, pre-event LiDAR data are unavailable for the vast majority of events, thus limiting the application of change detection methods. Post-event LiDAR data also need to be acquired on an ad hoc basis and through the use of airborne sensors, thereby making this approach less suitable at present for use in a semi-automated framework for damage detection.

c. Radio Detection and Ranging (RADAR) Sensor—Particularly Synthetic-Aperture Radar (SAR) Sensors

SAR is a form of active sensor used to create two-dimensional images or three-dimensional reconstructions of objects, such as landscapes. Successive pulses of radio waves are transmitted to illuminate a target scene, and the echo of each pulse is received and recorded, which can then be processed to create a SAR image.

A significant advantage offered by SAR over optical EO and LiDAR is that SAR data can be obtained even in poor-light conditions or at night and can be nearly independent of cloud cover. However, most of the SAR-based methods do not yet provide very high resolution. Recently, meter-level spatial resolution is being offered by several SAR satellites, including ALOS-2, COSMO-Skymed, TerraSAR-X, and TanDEM-X. The enhanced resolution makes building-level damage detection promising, especially when ancillary datasets such as digitized building footprint layers are available for use in conjunction with high-resolution SAR data.

Finer differentiation of damage grades involving detection of cracks in walls or residual drifts might still be challenging with the 1-meter to 3-meter spatial resolution offered by the current generation of SAR sensors. The Advanced Rapid Imaging and Analysis team, which is a joint effort of NASA's Jet Propulsion Laboratory and the California Institute of Technology, has developed urgent response products that will detect areas of damage caused by earthquakes, landslides, liquefaction, wildfires, floods, volcanoes, and tsunamis within 24 hours of the event.

Case Study

Semi-automated Damage and Loss Assessment

The World Bank has initiated and funded a pilot project that involves a collaborative research team combining experts from NASA's JPL ARIA, GEM Foundation, JBA Risk, and HOT to develop a framework for semi-automated assessment of damage and loss caused by earthquakes and floods. The framework will use EO data and other supplementary datasets, while leveraging recent advances in machine-learning algorithms.

The project conducts a comparison of the outputs from damage proxy maps (DPMs) developed using the methodology described by Yun et al.[29] The DPMs are Interferometric SAR coherence maps created before and subsequent to a damaging event; they show a few earthquake events including the 2015 Gorkha earthquake (Nepal), the 2016 Norcia earthquake (Italy), and the 2020 Zagreb earthquake (Croatia).

The comparison revealed good spatial correlation between the DPM and the preliminary damage assessment surveys for those events. The project team also generated flood proxy maps for major flood events on the basis of available SAR imagery. These maps can potentially provide guidance about areas that are likely to be flooded as a result of heavy rains or tropical storms. SAR imagery can identify the spatial extent of flooding, and further post-processing can produce maps about flood depth. However, further improvements, which are supported through machine learning, are still required to incorporate other important factors of damages such as flow velocity or flood duration.

Implications

The accuracy and pace of damage detection can be improved by using several EO data together, by applying deep machine learning, and by incorporating supplementary information such as local site conditions and building inventory data. Such rich data-fusion approaches to damage assessment are currently rare but are in development. The development of new risk-financing solutions will inevitably have to rely on innovative technologies, models, and datasets that leverage all the appropriate data in a semi-automatic approach. Some risk-financing solutions will become more relevant and attractive as this technology matures (for example, modeled loss-trigger parametric solutions will become more viable because of the improved ability to align modeled losses with the actual impact of the loss event).

29 Yun, S.-H., E. Fielding, F. Webb, and M. Simons, Damage Proxy Map from Interferometric Synthetic Aperture Radar Coherence (Patent No. US 9,207,318 B2), US Patent and Trademark Office, Washington, DC, 2015.

8.4.

Article 3:
New Generation Catastrophe Modeling and Implications for Insurance Products

Context

Public assets and infrastructure include a wide range of high-value facilities and other physical assets that have complex structural, operational, and interdependent characteristics.[30] Those characteristics create a significant challenge when developing risk-transfer strategies that effectively mitigate the risk to those assets from natural hazards, particularly for assets with a multidecadal lifespan. New mechanisms to support financial risk transfer of high value-at-risk, of aggregated asset exposures, and of national or regional scales—such as multiyear insurance, parametric, and other alternative risk-transfer mechanisms—also require an increased acceptance and use of data and modeling tools.

The Coalition for Climate Resilient Investment (CCRI),[31] which represents national and institutional public- and private-sector investment finance entities with more than US$5 trillion of real assets under management or investment, has also identified the critical need for data and analytics to quantify effectively the risk to infrastructure from current and expected future climate shocks. The potential longer-term impacts to infrastructure from chronic climate risks (such as sea-level rise, water stress, and heat stress) add further complexity to the financial protection of assets and the need to develop long-term risk assessments that will reflect the expected changes to hazards and vulnerabilities over decades.

Catastrophe models are a key source of asset risk assessment for risk transfer. Although the international insurance and reinsurance industry has been at the forefront of the application for more than 30 years (see chapter 3), catastrophe models still have limitations in representing infrastructure and complex assets. Until very recently, model coverage, in many countries, has been at best partial—both geographically and in terms of the range of natural hazards included.

30 Insurance Development Forum, "IDF Practical Guide to Insuring Public Assets," 2019, https://www.insdevforum.org/knowledge/idf-reports-publications/idf-practical-guide-to-insuring-public-assets/

31 Coalition for Climate Resilient Investment, "California Joins CCRI to Advance the Inclusion of Climate Risk Standards into Investment Decisions," http://www.resilientinvestment.org

There are significant gaps in every component of the catastrophe modeling framework: (a) exposure data are not adequately consistent or granular to represent asset structures and values, (b) vulnerability functions are poorly developed for complex and nonbuilding risks, and (c) data about the correlation or compound effects of different natural hazards are highly variable and lack the resolution for modeling asset risk. In recent years, several technological, data, and product developments have improved the potential to assess current and future risks to large-scale public asset and infrastructure and to support financial risk transfer, as shown in Box 8.2.

Box 8.2.

Emerging Developments Supporting Risk Assessments

A. Developing new approaches to model asset vulnerabilities and resilience and approaches that better reflect the interdependent and localized nature of assets and infrastructure to climate hazards

1. **Systems and network analytics to determine asset criticality and service disruption risks**

   The integration of systems and network analytics within asset-level catastrophe modeling is becoming possible if one uses appropriate data to represent the interdependencies and connectivity between assets (both physical such as power transmission and distribution networks and intangible such as supply chain). This approach is being pioneered at national scales through international initiatives such as the Coalition for Climate Resilient Investment and for country-specific asset modeling, thus enabling networked assets for critical services such as power generation to be modeled against multiple hazards (see article 4).

2. **Use of risk-engineering approaches to measure, monitor, and encourage resilience**

   The role of risk engineering is becoming increasingly important within national public assets and infrastructure strategies for disaster risk financing.i Risk-engineering teams within specialist insurers and intermediaries—who work in partnership with the asset owners—can assess, record, and prioritize factors that influence the level of vulnerability of those assets and their operation across a wide range of physical, maintenance, managerial, and safety issues.

   This approach enables the development of comprehensive risk-reduction strategies for critical assets to improve resilience. The level of physical (e.g., retrofitting or other physical resilience measures) and operations-and-maintenance resilience that protect those assets against failure or shock damage can then be represented within the insurance pricing mechanism. The specialist insight provided by expert risk engineers, either within insurers or specialist intermediaries, can be captured within catastrophe models by altering the vulnerability functions applied in appropriate ways, either through use of model vulnerability modifiers (see chapter 3) or use of damage functions in models that enable this approach. Resulting loss estimates can therefore reflect aspects of improved resilience.

B. Creating better data to represent the nature of assets and their resilience to disaster risks

1. Adoption of consistent open-exposure data standards to improve suitability of asset data

A key innovation within the catastrophe modeling field has been in the development of open data standards for exposure representation. The availability of accurate data that reflect the physical and operational characteristics of assets can influence the price and availability of insurance or other financial risk transfer products. The open-exposure data standard (developed through the Insurance Development Forum, OASIS LMF, and Nasdaqii) provides a clear and open access data format that can be used to structure the capture of key attribute data in a consistent and model-ready format. This format will be particularly important for modeling and risk management of assets at a regional, multinational scale.

By combining exposure data standards, risk-engineering approaches, and consistent climate-conditioned catastrophe modeling, a framework for analyzing the complexities of public assets risk assessment and insurance pricing can now be properly addressed and used to develop strategies at the national and regional scales for insurance and disaster risk-financing options. However, the creation of consistently accurate exposure and vulnerability data is the most important development. Capturing risk-descriptive data within centrally managed databases about public assets that can be applied to insurance modeling provides the most valuable component of regional risk transfer for public assets. For example, in Indonesia, the SIMAN database provides a key data source for the ABMN public assets insurance program (see SEADRIF 6th webinariii). It also provides the base for a future fully integrated risk-management and insurance system, thereby enabling both risk pricing and claims management.

2. The exploitation of geospatially referenced and valuation data (see also article 2)

The growth in new sources of earth observation (EO) and other geospatial data provides new sources of natural and built environment datasets to support improved model development. EO is also used for near-real-time event monitoring. This source of hazard and risk information is increasingly relevant to insurance product design and structuring (for example, in the derivation of improved catastrophe triggers for parametric risk-transfer products). Improved calibration and validation of models using EO and other sources will further increase model confidence and suitability, particularly to improve capture of local or regional hazard and exposure characteristics.

C. Developing the next generation of physical climate and disaster risk models to provide forward-looking estimation of both sudden catastrophe and slow onset climate hazards within the context of infrastructure lifecycles

1. Improved representation of current and future physical hazards (both shock and slow onset) using globally consistent hazard models

A new phase in catastrophe modeling and associated analytics is harnessing (a) new data and modeling approaches, (b) improved computational power, and (c) local data to produce models that can better represent the risk to assets both under present climatic conditions and

under possible future states. The recent development of the first globally consistent hazard models can account for possible future climate conditions by incorporating parameters that can represent scientific consensus on global and regional climate trajectories (such as the various representative concentration pathway scenarios that are produced under the Coupled Model Intercomparison Project (CMIP6).

The ability to represent expected changes in hazard frequency and severity under various climate scenarios is now being provided for flood and other hydro-meteorological hazards. For example, the global flood model produced by JBA Consulting enables various hazard and vulnerability parameters to be modified to represent changing climate conditions. Other modeling suppliers are developing national-scale hazard models, including for perils such as wildfires, and they will include potential increases in geographic distribution, frequency, and severity of wildfire under climate change.

Open source and open access data and models, such as the STORM stochastic tropical cyclone dataset and the OASIS Loss Modeling Framework, are providing increased access and capacity to create globally and regionally consistent hazard models—particularly with the input of local scientific and research institutions that can improve model representativeness and can provide better calibration against regional hazard characteristics.

2. **The application of scenario modeling to support strategic decisions against potential future states**

As well as using fully developed catastrophe models, the use of integrated climate-risk scenarios enable risk-transfer strategies to be developed that will take account of a wide range of potential futures across socioeconomic, geopolitical, policy, and natural systems. Those scenarios reflect different possibilities of climate change impacts, which will affect every aspect of public asset and infrastructure insurance on both the risk and investment sides of the insurance balance sheet.

The scenarios can be used by decision-makers to undertake "what-if" risk assessments while exploring different external and internal assumptions and parameters of the future. These risk assessments identify potential implications for long-term infrastructure investment and construction strategies.

"Heatmap" and risk indices of acute and chronic climate hazard risks can be generated for the different scenarios (for example, at 5- or 10-year intervals up to year 2100). The scenarios can be applied to understand how changes in hazards and vulnerabilities over asset lifecycles may impact the price of risk and may inform long-term strategies for investment and design of infrastructure to include resilience measures.

Notes and sources:

i. Risk Engineering Society in Australia, https://www.engineersaustralia.org.au/Communities-And-Groups/Technical-Societies/Risk-Engineering-Society.
ii. NASDAQ, "Open Exposure Data," https://www.nasdaq.com/solutions/open-exposure-data-oed#:~:text=Open%20Exposure%20Data%20(OEDTM,of%20the%20Oasis%20financial%20module.
iii. Southeast Asia Disaster Risk Insurance Facility, https://cdn.financialprotectionforum.org/sites/default/files/SEADRIF%20Webinar%206%20-%20Country%20experience%20final.pdf.

Trends in the Insurance and Risk-Transfer Mechanisms

The scale and complexity of the risks faced by national and regional public assets require structured insurance products that can deliver rapidly the required financial compensation against potentially catastrophic losses to a wide range of assets. In addition, new products are needed that can provide compensation for critical service disruption impacts (for example, a power outage). Faster and more effective claims payments after an event are also important—especially after a large-scale event that affects large numbers of assets and potentially produces multiple claims over a wide geographic area.

Many components in the insurance toolkit are well known and well proven, but innovation in technology, data, and modeling has led to more sophisticated products that are targeted at the needs for affordable and stable pricing and at certain and rapid claims payments. Examples include (a) using parametric products where speed of settlement is important, (b) having multiyear coverages that provide certainty of cost and coverage, and (c) creating pooling or collaborative purchase arrangements to lower costs and reduce exposure to market price shocks. Hybrid approaches are increasingly explored (for example, designing a product with indemnity and parametric elements or using remote-sensed loss adjustment with an indemnity product to speed and simplify claims settlement).

Budget certainty is a concern of governments, and one mechanism to manage budget certainty is to create a special-purpose insurance company, which is often partly capitalized with donor finance (see chapters 5 and 6). Examples of such schemes at a regional level (see chapter 6) include the Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company (CCRIF SPC), the African Risk Capacity (ARC), the Pacific Catastrophe Risk Insurance Company (PCRIF), and the Southeast Asia Disaster Risk Insurance Facility (SEADRIF). Other schemes are mooted in Central Asia, and pilots are underway to expand the concept to other regions and within countries (i.e., the state, province, or city pools).

Another way to hold pricing levels and to ensure the continued availability of insurance—after a large loss event or market shock—is to buy multiyear coverage. Such coverages are uncommon but not unknown in non–life insurance. Multiyear insurance is routinely offered by the capital markets through instruments called catastrophe bonds (see chapter 5). There interactions between the insurance, reinsurance, and capital markets are growing. Many large insurers and reinsurers have capital market arms, many capital market catastrophe funds have insurance operations, and several large reinsurance brokers can access to both markets.

The main advantage of multiyear protection is the certainty of coverage for a set price over a normally three- to five-year term. However, that advantage comes with a higher premium. Because insurers are unable to adjust their underwriting after a loss event in a multiyear coverage, they will typically charge higher premiums to compensate for that increased risk. Capital market products will also come with high transactional costs and typically with a higher risk premium than will traditional insurance. They do offer price and coverage certainty after a market price shock, such as COVID-19, or after an asset price crunch that impacts insurance availability and cost. However, they do not protect against post-loss price and coverage volatility. Unlike traditional insurance, which typically can be reinstated for an agreed fixed price within the policy period, catastrophe bonds tend to be single shot. When coverage is exhausted, a new bond needs to be issued, which leads to possible gaps in coverage and to exposure of a pricing risk when underlying risks are re-evaluated after a loss event.

The advantages can be largely gained and the disadvantages defrayed by using both markets in the placement, by targeting capital markets where the investor's appetite offers the best return, and by using reinsurance markets to put down lower price markers that will guide capital market pricing. The use of a market neutral structuring and placement advisor is crucial. Innovative structuring can also be used. An example is the reinsurance arrangements for the New Zealand Earthquake Commission where overlapping multiyear insurance coverage smoothed any post-loss price increases after the Canterbury earthquakes of 2010–2011.

Case Study

New Zealand Earthquake Commission

More than 20 years ago, the reinsurance broker-advisor of the New Zealand Earthquake Commission (EQC) recommended coverage from overlapping multi-year insurance. The general intent was to manage pricing volatility where only a set proportion of the program expired each year. This approach means that in sudden hard-market cycles, the EQC would not be exposed to the entire program that is subject to those hardened market terms. In any one year, the following would happen:

- As per most catastrophe insurance, 25 percent of required coverage was purchased on a single-year basis.
- Next, 25 percent of coverage was placed on a three-year term, with pricing fixed and coverage reinstated. One guaranteed reinstatement would occur within each policy year with coverage fully reinstated at the start of each new policy year in the three-year term.

- Then, 25 percent of the coverage would roll over from three-year coverage placed the year before.
- Finally, 25 percent of coverage would roll over from the three-year coverage placed two years before.

The structure meant that 50 percent of the program was requoted every year. This change defrayed reinsurers' concerns that they were locked into coverage over a three-year term, but it also helped EQC because reinsurers were allowed to participate in the annual reinsurance only if they also wrote the multiyear at the same terms. This approach meant that the overall pricing was comparable with a traditional single-year cover.

Over much of the period, the reinsurance market was soft (i.e., prices were reducing); however, its value became clear after the losses in Canterbury in the 2010 to 2011 policy year. In the following year, 50 percent of coverage was guaranteed at a fixed price and was unaffected by the loss. Although price levels for the expiring percentage of the coverage increased significantly post loss as reinsurers re-evaluated the risk, overall pricing increases were halved for 2011 to 2012. In subsequent years, the active and expiring multiyear covers put down a price benchmark that helped prices moderate quickly.

8.5.

Article 4: Systems Mapping and Criticality Analysis of Infrastructure Systems

Context

Historically, the focus of financial protection of public assets has been on protecting individual infrastructure and buildings (e.g., roads, hospitals, power plants, or government buildings). Recently, there has been increased recognition of the importance of considering the resilience of infrastructure systems as a whole, as well as the critical services that they provide (e.g., transportation, health care, energy, and administration). This focus has implications for the way we think about financial protection—shifting from protecting individual assets to ensuring that finance is available to guarantee the continuity of critical services.

Many public assets are also critical infrastructures (i.e., assets, systems, and networks that provide essential services for the security of a nation, its economic prosperity, and the health and safety of its citizens). Those services—such as energy, transport, and water—constitute the backbone of modern interconnected societies. To deliver those and other public services requires a well-functioning critical infrastructure system: (a) multiple physical assets connected in a network (e.g., roads, hospitals, power plants), (b) people, and (c) inputs (e.g., raw materials, fuel, electricity). Disruption to critical infrastructure can cause major adverse economic effects and significant harm to the well-being of citizens, especially the poor and vulnerable.

Better information and analytics can inform decisions at each step from planning to triggering action to implementing plans. *Systems mapping* provides the user with an ability to map and explore complex systems; to communicate understanding; and to allow for identifying knowledge gaps, intervention points, and insights. *Criticality analysis* is an approach that is increasingly being used in many countries to strengthen operational preparedness and resilience through identifying (a) the infrastructure that is most critical to the continuity of a service and (b) the critical points of failure in a system. Criticality assessment considers, for example, the *dependency* of the service on particular assets, inputs, or networks in terms of the amount of population served and the economic value of disruption to infrastructure, as well as the interconnectedness, resilience, and vulnerability to shocks. Different parts of the system will be exposed to different disaster or weather impacts. Vulnerability assessments and stress-testing can identify weak points where potential failures are likely to happen and to define the potential financial impacts under different scenarios.

Through better information and analytics, governments can also implement pre-arranged contracts and other forms of contingency planning, by identifying potential weak points or prioritizing critical assets. This provides greater clarity in the immediate aftermath of a disaster on how to allocate resources and finance. Additionally, improved analytics about future risks of climate change can also inform reconstruction activities after the disaster events, specifically to build back better and to incorporate future-proof features.

Case Studies

Vietnam

The World Bank worked with the government of Vietnam in 2016 to conduct critical analyses that would help inform strategies to strengthen the resilience transport networks. The livelihoods for a growing and rapidly urbanizing population

in Vietnam depend on reliable transport, energy, and water systems for their continued economic prosperity. A tool was developed to analyze and prioritize transport resilience that is based on spatial criticalities and risks, as well as on potential benefits of adaptation options. This tool included estimating the potential direct damages and people affected in instances of systems failure, as well as the infrastructure most critical to the provision of services.

A series of models was created and was based on geospatial data that detailed physical properties such as the lengths, conditions, and widths of transport network assets. From this outline, a framework based on a system-of-systems methodological approach was designed to analyze the transport multi-hazard risks for Vietnam from 2016 hazards and from future climate scenarios. Certain locations in the networks were identified to be at high risk for specific hazards and are systemically critical. The project estimated that the failures of critical road networks can result in high daily losses of up to US$1.9 million per day, while critical railway failures can result in losses as high as US$2.6 million per day. Those types of assessments use asset data—as described by the 2017 guidance note by the World Bank and the Asia-Pacific Economic Cooperation.[32] The assessments also include additional information about the value of services they provide and can model the interconnectedness between different assets. Such assessments can inform the prioritization of resilience measures, as well as identifying the residual risks that need to be managed through financial preparedness.

United Kingdom[33]

In 2018, the UK National Infrastructure Commission started a series of work to examine the resilience of the UK's infrastructure, which explored how the UK's economic infrastructure has been resilient to shocks and stresses over recent years. It also examined the steps needed to maintain a resilient system: (a) having a proactive approach to resilience and (b) facing up to the possibility of different or harder challenges in the future. Multiple streams of evidence were developed as part of the process; among supporting evidence were these:

- **A system mapping analysis.**[34] The analysis explored how national-level decisions (such as policies, incentives, markets, and other factors) influence levels of service in the water, energy, road, rail, and digital sectors. The study

32 "Report: Financial Risk Management of Public Assets against Natural Disasters in APEC Economies," World Bank Technical Contribution to the APEC Finance Ministers' Process, 24th Finance Ministers' Meeting, Hoi An, Viet Nam, Asia-Pacific Economic Cooperation, World Bank Group, 2017, http://mddb.apec.org/Documents/2017/MM/FMM/17_fmm_009.pdf.
33 National Infrastructure Commission, "Summary," Resilience, https://nic.org.uk/studies-reports/resilience/.
34 National Infrastucture Commission, "System Mapping for UK Infrastructure Systems Decision Making," 2020, ARUP, National Infrastructure Commission, 2020, https://nic.org.uk/studies-reports/resilience/system-mapping-for-uk-infrastructure-systems-decision-making/.

aimed to better understand how decisions relevant to resilience are made in practice and which ones have the greatest significance. Decision-making factors include (a) policy (if about water, what the government's strategic policy for water would be), (b) regulatory action (how water prices are set), (c) markets (how wholesale and retail water markets work), (d) service provision (what the operation and maintenance activities are), (e) emergency service provision (how operators and governments plan for major incidents), (f) customers (domestic, commercial, and industrial water customers), and (g) level of service (reliability of supply and water leakages).

- **A pilot system analysis of interdependent network vulnerabilities.**[35] The analysis covers the development and test of an approach to understand the main vulnerabilities in the interdependent networks dealing with multisector infrastructures. It also draws out vulnerabilities that arise from network architecture. The pilot uses network modeling techniques to capture functional dependencies—dependencies where one asset relies on another to function—between the assets in the water supply, rail, strategic road, electricity, and telecoms sectors. The approach models how failures could cascade through the cross-sector system and determines the scale of the impact of disruptions in terms of both the proportion of the population affected and the size of the economic impact.

Implications

The World Bank's Disaster Risk Finance and Insurance Program is working with experts across academia, the World Bank's international groups, and governments globally to explore how to integrate such tools within approaches to designing strategies for national financial protection that will manage the fiscal risks associated with disruptions to services and for protection of the economy and population. A focus on critical services, as well as on individual assets, also provides an opportunity (a) to bring in wider risks to the strategy in a well-bounded and practical way and (b) to build toward a whole-of-government, integrated, risk-management approach. In addition, where finances are constrained, a critical services approach helps ensure that limited financial resources for self-insurance or insurance premiums are being spent on the most urgent priorities. One important step would be to conduct systems mapping and analysis that would assess the potential fiscal impact from disruptions to critical services.

35 National Infrastructure Commission, "System Analysis of Interdependent Network Vulnerabilities," UK Infrastructure Transitions Research Consortium, National Infrastructure Commission, 2020, https://nic.org.uk/studies-reports/resilience/system-analysis-of-interdependent-network-vulnerabilities/.

8.6.

Article 5:
Privacy Preserving Analytics of Aggregated Data to Support Risk Management and Disaster Prevention

Overview

Climate-related risks are relatively new, potentially extreme, and rapidly changing. The COVID-19 pandemic has shown the deficiencies in risk management and prevention in an environment where data collection, sharing, and analytics are non-existent (e.g., such as collection of coronavirus symptoms and cases or sharing of medical and insurance data). The global cost to lives and economies is immeasurable.

Similarly, climate-related risk management and disaster prevention require vast amounts of new data from public and private sources (e.g., damages to households from hurricanes, increase of flood-related insurance claims, or impact of weather on the food supply chain). Relevant data are increasingly being captured by both the private and the public sector. However, privacy and data localization restrictions stand in the way of analytics about aggregated data sources. In particular, many countries have stringent restrictions on how data users should collect, handle, and use personal data while protecting an individual's privacy preferences and personally identifiable information.

Better information and analytics can inform decisions at every step, from observing to planning to triggering action and to implementing plans. Technological advances in privacy enhancing techniques provide the public sector with the ability to access aggregated data without compromising privacy or increasing risks (e.g., algorithms travel to the data to extract patterns). The actual data never moves—only the learnings from the data.

36 RegulAItion, "Cross-sector Consortium to Deliver AI-Driven 'Data Access Platform' for Regulated Industries," 2020, https://regulaition.com/2020/07/27/air-platform-launches/.

37 Recent advances in technology have proven that data anonymization does not remove the risk or re-identification, https://www.nature.com/articles/s41467-019-10933-3/. Recent studies have demonstrated that cybersecurity attacks in the first half of 2020 have already exceeded the total number of attacks of 2019, Intelligent CISO, "New CrowdStrike Report Reveals More Cyberattacks in the First Half of 2020 than 2019, 2020, https://www.intelligentciso.com/2020/09/17/new-crowdstrike-report-reveals-more-cyberattacks-in-the-first-half-of-2020-than-2019/.

By systematically providing data access through a technology platform, governments can create an ecosystem of interconnected parties that leverage each other's data to deliver value for everyone. The AIR Platform is a public-private, cross-sector collaboration funded by the UK government[36] to deliver a data collaboration ecosystem. By deploying next-generation technologies,[37] the AIR Platform enables data access without data sharing, without data transfer, and without data aggregation. Data remain in the secure servers of each data holder. A pre-agreed and prescreened algorithm travels to the data and extracts a pattern of behavior without revealing any personally identifiable information. This approach significantly reduces the risks of data breaches.

The AIR Platform is a technology infrastructure that does the following:

- Amplifies and supports efforts of the public sector in all areas, ranging from risk management to the fourth industrial revolution[38]
- Identifies data correlations that support effective policy creation
- Supports holders of large datasets who want to develop next-generation products and services (risk management, development of resilient sources of revenue, and transformation)
- Stimulates the economy by attracting technology companies that want to develop next-generation technology products and platforms (such as climate-related artificial intelligence tools)

Critically, governments can work collaboratively on shared risks (e.g., diminishing the shared water resources) before those risks crystallize.

Through a single-technology platform, governments can derive new insights from aggregated private and public data without moving, pooling, or disclosing data, thereby overcoming data localization regulation and cybersecurity risks. The platform allows data holders, academics, and private companies to execute and enforce programmatically their bilateral or multilateral agreements, thereby overcoming the usual time-consuming and expensive exercise of data sharing and analytics. Every interaction with the data is captured, thus making every computation verifiable and auditable. This feature the ability to explain powers algorithm and the development of responsible artificial intelligence.

38 Klaus Schwab, "The Fourth Industrial Revolution: What It Means, How to Respond," World Economic Forum, 2016, https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/.

Case Studies

Insurance Group in Southeast Asia

The public sector gathers workforce information from the private sector (e.g., worker name, date of birth, employment start date). Insurance companies have claims information from their private-sector clients (client industry, client size, client workforce size). Although the public sector may retain a centralized database, each insurance company has access only to its own data. The public sector and the private sector do not share claims-related data with each other. The insurance industry knows that there is a correlation between a corporate organization's average workforce age when compared to the average cost of claims by industry. However, those in the insurance industry cannot reveal this correlation accurately without access to the public data and to each other's data.

Revealing this correlation will help insurers build better pricing models (even a less than 0.5 percent improvement results in a cost reduction of millions of US dollars), provide proactive risk management advice to businesses (such as recommending measures to be taken on construction sites that typically will lead to a percentage reduction of workplace accidents), and ultimately reduce workplace fatal injuries to achieve or exceed international recommended standards (which is less than 1 death per 100,000 workers).

The AIR Platform is a mechanism for all parties to make their private data accessible to algorithms and to learn patterns from their data without ever sharing that data with each other (high risk of compromising data privacy) or aggregating the data into one location (high risk of compromising data security).

Isle of Man

The government of the Isle of Man has committed to achieving net zero emissions by 2050. It has implemented a multiphase action plan and committed to a range of actions. One action is to reduce household emissions from the heating of buildings, which contributes 35 percent of the country's emissions. The estimated cost to the government for reducing emissions by 10 percent is £112million (over a 10-year period). Typically, the government would (a) fund a five-year project to assess the likely contributors of high emissions (such as gas boilers), (b) develop hypotheses of the actions to be taken (e.g., provide grants to households to change their gas boiler, or grants to better insulate households), (c) disburse subsidies, (d) verify the use of subsidies, (e) capture existing emissions data (two-year retrospective emissions data), and then (f) observe changes in emissions post-implementation of the strategies (another two years of retrospective observation). This process is long, expensive, and uncertain.

By using the AIR Platform, the government is able to confirm its hypothesis and to model the expected benefits over a period of 12 months. It can then take required corrective action—and all for a fraction of the price, for one-fifth of the time, and with a significant risk reduction. The government achieves this savings by selecting a sample of households, by deploying IoT sensors to capture household emissions before the experiment, by making different changes to sample households (changing gas boiler in some, insolating homes in others), and then by studying the impact on household emissions for 365 days through all types of weather. All data are captured in real time. All data are kept private at all times. The government agency does not centralize the data, thereby reducing a potential risk to data security.

Implications

The COVID-19 pandemic has accelerated our adoption of digital services. Information gathering and management will continue to drive the proliferation of IoT devices. Data will continue to grow exponentially. Advances in data technologies (algorithms for complex analytics and modeling, privacy preserving data access, and IoT data capture) provide an opportunity for integrated risk management and for improved, real-time decision-making that can enhance opportunities and can mitigate downside risk for governments. Supporting the development of a data access infrastructure that is regulatory compliant is a critical foundation for extracting value from data.

8.7.

Future Outlook — Rising Risks from Climate Change and Increased Focus from Regulators about Reporting on Climate, Environmental Risk, and Disaster Risk

Overview

As climate change drives increasing intensities of extreme events, as well as particular risks to coastal and flood-prone areas, risks to government-owned infrastructure assets are increasing. The benefits of understanding risk, investing in resilience, and ensuring strong financial protection are growing. In addition, as the pressure on climate change action increases globally, there has been an emergence of voluntary initiatives and mandatory regulations concerning the disclosure and reporting about risk and resilience actions.

One area is the increasing pressure by asset owners for transparency about managing climate and disaster risks. Although much attention has been on private-sector owners and investors to date, this focus has increasingly moved toward sovereign wealth funds and pension funds (including public-sector pension funds), as well as toward governments as the owners and investors of assets and infrastructure. Countries such as Japan, Singapore, and the United Kingdom, for example, are imposing greater reporting requirements on public-sector asset owners and operators in order to better understand their exposure to climate-related risks.

Increased disclosure of risks is a core enabler of action. Through enhanced measurement and reporting of risks, governments can spur increased investment in resilience and adaptation not only for the public sector but also across all actors. Government departments are able to learn from each other in terms of risk exposure and risk management. The private sector and businesses also will benefit with greater transparency, which benefits the business and investment environment.

Case Studies

Task Force on Climate-related Financial Disclosures Impacts on the Public Sector and Sovereign Wealth Funds

In 2015, the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD) was set up.[39] It was led by the former governor of the Bank of England, Mark Carney, and by the former mayor of New York City, Michael Bloomberg. Since then, the TCFD has developed voluntary and consistent disclosures about climate-related financial risks for use by the private sector in order to provide information to investors, lenders, insurers, and other stakeholders. The TCFD considered what physical, liability, and transition risks were associated with climate change and what constitutes effective financial disclosures across industries.

Although a private-sector initiative, the TCFD and its effects have spilled over into public-sector and government-linked entities, such as sovereign wealth funds. In the United Kingdom, the Bank of England issued its own climate disclosure. The UK's Green Finance Strategy also included a range of commitments by public bodies as the government aims to lead by example.

39 Financial Stability Board, "Enhancing Climate-related Disclosure by Cities: A Guide to Adopting the Recommendations of the Task Force on Climate-related Financial Disclosures (TCFD)," FSB-TCFD, 2019, https://www.fsb-tcfd.org/about/, and Chartered Professional Accountants Canada, "A guide to adopting the TCFD recommendations for cities," https://www.cpacanada.ca/en/business-and-accounting-resources/financial-and-non-financial-reporting/sustainability-environmental-and-social-reporting/publications/tcfd-guide-for-cities.

In Canada, many cities are starting to use the framework to report on climate risks; for example, Vancouver was the first Canadian city to include disclosure guided by TCFD principles in its annual financial report. The city disclosed various public policies to manage climate risks and the impacts on a city's financial planning. Moreover, in its five-year financial plan, which is available publicly, the city now discloses the contingency costs for unforeseen events, such as public emergencies and issues related to climate change or to unusual weather events.

Sovereign wealth funds—including some of the world's largest in Asia such as the government of Singapore's Investment Corporation and Japan's Government Pension Investment Fund—are also conducting climate-related risk analysis and are reporting in alignment with the TCFD.

UK Adaptation Reporting Power (ARP)

Since the establishment of the Climate Change Act 2008 in the United Kingdom, the Adaptation Reporting Power has taken effect; it mandates a number of organizations that will provide functions of a public nature (called reporting authorities) and will produce reports about what the United Kingdom is doing to adapt to climate change.[40]

Reporting authorities must prepare and send to the central government reports containing (a) an assessment of the current and predicted impact of climate change in relation to the reporting authority's functions and (b) a statement of the reporting authority's proposals and policies for adapting to climate change in the exercise of its functions and of the timescales for introducing those proposals and policies. The reports include organizations that are responsible for important services and infrastructure such as the road and rail operators, the power sector, the water companies, and the airport and port operators. Additionally, many government regulators and public bodies are also subject to the reporting requirements.

The ARP is currently in its third round of reporting, with increasing participations in each round. Evaluation after the second round[41] revealed that reporting organizations derived good value from both the reporting process and the availability and use of those reports. The added value ranged from further raising awareness, consolidating information about climate change adaptation activities,

40 Department for Environment, Food, and Rural Affairs, United Kingdom,, "Adaptation Reporting Power: Frequently Asked Questions and Answers," 2011, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/182636/report-faq-110126.pdf; United Kingdom Government, "Climate Change Adaptation Reporting: Third Round," policy paper, 2018. https://www.gov.uk/government/publications/climate-change-adaptation-reporting-third-round.

41 R. B. Street, V. Hayman, and T. M. Wilkins, "Understanding the Value of the Adaptation Reporting Power Process to the Reporting Organisations Involved," UKCIP (Oxford, United Kingdom: University of Oxford. 2017.

and promoting discussions about climate risks and adaptation in the organization, as well as within and across sectors. Reporting organizations also developed interest in using the information to track their progress, share and learn from good practices, and support improved understanding of dependencies and interdependencies with other agencies.

Implications

The trend for greater transparency concerning risk management for climate disasters is continuing for asset owners and operators. On the one hand, there is increasing pressure for governments to provide greater transparency about how they are managing their public assets, plus their financial exposure to climate and disaster-related risks. On the other hand, more resources are available to support governments in the process, to learn from private asset managers and operators, to use similar and relevant frameworks, and to establish good practices for risk management.

By taking ownership of an intergenerational risk early, governments position themselves to effectively manage adaptation over the longer term and to plan interventions that are based on the proximity of risk and the time value of money.

Worksheet for Chapter 8

Test your understanding of the chapter, and record your insights through this worksheet!

Activity 1.
Can you match the terms listed with their definitions or descriptions?

Terms	Definitions
Internet-of-Things (IoT)	It refers to the process of gathering, storing, organizing, and analyzing very large data sets such as those collated from smart devices.
System Mapping	The concept that objects (in this case, public assets) may be embedded with smart devices and data connectivity to allow them to be monitored or controlled remotely—typically through the internet.
Stress Testing	It provides the user with an ability to map and explore complex systems; to communicate understanding; and to allow for the identification of knowledge gaps, intervention points, and insights.
Big Data	It can identify weak points where failures are likely to happen, as well as the potential financial impacts under different scenarios.

Activity 2.
Identify whether the following considerations are an advantage or challenge in the overall program management, including the activation, renewal, and claims stages.

#	Relevant Initiative
1.	
2.	
3.	

Activity 3.
Identify whether the following statements regarding key considerations for effective claims management are true or false.

	Statement	True	False
1.	Emergence of mandatory regulations, as a result of climate change risks, are imposing greater reporting requirements only on private-sector asset owners.	☐	☐
2.	Vulnerability assessments can identify weak points where potential failures in a system are likely to occur.	☑	☐
3.	Services such as uninterrupted water supply and seamless telecommunication require well-functioning systems for critical infrastructures.	☐	☐
4.	Criticality analysis provides the users with an ability to map and explore complex systems, to communicate understanding, and to allow identification of knowledge gaps.	☐	☐
5.	Using the Internet of Things and big data within the insured assets can help in overall risk management.	☐	☐
6.	Climate-related risk management and disaster prevention require vast amounts of relevant data that are increasingly being captured by the private and the public sector.	☐	☐

Activity 4.
Reflections

[a] My top three takeaways from this chapter are these:

[b] Three concepts or ideas I would like more information about are these:

GLOSSARY

Actual Cash Value (ACV) Depreciated or fair value, which is equivalent to reinstatement (replacement) cost minus depreciation.

Accuracy (of data) The degree to which the result of a measurement, calculation, or specification conforms to the correct value or a standard.

Adequacy (of data) Being sufficient for the purpose concerned.

Adverse selection Adverse selection occurs when individuals or organizations that know they present particularly poor risks take out insurance and those that know they are much less at risk of needing insurance do not purchase it.

Aggregate (loss or limit) The maximum payout in an insurance policy, irrespective of the number and amount of claims.

Annual average loss (AAL) AAL is the mean loss expected annually to an asset or collection of assets. It forms part of insurance pricing and is known as the pure premium.

Artificial intelligence Artificial intelligence (AI) or machine learning is the simulation of human intelligence processes by machines, especially computer systems. In asset management, AI can be used, for example, to support portfolio management that involves monitoring or building a portfolio with specific risk and revenue characteristics.

Asset Something that has potential or actual value to an entity.

Asset management Asset management enables an organization to realize value from assets in the achievement of its organizational objectives.

Asset management system An asset management system is used by the organization to direct, coordinate, and control the asset management activities.

Attachment The monetary level of a loss at which the insurance will apply. It usually defines the point where coverage begins (a retention, deductible, or excess).

Attribute (of data) This specific data field in a database or *schema* describes a particular characteristic of an asset, such as its primary use (or occupancy)

Averaging This process is used by *Insurers* to proportionally reduce claims payments if the actual value of the asset(s) insured is higher than the value stated on the insurance policy. Averaging may be applied as a matter of insurance law in some countries but in others may require the inclusion in the policy of a special clause.

Basis risk The risk associated with *Parametric insurance* and Catastrophe bonds that the underlying model does not match the actual loss incurred, leading to the possibility of a mismatch between the payout and the actual losses. This includes (a) the insured does not receive a payout (or a lower payout) in spite of actual losses (negative basis risk) or (b) the insured receives a payout (or a higher payout) despite no actual losses (positive basis risk).

Binding or bound The situation where insurance coverage is in place although a policy has yet to be issued.

Broker (intermediary) A specialist commercial advisory and advocacy agent acting on behalf of the insured to negotiate the best coverage and terms for the assets at risk. Services include analytics, legal wordings, claims services, and transactions.

Building information modeling (BIM) BIM is the process of generating and managing building data during an asset's design, construction, and life cycle. Typically, the process uses three-dimensional software for building modeling that will increase productivity of consultants and contractors during the asset's whole life cycle. The process produces the BIM database, which encompasses building geometry, spatial relationships, geographic information, quantities, and properties of building elements.

Buildings TIV Total *insurable value* for buildings is the reinstatement or rebuilding costs to replace the structure if it is totally destroyed. TIV should include estimates for materials, labor, and any reasonable fees or costs associated with reconstruction including the cost of clearing the site. It is the same as *Rebuild value*.

Consequential damages (or consequential loss) Consequential damages insurance is for the loss of income (also called either loss of profits or business interruption) for a specified time after direct damage or disruption to the property affected. The coverage can include risks such as loss of access caused by damage to other property.

Consequential damages TIV This *Total insurable value* is related to loss of income covered under a consequential damages policy. It is related to the time limit on the policy (the business restoration period).

Business restoration period This period is stipulated in the policy as the limit for calculating the loss of income, commonly 6, 12, or 24 months.

(Underwriting) Capacity The largest amount of insurance or reinsurance available from a company or the market in general, and is based on capital, provisions and reinsurance or retrocession arrangements.

Capital partners These partners or entities have contributed capital or placed capital at risk on agreed terms and conditions.

Captive An insurance company wholly owned and controlled by its insureds as shareholders. *Captives* are used to reduce external administrative fees, to self-insure certain risks, and to obtain access to reinsurance marketplace.

(Risk) Carrier This insurance company that bears the risk under the terms and conditions of the policy it has issued.

Catastrophe A single event or the aggregation of several events, in a specific time period (e.g. one year) which can cause widespread damage at several units of risk. It is often a disaster caused by natural hazards but it can also be human made, such as a nuclear explosion.

Catastrophe bond The high-yield debt instrument defaults on the occurrence of a defined catastrophic event and so provides funds for issuers such as insurance companies.

Catastrophe insurance Special clauses include the definition of *Event* and the *Hours clause*. Catastrophe insurance is often an addition to a normal insurance policy covering direct damages.

Catastrophe model A computational analytical approach combines hazard, vulnerability, and property portfolio data used to quantify and manage the risk from extreme events across their portfolio of insureds. It is usually licensed from specialist catastrophe modeling companies.

Cedant (or the reinsured) An Insurer passing part or all of the risk it has accepted to a reinsurer, either on a single policy (*Facultative reinsurance*) or on an entire portfolio of policies (*Treaty*).

Claim A formal notice and request for compensation by an insured to the *Insurer* or from a *Cedant* to a reinsurer under the terms of the policy between them.

Co-insurance or co-payment (for the insured) This is the proportion of a claim an insured must pay, as agreed on the policy or by way of enforcing an average.

Co-insurance (for the insurers) When several insurance companies share the insurance of a single unit of risk, each with a specified portion.

Compliance The process of ensuring that Insurers are operating within the requirements stipulated by regulators and the law. Compliance processes are both external and internal to the insurer.

Consortium A contractual arrangement under which insurers or reinsurers delegate authority under the terms of a binding authority agreement to the *Lead insurer* to enter into contracts of insurance on their behalf.

Construction class A key attribute (often based on standard code systems) describes the structural characteristics of the asset, such as its primary building material and method plus the link to specific vulnerability functions.

Constructive total loss In this situation, an asset is completely unusable despite not being totally destroyed (e.g., a building that is unsafe to occupy but is still intact). Insurance policies may include or exclude deeming such assets a total loss for claims purposes.

Contents TIV The total insurable value of all nonstructural assets contained within the structure.

Contingent capital These funds would be available under a pre-negotiated agreement if a specific contingency (such as a disaster caused by natural hazards) occurs or a threshold is crossed.

Contingent liability A liability which may or may not materialize in the future.

COPE Construction, occupancy, protection, and exposure (COPE) is an insurance underwriting term for the primary risk modifiers and values at risk.

Cover, or coverage The amount of risk (usually financial) transferred to the *Insurer* such as the sum insured. It also refers to the hazards that are insured (e.g., fire, earthquake, typhoon).

CRESTA Catastrophe Risk Evaluation and Standardizing Target Accumulations (CRESTA) is an industry body providing standardized geographic accumulation zones that are used for underwriting and risk aggregation assessments. The acronym is also used to describe geographic zones used in a particular country by number (e.g., CRESTA Zone 6).

Deductible An amount or proportion of a claim is retained by the *Insured* before any payout. It is also called an Excess.

Deficit The term applies when the financial assets of a risk-financing vehicle are less than its liabilities over a defined financial period.

Event The event is the cause for a claim to be triggered against a policy. The definition of an event and its duration will vary by the type of *Peril* and the terms of the policy.

Excess The amount of a claim that the *Insured* must bear, or a *Deductible*.

Excess loss This type of insurance or reinsurance is subject to a specified limit and indemnifies against all or a portion of the amount of loss in excess of this amount.

Exclusion This policy term removes liability on the Insurer to make a payment for losses of that type. Exclusions may be defined in various ways under a policy.

Expiry In the context of insurance, it is the hour and day that insurance coverage ends (i.e., the policy expires). Many insurance policies offer the option of renewal. Upon renewal of a policy, a new expiration date applies, generally in 12 months.

Exposure The situation or characteristics of the insured assets that could lead to a loss. For public assets, exposure could refer to the character of its structure, its value, and its vulnerability or resilience to the type of peril being considered. Exposure is the extent of the risk, from high to low, but it is sometimes used as a synonym for Risk.

Facultative reinsurance For the reinsurance of policies on an individual basis, neither does the insurer have an obligation to offer a risk nor does the reinsurer have any obligation to accept or decline an offer. See also *Treaty reinsurance*.

Followers or following market Insurers which are part of an insurance consortium, filling the balance of the insurance placements not taken by the lead insurer of the consortium.

From ground up The total amount of insured value covered disregarding Excess, Deductible, or Retention.

Fronting This is an arrangement under which the *Insurer* issues a policy but transfers most or all of the risk to another *Insurer* or a *Reinsurer*.

Full rebuild costs This term addresses costs associated with rebuilding including materials, labor, and all other fees and costs such as land and debris clearance, legal and other professional fees, taxes etc. It should be part of the Total insurable value.

Geocoding This method is used to attach geographic coordinates (latitude and longitude) to assets through inferential matching against specialist databases using address data provided in the property database

Hard market The upswing in an insurance market cycle, when premiums increase and capacity for specific insurance decreases. This approach encourages new entities into the insurance and reinsurance markets, thus turning the cycle toward a soft market.

Hazard This situation determines (increases) the chance of a loss from a given peril. For example, proximity to a floodplain generates a hazard from flooding.

Indemnity The term covers security or protection against a loss or other financial burden.

Indemnity insurance This is an insurance agreement under which the *Insurer* pays for damage sustained by the *Insured* under the terms of a policy. Technically, an indemnity policy places the insured in the same financial position that they were in before the damage occurred (i.e., it takes account of depreciation and obsolescence). A replacement policy repairs or replaces to a condition of "as new", which is an advantage over a pure indemnity policy.

Insurable interest Insurable interest refers to the legal right to insure arising out of a financial relationship recognized by law, between the insured and the subject matter of insurance. Insurable interest is a fundamental insurance requirement which seeks that no party may enrich because of a claim Thus an economic relationship between the insured and the loss being covered is required.

Insured value This is the sum that an asset is being insured for, also described as *Value* at risk. Insured value is used to determine total *Exposure* and is used in premium calculation.

Insurer This is the risk carrier, or the insurance company.

Intermediary Insurance intermediaries facilitate the placement and purchase of insurance, and provide services to insurance companies and consumers that complement the insurance placement process. Most commonly, insurance intermediaries include insurance agents and insurance brokers.

International Organization for Standardization (ISO) ISO is an international standard-setting body composed of representatives from various national standards organizations.

Internet of Things (IoT) IoT refers to the interconnection through the internet of computing devices embedded in everyday objects, thereby enabling those devices to send and receive data. IoT and its industrial version, called industrial IoT, can support asset management by making the system smarter in these ways: by sending alert automatically, by tracking and monitoring the condition of an asset with fewer human interventions, and by creating optimized and dynamic maintenance scheduling.

Lead (insurer) The insurer issues a policy for a *Consortium* or reinsurance panel. Usually (but not necessarily), the lead will retain a larger proportion of the total exposure for a proportionate share of premium.

Limit The maximum amount that an *Insurer* or reinsurer is liable to pay the *Insured* or reinsured under terms of the policy or the reinsurance contract.

Liquidity This is the ease with which an asset or security can be converted into ready cash without affecting its market price.

Loss (claim) The damage or financial impact suffered by the *Insured*. A claim for the loss will be made by the Insured to the *Insurer* under terms of the policy.

Loss adjustment The process of investigating, estimating, and advising about the size of a claim. Usually a loss adjuster, who is an independent third party, is employed by the Insurer.

Loss assessment This assessment is undertaken to quantify and determine the size of claim to be made for a loss to the *Insurer*.

Margin clause This clause applies a pre-set margin over the declared valuation (e.g., 20 percent), and it provides insurance for the actual Sum insured plus this margin in order to cater for variations or additions to the assets insured during the period of insurance. It is used in policies that insure several assets, each with its own *Sum insured*.

Market The term covers the business of insurance reinsurance and capital markets (for insurance-linked securities or ILS). It is used to define the general form of business conditions that exist and that influence the price, capacity, and terms of insurance or reinsurance. Markets can be defined as hard (premium is higher; policy terms are more favorable to the insurer) or soft (premium is lower; policy terms are more favorable to the insured). Market conditions tend to follow cyclical trends.

Moral hazard The term describes an instance in which a *Policyholder* may, because it has insurance, takes more risks or acts in a way that may lead to higher losses.

Mutual In insurance, this is a company owned entirely by its policyholders. This insurance entity is formed as a cooperative to provide Coverage to its members. Any profits earned by a Mutual can be retained within the company, rebated to policyholders as dividends, or contributed to lower future premiums.

Non-proportional reinsurance See also *Proportional Insurance*. In contrast to proportional insurance, in non-proportional insurance, the ceding insurer agrees to accept all losses up a predetermined level. The reinsurer agrees to reimburse the ceding insurer for losses above the predetermined level and up to the reimbursement limit provided for in contact.

Opportunity cost The loss of other alternatives when one alternative is chosen.

Parametric insurance This form of insurance provides a payout that is dependent on the measurement of an underlying index coverage (for example physical characteristics of an event), rather than the direct economic losses suffered by the insured. It is not therefore reliant on actual damages.

Participation (of co-insurers) The share that a particular *Insurer* or *Reinsurer* will take in an insurance Cover. It usually refers to both the risk accepted and the share of premium received in return.

Payout This sum is paid to the *Insured* in settlement of a claim. For indemnity insurance, payout commonly follows a *Loss adjustment* while for parametric insurance it is dependent on the underlying index coverage.

Peril A specific risk or cause of loss is covered by an insurance policy. Risks are such as fire, windstorm, flood, or theft. This event or phenomenon could cause a loss to the Insured. Earthquakes, floods, landslides, wildfires, theft, and explosion are all perils. The precise definition of a Peril in a policy can determine the type of payout to be expected. Some perils may be excluded.

(Insurance) Policy This document records the terms and conditions of the (time limited) contract between the Insured and Insurer.

Policy holder, or Policyholder This is the Insured.

Pool or pooling Under this arrangement, several asset owners combine their interests and insure under a single policy, or they form a single self-insurance scheme

Premium The agreed price that is paid by the Insured to the Insurer for the insurance provided. It may be derived using a rate (percentage) of the value of the insured assets, or it can be expressed simply as a monetary figure.

Pricing A determination of the Premium charged by the Insurer for the insurance provided.

Probable maximum loss (PML) The maximum loss expected to be incurred given the types of perils and hazard being insured. The estimation determines the exposure of the insurer in the event of an unusual (low frequency) event that has a major economic impact (high intensity).

Probabilistic risk Probabilistic risk assesses the likelihood of an event or several events.

Procurement Procurement is the process of finding and agreeing to terms and of acquiring goods, services, or works from an external source—often through a tendering or competitive-bidding process.

Professional indemnity insurance The term covers legal costs and expenses incurred in the defense of a legal action, as well as any damages or costs that may be awarded for inadequate advice, services, or designs that cause a quantifiable financial loss to a party to whom a legal obligation is owed.

Proportional reinsurance A reinsurance agreement under which the reinsurer receives a proportion of premiums and pays the same proportion of claims on the policies covered in the agreement. (See also *Quota Share* and *Surplus Share*.)

Public asset registry (PAR) The PAR database contains specific information about the public assets owned or controlled by an organization.

Quota share reinsurance A *Proportional reinsurance* under which the same proportion is ceded to the reinsurer on every policy. The insurer and reinsurer share premiums and losses according to the same fixed percentage on all policies

Rating The practice of determining the price to be charged for the insured risk.

Rebuild value or cost An estimate of the amount required to reconstruct an insured asset in the event of its being totally destroyed. *Rebuild* should include estimates for materials, labor, and any reasonable fees or costs associated with the reconstruction, including the cost of clearing the site. It determines the total sum insured for the asset and, in association with the rate, will determine the premium charged. (See also *Buildings TIV*, which is the same.)

(insurance) Regulator This entity is authorized to conduct oversight and supervision of *Insurers*, *Reinsurers*, and *Brokers* within a certain market.

Reinstatement (1) With reference to a claim, this is the restoration of property to its condition as new. The value associated with this is called the "Reinstatement value."

Reinstatement (2) With reference to the *Sum insured*, the restoration is to its original value after a claim payout. Claims reduce the sum insured of a policy, and reinstatement is the process of restoring the sum to its original value, often for a premium charge.

Reinsurance The insurance of insurance companies. Reinsurance indemnify insurers for the claims incurred under the policies they issue. In this way, they can cede (lay off) part of the accepted risk so they can reduce claims volatility and protect their capital.

Reserves or provisions In insurance, these funds are set up by an *Insurer* to meet the costs of future liabilities including losses already incurred but not paid, for those incurred but not yet reported (calculated using a formula based on premium income), or for future catastrophe risk.

Residual risk This is the amount of risk or danger associated with an action or event remaining after natural or inherent risks have been reduced by risk controls.

Retention This is the amount that the *Insured* remains liable for after a claim and is therefore not insured.

Return period This period measures the probability of occurrence of a particular Peril (e.g., the 1-in-100-year flood).

Retrocession, or retrocessionaire This is a form of *Reinsurance* for reinsurers.

Risk In insurance, *Risk* can be the chance of a financial loss or the subject of the insurance (e.g., a building). It may also mean *Hazard* or *Peril*.

Risk analytics The services and methods applied to assist in the identification, quantification, and pricing of risk and in the design of insurance and other financial transfer mechanisms. Analytics will include catastrophe modeling, underwriting, actuarial, and exposure specialisms.

Risk appetite The risk that an entity is prepared to retain, pursue, or take (ISO 31000). *Risk appetite* is a matter for corporate governance because it influences the organization's attitude toward risk.

Risk exposure This is the measure of potential future loss that results from a specific Peril or Event.

Risk pooling See *Pool*, or *pooling*.

Risk profile A summary of the risks to which an organization or asset.

Risk tolerance This is the degree of uncertainty that an organization can accommodate with negative consequences ("downside risk"). *Risk tolerance* is tactical and operational, being the application of an organization's *Risk appetite* to specific objectives.

Risk transfer A risk management and control strategy that involves the contractual shifting of a risk from one party to another. Insurance is a very common example of risk transfer.

Self-insurance This internal fund or budgeted amount is used to pay claims without risk transfer.

Soft market The downswing of the market cycle is characterized by low rates, high limits, flexible contracts, and high availability of coverage.

Special purpose vehicle (SPV) (for catastrophe bonds) A company is set up to hold the proceeds of a catastrophe bond issue pending the release of those proceeds either to the issuer if a *Trigger event* occurs or to the investors if no trigger event occurs.

Stop loss This type of excess loss insurance or reinsurance is also known as aggregate excess loss; it that allows the adding of all losses over a specified period. A claim is paid for the amount by which this aggregation exceeds the limit.

Structure In insurance and reinsurance terms, the organization of retentions, limits, deductibles, and shares is based on the total insured value that determines the level of coverage to be acquired. This activity is commonly performed by brokers on behalf of the *Insured* or *Reinsured*.

Sum insured This is the limit of the insurer's liability on its policy, usually the value of the asset or assets insured. Under *Catastrophe insurance*, the sum insured may be the limit payable for any single event or for the aggregated sum of events within a specified period.

Surplus It applies when the financial assets of a risk-financing vehicle are greater than its liabilities over a defined financial period.

Surplus reinsurance A type of *Proportional* reinsurance under which the Insurer retains up to a set monetary amount on each of its policies and the reinsurer accepts up to the agreed multiple of this amount as a proportion of the entire risk.

Tariff These fixed and agreed rates or premium will be charged throughout a *Market*. Tariffs are usually authorized by regulators and are used to curb overcompetitive behaviours that could lead to insurance company failures.

Total cost of risk This is the cost of managing risks and incurring losses. Total cost of risk is the sum of all aspects of an organization's operations that relate to risk, including retained (uninsured) losses and related loss adjustment expenses, risk control costs, transfer costs, and administrative costs.

Total insurable value (TIV) See R*ebuild value, Buildings TIV, Consequential damages TIV*, and Contents TIV.

Transaction The process of agreeing to insurance or reinsurance under terms of the policy and for the agreed premium.

Treaty reinsurance This is reinsurance of policies on a portfolio-wide basis under pre-arranged terms and conditions. (See also *Facultative reinsurance*.)

Trigger, or triggering event This event is defined in a *Parametric insurance* contract that entitles the Insured to payment of the agreed amount.

Underinsurance The practice of insuring assets for less than their insurable value.

Underwriting The process of establishing the insurability of the risk, and if acceptable, the associated pricing and terms and conditions.

BIBLIOGRAPHY

Asian Development Bank. 2017. *Meeting Asia's Infrastructure Needs*. Manila, the Philippines: Asian Development Bank. https://www.adb.org/publications/asia-infrastructure-needs.

Bova, Elva, Marta Ruiz-Arranz, Frederk Toscani, and H. Elif Ture. 2016. "The Fiscal Costs of Contingent Liabilities: A New Dataset." Working Paper WP/16/14. Washington, DC: International Monetary Fund. https://www.imf.org/external/pubs/ft/wp/2016/wp1614.pdf.

Hallegatte, Stephane, Jun Rentschler, and Julie Rozenberg. 2019. *Lifelines: The Resilient Infrastructure Opportunity Sustainable Infrastructure.* (Washington, DC: World Bank). https://openknowledge.worldbank.org/handle/10986/31805.

Insurance Development Forum. 2019. *IDF Practical Guide to Insuring Public Assets*. https://www.insdevforum.org/knowledge/idf-reports-publications/idf-practical-guide-to-insuring-public-assets/

International Finance Corporation. 2007. *Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets.* Washington, DC: International Finance Corporation. https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/publications/publications_handbook_stakeholderengagement__wci__1319577185063.

International Standards Organization. ISO 55000:2014 (English): *Asset Management—Overview, Principles, and Terminology.* https://www.iso.org/obp/ui/#iso:std:55088:en.

International Standards Organization. *ISO 55002:2018 (English): Asset Management—Management Systems—Guidelines for the Application of ISO 55001.* https://www.iso.org/obp/ui/#iso:std:iso:55002:en.

Middleton, David. 2016. *Risk Financing in Local Government: A Guide Prepared by David Middleton ONZM, Kestrel Group.* Wellington, New Zealand: Local Government New Zealand. https://www.lgnz.co.nz/assets/9190f8591f/42600-LGNZ-Risk-Financing-Guide-Final-WEB.pdf.

Mitchell-Wallace, K., J. Hillier, M. Jones, and M. Foote. 2017. *Natural Catastrophe Risk Management and Modeling: A Practitioner's Guide.* London: Wiley.

Organisation for Economic Cooperation and Development. 2012. *Disaster Risk Assessment and Risk Financing. A G20/OECD Methodological Framework.* Paris: OECD Publishing. https://www.oecd.org/gov/risk/G20disasterriskmanagement.pdf.

Organisation for Economic Cooperation and Development. 2015. *Disaster Risk Financing: A Global Survey of Practices and Challenges.* Paris: OECD Publishing. http://dx.doi.org/10.1787/9789264234246-en.

Organization for Economic Cooperation and Development and World Bank. 2019. *Fiscal Resilience to Natural Disasters: Lessons from Country Experiences.* Paris: OECD Publishing. https://doi.org/10.1787/27a4198a-en.

Oxford Economics and the Global Infrastructure Hub. 2014. *Global Infrastructure Outlook: Infrastructure Investment Needs 50 Countries, 7 Sectors to 2040.* Oxford, United Kingdom: Oxford Economics. https://www.oxfordeconomics.com/recent-releases/Global-Infrastructure-Outlook.

Praxiom. 2010. "Fundamentals of Risk Management for CFOs–Unlocking Hidden Value." https://www.slideshare.net/Praxiom/fundamentals-of-risk-management-for-cf-os-3398412.

PRINCE2.com. 2011. "How to Engage Stakeholders." September 19. https://www.prince2.com/eur/blog/how-to-engage-stakeholders.

Qian, Rong; Signer, Benedikt Lukas; Skalon, Tatiana; Marohombsar, Zidni. 2020. *Public Expenditure Review : Disaster Response and Rehabilitation in the Philippines.* Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/35064 License: CC BY 3.0 IGO.

Woo, G. 2002. "Natural Catastrophe Probable Maximum Loss." *British Actuarial Journal* 8: 943–59.

World Bank. 2014. *Financial Protection Against Natural Disasters: An Operational Framework for Disaster Risk Financing and Insurance.* Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/21725

World Bank. 2016. *Sovereign Disaster Risk Finance in Middle-Income Countries: Annual Report 2017–2018 (English).* Washington, DC: World Bank Group. http://documents.worldbank.org/curated/en/590781533884356379/Sovereign-disaster-risk-finance-in-middle-income-countries-annual-report-2017-2018.

World Bank. 2017. "Improving Public Assets and Insurance Data for Disaster Risk Financing Solutions." Technical Contribution to the APEC Finance Minister's Process, Hoi An, Vietnam, October 21, 2017.

World Bank. 2020. *Catastrophe Insurance Programs for Public Assets: Operational Framework.* Washington, DC: World Bank. https://openknowledge.worldbank.org/handle/10986/34440.

World Bank. 2021. *Colombia - Reduction in Fiscal Risk by Insuring 40 Billion Dollars Road Infrastructure under Concession (English).* Washington, DC: World Bank Group. http://documents.worldbank.org/curated/en/235241614150261707/Colombia-Reduction-in-Fiscal-Risk-by-Insuring-40-Billion-Dollars-Road-Infrastructure-under-Concession

ANNEXES

Annex 1.
Common Concepts and Definitions—Public Assets and Critical Infrastructure

Public asset is a term used to describe assets across a wider range of services and functions of government, including education, administration and health. Often, this term expands to include critical *infrastructure* and other assets owned through public-private partnerships. As part of an effective insurance strategy, determining the scope and priorities for the coverage of assets enables the creation of collective approaches to prioritize risk among various asset owners. It also enables the ability to properly characterize the assets in relation to their risks. Therefore, defining what is a public asset and what are other assets considered within the scope of the insurance coverage is a key stage in the process of designing and applying an insurance program. Definitions are applied at the national and multinational levels, as well as by various agencies and other actors with interests in managing assets or services.

Critical infrastructure includes systems, assets, facilities, and networks that provide essential services and are necessary for the security of the nation and its economic security and prosperity, as well as for the health and safety of its citizens. The definition of critical infrastructure is not static and can be revised in response to a changing national and international risk landscape. Overall, six sectors are widely classified as being critical: (a) information and communication technologies, (b) energy, (c) finance, (d) health, (e) transport, and (f) water, although there are many variations. In some cases, it can include education, agriculture, environment, and defense, among others. Some definitions of public assets will be driven by consideration of their monetary value, as well as by their role in providing the essential public services. Ownership and legal rights may also be used as definitions.

It is useful to consider public assets as elements or components of an infrastructure or other systems (for example, the individual components of a power network's generation, transmission, and distribution assets). In many cases, then, the definition of public assets and critical infrastructure can be combined into one strategic approach, which considers both critical service importance and value.

Various international standards have also developed, including these:

- **The International Standards Organization (ISO)** has developed an international standard (ISO 55000), which relates to management of all types of assets, including not exclusively being physical or property related. ISO 55000 has been linked to the relevant Sustainable Development Goals (6,7,8,9,11,12,13). There are also many other ISO standards related to functional groups with asset characteristics (for example, resilient cities [ISO 37123] and energy management systems [ISO 50001]).
- **The Institute of Asset Management** defines an asset as an "Item, thing, or entity that has potential or actual value to an organization." It does not differentiate as to what can be constituted as a public asset. It suggests that assets may be grouped into those with common characteristics, referencing the ISO standard section ISO 55000:2014 (3.2.7).[43]

The European Union defines critical infrastructure as "an asset or system which is essential for the maintenance of vital societal functions." Moreover, "[t]he damage to critical infrastructure, its destruction or disruption by natural disasters, terrorism, criminal activity, or malicious behavior may have a significant negative impact for the security of the EU [European Union] and the well-being of its citizens."[44] A European Commission (EC) Directive (2008/114/EC) and associated European Program for Critical Infrastructure Protection (EPCIP) included only energy, transport, health, financial, information and communications technologies (ICT), water, food and public order as key sectors.

The New Zealand government developed the following classification of public assets after the Christchurch earthquakes in 2010 and 2011 (see Table A1.1).[45]

Regarding the insurance and reinsurance sector, public assets are generally not considered a specific class of risks. Instead, public assets are treated as property risks in the same way as commercial risks. They are also property risks in the case of infrastructure (for instance, public-private partnership [PPP] projects) or in the case of specific credit, guarantee, liability, or other risks—depending on the life cycle stage.

From the Insurance Development Forum (IDF), the "'Practical Guide to Insuring Public Assets" defines six general categories of infrastructure-related public assets as follows:[46]

- Transport
- Energy
- Social infrastructure
- Water and sanitation
- Telecommunications
- Natural and green infrastructure

44 See European Commission, "Migration and Home Affairs: Protection," https://ec.europa.eu/home-affairs/what-we-do/policies/crisis-and-terrorism/critical-infrastructure_en.

45 See Controller and Auditor-General, New Zealand, "Managing Public Assets," https://www.oag.govt.nz/2013/managing-public-assets/docs/managing-public-assets.pdf.

Table A1.1.
Public Assets Types

HIGH LEVEL	SUB LEVEL
Economic	Transport
	Power generation, transmission and distribution
	IT and networks
	Communications
Environmental	Land
	Stormwater or flood protection assets
	Landfill
	Conservation
Health	Health district assets
	Water supply or sewerage
Educational	Primary, secondary, tertiary, and regulatory
Social, Cultural, Heritage	Cultural and sporting assets
	Museums, art galleries, and libraries
Protection and Security	Police, defense, correctional, fire, and civil defense assets

Source: Controller and Auditor-General, Government of New Zealand, 2013.

46 See Insurance Development Forum, https://www.insdevforum.org/knowledge/idf-reports-publications/idf-practical-guide-to-insuring-public-assets/

Annex 2.
Detailed Description of Primary Modifier Attributes

This annex provides a more detailed description of the following primary modifier attributes:

- Location
- Construction
- Age
- Floor area
- Height
- Protection measures
- Exposure

Location

One of the most important features of exposure data is an accurate geographic position for each risk. Knowing the accurate position allows the identification of linkages to hazards and potential damage-causing events, as well as the assessment of whether assets are clustered or distributed.

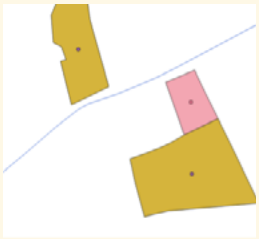
For most insurance purposes, the best practice is to represent each insured asset element with a latitude and longitude coordinate (describing a point on earth). The point is usually based on a global referencing system such as that used by Google Earth (called WGS84). By providing a unique coordinate for each element, a geographical map of assets can be produced that show the position of each relative to each other.

However, although the point is a reasonable estimate of location for most building assets and some infrastructure such as pylons, tanks, and other single standalone features. Not all public assets and critical infrastructure can be easily represented by a single point, as shown in Table A2.1. For example, infrastructure such as roads and pipelines are linear, while others such as sports facilities or compounds are geographically distributed across wider areas. Tall infrastructure—such as large office blocks—can be exposed to different and complex risks, which are layered vertically. In those cases, asset managers should aim to capture the most appropriate geographic information available. In general, it is recommended that assets with the highest risk, or those with the largest insured values or both are prioritized for more detailed geographic referencing.

In many cases, a geographic coordinate may not be available. Address information can be used to find coordinates if the address is suitably complete, accurate, and unambiguous. Tools called geocoders provide automated methods to identify location coordinates for a given address. Insurers can and often do use address data to geocode risks, but doing so adds time to the process and tends to result in lower confidence within geographical referencing.

Table A2.1.

Different Types of Assets and Use of Location Reference

ASSET TYPE	REFERENCE	GRAPHICAL EXAMPLE	ADVANTAGES AND DISADVANTAGES
Standalone Building, Structure, or Parcel	Single point coordinate falling within the property area Decimal degree or degree-minutes-seconds		It shows relative positions of structures. Low data storage is needed. Larger buildings or areas are not well represented.
Linear Assets (roads, rail, power transmission lines, pipelines)	Linear segments with start and end coordinates (nodes) Geographic Information System can represent linear assets as geographic line formats		Higher data storage is required. It lacks detailed roads data, for example on their fragility.
Campus Risks (large schools, universities, government compounds)	Multiple structures within a single compound		A single coordinate may not capture all locations, varying asset types, or areas covered by the facility or compound.
Complex Risks (bridges, tunnels and other complex)	Either a single point or multiple points to represent the center and end points, depending on size of the asset		It can use points to reference, but it may not capture the full extent or complexity of the risk structure in all cases.

Source: World Bank staff. Maps are illustrative only.

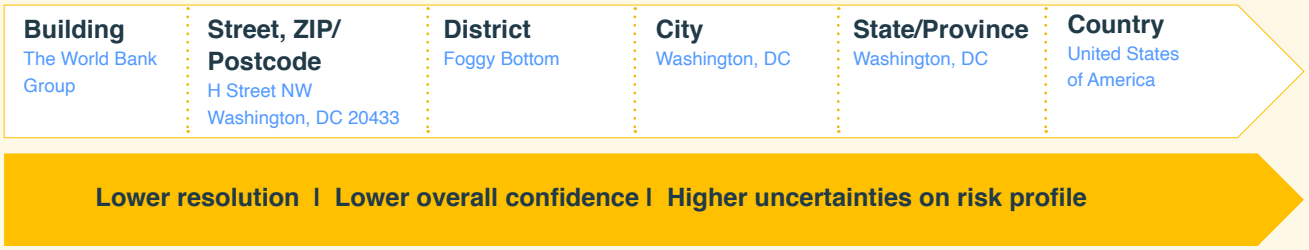
Care should be taken when using address information to locate assets, because the format may be unsuitable—for example, if large numbers of abbreviations are used or if the addresses are not in a consistent format. Geocoding tends to be more suited to urban areas and to areas where there is already a detailed source of address location data. The quality of the underlying data for address-location matching will be a key determinant of the level of quality likely to be achieved when using address data geocoding.

Other lower levels of geographic resolution are also often used for insurance purposes, such as those shown in Figure A2.1, in descending order of geographic resolution. Such resolutions usually to produce aggregate data where the data related to numbers of individual assets are grouped together. Lower resolution aggregation will tend to result in lower overall confidence in the quality of the risk data and may influence the price set for the risk, because the uncertainty of risk potential will be greater with lower resolution geographical data. In addition to those shown in Figure A2.1, Catastrophe Risk Evaluation and Standardising Target Accumulations (CRESTA) Zones, which are part of an international system of geographic zoning that helps brokers and reinsurers manage natural hazard risk, can also be used.

For non-building risks, insurers' expectations of geographical data quality can often be lower (especially for lower-materiality regions). For example, it is common for linear exposure, such as railway, road, or pipeline data, to be provided on an aggregate geographical reference such as a postcode or administrative district. For instance, the total length of the asset is within a given area. Although this approach does reduce overall confidence, insurers can and will compensate accordingly when assessing the financial risk levels from such data.

Figure A2.1

Other Geographic Resolutions to Represent Location Data



Construction Classification

A construction reference is important for risk assessment because it determines the likely resilience of a structure to the hazard in question and it will be used to drive the choice of vulnerability estimates used to assess damage potential to assets. For example, an adobe-built or simple masonry structure will tend to be more vulnerable to earthquake shaking than will a reinforced concrete building with a load-bearing frame. Risk models will make assumptions to reflect construction codes when calculating damage and loss potential. Some construction references used in insurance are peril-specific. For example, if the primary risk is from windstorms, more focus will be on the roof materials and types when a construction code is selected.

Most construction codes will be based on engineering approaches and often will include generic descriptions to assist in the choice of the most appropriate. Construction codes for building structures are often based on the primary structural material such as wood, masonry, concrete, or steel.

For *non-building* structures such as bridges, tunnels, pipelines, roads, railways, towers, and pylons, separate construction codes are often provided. Codes will often represent generic types of structural, risk, and resilience features (for example, construction material, span of bridge, height of pylon, etc.). Some construction codes will be designed to reflect the susceptibility or resilience of a structure to a fire rather than to natural perils (for example, see fire codes of the Applied Technology Council and the Insurance Services Office.

In addition, for a complex infrastructure such as power generation, telecommunications, transport, sewerage, and water, discrete codes will be provided. Those composite classifications are often included in the occupancy codes.

When asset managers are providing construction information as part of their *material disclosure*, they will need to select construction codes, or text descriptions, for assets where the selection can be justified on the basis of their known structural characteristics. The choice of codes can significantly alter the modeling of damage potential and loss estimates; if in doubt, a lower detail classification should be used to provide more confidence. For example, if a property is known to be of masonry construction, but if there is no record of the specific type of reinforcement that may be included in its construction, the generic masonry code should be applied.

Often, asset management teams will have information that can be used to infer construction methods. It is possible for engineering and survey teams to be provided with a mapping between known design characteristics and the appropriate classes of insurance construction so that linkage and capture will directly appear in a system for centralized asset management.

Equally, it is often possible for insurers to apply their own coding assumptions that are based on the descriptions provided by the insureds, particularly for complex asset and infrastructure risks. If a broker or intermediary has been retained to support disaster relief financing for an insurance transaction, the broker or intermediary can be asked to provide expert assistance in the correct coding of assets.

Occupancy Classification

The insurer will look to capture the occupancy of assets being insured. This identification relates to the *primary use* of the asset and reflects a number of risk aspects, including these:

- The likely risk-management regime applied by the asset owner or user
- The overall vulnerability of the asset and its contents to specific hazards
- An estimation of the business-interruption or time-element loss potential

In many commercial catastrophe models, if a construction code cannot be provided, an occupancy code will be used as a proxy; that proxy will be based on location of the asset so it can estimate the type of construction and vulnerability. The following are common generic classes for occupancy.

- Unknown
- Residential
- Commercial
- Industrial
- Government
- Religion and nonprofit
- Education
- Transportation
- Utilities
- Flood control

As noted in the bulleted list, some complex infrastructure classes may also be available. Again, a hierarchical system will often be used to provide more detailed description of various occupancy types.

Age and Year-Built Classification

The age of an asset, particularly for a building, is a key attribute for insurance because it can be used to infer two risk features:

- The potential deterioration of the asset (for example, if an asset is nearing the end of its expected lifetime)
- The building codes and other regulatory regimes in which the structure was designed and constructed

Catastrophe models will include year-built ranges, usually based on the building code epochs that have defined key resilience, construction, and other factors. For example, in the Philippines, a year-built range of 1972–1991 is common in earthquake models because it defines the period after the introduction of the National Building Code but before subsequent updates in the early 1990s.

If significant retrofitting or other resilience or maintenance improvements have been applied to the assets (for example, a new and more robust roofing system), this date can be included as a separate data field because it can be used to modify an underwriting view of the asset risk.

It is recommended that no age value is entered if it is not clear when an asset was constructed. If there is confidence that a structure was created within a given decade or building code period, then it permissible to enter the mid-year date.

Floor Area Values

The floor area is a proxy that can be used to infer (often with the number of stories) the rebuilt construction values (e.g., based on a construction estimation matrix). Equally, the floor area can assist in risk assessment as an additional proxy for vulnerability.

Height (number of stories) Values

The height of a structure, either as a linear measure (for nonbuildings) or as a number of stories (for buildings), will also have a significant influence on the damage estimation, especially for an earthquake. The height of a structure will determine the response to the ground motion affecting the structure and therefore the potential for damage or collapse.

Equally, as noted earlier, the number of stories (alongside floor area) can be a useful contributor to estimates of construction costs.

Protection Measures

This category is important for risk managers from a safety standpoint and for underwriters from the perspective of reducing property damage. Various features, which are usually considered while analyzing this category, are these:

- **Sprinkler systems:** type, condition and coverage area
- **Fire extinguishers:** number, class type, location in the building, and inspection status
- **Fire doors and walls:** noncombustible materials making up a building or wall and HVAC ducts
- **Distance from the fire department:** type of fire department and distance from structure
- **Security Systems:** type, monitoring, installation, site of alarm sound
- **Disaster resilience:** Ductility, base isolation, bracing, and other earthquake-resistance measures

In addition to those features, any upgrades performed on buildings are also considered while arriving at the risk profile of the building (for example, any upgrades done on plumbing, roof, HVAC, and electrical). Importantly, recording of such data will reduce efforts spent by underwriters to collect the data and may influence the insurance premium.

Exposure

The three categories discussed earlier usually focus on risks arising from within the building, whereas this category (exposure) deals with risks arising from external hazards. Various external hazards, in addition to fire, that are likely to be considered by underwriters are as follows:

- Damaging winds or water (flood, etc.)
- Earthquakes or seismic activity
- Wildfires
- Proximity to high-hazard operation such as nuclear power plants
- Human-made hazards such as war and terrorism

The data about risks resulting from those hazards comes from a separate database, which records risk data for locations of various external hazards. Some agencies assign flood zones to various locations, areas, or provinces, and certain state or central urban departments assign building codes to the structures. For gauging the likelihood of a structure or asset to sustain damage from windstorms and seismic activity, the government must consider various details—for example, windstorms data about the effectiveness of roof strapping and, for seismic activity, data about the experience of various types of walls and overhangs, as well as the possibility of buildings pounding against each other.

Annex 3.
Insurance Instruments

Having analyzed the downside risks in the context of their risk appetite (the governance aspect of risk) and the tolerance (the operational side), asset owners need to decide whether to avoid, reduce, retain, or transfer each risk—either fully or partially. Risk transfer is normally by way of insurance, of which there are several types as briefly described within various parts of Table A3.1. Those types include the following: indemnity, excess loss, parametric, risk- or insurance-linked securities (catastrophe bonds), risk swaps, contingent capital, and contingent cover. Asset owners must select the appropriate type of insurance and may use the expertise of an insurance broker to assist with this selection.

Table A3.1

Risk Transfer Types

TYPE	INDEMNITY INSURANCE
What is it?	A traditional insurance policy is designed to reimburse or reinstate a loss that has occurred. Modern policies compensate to the full value required to repair or rebuild (replacement value), not deducting value to recognize the age and condition of what was damaged (indemnity value).
How does the market work?	Insurance companies issue policies that identify the Insured, the property covered by the insurance, the perils (causes of damage) insured, and the terms and conditions of the insurance contract. Policies are in the name of the asset owner and anyone else with a financial interest (such as a mortgagee). Several asset owners may combine to insure under one policy as a pool or collective (such as the Universities Collective in New Zealand).
Best suited for	⊙ It is most suited for assets that are susceptible to the perils insured by standard insurance policies. ⊙ It is best suited for specialist policies such as engineering insurance and for policies covering nontangible subjects such as liability. Insurance policies against accident or death of individuals are also available.
Benefits	⊙ Products are readily available and are from the local insurance industry. ⊙ Contracts can be executed quickly. ⊙ There is widespread understanding, and insurance markets share common practices. ⊙ Expertise to deal with the insurance market is typically available locally.
Disadvantages	⊙ Transferring unusual risks that are not well understood by the insurance industry or that are regarded as particularly hazardous can be expensive. ⊙ Insurers rely on a large sample of homogenous risk to enable them to assess premiums, and they will charge higher premiums in the absence of reliable data and statistics. ⊙ The pricing of insurance is based on factors not relevant to every policyholder (for example, a large disaster event in another region or country). Pricing can be volatile from year to year.
Examples	⊙ Property (asset) insurance ⊙ Motor vehicle insurance ⊙ Increased cost of working (following a fire or disaster) insurance ⊙ Personal accident insurance

TYPE	EXCESS LOSS INSURANCE
What is it?	This insurance pays only for severe damage or loss because it carries a high deductible or excess. There are different forms: ⊙ **Working excess loss:** applied to individual assets ⊙ **Aggregate excess loss or stop loss:** applied to total claims paid out in a given period (usually a year) ⊙ **Catastrophe excess loss:** applied to total damage costs at all insured sites when attributable to the same disaster event
How does the market work?	The high excess on the policies is a material factor in their pricing because it significantly affects the risk to the insurance company. Therefore the actual amount of the excess is a critical negotiating factor.
Best suited for	⊙ **Working excess loss:** high-value assets that would be expensive to insure with a normal indemnity policy ⊙ **Aggregate excess loss:** assets that are subject to many small claims ⊙ **Catastrophe excess loss:** portfolios of properties where several could be affected by the same disaster
Benefits	⊙ **Working excess loss:** premium savings ⊙ **Aggregate excess loss:** protection from unusual runs of small damage events in the period (such as more motor vehicle accidents than normal) ⊙ **Catastrophe excess loss:** more suitable than indemnity insurance for multiple-asset owners when more than one asset could be damaged by the same event. Damage can be aggregated in a single claim for all assets involved, including at different sites. The excess and value insured on each asset will be replaced by a single excess and value that is the reasonably foreseeable amount of damage that could be incurred at all sites (the probable maximum loss, which could be, say, a 1-in-200-year event). (Catastrophe perils such as disasters caused by natural hazards are included in indemnity policies, and single-asset owners do not need additional protection from catastrophe excess losses.)
Disadvantages	⊙ Pricing volatility is greater than traditional insurance, especially for insurance covering catastrophe excess losses. ⊙ The availability of catastrophe excess loss insurance may also be volatile. For example, for a few years after the Canterbury earthquakes in New Zealand, private sector insurance companies declined to offer earthquake insurance in the affected area, reflecting their own lack of ability to obtain affordable reinsurance protection. ⊙ Interpretation of catastrophe excess loss policies can be contentious, including the following: (a) which damage can be included in the same event, (b) whether the catastrophe peril or some other had caused the damage, (c) what was the pre-existing damage, and (d) what repair costs were covered when additional building safety standards were applied
Examples	⊙ **Working excess loss:** a ministry's headquarters building ⊙ **Aggregate excess loss:** a ministry's motor vehicle fleet ⊙ **Catastrophe excess loss:** the Ministry of Education's schools

TYPE	PARAMETRIC INSURANCE
What is it?	A contract for this insurance provides for the full amount to be paid out on the occurrence of a certain triggering event (for example, an earthquake of a certain magnitude in a pre-agreed area), whether or not an actual loss occurs. This contract is a contrast to indemnity insurance policies, which reimburse loss or damage to the particular assets named in the policy schedule.
How does the market work?	Pricing is based on the probability of occurrence of the triggering event; therefore, science and modeling are critical. Conversely, asset valuations and locations, which are features of normal insurance underwriting, are less relevant.
Best suited for	⊙ When speed of claim settlement is more important than precise evaluation of damage ⊙ Where greater freedom in directing the funding is needed (as compared to normal insurance under which funds are tied to specific damage and repair costs) ⊙ Perils with outcomes that are difficult to define or impacts that are difficult to measure
Benefits	It provides speedy settlement of claims and provides the insured discretion over the deployment of the payouts.
Disadvantages	⊙ Basis risk is when the payout is not calibrated to any actual financial loss but to the occurrence of the triggering event. ⊙ There are prospects of a windfall gain (payout exceeds the actual costs) or a retained loss (payout is insufficient to meet the costs). Risks of windfall gain can be mitigated through clauses on the limits of the payout.
Examples	⊙ The proposed Philippines Catastrophe Insurance Facility includes an immediate payout to claimants of a set amount without a proof of loss as part of its coverage of damage to homes by an earthquake, typhoon, or flood. ⊙ The SEADRIF Catastrophe Insurance Pool provides rapid and predictable relief funding to its members on the occurrence of flooding.

TYPE	RISK- OR INSURANCE-LINKED SECURITIES (CATASTROPHE BONDS)
What are they?	These are investment bonds issued to the capital market. They default on the occurrence of a defined catastrophe event (the trigger) so the issuer (i.e., the insured owner of assets) is not required to repay the bond.
How does the market work?	The asset owner takes out insurance with an entity that has been set up to issue the bonds (a special purpose vehicle) to the value of the insurance. Under the terms of the bonds, the principle would not be repaid by the special purpose vehicle following a trigger event. Instead, payment would be made under a claim on the insurance. Like other financial bonds, catastrophe bonds can be traded among investors.
Best suited for	⊙ When speed of claim settlement is more important than precise evaluation of damage ⊙ Where greater freedom in directing funding is needed (as compared to normal insurance under which funds are tied to particular damage and repair costs) ⊙ When outcomes of catastrophic events are difficult to define or their impacts are difficult to measure ⊙ When the terms of the bond are more attractive than those in the insurance or reinsurance market ⊙ When the amount of coverage required is larger than the insurance or reinsurance market can supply through providers of acceptable financial strength
Benefits	It provides speedy settlement of claims and provides the insured discretion over the deployment of the payouts.
Disadvantages	⊙ Basis risk is when the payout is not calibrated to any actual financial loss but to the occurrence of the triggering event. ⊙ There are the prospects of a windfall gain (payout exceeds actual costs) or a retained loss (payout is insufficient to meet costs). ⊙ Catastrophe bonds can take months longer than insurance policies to arrange, and their set-up costs are far higher. ⊙ Because catastrophe bonds are individual issues, investors require a set of comprehensive risk assessments, a precise definition of the triggering event, a set of actuarial reports, a compilation of legal and accounting advice, and other capital market requirements including full disclosure of relevant interests.
Examples	⊙ Several governments have issued catastrophe bonds, including Mexico and Taiwan. ⊙ The California Earthquake Authority has issued a series of catastrophe bonds to protect its liability to home-owner policyholders. ⊙ Several of the US State Fair Access to Insurance Requirements Plans have also protected their liabilities with catastrophe bonds.

TYPE	RISK SWAPS
What are they?	They are the exchange between owners of two or more of their risks, thus diversifying the risk of each.
How does the market work?	The risks are clearly defined and quantified (through extensive scientific input and hazard modeling) to achieve parity. The science and modeling standards must be of comparable quality so that each side can have a similar level of confidence in the other's ability to assess its risk. Loss probabilities are equalized so that, for example, the probability of a force X typhoon in Japan was equated with that of a magnitude Y earthquake on the New Madrid fault, with X and Y being adjusted until they have an equal probability of occurrence according to the hazard models.
Best suited for	⊙ Risk swaps connect regionally concentrated but diversified partners. ⊙ Risk swaps work best when two partners exchange extreme risks, such as those for which coverage is expensive because of the charging of minimum premiums (when the risk plus uncertainty factor plus overheads is exceeded by the insurer's cost of capital).
Benefits	⊙ They provide a solution to non-availability of insurance at reasonable prices. ⊙ They promote relationships between the parties that could be the foundation for other joint ventures
Disadvantages	⊙ There is susceptibility to post-event controversy over whether the risks were correctly equalized. ⊙ There is a risk of negative public and political perception. For example, the New Zealand Earthquake Commission was wary of swaps because of the possibly negative reaction to the export of some of its reserves to pay for a foreign disaster.
Examples	Examples of swaps that have been negotiated are Japanese earthquake for California (US) earthquake, Japanese typhoon for Florida (US) hurricane, and French storm for an earthquake on the New Madrid fault in central Missouri (US).

TYPE	CONTINGENT CAPITAL
What is it?	It is a contract or structure that gives an organization the right but not the obligation to issue debt instruments after a disaster event, such as investment bonds at previously agreed terms. It is like a financial market "put" option (a financial market derivative instrument which gives its purchaser the right to sell an asset at a specified price, by (or at) a specified date to the seller of the put.
How does the market work?	Contingent capital options involve complex financial market engineering and pricing. There are some common features with catastrophe bonds and risk swaps. For example, there will be the equivalent of a parametric trigger that puts the option in the money. This trigger may be the impairment of an organization's capital to a predefined extent.
Best suited for	It is best for a situation in which the risk is that an organization will have to borrow to finance its obligations arising from a disaster event.
Benefits	There is certainty about the terms and conditions under which the capital markets may be accessed to finance post-disaster liabilities.
Disadvantages	Complexity and costs are additional to other risk-transfer expenses, such as insurance premiums.
Examples	Contingent capital options have been used to secure the capital bases of insurance companies and of some US State Fair Access to Insurance Requirements Plans that provide last-resort insurance to property owners unable to obtain private sector insurance coverage.

TYPE	CONTINGENT COVER
What is it?	The cover is for a range of possibilities that are outside the scope of existing insurance arrangements (see examples).
How does the market work?	Specialist insurance and finance industry organizations provide insurance for particular contingencies, which are often tailored to a client's needs.
Best suited for	It provides protection against risks inherent in an insurance program (e.g., many claims arise in one year or large premium increases are demanded).
Benefits	It counters some of the limitations of traditional insurance contracts.
Disadvantages	Complexity and costs are in addition to other risk-transfer expenses, such as insurance premiums.
Examples	⊙ **Aggregate retention protection:** It protects in case several insurance deductibles (excesses) are incurred in one year because of the number of claims. ⊙ **Premium caps:** The caps insure against an increase in premiums above a certain figure ⊙ **Additional reinstatements:** It allows reinstatement in case the insurance policy is fully expended before its next renewal date. ⊙ **Double trigger covers:** The parametric insurance has two triggers that have to be met (e.g., a disaster caused by natural hazards plus related uninsured losses).

Annex 4.
Reinsurance Market

Insurance companies must have the capital and financial reserves to meet the liabilities they incur for claims under the policies they issue. In many countries, prudential supervision legislation aims to protect policyholders by ensuring that their insurance companies do have the necessary financial backing. Insurance companies, including state-owned entities, captives and mutuals, can pass some of this liability on to the reinsurance market, thus enabling that body to issue more policies or to provide insurance for greater values.

Insurance companies can also take on more capacity than they wish or are allowed, and they can pass on (or cede) the excess to reinsurance companies by either pre-arranged treaty reinsurance or individually negotiated facultative reinsurance. The reinsurance market is prominent in the protection of insurance companies against their overall liability arising from large disaster events (catastrophe reinsurance).

Reinsurers accept the terms and conditions of the original policy and pay their share of whatever claims are settled by the insurance company. This approach is enforced by a reinsurance clause obliging the reinsurer to follow the fortunes of the insurance company. Reinsurance companies protect themselves against taking on excessive risk by their own reinsurance, called *retrocessions*. This practice is how exposure of the insurance industry to major risks is shared around the world.

By using a state-owned insurance company, a captive, or a mutual to engage with the reinsurance market, the governments or asset owners can cut insurance costs because they do not have to pay an insurance company's overheads such as acquisition costs and profit margin.

Reinsurance can be categorized as follows:

- **Facultative or Treaty**
  - **Facultative**—Individual insurance policies are reinsured.
  - **Treaty**—The reinsurer accepts automatically an agreed portion of all policies falling within the scope of the treaty (such as all policies issued in the property insurance department of an insurance company).
- **Proportional or Excess Loss**
  - **Proportional**—The reinsurer accepts a set proportion of each policy for the same proportion of the premium, as either of these:
    - A quota share—An agreed percentage (such as 30 percent of every policy) is shared.
    - A surplus line—The amount above the agreed line (monetary limit) is retained by the insurance company. For example, if a line were $100,000 on a policy for $500,000, the reinsurer would accept four lines of surplus to one line (i.e., 80 percent); on a $2 million policy, the reinsurer would accept 19 lines of surplus to one line (i.e., 95 percent)
  - **Excess loss**—The reinsurer is liable for the amount by which a claim exceeds the agreed threshold (variously called the excess, deductible, or attachment point). The three types of excess loss reinsurance mirror those described in chapter 5
    - Working—The reinsurance applies to a single asset.
    - Aggregate (stop loss)—It covers the amount by which all the claims during a set period on policies covered by the treaty exceed the agreed attachment point.
- **Catastrophe**
  It covers all claims from policies issued in the insurance company's property department arising from the same event, such as an earthquake or hurricane.


WORLD BANK GROUP