Insurance Development Forum

IDF Practical Guide to Insuring Public Assets

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IDF Practical Guide to Insuring Public Assets

Contents

Introduction

Infrastructure is an essential ingredient for the success of a modern economy that positively impacts output, productivity and long-term growth. The OECD and IMF have found that every dollar of investment in infrastructure has a multiplier of 1.6x[1] in the form of a boost to short-term employment combined with a longer-term productivity gain to the economy.

Investment in these critical public assets, usually a large and long-term commitment, is a major financial decision for governments and sub-sovereigns, especially in emerging countries where resources are scarcer, and development needs stronger. These investments therefore need to be protected by ensuring the assets are maintained and are resilient against a variety of risks.

Disaster risk is one of the most important to protect against given the significant damage that can be caused to assets and the fact that disruptions to critical infrastructure can exacerbate a disaster's economic impacts; for example, by cutting access to lifelines like electricity, water or food distribution. Large and very rapid volumes of financing are therefore needed which account for a major share of public expenditures. These costs are also the most difficult to control.

Just focusing on a single but particularly catastrophic year, 2010-2011, reveals to what extent disasters can damage infrastructure and cause disruption. In that year, New Zealand was hit by a series of earthquakes that cost the government more than USD 2 billion in reconstruction and restoration of public assets at the same time as its revenues were squeezed[2]. The 2011 Great East Japan Earthquake caused USD 34 billion[3] in damage to public infrastructure, also shutting down nuclear power plants that halved power output across the country[4]. The Thai floods that same year caused six months of disruption to transport, electricity and water management networks and cost around USD 1.86 billion in infrastructure damage and losses[5].

Insurance is a central component for protecting public assets against this disaster risk that enhances governments' financial resilience through risk transfer. A number of governments have been pioneers in setting up innovative and comprehensive public asset insurance programmes, among them Mexico. The Mexican federal and state governments spend, on average, more than USD 1.5 billion annually on reconstructing public assets and low-income housing after disasters. In 1996, the government decided to set up a Natural Disaster Fund, FONDEN, to access adequate funding without compromising committed government spending[6]. Over the years, FONDEN has evolved to become a global trailblazer in disaster risk management, using innovative risk transfer tools, incorporating risk reduction and making important advancements in data use and technology.

Setting up these programmes is a complex exercise that can take years of refinement to reach the levels of sophistication and cost efficiency attained by the likes of FONDEN and others. With this Guide, the Insurance Development Forum (IDF) strives to support governments and sub-sovereigns in navigating the complexity and accelerating the process by sharing knowledge from the insurance market as well as learning from pioneering governments.

As a public-private partnership that brings together the re/insurance market with the World Bank and the United Nations, the IDF is in a unique position to provide this expertise. The Guide's primary contributors are public sector leaders within the insurance industry as well as experts in legal and regulatory issues and catastrophe risk modelling who have directly worked with governments on developing public asset insurance programmes globally.

Based on these experts' direct experience, the Guide lays out the practical considerations for establishing a public asset insurance programme from A to Z. It first contextualizes the high-level benefits of these structures, including the cost efficiencies of pooling risk, the deepening of local insurance markets and the positive knock-on effects on data and risk understanding, as well as the limitations of insurance relative to other risk financing tools. The Guide then examines the key decisions that need to be made before a programme can be set up, for example deciding which governmental entity owns what risk and what premium budget can be allocated. It then dives into the operational detail of programme creation and how this is tailored to the public sector entity's needs as well as guidance on how to work with the private sector. Finally examples of existing programmes are provided as well as their key learnings.

Having started my career within the French Ministry of Finance before moving to the private sector to lead finance, strategy and operations for global insurer AXA, I've had the privilege of experiencing both the private and public sectors and seeing first-hand how critical risk management is to each. Indeed, in the words of Tharman Shanmugaratnam, chair of the Monetary Authority of Singapore and former head of the IMF's International Monetary and Financial Committee who gave some very pertinent and hard hitting advice on climate risk earlier this year: "1) Systematically think of the worst case scenarios; 2) Don't postpone action and 3) This is a business of uncertainty so err on the side of caution…"

Now in my current role as chair of the IDF, I have also had a taste of how powerful the collaboration between the private and public sectors can be. Leveraging the expertise of both sides, we at the IDF hope to make a real difference in enhancing governments' disaster risk management, and in boosting resilience to protect precious public assets as well as the wider economy. We hope this Guide will provide valuable direction in achieving these vitally important outcomes.

Denis Duverne

Chair of the IDF and AXA Group

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2 OECD/World Bank (2019), *Fiscal Resilience to Natural Disasters: Lessons from Country Experiences*. Available at: https://www.oecd.org/environment/joint-oecd-and-world-bank-report-urges-governments-to-improve-resilience-to-disasters-and-related-fiscal-risks.htm
3 APEC (May 2018), *Casebook of Infrastructure Build Back Better from Natural Disasters*. Available at: https://www.apec.org/Publications/2018/05/Casebook-of-Infrastructure-Build-Back-Better-from-Natural-Disasters
4 (OECD/World Bank, 2019)
5 (APEC, 2018)
6 World Bank (2013), *FONDEN: Mexico's National Disaster Fund*. Available at: http://siteresources.worldbank.org/EXTDISASTER/Resources/8308420-1357776325692/FONDEN_final_FCMNB.pdf

Forewords

The importance of public assets and services to drive sustainable economic and social development cannot be overstated. Investment in roads, power and clean water in developing countries can transform communities, increase well-being and grow economies and livelihoods. While current global infrastructure investment is estimated to be over USD 2.3 trillion per year, the investment needs in developing countries is far greater (between 2 and 8 percent of GDP a year), reflecting the relatively low level of resilient infrastructure within countries.

Growth in infrastructure and public assets can also lead to increased risk of disruption, particularly where key assets are highly exposed to extreme events. In particular, schools, hospitals and critical infrastructure networks such as power, transport and water are especially vulnerable to damage and disruption, particularly those arising from climate and disaster shocks. This was illustrated in the aftermath of Tropical Cyclone Idai; this powerful storm disrupted the lives of 2 million people and resulted in more than one thousand fatalities. In addition to the toll on people, Idai damaged or destroyed infrastructure and associated assets valued at more than USD 2 billion, adding stress on the already weakened sovereign fiscal balances of Mozambique, Malawi and Zimbabwe (World Bank, 2019).

The complexity and interdependence of assets and infrastructure networks also drives large negative effects, particularly to low-income countries vulnerable to disasters. Increased expenditures and reduced revenues due to damaged assets and disrupted services can lead to significant debt burdens. Social and economic vulnerabilities can be exacerbated through reduced capacity to respond after extreme events due to infrastructure failures and increasing recovery lag times, further affecting the most vulnerable populations.

The IDF brings together many of the world's leading private sector insurance, reinsurance and intermediary companies, with international public sector organizations that provide financing and technical assistance including the UN and the World Bank Group. This creates a valuable collaboration between the public and private sector insurance and reinsurance markets, leveraging the capital resources and technical expertise of these markets to support financial resilience in the poorest and most vulnerable countries.

The re/insurance industry already plays a significant role in helping countries manage their disaster-related contingent liabilities against climate and disaster shocks, as part of their comprehensive, disaster risk financing strategies. With over USD 580 billion of reinsurer capital available (AON, 2019) the re/insurance industry is not only a major provider of capital for financial risk transfer, but is also a source of specialist skills and knowledge which can be used by countries to enable risk-informed strategic decisions on asset management, investment and protection to be made in advance of disasters.

The re/insurance industry is also a major promotor of new technologies and data with an emphasis on harnessing innovative approaches to risk assessment, supporting greater resilience in critical assets, and providing more effective ways to financially compensate populations and communities in the wake of disasters. This is no more evident than in the public assets and infrastructure areas, where the use of smart sensor technology and sophisticated risk analytics are revolutionizing the risk management environment, enabling asset owners and operators to increase resilience and reduce potential impacts on critical assets from different types of shocks.

This Guide therefore provides a timely and valuable contribution to the approaches and methods used by the re/insurance industry in minimizing and mitigating the risks affecting public assets and infrastructure and will provide greater understanding of the options and benefits open to countries that seek to benefit from insurance as an important component of broader fiscal resilience strategies. In particular, the Guide can help the most vulnerable countries address some of the fundamental questions they face when considering strategic decisions on how best to protect their critical public assets.

The World Bank group looks forward to continuing our cooperation with the IDF in this critical area, through the ongoing development of open knowledge sharing such as this Guide, that will form valuable contributions to the public good and support our dialogue with country partners on financial resilience.

Keiko Honda

Executive Vice President and Chief Executive Officer of the Multilateral Investment Guarantee Agency (MIGA) World Bank Group

Roads, airports, schools, hospitals, parks, as well as water and sewerage systems, all provide critical facilities, operations, and services. Their direct economic dividends include driving growth, the generation of jobs and the connection of markets. Increasingly, public assets play a critical role in tackling climate change and the conservation of scarce resources through areas such as clean energy generation, more efficient transport systems and cleaner industrial production. Socially, public assets provide a range of services such as health, education, energy and transportation that citizens need – and investment in these areas provides massive opportunities to ensure more equitable access to them.

Therefore, it is essential to consider how the trillions of dollars that will be invested in the construction of public assets between now and the year 2030 can and must support the achievement of the 17 Sustainable Development Goals (SDGs).

In doing so, the international community must work collectively to help governments around the world ensure that all new investments in public assets are thoroughly informed by a better understanding of risk. This support should help guarantee that all new infrastructure is resilient in order to deliver the operations and services for which it was built while ensuring that any new infrastructure contributes to risk reduction, rather than its creation. This is a challenging task, one made distinctly more difficult by the effects of climate change.

This is where the appropriate insurance of these valuable public assets becomes critical. Thus, the Insurance Development Forum's (IDF) Practical Guide to Insuring Public Assets aims to support the often complex work undertaken by governments and the international community to protect and enhance public assets. The core tenet of this guide, prepared by experts from both the public and private sectors in the Insurance Development Forum, is that when it comes to public assets, risk-informed development is absolutely critical.

In this respect, this practical guide is one the first of its kind to provide technical advice to governments on the risk management of public assets through macro-economic protection; the pooling of risk; and the diversification of reconstruction funding. The guide also articulates the expertise of the insurance and reinsurance insurance industry well beyond the design and provision of specific insurance products. For instance, insurance industry insights into data, analytics and new technology have the potential to spur major new investments in critical sectors by highlighting both the risks of doing business, and ways to tackle that risk.

This guide, which treats the insurance of public assets as part of a comprehensive approach to risk management and development, complements the outlook of the United Nations Development Programme (UNDP). It is an approach which involves the insurance industry and the development sector working closely with countries and communities to not only transfer risk, but also to manage and reduce risk.

The guide's strong focus on the role of natural capital -- the world's stock of natural resources -- as a public asset is also welcome. It reminds key stakeholders that they must work together to protect our planet's assets on which our lives and livelihoods depend.

Ensuring that public assets are both adequately protected and enhanced to benefit communities around the world is a long-term endeavour that requires a better understanding of risk. Such support to public assets can also play a key role in fostering long-term stability in countries – increasing not only their disaster risk reduction capacity but also setting the conditions to help reduce the risk of conflict and forced displacement, amongst a wide range of other areas. In this respect, this guide provides a very clear added-value. UNDP will continue to provide concrete support and share its long-standing expertise in this crucial area.

Achim Steiner

UNDP Administrator

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About this Guide to Insuring Public Assets

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About this Guide to Insuring Public Assets

A fundamental role of governments around the world and at all levels – national, regional and local – is to build, manage and maintain a diverse array of public assets. However they are categorized, public assets play a vital role in enabling a country's economic and social progress and in promoting stability and prosperity.

Whether driven by a need to support citizens in leading healthier, more productive and prosperous lives; to promote economic development; to update aging structures in mature economies; or to build out new infrastructure in emerging markets, constructing, managing and maintaining public assets represents a substantial part of government spending.

To support the efforts of maintaining and building out infrastructure, these assets need to be protected so that in the event of major man-made or natural catastrophes causing losses, governments are able to repair or reconstruct them without causing an undue strain to the national economy.

Developing economies are particularly vulnerable

The economic losses, disruptions to markets and supply chains, and migration that disasters can cause can often be felt globally. Yet the impacts of disasters are most severe in the developing world, where the majority of mortality from disasters occurs, the adverse social and economic effects are felt more deeply and widely, and countries often take longer to recover.

The total impact of a disaster to a country includes both the direct costs associated with the value of the physical assets damaged or destroyed (e.g., housing, schools, hospitals, roads and bridges, ports and airports) as well as the change in economic flows including, e.g., losses of production capacity, reductions in revenue, loss of jobs and wages, increases in production costs, and so on.

Case study –
New Zealand and Haiti

At the start of the decade, both Haiti and New Zealand were struck by massive earthquakes. Both suffered loss of life, damage to major infrastructure and business interruption. Yet their stories are remarkably different.

While absolute economic costs were lower in Haiti (USD 8.5 billion), the economic costs amounted to some 120 percent of the country's annual GDP. Ultimately, just 1 percent of the losses were insured, forcing Haiti to become almost completely dependent on foreign aid.

The economic costs of New Zealand's earthquakes were much higher at USD 31 billion, but these only amounted to around 18 percent of GDP. Around 80 percent of the resulting direct losses in New Zealand were covered and reimbursed by insurance. And while GDP growth dipped slightly (though never into negative territory), growth quickly resumed its upward trajectory.

The comparison between Haiti and New Zealand illustrates two points:

— The first is that vulnerability to disasters is related to levels of preparedness and the ability to absorb losses.

— The second is that, by facilitating investment, reconstruction and stimulus, insurance can minimize the negative impacts of disasters on economic growth.

In the absence of the capabilities to make them more resilient or the financial means to repair and rebuild them, the loss of public infrastructure facilities can have a profound impact on an economy through potentially debilitating knock-on effects that lead to a self-reinforcing destructive cycle that is difficult to reverse. Closed hospitals cannot save lives; entire generations can be left behind without access to education; transport of critical goods is interrupted; public services such as electricity and water remain unavailable for long periods of time – all affecting people as well as the country/region.

This challenge is the core reason for producing this *Practical Guide to Insuring Public Assets*.

By creating risk transfer schemes which move risk liabilities from the public to the private sector, the insurance industry can and does play a critical role in aiding development and contributing to increase countries' resilience, especially to climate risks. Responding to the needs of different countries, regions and cities, the insurance industry can assume vast amounts of diversified non-correlated natural catastrophe risk on a pooled basis, and thus share the risk via syndication.

This is not meant to imply that insurance is a single solution, or that re/insurers will necessarily offer insurance protection in all instances, or at least for an affordable price. For some public assets, the characteristics of the facilities along with their risk profile could significantly limit if not preclude entirely the amount of risk re/insurers are willing to accept.

Purpose of this guide

The purpose of this Guide is to share fundamental re/insurance know-how to aid decisions-makers in public positions who are considering using insurance to protect their country's, region's or city's public assets, or are in the midst of choosing the right solutions for their Public Assets Insurance Programme (PAIP). The document also aims to guide the reader through the different aspects a public administration needs to consider – the know-how it needs to access and the information that is needed – to set up a PAIP.

The Guide also aims to outline the broader benefits of insuring public assets; that is, in addition to accessing needed funding for repair and reconstruction. These include capacity building (up-skilling), the development of local insurance markets, support to economic growth and development, and the increased resilience that countries, and especially those with developing economies, can experience when critical assets are protected by insurance.

With this *Practical Guide to Insuring Public Assets*, the re/insurance industry, represented by the Insurance Development Forum (IDF), aims to provide a public goods document that contributes to countries' economic and social development and especially to increasing resilience to the impacts of climate change. We hope that as more countries choose to insure their public assets, this will contribute to closing the protection gap – that is, the difference between insured losses and overall economic losses.

The intended audience

This Guide is aimed primarily at public officials who need to make decisions about insuring their public assets and who are responsible for those assets as "owners", "managers", or both. These include officials working in different areas of a country's, region's or city's public administration, for example:

— Ministries of finance, the economy or the interior – or equivalent departments in regions/cities; and

— Specialized ministries/ administrations like education, health, public works and public security.

While aimed primarily at officials in developing countries, we believe this Guide can also be an important aid to public officials in developed countries who need to also work actively towards closing the protection gap in their jurisdictions.

Public asset categorization

While public assets can include a wide assortment of facilities and operations, the types of public assets that a government could decide to insure – which is the focus of this Guide – typically fall into one of six broad categories:

Transport including airports, ports/harbours, railway networks, roadways, bridges and tunnels;

Energy including power plants, hydroelectric facilities, electricity grids, and gas and oil pipelines;

Social infrastructure including schools, libraries, parks and recreational facilities, hospitals, clinics and prisons;

Water and sanitation including dams, irrigation and flood control waterworks, and local water and wastewater treatment systems;

Telecommunications including cables, towers and transmission lines for telephone and internet systems; and

Natural/Green infrastructure and ecosystems.

Note: This is an indicative but not exhaustive list of assets that can be owned and managed by a public entity. Also, military defence facilities are not considered in this document since commercial insurance is not commonly available for these assets.

Why a guide to insuring public assets

For a city, region and especially a national government, setting up a PAIP to protect its infrastructure can be a daunting task requiring numerous and varied decisions as well as a broad range of technical capabilities and expertise.

At the outset, the government needs to establish how the insurance programme fits within the broader risk management and resilience framework. It also needs to secure access to the resources and capabilities needed to set up such a programme, and to understand the advantages and disadvantages of different insurance options including the critical issue of price versus protection.

Setting up and managing a PAIP over time always requires collaboration and coordination with diverse stakeholders including, for example, elected officials, government agencies, NGOs and national and international re/insurers. Specific legislation and structures may need to be put in place. This all requires a solid understanding of the context and the target mode in which a PAIP should be set up.

To aid public officials in addressing this task and encourage the use of public asset insurance programmes, and responding to a request from the World Bank, the IDF has prepared this *Practical Guide to Insuring Public Assets*. The Guide aims to help local, regional and national governments who are planning to set up a public assets insurance programme better understand up-front what is involved, what issues they need to consider and what options and choices they may have in their decision-making.

This Guide addresses the creation of insurance programmes for public assets where the policyholders are governments who use any insurance payouts to manage liquidity gaps and maintain public services for their communities.

While this document is by no means exhaustive, it brings together the experience and insights of different global re/insurance companies and public sector experts working in both mature and emerging markets. We believe that by making this Guide available as a *public goods document*, it should help elected officials and government administrators in their efforts to protect the very infrastructure their constituents have paid for via state contributions.

This Guide also aims to facilitate conversations and collaboration between governments and the re/insurance industry and, especially the IDF, regarding when and how to set up their Public Asset Insurance Programmes (PAIPs).

Rationale for a Public Asset Insurance Programme (PAIP)

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Rationale for a Public Asset Insurance Programme (PAIP)

The rationale for setting up a PAIP will vary from government to government depending on the economic, fiscal, political and social context. While improving the resilience of public assets has to be the overarching reason to create a PAIP, in doing so, there are many important benefits that can be realized, as outlined in this chapter.

a. Protecting the government's budget from unexpected shocks from disasters

The impact of natural disasters on public assets is one of the major sources of fiscal vulnerability, especially in developing economies. For instance, in APEC economies damages to public assets from natural disasters are estimated to account for around 10 to 20% of total damages and can amount to 70% in exceptional cases.

Often a government considers insuring its public assets to insulate its planned budget allocations against significant shocks or disruptions following a major catastrophe which would otherwise require a re-allocation of budget items.

As they balance taxation, spending and borrowing, governments face budgetary constraints while having to address many social and economic issues at the same time. Building and setting aside reserves in anticipation of shocks to the budget could imply that other relevant priorities have to be deferred; this is an opportunity cost that is often difficult to justify.

Furthermore, in some administrations the budgeting process may limit options for making an ad hoc budget re-allocation for disaster response after a major unexpected adverse event; such a re-allocation also could challenge or slow down GDP growth. Moreover, when governments need to alter their budgets to address impacts, the process is often cumbersome and can take time. As a result, response is further delayed, and the impacts amplified.

In contrast, putting a PAIP in place spreads the cost of financing losses, or rather of repairing or reconstructing public assets, over a longer period, making it easier for governments to manage their finances in an organized and planned manner – and effectively reducing fiscal vulnerability.

b. Gaining the positive effect of pooling risks

Two fundamental principles of insurance are the diversification of risk and the theory of large numbers. Risk diversification also has a positive effect for the insured party. In short, the larger and more diversified a risk portfolio is, the more cost-efficient it should be.

The losses expected for specific assets are the same whether they are pooled into a portfolio or not. However, the capital that needs to be held against them if they are pooled into a portfolio is lower than if the assets are insured separately.

As a result, if an insurer is presented with a portfolio of different assets, the aggregated risk premium, and thereby the average premium per asset, should be lower than if different risk owners procured coverage separately. In addition to the effect of diversification on the price for cover, both insurer and insured can benefit from greater administrative efficiencies which can also reduce the overall pricing.

Hence, it is recommended to make use of the scaling effect by pooling risks together and to structure an overall insurance cover for the cumulative portfolio. This can be done at the national level, by specific regions or by asset type.

c. Diversifying the financing sources for rebuilding efforts

Another reason for setting up a PAIP, especially for developing economies that can face severe public budget constraints after a disaster, is the access it provides to alternative sources of financing for any rebuilding efforts after a disaster. Insurance tends to be a cost-effective approach to financing the highest (least frequent, most severe) layers of risk.

A public asset insurance scheme can broaden a government's financing sources as it not only increases participation in rebuilding efforts from the local and international re/insurance market, but it also can help foster growth and stability in the local insurance industry. Access to insurance payouts as additional funding in the aftermath of disasters provides greater flexibility for governments.

d. Enabling more effective and faster infrastructure repair/reconstruction

By having at least some of the necessary funding in place after a disaster, assets covered by insurance will typically be repaired or reconstructed more effectively compared to unprotected public infrastructure; this is especially relevant for developing countries. Moreover, once the government has certainty about the available funds, it has much greater flexibility in planning repair or reconstruction efforts based on different needs and priorities. For instance, the funding could be used to "build back better"; that is, repair or reconstruct the structure(s) to a higher standard and in so doing, increasing long-term resilience.

In contrast, pursuing such an approach is often less feasible when unprotected public assets are damaged or destroyed. Also, when the repair/reconstruction effort is funded via an ad hoc allocation, this can naturally create pressures to lessen the scope and/or quality of the work.

Asset repair or reconstruction also can proceed more quickly when there is an assured source of funding for at least a portion of the losses. This is particularly the case when the assets are covered by parametric or index-based insurance, which is triggered when specific agreed thresholds or parameters based on objective meteorological or geological data are recorded. Since a proper damage assessment isn't required, payouts from parametric schemes can be issued in a few weeks or even days after a disaster. This can be particularly beneficial if there is a need, for example, to quickly clear debris or erect temporary structures. *See also chapter 3, section 3.4 a Type of insurance: indemnity, parametric or hybrid and Appendix 1 for a more detailed discussion of parametric insurance.*

Note that while insurance can help enable a more effective reconstruction effort, there are many issues a government and its re/insurers need to address in deciding how to use claims payouts. *See chapter 6, Claims Management for more details.*

e. Promoting sustainable development and the SDGs

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The UN's Sustainable Development Goals (SDGs) – as part of the 2030 Agenda for Sustainable Development – demonstrate high-level international commitments in this area on the part of governments, international organizations, business and civil society.

However, climate and natural hazard risks slow the global effort to achieve the UN's Sustainable Development Goals: they reinforce poverty and hunger; they reduce access to education, health services and clean water; they cause environmental harm; and they take people out of productive work.

The services delivered by non-networked public infrastructure assets are clearly central to numerous SDGs and to different dimensions of development, including education, healthcare and the rule of law.

At the same time, networked infrastructure either plays a fundamental role in enabling the delivery of the services provided by non-networked infrastructure, or greatly enhances its ability to do so – and to support sustainable development. For example, to advance progress towards *SDG 4: Quality education*, it is not only necessary to provide school buildings (non-networked infrastructure), but those schools can only function effectively if they have access to the basic services that networked infrastructure provides, such as electricity and water.

In other words, PAIPs directly support sustainable development by protecting public infrastructure assets and making them more resilient to disasters. Especially as public infrastructure benefits a vast section of a country's economy and population.

Following are examples of how PAIPs can support specific SDGs.

	**Opportunity:** Increasing the resilience of the assets needed to provide public services (education, health, energy, water) and ensuring their restitution after disasters can contribute to reducing the vulnerability of those living in poverty and improve their opportunities for achieving greater social and economic inclusion.
	**Opportunity:** Increased use of retro-fitting and maintenance driven by the use of insurance can enhance the resilience of medical centres; insurance cover can ensure that public health facilities damaged or destroyed by a disaster can be repaired/re-built and that access to medical services can be restored more quickly – thereby supporting specific goals such as reducing maternal mortality and premature deaths due to incommunicable diseases, among others.
	**Opportunity:** Insuring public schools can indirectly encourage better maintenance and directly help improve schools' condition, and appropriate contracts can enable betterments through retro-fitting or by reconstructing schools to better standards after they are damaged or destroyed.
	**Opportunity:** Insurance programmes can help enable investment in projects to provide new freshwater ecosystems and sanitation facilities, contribute technical know-how and protect those critical facilities once they are built, helping increase and protect access to water and sanitation.

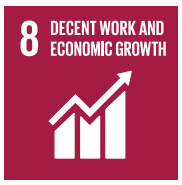
	**Opportunity:** Insurance programmes can help enable investment in projects to build energy installations and contribute relevant know-how on their maintenance, increasing their resilience.
	**Opportunity:** The introduction of risk management practices through insurance programmes for public infrastructure assets or public housing can add new jobs. For example, in the local insurance companies to serve these programmes; in the construction industry expanding retrofitting and maintenance of public buildings; through the creation of an administration entity in the public or private sector, to manage the programme.
	**Opportunity:** Insurance programmes can help enable investment in innovative infrastructure, help protect the quality of existing public assets and enable their restitution after a disaster, supporting a country's overall sustainable development.
	**Opportunity:** Through programmes to protect urban infrastructure, the insurance industry can contribute expertise in effective urban infrastructure maintenance to increase their resilience and sustainability.
	**Opportunity:** Insurance, and associated risk management capabilities like risk modelling and predictive analysis, can help to deepen understanding of climate risks and engender tools to better manage these risks. Insurers can also help to reduce greenhouse gases emissions and combat the effects of climate change by insuring renewable energy installations and contributing their expertise on new, sustainable building techniques.
	**Opportunity:** Insurance can provide protection for national parks and nature reserves, helping to support food security and shelter and to combat climate change.
	**Opportunity:** Insurance programmes can contribute to the practice of good governance regarding the use of payouts from insurance claims, help control fraud and misappropriation of public funds and generally contribute to establish greater transparency in the use of public funds.
	**Opportunity:** Re/insurers can create public-private partnerships to drive the implementation of insurance programmes in developing countries where capabilities and protection are most needed to support development and address climate risks, working with relevant local organizations as well as industry, national and multilateral agencies.

Figure 1 provides a graphic representation of how infrastructure forms a central component of the SDGs – underpinning sustainable development.

From *Infrastructure: Underpinning Sustainable Development. UNOPS, Copenhagen, Denmark.*

f. Supporting economic growth and development

A country's relative resilience and economic stability are important considerations to investors. Countries that rebound more promptly following a disaster, enabled in part by having insurance for select public assets in place, will be more attractive to private investors compared to countries that have to rely on ad hoc budget allocations and loans to finance rebuilding efforts, potentially leading to a lower sovereign rating. And in today's highly inter-connected and inter-dependent global economy, these factors can be a source of comparative advantage.

A PAIP can act as an important catalyst for economic growth and development by, among other factors, helping to foster growth in the local insurance industry. A more stable and mature local insurance industry ultimately leads to a more resilient economy and that, in turn, can stimulate economic growth by enabling investments in projects to build new infrastructure while ensuring that important public assets are repaired/reconstructed after a disaster.

As an example, a case study of Mexico's Fund for Natural Disasters (FONDEN) has provided an early indication that access to funding for the reconstruction of roads, infrastructure (and housing) boosted local economic activity by up to 4% in the year following a disaster.

Note: Several organizations including the IDF, Geneva Association and the World Bank have conducted research and published papers on the positive economic impacts that can be achieved by reducing the "insurance protection gap", the difference between economic losses caused by disasters and the portion of those losses covered by insurance coverage. *The most relevant publications are listed in the References section.*

g. Incentivizing risk mitigation

Another important benefit of transferring public risk to the private sector via insurance is the positive effect it can have on incentivizing risk mitigation measures to reduce losses and increase resilience.

Putting insurance in place leads to a more thorough understanding about how different assets are exposed to various risks. That greater understanding, coupled with the desire to mitigate risk via insurance as a last resort, creates strong incentives for asset owners or managers to look for cost-effective opportunities for minimizing the risks, and in so doing, reducing the cost of insurance. Moreover, having a better understanding of hazards, exposures and vulnerabilities can help asset owners/managers to prioritise spending for targeted actions that can be taken to lessen the overall impacts of disasters before they occur. *See also chapter 6, Claims Management.*

Indemnity insurance especially contributes to risk understanding, as it requires detailed information on the quality of a government's assets and its exposures. *See also chapter 3, section 3.4 a Type of insurance: indemnity, parametric or hybrid.*

Also, an important consideration for PAIP's involving multiple asset owners is how to allocate premium payments as well retentions/deductibles among the various entities. *See also chapter 6, "Claims Management".* These allocations can act as a powerful mechanism for incentivizing risk prevention or minimization. That is, when allocating premiums and setting retentions for individual asset owners/managers, the programme administrator or equivalent can use these to reward those entities that are effectively maintaining and/or retro-fitting their assets and thereby successfully minimizing their exposures, and vice-versa.

The involvement of the private insurance sector also can have a beneficial effect in creating alignment around public and private priorities for loss control. For instance, if the insurance sector is reinsuring a pool of aggregated risks in excess of a certain amount for a variety of public entities, the reinsurer(s), as well as the entity paying the premiums, will want to ensure that:

— only qualifying losses are attributed to that risk pool;

— there is no incentive for moral hazard, such as providing misleading information, for protected public entities; and

— any claims paid are used only to fix damages to assets from a covered event and not to reduce the amount of "pre-existing damages".

h. Up-skilling or capacity building for developing economies

For developing economies, the implementation of an insurance programme for public assets can have the added benefit of enabling and driving up-skilling or capacity building in different areas. This benefit will more likely be achieved if programme design and structuring are handled as a public-private partnership project, which brings together experts from international re/insurers who share their expertise and capabilities with local insurers and other experts participating in the programme.

In addition, such a project may help expose local skills gaps that need to be addressed through capacity building (up-skilling) in order to enable the effective development and implementation of the insurance programme. For example, the World Bank's 2012 review of public building insurance in Colombia found that while many public institutions were mandated by law to buy disaster insurance for the assets under their administration, the majority did not have an appropriate risk management unit at their disposal.

The implementation of a PAIP can include specific training activities around insurance programme design and administration to close relevant skill gaps. Depending on how the PAIP will be administered, that training can be targeted to either a designated central manager within the public sector or the responsible employees of a third-party provider. In Mexico, for instance, technical assistance is provided to subnational governments seeking to procure public asset insurance by the Risk Analysis Division of the Directorate of Insurance, Securities, and Pensions within the Ministry of Finance.

Also, the re/insurance industry has formed multiple development organizations which, with contributions from donor countries supporting the SDGs, can contribute to capacity building. See for example a link to InsuResilience in the *Resources* section.

i. Supporting good governance

Finally, the implementation of a PAIP can help to strengthen governance practices and procedures in both the public and private sectors; that can be an especially important outcome in countries where governance is less well established.

In particular, in the course of setting up a PAIP and before committing funds for premium payments, the public entity(ies) that own and/or administer the assets will need to exercise discipline and transparency in, e.g., determining which assets to cover and at what levels, allocating premiums/retentions across different asset owners/managers, and deciding where and how use claims payments.

Activities that increase transparency include:

— Inventorying and auditing the portfolio of public assets to achieve a better understanding of their condition and value;

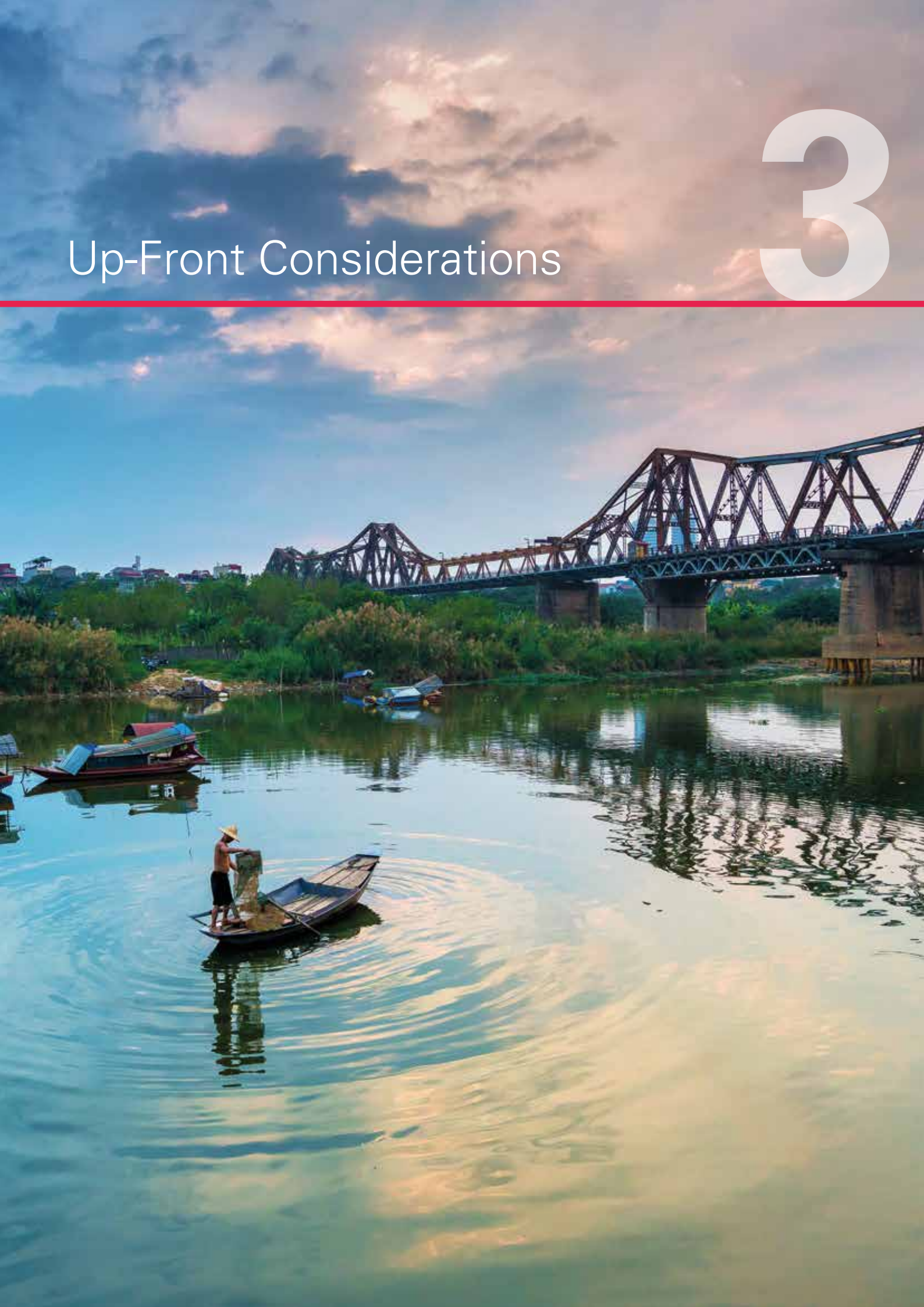
— Purchasing the cover via a public tender process with clearly defined criteria, both prescriptive and descriptive;

— Establishing transparent rules for payouts from insurance claims, helping avoid fraud.

In sum, PAIPs can contribute to the development of "virtuous circles" where reduced risk and greater resilience help to stimulate progressive economic development.

3

Up-Front Considerations



3

Up-Front Considerations

There is no standard model for a sustainable public asset insurance scheme; its design and management should be driven and informed by the government's purposes and objectives. These can vary considerably between different countries as well as among various owners of public assets (risk owners) within the same country, depending on their specific circumstances.

This chapter outlines a series of topics that a government needs to consider before deciding whether setting up a PAIP is the right priority and, if this is the case, to do so on an informed basis.

Before specific design and operational issues can be discussed (these are covered in chapters 4 – 8), the government first needs to address two fundamental questions:

— What is the purpose of the PAIP?

— What benefits and limitations will a PAIP have relative to other risk financing options?

3.1: Deciding whether to set up a PAIP

a. Establishing the purpose of the PAIP

Before deciding whether to set up a PAIP, a government needs to consider a basic question: What beneficial outcomes does it aim to achieve by transferring some of the risks these assets face to the private insurance sector?

Establishing a clear and explicit rationale for the scheme and its expected outcomes is critical for several reasons. First and foremost, the answer will build the foundation for the design of the scheme and help ensure alignment of important dimensions to the purpose. It will also serve as the basis for evaluating its effectiveness.

Mexico, for example, is exposed to earthquakes, tropical cyclones, flooding and storm surges; between 1970 and 2009, about 60 million people were affected by disasters in Mexico. Following the 1985 Mexico City earthquake that killed six thousand people and left a total of 150 thousand victims, the Mexican government embarked on an effort to develop a comprehensive institutional approach to disasters.

At the outset of this undertaking, federal, state and local governments in Mexico were individually required to reallocate planned capital expenditures towards financing post-disaster reconstruction efforts. According to the Global Disaster Preparedness Centre, an arm of the American Red Cross, "[The need for such] budget reallocations created delays and scaling back of investment programmes, while also slowing deployment of funds for recovery efforts." In response, in 1994, legislation was passed to require federal, state and municipal assets to be privately insured. In 1996, the government created the Fund for Natural Disasters in the Ministry of Finance (FONDEN).

FONDEN's main purpose was clearly established: to provide immediate financial support to federal agencies and local governments recovering from a disaster, and in particular for i) the provision of relief supplies; and, ii) financing for the reconstruction of public infrastructure and low-income homes. FONDEN relies on indemnity insurance for the higher risk layers. *See chapter 9 for more details about FONDEN.*

As the experiences in Mexico demonstrate, a "comprehensive institutional response" that includes provisions for repairing or replacing public assets requires a coordinated approach plus a *long-term* commitment that is formalized by, e.g., legislation requiring that specific authorities maintain a line item for these responsibilities in their annual budgets.

PAIP's are better suited for covering residual risks

It is important for governments to recognize that insurance is better suited for covering residual risks associated with less frequent and more severe events; that is, the threats that remain after all reasonable efforts to identify and eliminate risk have been made.

Conversely, it is less advisable to use insurance for high frequency, lower cost claims; in most instances, a government will be better off self-insuring those losses if it aims to keep insurance premiums low. This makes sense for several reasons including the fact that assessing small claims, especially in remote locations, can be disproportionally costly in relation to the size of the claims.

b. Benefits and limitations of a PAIP in the context of other risk financing options

Ideally, a public asset insurance programme will be part of a comprehensive disaster risk management strategy and one integral, complementary measure of a risk financing framework. The decision to set up a PAIP should be made only after the government evaluates the cost-benefits of different options for risk financing and transfer and determines the desired levels of risk to retain and transfer.

Setting up an insurance programme, building up reserve funds for reconstruction needs, reallocating spending, issuing catastrophe bonds, or borrowing for post-disaster recovery – these and other approaches to risk financing and risk transfer should be considered not as alternatives, but as possible complementary measures to address disaster risk.

In addition to all the efforts governments take to prepare for natural or man-made catastrophes, an insurance programme that pools public asset risks together can deliver important benefits pre- and post-event. Insuring assets together in a programme or pool, has a positive effect on price, reducing the cost of premium per asset, due to the benefits from administration efficiencies and risk diversification. PAIPs also help finance rebuilding efforts and incentivize better risk management. However, insurance is not an all-encompassing solution. So, if a government decides to procure insurance cover for its public assets, its decision-making stakeholders need to clearly understand the benefits and limitations of the insurance solution.

Understanding the value that insurance cover can provide in comparison to other available ex-ante financing tools (pre-agreed ahead of an event) ensures that decisions are based on an informed view of the relative merits of the different solutions available to the government.

Strengthening risk management

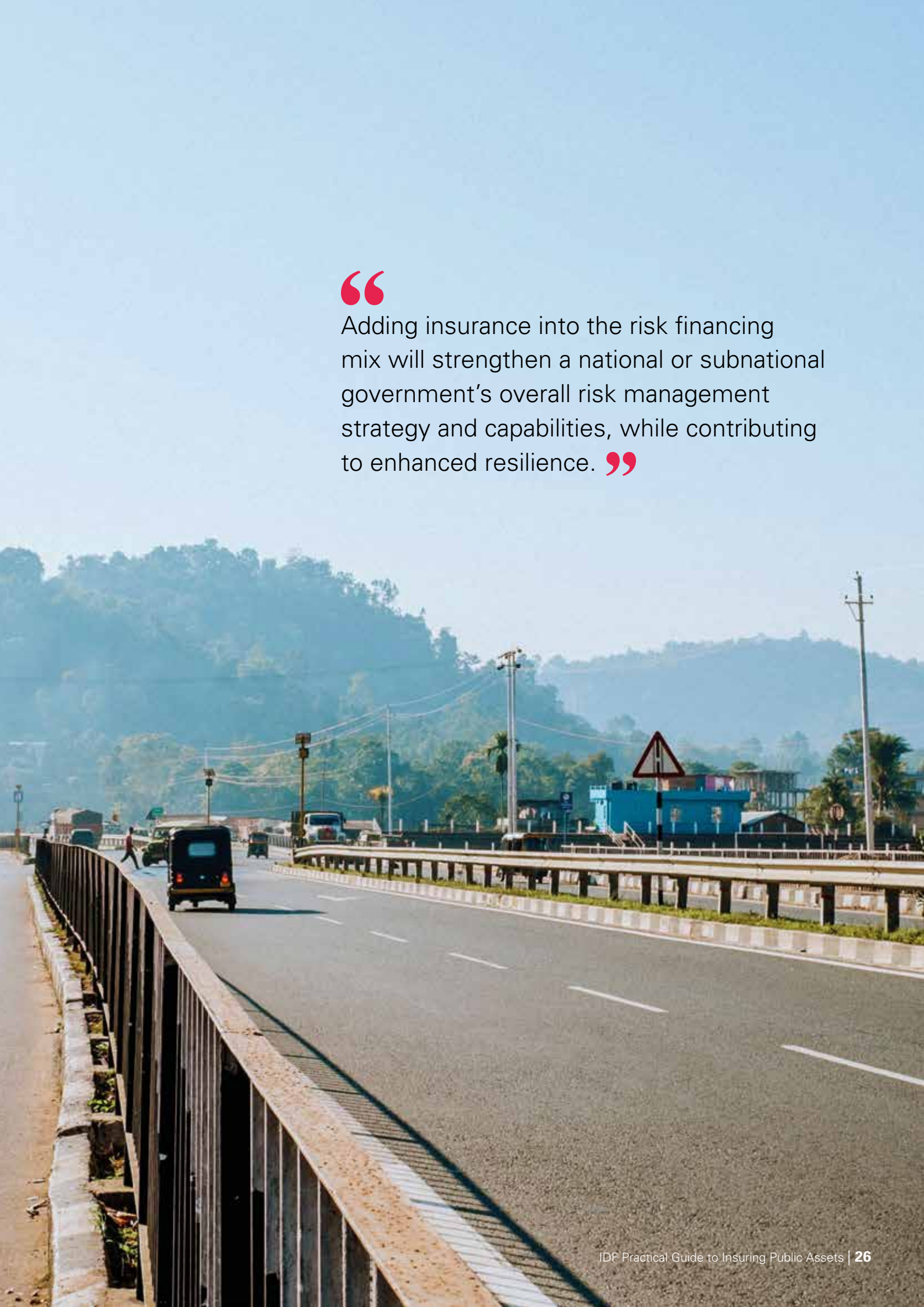
Adding insurance into the risk financing mix will strengthen a national or subnational government's overall risk management strategy and capabilities, while contributing to enhanced resilience. This is attributable to the fact that the overall process for setting up and managing a PAIP will typically:

— drive a more detailed understanding of the quality and condition of the assets;

— provide a greater understanding of the risks a portfolio of public assets is exposed to; and

— promote risk management practices such as better maintenance and retrofitting of vulnerable structures to increase resilience.

In developing economies in particular, where more limited budgets will demand efforts to control the costs of insurance, having greater insights into the public asset portfolio will help enable and drive better risk management practices including, e.g., the need for more regular maintenance, more robust safety procedures and/or heightened protection measures. These and other actions, in turn, will typically lead to lower insurance premiums.



> Adding insurance into the risk financing mix will strengthen a national or subnational government's overall risk management strategy and capabilities, while contributing to enhanced resilience.

Insurance can reduce fiscal vulnerability

The costs and benefits of insurance are more predictable compared to other risk financing options. With insurance, the premium level is known in advance as are the payout conditions. So, a government can budget a fixed amount for the insurance premiums and base its post-disaster plans on pre-agreed payouts.

In comparison, with traditional debt instruments such as bonds or contingency loans, the cost to the government to set up the vehicle may be relatively modest. But once the bond or loan is activated by a disaster, the government becomes an effective debtor and is obligated to pay both the interest on the debt while also repaying the principal. For developing countries, these expenses can represent a considerable burden on the government's available cash flow after a disaster. Moreover, if the country's economy is heavily affected by the disaster, tax revenues from businesses and individuals necessarily will be curtailed. That can lead to an increase in the country's debt ratio, and lower its sovereign rating, in turn making refinancing from the capital markets more expensive.

In summary, especially for developing countries with more vulnerable economies, putting in place an insurance programme for the highest layers of risk (from less frequent but more severe events) adds a financing option to repair/reconstruct public assets after a disaster which can considerably reduce the stress to the economy versus relying solely on ad hoc budget allocations and/or traditional debt instruments.

Combining different approaches into a holistic disaster risk management (DRM) strategy allows for the most effective allocation of resources and helps define realistic goals and expectations for the insurance programme.

Also, if the insurance is procured independently from other financing sources, its performance is more likely to be assessed subjectively rather than objectively. For example, in the case of small losses that do not trigger the insurance programme, there could be a misperception that the insurance programme has not performed well if it was purchased independently of a DRM strategy where smaller losses were accounted for by other financing tools.

The table below outlines the suitability of a PAIP depending on the characteristics of the country's infrastructure plus the government's budgetary processes, financial circumstances and access to different funding sources:

Elements of influence	More suitable for insurance scheme	Less suitable for insurance scheme
Relevant characteristics of the country's public assets: 	— A high number of "critical" infrastructure assets (whether explicitly classified or not) — Many high-value assets (threshold to be decided by the respective government) — New infrastructure assets that are intended to enable future economic growth — A regularly updated national infrastructure assessment/development plan with specific medium- and long-term priorities and including funding sources/options	— Infrastructure that plays a limited role in the country's economic stability or security — Few high-value assets (threshold to be decided by the respective government) — Older assets nearing the end of their expected usability — A national infrastructure development plan that is largely aspirational and with unclear funding sources
The government's budget allocation framework and procedures: 	— Budget allocation procedures and outcomes are well defined, e.g., for allocating or shifting funds outside of the established cycle — Long-term: budget plans are set in advance for multiple years — Comprehensive processes and decisions based on consensus finding	— Flexible, fast and relatively ad hoc procedures — Budget is allocated for short-term purposes or needs, e.g., monthly
Participation of private funds in public infrastructure: 	— Low insurance penetration in the market — Mainly local funding and limited alternative funding sources (i.e., low foreign investment funds via FDI, capital markets)	— Sources of risk financing are already widely diversified
Government's access to funds to drive economic growth: 	— Many infrastructure or other long-tail projects in the pipeline — High debt ratio — Anticipated slower economic growth	— Government has multiple funding sources to self-insure large losses and damages to critical infrastructure — Government limits its holding of physical assets

3.2 Prioritizing assets to insure

As public infrastructure assets are central to delivering public services, virtually all governments have at least rudimentary infrastructure development and maintenance strategies and plans. Decisions about insuring public assets, including which insurance structures would be most suitable to be insured, naturally should be consistent with these strategies and plans.

There are no standard models for prioritizing public assets in terms of the need for, or value of, insurance protection. *(For guidance, see "Climate Risk Insurance Solutions: Understanding the Drivers of Cost Effectiveness" in the References section.)* However, there are some general criteria a government should consider when making these determinations. These include how "critical" an asset is to a country's economic security and stability; in this context, "critical" can be an explicit designation or a more general characterization, as outlined below.

Whatever criteria are used to define it, it is logical to prioritize public infrastructure that can be categorized as "critical" when considering which assets to insure first, to cover the residual risk. Still, issues like data availability may also influence the prioritization.

a. Critical infrastructure

Many governments have explicit policies and programmes identifying and addressing "critical infrastructure". For governments that have not yet identified their critical infrastructure, it is recommended that they do so, and the criteria developed in other countries may prove useful.

While the categorizations vary somewhat between countries, the UK's Centre for the Protection of National Infrastructure (CPNI) defines critical infrastructure as those "… facilities, systems, sites, information, people, networks and processes, necessary for a country to function and upon which daily life depends. It also includes some functions, sites and organizations which are not critical to the maintenance of essential services, but which need protection due to the potential danger to the public (civil nuclear and chemical sites for example)".

Which specific infrastructure assets are designated as critical depends on different criteria including e.g., a country's geography, the pillars of its economy, the extent to which its citizens live in urban versus rural areas, and similar factors. For example, if agricultural exports represent a significant part of a country's economy, then the transport networks – including roads, bridges and port facilities – would most likely be considered critical infrastructure.

Also, governments that have identified critical infrastructure as a national priority typically have procedures and criteria to determine which infrastructure warrants this classification, and requirements about how these assets are to be protected from various threats, including natural and man-made disasters.

However, where explicit programmes to protect critical infrastructure have been implemented, the requirements usually focus on the need to strengthen the facilities with appropriate protective measures and do not necessarily include provisions for financing their repair or reconstruction. At the same time, while protective measures may significantly limit damage to those assets, they are still unlikely to emerge unscathed from a major disaster. Moreover, the costs of insuring any critical infrastructure that has been "hardened" to lessen its vulnerability should typically be lower than for comparable facilities that lack such protections.

Smart cities

The increasing profusion of connected objects – also known as the internet of things – supported by a vast array of new technologies is prompting the development of "smart cities". The aim of these new technologies and processes is to enhance the quality and performance of urban services such as energy, transportation and utilities in order to reduce resource consumption, wastage and overall costs. This trend will only continue, and more and more infrastructure elements and systems are expected to become increasingly inter-connected. While the benefits of these approaches can be substantial, smart infrastructure also is considerably more complex, and connected assets are exposed to a broader set of risks, including cyber.

While the specific challenges and issues associated with smart infrastructure are beyond the scope of this Guide, these are explored in detail in publication "*Smart Resilience Indicators for Smart Critical Infrastructure*"; a link to this document can be found in the *References* section.

b. Networked vs non-networked infrastructure

Networked infrastructure is a general term that refers to interconnected lifelines. "Lifelines" are networks that provide for the proper functioning of modern society. Networked infrastructure systems include energy, transportation, water, waste management and digital communications.

By providing and supporting essential services, networked infrastructure forms the backbone of modern society. As well as providing for people in their homes, the services from these infrastructure systems support other non-networked infrastructure systems that are critical for the functioning of society.

Networked infrastructure is generally critical to the functioning of a country and hence should likely be identified as "critical infrastructure".

Also, when prioritizing infrastructure for possible inclusion in a PAIP, a government should consider all the assets within an infrastructure network and not just individual nodes. For example, a power plant may be the most important element in a country's energy infrastructure and, as such, merit inclusion in a PAIP. However, that insurance coverage could prove to be of limited value if other elements of the country's energy network like substations and transmission lines are left unprotected.

Non-networked infrastructure consists of a single asset type, a building or a facility, which supports the delivery of a service. These include hospitals, schools, industrial facilities, community centres and government (administration) buildings. However, no infrastructure system exists in isolation and single assets will mostly depend on the services that networked assets provide, such as electricity and water, to be operational.

Networked vs non-networked public assets

Networked infrastructure	Non-networked infrastructure
Digital Communication	Community Centres
Energy	Courts and Prisons
Solid Waste	Educational Buildings
Transport	Government Buildings
Water	Healthcare Centres
	Housing and Shelter
	Industrial Facilities
	Markets

3.3: Basic insurance considerations

There are a series of issues and questions about insurance which a government will have to take into consideration when planning to insure its public assets; these are outlined below. Their resolution will create the foundation for implementing and managing a PAIP.

More details about specific elements of the PAIP including operational issues, the institutional basis for the programme, and the different ways insurance can be structured to protect public assets are addressed in chapters 4 – 7.

a. Premium budget allocation

The question of financing the necessary premium has to be solved by the responsible public sector entity before starting the development of a PAIP. Whichever entity is responsible for financing the premium should aim to secure its funding as a long-term, ongoing commitment, especially given the complex task of setting up a PAIP. Although the PAIP can certainly be revised and updated as circumstances warrant, it is generally understood that these are not intended as short-term or temporary solutions.

Premium financing options

While different financing approaches may have to be employed, creating trust among the stakeholders and ensuring that the insurance programmes are sustainable should be important considerations in selecting the most appropriate financing option.

The most common premium funding options are:

- full funding of the premiums by the government;
- partial subsidy by the government with voluntary or compulsory contributions from the beneficiaries;
- engaging with participating public asset owners or managers who retain part of the risk while insurers share residual risk above a benchmark level; or
- the government plays the role of reinsurer on a stop-loss basis; that is, the government takes on the responsibility for covering losses incurred over a certain period (usually one year) that exceed a specified amount, up to the policy limit.

Premium financing for developing countries

Developing countries have the possibility of receiving financial support for insurance premiums, especially at the start of a programme, from various development agencies in the context of those organizations' commitments to the SDGs. This can be accessed through different re/insurance industry organizations – see especially *InsuResilience* in the *Resources* section for ways in which countries have sought to structure such support.

In the past, otherwise viable and sensible PAIPs have not been implemented due to uncertainties about how the premium will be financed. Ultimately, whether the budget is provided by the relevant national or subnational government or not is primarily a question of "value for money" and a reflection of the purpose and objective of the scheme.

As reference, see *Financial Management of Earthquake Risk, OECD 2018* in the *References* section. This report applies the lessons from the OECD's analysis of disaster risk financing practices and the guidance in the OECD Recommendation on Disaster Risk Financing Strategies to the specific case of earthquakes. It provides an overview of the approaches that economies facing various levels of earthquake risk and economic development have taken to managing the financial impacts of earthquakes.

b. Risk context

When looking to insure public assets, both the risk context and the government's goals and objectives will influence the form and structure of the insurance required. The risk context refers to which hazards or perils threaten which assets, while the government's goals and objectives will determine the types of losses the government wants to cover and how it intends to use the claims payouts.

Scope of perils or hazards

When referring to perils or hazards, the re/insurance industry divides these into two basic categories: natural and man-made.

- Natural perils include meteorological- or seismic-related events including tropical cyclones, floods, drought, wildfires, extreme heat and storm surges, as well as earthquakes.
- Man-made disasters include explosions, fires and civil strife, among others.

In many instances, risk models based on computer simulations derived from historical data, and combined with engineering analyses as well as scientific knowledge of meteorology and geophysics, can be used to estimate the potential impacts of particular natural perils in specific locations. Most man-made disasters are more difficult to model given the idiosyncratic nature of the underlying causes.

The insurance industry can offer coverages for a single peril, a selection of perils, or all applicable perils. Depending on how these are selected, insurance cover can either be very narrow and bespoke to a specific hazard or encapsulate the full array of adverse events that could potentially occur. In many parts of the world, for example, governments subsidize programmes to indemnify farmers from losses caused by hailstorms. Conversely, Mexico's FONDEN programme covers earthquakes as well as a variety of meteorological risks, including tropical cyclones and flooding.

The table below provides a high-level checklist for defining the risk context.

Checklist for defining the risk context for protection of government budget
Define geographical coverage, e.g., — national — sub-national — municipal
Define hazard(s) or peril(s) to be covered, e.g., — cyclone — drought — earthquake — epidemic — excess rainfall — windstorm
Define what risk(s) are to be covered, e.g., — agriculture infrastructure — budgetary risks post-disaster — critical infrastructure — property

Adapted from The Geneva Association and Insurance Development Forum (2017).

c. Risk ownership

While PAIP's and other insurance schemes can create strong incentives for understanding risks and promoting more effective risk management, realizing these benefits also requires that there is a clear and explicit understanding as to which entity actually "owns" a risk. With public assets, however, this issue is not as straight-forward as one might expect.

In some countries, the lines are clear as to which government entities own which assets, as well as their respective responsibilities for various assets. In other countries, issues can surface after a disaster when the lines of responsibility are unclear, and the roles of different entities in driving the response have not been specifically delineated. This can be especially problematic in cases involving different *levels* (e.g., national versus provincial) or *lines* of authorities (e.g., ministry of finance versus ministry of health).

Premium payer versus claims beneficiary

Risk ownership is fundamental to the design and implementation of a PAIP, as it also directly impacts the question of which entity is responsible for paying the insurance premium and which is the beneficiary of any payouts; with PAIPS, it can be the same or different entities. Furthermore, official policies or budget allocation frameworks might have to be introduced to clarify the role and level of involvement of different entities in the flow of funds and resources, especially if the premium payer and the beneficiary of the claim are not the same.

Defining the risk owner and establishing a risk ownership framework

Therefore, it is critical for the government to align its views on the so-called "risk ownership", i.e., the entity in charge of the risk management as well as crisis response for a particular public asset or set of assets.

While specific governance structures can be built around the relevant entity to ensure appropriate conduct, naming one agency as the risk owner helps to ensure smooth end-to-end execution of the risk management and crisis response activities, reduce friction in the implementation and increase accountability.

A framework of clearly defined roles and responsibilities can further help to minimize or eliminate ineffective or inconsistent responses by different stakeholders who are part of the governance system. This can include, for example, avoiding situations such as a municipal agency not taking action because it believes that the national entity is responsible for addressing the incident.

Risk ownership framework – options

Which administration level owns the risk?	National
	Regional
	Provincial
	City
	District
	Municipal
Which entity owns the risk?	Ministry of Finance
	Ministry of Transportation
	Ministry of Urban Development
	Ministry of Rural Roads
	Disaster Management Agency

Establishing insurable interest

For all insurance coverages, there is either a legal or contractual requirement that the policy holder has an "insurable interest" in the coverage provided. Concretely, an entity has an insurable interest in a physical asset when loss of or damage to that asset would cause the entity to suffer a financial or other kind of loss. Insurable interest usually results from property rights (ownership), contractual rights or potential legal liability. It is generally defined as an interest by the insured in the value of the subject of insurance, including any legal or financial relationship. Insurable interest is based on the premise that someone cannot purchase insurance for something it does not own or have a financial interest in. In other words, people or entities not subject to financial loss from the damage to the item or asset, do not have an insurable interest.

In the context of public asset insurance, the concept of insurable interest will rightly include the particular dynamics of the government's assets and its responsibilities to its citizens; those can be specifically mandated or driven by political expediency.

Accordingly, in structuring insurance protection for public assets it is important to consider:

1. Who owns the physical assets in question – federal, state or local governmental entities? In some cases, these interests may be overlapping.
2. Regardless of ownership, what implicit or political expectation (and hence necessity) will there be for the insured to reconstruct an asset? For example, if a town is devastated by a typhoon, the federal authorities may be compelled to rebuild schools, hospitals or roads that are owned by local entities.
3. Beyond repairing or reconstructing damaged physical property, what other costs will the insured government entity have in the event of a disaster? This may include expenses for emergency response, humanitarian aid, evacuations, loss of tax revenue, etc.

Also, consideration should be given to who has the responsibility/authority to repair or reconstruct public assets. As noted above, these rights may be separate from ownership.

Finally, and as discussed further below, consideration also must be given to how claims payments will be made, and suitable controls and audit requirements need to be established for both the receipt and disbursement of claims proceeds. A key component of all aspects of the public asset insurance programme will be clarity and documentation of who has what interests and responsibilities.

d. Defining the intended purpose for claims payments

Determining how and for what purposes claims payments should be used is closely tied to the rationale for the PAIP and its expected outcomes. These priorities, in turn, will help define which type of insurance is best suited to meeting the government's goals and objectives.

Two significant considerations regarding how claims payments will be used are outlined below.

Speed of payment

The first consideration has to do with timeliness and speed; that is, how quickly does the government want or need to receive claims payouts after the insured public assets are damaged or destroyed?

The issue here is whether the government expects to use the funds to provide swift temporary replacement of specific assets or, instead, intends to use the payments to finance the timely but less urgent repair or reconstruction of damaged assets.

If a government needs to receive the funds as quickly as possible after a disaster strikes – for example, to finance the temporary replacement of critical infrastructure such as bridges with boats, or of water treatment facilities with water brought in from a different location – it may want to consider a parametric insurance solution instead of a traditional indemnity product. With parametric solutions especially, the issue of basis risk will need to be carefully evaluated. Basis risk refers to the possibility that the objective measurement(s) used to trigger a

payout doesn't accurately represent the actual situation on the ground; it can be either positive or negative. *Parametric insurance and basis risk are described in more detail later in this chapter.*

Governments often choose a parametric cover, or an insurance programme that includes a parametric element, when fast claims payments are a priority since with these solutions, funds can begin to be released within a few weeks or even days after a disaster, based on objective meteorological or geological data such as wind speed for a cyclone or ground shaking for an earthquake.

For example, the Caribbean Catastrophe Risk Insurance Facility (CCRIF) buys parametric solutions and it promises to start making payments within 14 days of a cyclone, earthquake or extreme rainfall event; it so far has met this standard in every instance when payouts were made. It also strives to notify the affected entity within a few days after an event about how much it can expect to receive, further enabling effective planning after a disaster.

In contrast, indemnity insurance requires a proper damage assessment, often onsite. That typically takes much more time to complete given the availability of qualified assessors or adjustors, difficulties reaching the affected areas, and the possibility that communications systems are down; any or all of these can contribute to delays in reaching a settlement.

Planned use of the claims payments

The second dimension refers to how the funds from claims payouts will be spent when available. There is a continuum:

— to use the funds for temporary repairs or ad interim replacements, e.g., erecting temporary buildings or implementing boat service while a bridge is being rebuilt; or

— to reconstruct exactly what was damaged; or

— to take the opportunity to refit or rebuild the damaged asset to better standards, e.g., by making buildings more energy-efficient or more resistant to earthquakes – this concept is often referred to as "*build back better*".

Considering the two dimensions of speed of payment and planned use of the claims payments should provide clarity on the most suitable and feasible insurance product.

3.4: Insurance type and programme approach

In addition to the considerations outlined in the previous sections, a government has two fundamental options concerning the design and operation of a PAIP: the type of insurance and whether participation in the scheme is voluntary or compulsory.

a. Type of insurance: indemnity, parametric or hybrid

Whichever type of insurance a government chooses, the fact that certain public assets are protected, at least to some extent, can contribute significantly to improving the resilience of public infrastructure. However, there also are particular benefits and challenges associated with the different types of coverages; a government needs to understand these so that it can implement a solution that is most appropriate and fit-for-purpose given its needs and circumstances.

Indemnity insurance

Indemnity insurance has been the traditional mechanism for mitigating or transferring risk since at least the 17th century when the modern insurance industry began to take shape in Edward Lloyds' coffee shop in London. Its main characteristic is that it indemnifies or compensates the insured for an incurred loss caused by damage to an asset. In other words, the size of the claims payout is dictated by the size of the actual loss. Accordingly, the fundamental requirements of an indemnity insurance contract are:

— the assets to be insured are known and their value understood;

— losses are verifiable and documented so that an appropriate sum of money can be paid as compensation; and

— the policyholder has an "insurable interest" in the assets; that is, the loss of or damages to the asset would cause the policyholder to experience a financial or other type of loss.

Benefits of indemnity insurance:

— Robust risk management: With indemnity insurance, detailed information about the portfolio of assets to be insured needs to be available and documented to assess the risk: where are they; what condition are they in; what is their value, etc. This information, in turn, enables the government to understand the assets it owns and can help to promote more robust risk management, including aspects such as disaster preparedness and emergency response.

— Loss control: Documented information on the assets will also help a government avoid artificially inflated or fraudulent claims leading to better loss control.

Said differently, only when a government understands the assets it owns, can it aim to manage them in a way that minimizes risk and increases resilience. *See also chapter 5, section 5.1,a, Loss exposure-based risk valuation, for more details on the information needed to cover an asset with indemnity insurance.*

Challenges of indemnity insurance:

— **Need for detailed information:** As noted above, insurers need good quality and detailed data about the public assets before an indemnity insurance programme can be set up. While compiling that data can be beneficial, the information the government currently has about different assets may be lacking in quality and/or detail, and the time and effort required to collect the necessary data could be significant.

— **Slower claims payments:** Because it compensates the insured for actual incurred losses, the traditional indemnity insurance model requires time and resources to conduct a proper damage assessment, often onsite, after a disaster strikes. This can lengthen the time it takes for claims payments to be made, especially if the damages are widespread and severe.

— **Costly damage assessment:** With a large asset inventory, which may also be widely spread geographically, damage assessments can be time-consuming and hence costly. This challenge is magnified if any of the assets are located in remote or hard to reach areas. Also, relying on damage reports being prepared locally increases the possibility of inaccurate claims reports. The temptation can creep in to report greater damages than were actually sustained in order to receive a larger payment; for example, to fund long-needed improvements. This artificially inflates claims payments which, over time, will lead to increased premiums.

— **Cost of settling disputes** concerning the adequacy of the original sum insured (the maximum amount the insurer will pay) or the application of contract terms:

  — The sum insured is often limited to the available loans/financing, leading to under-insurance and consequent challenges in claims settlement.

  — Disputes about the application of contract terms can stem, for example, from an improper selection of perils covered (e.g., opting out of flood and earthquake covers), or not opting for reinstatement value and replacement value, among other reasons. In these and other instances, an appropriate dispute resolution process is required, whether via litigation, arbitration, mediation or a combination of these. However the dispute is handled, the process for resolving the issue necessarily requires additional costs and can be time-consuming.

Parametric insurance

Parametric insurance is based on an independent parameter or set of parameters closely correlated to a client's risks. It differs from indemnity insurance in that claims payments are triggered automatically once an agreed-upon threshold is reached.

Parametric covers have three main features:

1. **The index value:** one or more variables that are correlated with expected losses/damages. These are objective factors or parameters such as rainfall, temperature, wind speed or seismic magnitude. An insurance payment is triggered when the index exceeds a pre-defined value, based on actual meteorological or geological conditions measured by, e.g., weather stations, seismographs, river gauges or assessed satellite images.

   For example, the index could be based on the wind speed of a tropical cyclone. Since the correlation between wind speed and damage levels can be found in historical events, the index should reflect the actual damages that are incurred when the wind speed reaches or exceeds certain thresholds.

   However, modelling the relationship between cause and effect requires robust historical meteorological or seismic records plus engineering data on the exposed assets. When the available data are lacking in terms of quantity and/or quality, the potential for basis risk is amplified. *See below for a more detailed discussion of basis risk and also chapter 5, "Key Information Needed for a Sustainable PAIP".*

2. **The threshold level/deductible:** the point at which the insurance starts to pay.

   These can be structured in different ways:

   a) A purely binary structure where the full limit is paid when an index value above or below a pre-defined threshold is recorded; or

   b) A linear structure where the payout is linked to the severity or magnitude of the event; for instance, a Category 4 cyclone triggers 50% of the limit while a Category 5 cyclone pays 100%.

3. **The limit:** the maximum payout that will be made. For it to be insurance, the amount paid-out has to be less than or equal to the client's actual losses.

Parametric contracts can be enhanced by constructing an index from the basic meteorological or seismic data to better reflect likely damage or loss (e.g., population-weighted), or by using a catastrophe risk model to take into account vulnerability and exposure which can add an extra layer of sophistication of calculation, although at some cost of transparency.

Parametric solutions are usually chosen when the insurance payout will be used primarily or exclusively for the swift financing of emergency response, as opposed to financing the repair or reconstruction of destroyed assets. In relation to public assets, this could include building urgently needed temporary structures such as bridges.

Benefits of parametric insurance

- **It's objective and transparent:** the index value(s) is derived from independent, third-party data and claims payouts are triggered automatically when pre-agreed threshold levels are exceeded on an agreed parameter as measured by, e.g., weather stations or satellites.
- **It reduces uncertainty for the insured:** the organization taking out the insurance knows in advance exactly what the payouts will be at each index value.
- **Payouts are made quickly:** once a threshold is reached, claims can be paid in days or, at most, weeks. This can significantly lessen the overall impact of a disaster if funds are used to support disaster response efforts.
- **It's tailor-made:** the policy covers specific locations/facilities defined by the client, and the programme structures – index values, payout formula and coverage limits – are customized to the client's strategic objectives, risk appetites and budgets.
- **It is cost-efficient:** loss appraisers aren't needed to resolve claims. Also, coverage disputes, as well as potentially fraudulent claims, are not an issue since payouts are based on objective third-party data.
- Compared to indemnity insurance, **less information is needed** about individual assets, e.g., their quality, construction, age, etc., to structure the contract and terms This can be helpful in instances in which limited information about the assets is available.

Challenges of parametric insurance

The most noteworthy potential drawback of parametric insurance is the basis risk. Basis risk refers to the possibility that the index doesn't precisely reflect actual losses on the ground; it can be either negative – payouts, if any, don't match the losses, or positive – payouts greater than actual losses.

Following is a simple example of *negative* basis risk:

- A public utility takes out a parametric insurance policy covering its transmission lines and towers against damages from high winds. The threshold for payouts is reached when wind speeds exceed 170 km/hour; that's based on historical data showing that the lines and towers will topple when wind speeds surpass that level. When that occurs, the utility receives USD 20 million to repair the damages.
- In the next season, a typhoon blows across the country with maximum winds of 150 km/hour.
- Despite the somewhat milder wind speeds, some of the transmission lines and towers go down, and funds are needed to restore them.
- However, since the wind speed did not exceed the agreed threshold of 170 km/hour, a payout is not triggered by the parametric insurance.

The same example where the basis risk is *positive*:

- A typhoon hits with a maximum wind speed greater than 170 km/hour.
- Nonetheless, the transmissions lines and towers are undamaged.
- As the threshold of 170 km/hour was exceeded, the insured still receives the USD 20 million payout.

For a government, *negative* basis risk can be politically challenging when a disaster causes damage and funds are required, but the parametric threshold was not met, and no claims payments were made. When that happens, citizens who understood that certain assets were covered by insurance will understandably be dismayed to learn that is not the case, and the explanation for why that is so is likely to be met with scepticism. *See Appendix 1 for a more detailed comparison between indemnity and parametric insurance coverages.*

Hybrid structures

Another option available to governments is a hybrid structure that includes both indemnity and parametric coverages. For PAIPs, such a programme typically would include a parametric element that provides financing for disaster response and temporary measures, combined with an indemnity component that can be applied to the eventual repair or reconstruction of the assets.

For example, a government could structure a PAIP in which an initial payout is made based on a parametric trigger; as noted, these funds could be released very quickly, especially to support disaster response efforts. This initial funding could then be complemented with claims payouts from an indemnity policy after a proper damage assessment has been conducted; these funds typically would be used to repair or reconstruct the covered assets.

Benefits of hybrid structures

With a hybrid insurance structure that includes both parametric- and indemnity-based coverages, governments can take advantage of the benefits afforded by each type of insurance; they potentially offer the "best of both worlds".

When a disaster strikes a country, the responsible entities face several challenges. In the hours and days afterward, they have to quickly mobilize a disaster response effort that aims to contain or limit the damages while also addressing humanitarian needs, commencing the clean-up process and laying the groundwork for the eventual repair or reconstruction of the assets. Having an assured source of funds for severe events, that can be accessed within a few days or at most weeks, can greatly facilitate the efficiency and effectiveness of these activities.

Disaster response is followed, of course, by rehabilitation. Although a government will naturally want to expedite the recovery process, repairing or reconstructing infrastructure assets necessarily takes some time. Damage assessments need to be conducted; decisions have to be made about how to best repair or reconstruct the asset – e.g., build back better with more resilient construction, and/or re-build in a different, less hazard-prone location; architectural/ engineering designs need to be commissioned; building materials must be procured; and so on.

Since these activities are not as time-critical as the emergency response effort, the additional time it takes to conduct a proper damage assessment under the indemnity component of the programme is less of an impediment compared to a PAIP based solely on indemnity insurance. Also, once the damage assessment is completed, the government can factor the amount of funds coming from the indemnity insurance into its decisions about how to best repair or reconstruct the asset.

Challenges of hybrid structures

While a structure based on both parametric and indemnity coverages can provide a broad and flexible solution, designing the programme will tend to be more complex and time-consuming.

With indemnity coverage, detailed information on the assets will still need to be collected to design the programme and damage assessments need to be conducted after an event; both aspects require additional time and expense. However, the fact that claims payments under an indemnity policy take longer to be released is less of a drawback in a hybrid scheme, compared to an indemnity-only programme, since the parametric element can quickly deliver funds for more immediate and pressing needs.

Basis risk also can be a noteworthy drawback of parametric insurance. With a hybrid structure, basis risk could be mitigated, at least to some extent, especially if the index values are set at a level where the insurance is only triggered by more extreme events.

b. Compulsory versus voluntary insurance programmes

The advantages and disadvantages of making participation in a national insurance programme for public assets compulsory versus voluntary have to be considered against the goal of increasing the level of insurance protection. There is no standard solution for all countries and experience to date in homeowners and commercial property insurance suggests that a variety of approaches can work.

Even in countries where procuring insurance for public assets is compulsory, not all public assets are reliably insured.

In Colombia, Peru and the Philippines, procuring insurance is compulsory for those managing the assets, e.g., government agencies, subnational governments and ministries, yet for different reasons, not all public assets are insured. In Vietnam, insurance is compulsory for certain types of public assets. Other countries such as Costa Rica are establishing an insurance vehicle for insuring public assets through a public insurer and transferring only excessive losses to international financial markets. *Further examples of public disaster risk insurance schemes are given in Chapter 9.*

Government policy makers will have to consider, for example, the nature and level of the relevant risk exposures, the degree of centralized versus local control over insurance decisions, overall economic resources and of course the political environment. Some of the considerations regarding both types of programmes are set forth below.

Flat vs risk-adjusted premium

It is important to consider the extent to which the premium is flat or truly risk-adjusted/reflective of the participants' risks. Most risk-adjusted pricing schemes are flattened with some explicit or implicit cross-subsidisation.

With a flat-priced, solidarity-based pricing model – and assuming no central subsidy – low-risk buyers will be less inclined to buy into a voluntary scheme (or perhaps seek private cover), whilst higher risks ones will be more inclined to do so; a classic example of "adverse selection". This will need to be considered when the rate level is set or else the scheme will not be sustainable – pushing the price higher and lowering take-up.

If pricing is risk-adjusted and the programme is voluntary, then the opposite may occur – those most at risk, and so most in need of the cover, probably can't afford it.

While realizing the right price balance for a voluntary scheme is difficult, finding the political will to enforce a compulsory scheme presents another set of challenges, as outlined in more detail below.

Addressing these challenges carefully for a PAIP is especially relevant when seeking to create a programme to pool public assets owned by different public entities. In this case, engaging stakeholders to try to find consensus for the best answer is critical to securing adequate participation, since examples have shown that even with compulsory schemes, participation can be limited if there is resistance to the programme.

Compulsory insurance programmes

Debates about who needs to and who should be part of the public assets insurance programme can be eliminated in a compulsory scheme. With a compulsory scheme, the government can institutionalize the solidarity of its entities by requiring all of them, in a particular sector or region, to contribute to the scheme and share in the post-disaster burden.

However, as the level of solidarity depends on premium/risk differentiation, compulsory schemes need to be designed carefully. The solidarity feature can fail if any participating entity believes it is potentially subsidizing the misconduct of others.

The potential benefits and considerations of compulsory insurance programmes include:

- Requires potentially difficult decisions on the nature and level of the requirements, especially considering the financial resources needed and available to meet the compulsory requirements.
- Accelerates the speed with which public assets are insured.
- Increased participation provides economies of scale and beneficial risk diversification.
- Reduces the potential for adverse selection.
- Helps insulate government officials from political repercussion for spending government resources on insurance protection.
- Avoids the danger of blinding optimism about risk exposure and the tendency to assume losses will not be significant or that others will provide aid if needed.
- Creates incentives to reduce risk, to reduce the financial burdens.
- Requires decisions on whether protection is purchased at the national, state or local level.
- Re/insurance capacity to cover all relevant risk may not be adequate.

At the same time, because compulsory schemes are usually based on principles of "solidarity" rather than those of "mutuality" which are applied in voluntary commercial insurance, they also present some challenges. These include:

- Some sub-national owners'/ managers' public assets may be more resilient and may not need the level of protection afforded by the scheme.
- There can be a perception that some public asset owners/ managers pay more in premium, while some receive more in payouts. Even when the scheme is not payment-based (but rather funded centrally), there can be a perception that some public asset owners/managers can influence what they receive from the system.
- Resources are vulnerable to misuse, abuse and fraudulent use – not just by the intended beneficiaries, but equally by local insurers.

Also, even when insuring public assets is compulsory, the coverages may still not be adequate. For example, a report published by the government of the Philippines in 2014 found that 70% of local government properties were not insured at all, and among those that were, the coverages only amounted on average to 15–20% percent of their replacement value. Or, the government entity responsible for the public assets may lack sufficient capabilities for taking out insurance. The World Bank's 2012 review of public building insurance in Colombia, for instance, found that while many public institutions were compelled by law to buy disaster insurance for the assets under their administration, the majority did not have an appropriate risk management unit to do so.

Voluntary insurance programmes

A voluntary scheme allows for separate risk owners to decide for themselves whether insurance is needed or not. Hence, an important benefit is that the autonomy of different entities is maintained.

Other potential benefits and considerations of voluntary insurance programmes include:

- Different public entity risk owners often need support in conducting a sound risk assessment on the assets they own and, as a result, scaling up to other entities could be slowed down.
- Provides greater flexibility to address specific needs and resources.
- Requires greater education and public engagement.
- Increases the potential for a riskier pool of insured assets, due to adverse selection
- Avoids the political implications of coercion.
- May lead government entities to only act to the minimum extent required.
- May lead to inconsistency in insurance terms, premiums and coverages across assets owned by different government agencies.

A review of public asset insurance status in New Zealand following the 2010-2011 earthquakes in the Christchurch region identified many challenges and considerations faced by both national and local government agencies using a range of approaches; these included a public entity that self-insures, a sector that insures collectively, and a specialist insurer of local government assets (Office of the Auditor-General New Zealand, 2013).

It is also possible to consider variations of these two approaches, such as voluntary programmes that come with strong incentives to insure; for example, if they are combined with a clear choice to join the voluntary insurance programme or to rebuild with own resources if self-insured. The soft power of incentives could achieve the benefits of both approaches while perhaps mitigating some of the downsides.

Compulsory versus voluntary schemes – benefits and challenges

	Benefits	Challenges
Compulsory scheme	— Can foster solidarity amongst all risk owners — Includes all assets at once — Limits the potential for adverse selection — Requires only lean *capacity building* activities, as skills are gained through direct experience with insurance — Eliminates debate about who should join the scheme	— Needs to be designed carefully and consider premium/risk differentiation — Finding consensus with all involved parties — Enforcing execution in the first year of implementation — Potential complaints about unjust policy by those with *remote* risks
Voluntary scheme	— True buy-in from risk owners that join the scheme — Thorough risk assessment and risk strategy by risk owners	— Slow uptake and low sign-up — Increased potential for adverse selection — Rather extensive *capacity building* (or skill building) is necessary — Difficult to bring risk owners with *remote* risks into the scheme

3.5: Determining the insurer(s) and securing re/insurance capacity

Large, potentially complex insurance programmes that cover public assets require significant technical know-how to set up, as well as re/insurance capacity (capital) to cover the risks. That applies particularly to national programmes that aim to cover either a vast number of assets – for instance, all of a country's public school or hospitals – or especially costly networked infrastructure such as energy installations and networks.

a. Identifying the primary insurer

The question of whether local private insurers are able, interested and willing to insure a portfolio of public asset risks, individually, through co-insurance, as a consortium or through a pool, is critical. This set-up will depend on the size and maturity of the local market, as well as on what is permitted by the local insurance regulator.

For developing countries, helping promote a local private insurance market that is stable and efficient can be especially beneficial in helping to enable economic growth and development, and to reduce dependence on government funds for insurance.

If existing direct insurers cannot provide the necessary cover, the government has two other options:

— To insure its assets with a global insurer through existing "non-admitted insurer" rules or ones newly established for this purpose; or

— To set up a public/government-owned insurance company to insure the risks.

Considering the option to establish a state-owned insurer

A public insurer could play a useful role in insuring one or several portfolios of government assets, and in facilitating access to insurance protection before turning to the global reinsurance markets.

While creating a public insurer is a complex and multi-faceted undertaking in which critical aspects such as know-how, efficiency, capacity and good governance need to be addressed, such an entity could help to reduce the overall insurance costs.

This option and its implications also have to be considered carefully if there is a local insurance industry which is already providing brokerage and cover for some public assets, perhaps individually.

It is also important to consider that state-owned insurers or government pools established primarily if not exclusively to insure public assets are typically expected to have a higher level of sustainability compared to a commercial insurer. state-owned insurers in particular tend to operate to higher solvency standards; while a common regulatory requirement for commercial insurers is to ensure solvency following a 1-in-200 worst-case year, a government-owned insurer could be required to have the resources to withstand losses associated with a 1-in-500 worst-case year. Compared to commercial insurers, this implies either higher capital ratios to premium income/risks, and/or greater reliance on reinsurance. Moreover, there may be limitations on what discriminatory underwriting a state-owned insurer or government pool can do and how risk adjusted its premiums can be.

For governments considering the option to establish a public insurer, it is worth reviewing how other countries have fared with this experience, such as Australia's state governments' captives, Nigeria's government-owned NICON set up in the late 1960s, India's public insurance companies, or the Philippines with GSIS. *See chapter 9 on the Australia and Philippines examples.*

b. Securing capacity (re/insurance capital)

Regardless of whether the primary insurer is a local company, global insurer or a public/state-owned insurance company, a portion, and in exceptional cases all, of the risks can be transferred to global reinsurers. That's particularly relevant when local insurers don't have the necessary capacity (capital) to insure a large portfolio of costly public assets; that's generally the case in developing economies.

As a result, having access to capital in the global reinsurance markets typically is critical to establishing a PAIP. The following material outlines the role of reinsurance in a PAIP and, importantly, the factors influencing reinsurance pricing.

Reinsurance requirements

The need for, and price of, reinsurance needs to be factored into the pricing equation. Reinsurance premium is often cited as the largest "expense" of a PAIP, but this is a misunderstanding of the role of insurance. Reinsurance is not a fixed cost but rather a means for primary insurers to offlay surplus risk to reduce their capital exposure.

The need for reinsurance, and the form and quantity of the reinsurance required, will be driven by a number of factors, as outlined in the next section. While the comments specifically apply to instances in which the PAIP is delivered by a specially created vehicle (i.e., a legal entity such as a private consortium or a state-owned captive or pool), many of the considerations also apply where the programme takes a different form, for example, a centrally administered co-insurance arrangement.

Also, regardless of how the reinsurance is structured, the wordings in the insurance contract for the PAIP need to be very precise in order to be accepted by global reinsurers.

What drives the quantity and form of reinsurance needs:

- The capital available to the entities participating in the PAIP, particularly in its early years.
- The diversification of the assets covered by the PAIP; diversification can encompass both geography as well as construction methods and materials, and occupancy. Whether the portfolio is highly diversified, or not, will greatly influence how the reinsurance is structured and priced.
- The ability to replenish the capital of the vehicle after a loss: Given its narrow focus and the fact that an insurance vehicle created to insure public assets will likely cover higher layers of risks (i.e., less frequent, larger risks), such a vehicle will have a more conservative view than a typical commercial insurer, perhaps wanting to be in a position to remain trading after the worse loss year expected in 500 years compared to a typical regulatory requirement to have enough capital to meet liabilities in a worse case 1-in-200 year.
- The availability, or not, of government guarantees: For example, the terrorism pool in the UK, Pool Re, obtained explicit reinsurance from the UK government when it was formed in 1993, whereas its flood equivalent, Flood Re, did not when it was formed in 2016 in a more challenging financial environment.
- The premium adequacy of the inwards business: Higher rates of premium will, over time and on average, result in an increase in capitalisation and so a reduction in reinsurance requirements.
- The availability of subsidy: Flood Re is funded partially by inwards premium but also in part by a levy on the UK domestic property insurance industry – essentially a proxy form of premium.
- The take-up rate (i.e., the number of entities that take up insurance cover if the programme is set up as a voluntary option): If the insurance offered by the programme is not compulsory, the take-up rate is likely to be low (unless premium rates are inadequate/unsubsidized) and adverse selection is likely to apply unless premiums are truly risk rated (normally they are flat or flattened to ensure affordability).
- Tax policy: Will retained profits held as reserves be taxed or can they be held tax-free? If taxed, there is little motivation to hold retained profit and that can act as an incentive to offload risk to reinsurers.
- Appropriation risk: If the PAIP is a state-owned entity and reserves increase after a series of loss free years, there is a risk the government will consider these monies as "surplus to requirement" and requisition some of it, increasing the need for reinsurance post-seizure or, in anticipation of this, an incentive to buy more reinsurance to get better value for the dollar spent or seized.
- The cost and availability of reinsurance.

Reinsurance pricing

Reinsurance pricing is driven by factors similar to the pricing considerations of the PAIP. Indeed, reinsurers themselves normally buy broker-arranged reinsurance to protect their own books of business, i.e., retro reinsurance. But there is a key difference.

An entity set up to provide a PAIP will concentrate on risks in a country, or perhaps a region, and underwrite relatively limited types of risk against a relatively small number of hazards. By contrast, most international reinsurers operate globally, writing perhaps hundreds of different classes of insurance for virtually every conceivable hazard. Their books of business are far more diversified.

This means that for every dollar of, say, Philippines wind storm protection they underwrite, they need to set aside a far lower marginal amount of capital compared to what would be required by a Philippines insurer underwriting only local business for a limited number of classes.

Therefore, the capital charge element of the premium for an international reinsurer should be far lower and so, the price of the cover for each dollar of transferred risk should be lower than retained.

However, this is not always the case. A reinsurer may take a different view of the adequacy of the modelling underpinning the expected losses of the book of business and/or have concerns about the technical competence of the insurance company or vehicle underwriting the PAIP. Normally, these company or vehicles employ brokers to advise them both on the adequacy of modelling for inwards business purposes but also, crucially, to help "sell" their model view, and technical competence, to the reinsurance markets in order to give reinsurers greater faith in the modelling and allow them to achieve a lower charge for the reinsurance they buy.

How reinsurance pricing works – examples:

For some insurance schemes, for example the regional emergency response insurers African Risk Capacity (ARC) and the Pacific Catastrophe Risk Insurance Facility (PCRIC), the greater diversification of the reinsurers coupled with broker-driven marketing of underlying risk modelling, allows the facilities to buy their reinsurance at a lower price than they charge their insurance clients. This means there is an expectation that their capital will grow over time, providing greater security to their customers in the future while also incentivising them to purchase appropriate reinsurance protection today.

By contrast, sister organisation CCRIF SPC in the Caribbean and Central America is in a less favourable position given that the primary risk it covers is tropical cyclones; international reinsurers already have huge accumulations in this region for these risks, and CCRIF's losses are highly correlated with US windstorm events. This necessarily makes reinsurance for CCRIF more expensive per dollar of transferred risk than in the Pacific or sub-Saharan Africa where global reinsurers currently have negligible exposure. This means, in turn, that CCRIF must charge its clients more and does not have the luxury of making positive arbitrage on their deal. It is also forced to retain more risk and, therefore, is more exposed to reinsurance price shock.

Considering different reinsurers is important

Reinsurance markets, as well as the broader risk transfer market including catastrophe funds and pure capital market players, are not homogeneous. Different reinsurers have different views of risk, different portfolios of business and different risk appetites. And at specific points in time, some reinsurance teams may be keen to write new business while others could be at or close to full capacity and reluctant to take on new accounts.

This is why, to get the most value for money, the full reinsurance market should be surveyed, ideally by a broker who knows the different markets and their current risk/underwriting appetites.

Of course, as discussed elsewhere, price is not everything: expertise, services offered, service standard, continuity of relationship, financial security and track record also are critical in selecting the reinsurance providers and must be taken into consideration along with the bottom-line cost of the premium.

Securing continuity of reinsurance price and coverage

To counter reinsurance price shock and secure continued access to reinsurance capital, it is possible to purchase reinsurance on a multi-year basis.

The New Zealand Earthquake Commission, for instance, split its reinsurance into four tranches: one-quarter renew annually while the remaining three-quarters renew in overlapping three-year tranches. This meant that, post event, 50% of its reinsurance was fixed at prices agreed one and two years previously, giving it affordable cover at a known cost while also setting a price marker for the unplaced portion.

Multi-year reinsurance almost invariably includes automatic reinstatement of cover, giving continuity of coverage and price certainty even after adverse years of losses.

Note that an advisor or broker supporting a PAIP will usually build a stochastic financial model to test the likely impacts of varying any of the programme elements, typically including original terms and coverage offered to policyholders and the impacts of different reinsurance structures; for example, excess of loss vs quota share, attachment probability, exhaustion probability, reinsurance price and price volatility post loss, limit purchased, etc.

4

Preparing to Establish a PAIP

4

Preparing to Establish a PAIP

When a national, regional or city/local government considers setting up a public assets insurance programme or PAIP, it will need to do so in the context of its authority and the underlying legal structure. It will also need to have access to the know-how necessary to set up the programme and, if not already in place, to establish the necessary framework of regulation, governance, management resources and processes to enable the programme and to manage it effectively over time. This chapter outlines the operational and institutional aspects relevant to setting up a PAIP.

4.1: Operational considerations in setting up a PAIP

a. Setting up a project to establish a PAIP

Establishing a PAIP requires considering and responding to the varied needs and demands of different stakeholders. As a result, the process of designing the programme is most effective when the effort is structured as a project sponsored by the relevant government or public entity and assigned to an appropriate entity/department to lead it. Under such a structure, the project lead will be charged with bringing in other necessary resources from relevant public and private organizations to help execute the project.

These projects are usually structured in different phases as follows:

- An exploratory first phase to collect relevant information/data about the assets and the options for protecting them via insurance. This first phase typically focusses on addressing fundamental questions such as:
  - What is the rationale for setting up the insurance programme and what are its objectives?
  - What are the risks faced?
  - Which risks should be covered and how?
  - Who could insure the risks?
  - Who will pay the premium?
  - Who will be the beneficiaries of the claims payments and how will these monies be used?
  - Once these facts are established, which entity will take over the administration of the PAIP, effectively representing the public entity who pays the premium as well as the asset owner(s) (in the event they are different) and as necessary, centrally managing the process of claims reporting and claims payments to the beneficiaries?

The information gathered, and decisions taken, in this first phase will inform and guide the next set of activities. These typically encompass:

- A second phase focused on delivering concrete recommendations on how to set-up the programme, including which insurance structure(s) will best deliver on its goals.
- Once a positive decision is reached, the third project phase drives the implementation of the programme.

b. Decision makers and commitment

Before a project begins and the issue of deciding which assets and risks to cover is addressed, it is important to determine which stakeholders will need to be involved, some with decision-making authority while others may be important influencers and/or crucial for implementation.

These questions include:

1. Who owns and who managers the assets which are to be insured?
2. Who has the authority to approve the implementation of the public assets insurance programme; who are the decision makers?
3. Who will drive and manage the process/project to set up the PAIP, ensuring that all relevant stakeholders are involved and that all aspects of the set-up are addressed?
4. Who can contribute expertise to the project?
5. Is there a clear, documented commitment to explore setting up a PAIP and, depending on the results of a preliminary study, a commitment to implement it?

The project should only begin once the decision makers have been identified and the necessary commitments have been documented.

c. Engaging all relevant stakeholders

In creating a PAIP, counting on the engagement and support of a broad range of relevant stakeholders will greatly contribute to its success. For those actively involved, their respective responsibilities for making certain decisions or taking certain actions needs to be clearly delineated in relation to the specific issues that will need to be addressed; from the design to the implementation to the ongoing management of the PAIP.

In addition to understanding the particular needs of different stakeholders – a prerequisite for securing broad buy-in and participation – involving relevant stakeholders from the outset of the process is critical in order to access the necessary expertise and capabilities, enable product development, and contribute to developing in-country technical and operational capacities necessary for sustainability.

Securing broad support and overall agreement

Because the design and implementation of the PAIP involves such a diverse set of stakeholders, once the intention to establish a PAIP has become a serious option, it is essential to build support for the programme's objectives and approach. This is best achieved by informing and engaging different relevant stakeholders, including those with political influence, as well the local insurance industry and eventually, the public at large about its purpose and the expected benefits.

If the purpose has not been previously agreed amongst the decision-making bodies within the government, any law or policy developed to enable it will lack a strong pillar and remain vulnerable to be challenged and potentially jeopardized by opposing stakeholders.

In a typical project, a range of essential stakeholders will contribute to the development of a PAIP including:

- government entities – possibly both national and subnational;
- the asset owners and/or asset administrators (e.g., a city or regional hospital board could administer facilities owned by the ministry of health);
- the local re/insurance industry;
- relevant experts (*see next section d "Securing needed capabilities and know-how"*):
- in developing countries, different subject matter experts from the global re/insurance industry as advisers;
- national and/or international technical agencies and data providers;
- multilateral international and regional development banks;
- in specific cases, non-governmental organizations (NGOs).

d. Securing needed capabilities and know-how

A broad range of expertise is needed not only to set up a PAIP but also to manage the programme in the longer term. Accordingly, it is important that the decision makers secure access to the relevant capabilities up-front.

In developing countries with less mature local insurance markets, the know-how to help develop and/or participate in the programme in a meaningful way may not be available, even if re/insurers and other organizations are otherwise supportive of the effort. In that case, if the PAIP is to be developed as a PPP project (see further below), the government can seek support – including advice, technical expertise and possibly financial contributions – from global re/insurance organizations; national, regional or global development organizations; and multilateral institutions like the World Bank.

Identifying resource needs and skill gaps for capacity building (up-skilling)

Once a government identifies the experience and know-how required to set up a PAIP (see box) and before embarking on the effort, it is important to consider what specific resources and skills are available, where are there gaps and how can any missing skills be accessed.

Skills and capabilities typically needed to implement and manage a PAIP

Insurance skills

- Data collection and analysis
- Data modelling
- Risk assessment
- Risk mitigation
- Claims management
- Loss adjusting

Other skills

- Accounting and finance
- Legal and regulatory
- Private and public administration
- Management and coordination
- Private and public sector procurement
- Sector specific skills, e.g., construction, energy, health, etc.

Developing countries can access global expertise through a PPP project

The re/insurance industry has expressed its interest in supporting the development of insurance markets as a means to help close the protection gap and increase resilience to climate risk.

Hence, one option for developing countries which can't tap locally into the technical expertise and execution support needed to develop and manage a PAIP, is to set up a public-private partnership (PPP) project. With this approach, the government partners with the global private re/insurance sector, often with support from different organizations/institutions committed to assisting these efforts, to share expertise and resources toward the common objective of implementing an effective and sustainable PAIP.

This means that the project can be conducted at no or minimal cost to the government, as project work involving different parties can be funded by industry, national or multilateral development agencies.

One of the reasons for creating the Insurance Development Forum (IDF) was to facilitate partnerships between the re/insurance industry and governments, given the significant challenge in addressing the protection gap and establishing PAIP's. Hence, IDF has a strong focus on providing relevant technical expertise and support for the development of PAIP's in collaboration with sovereign and sub-sovereign governments for the implementation of their insurance programmes, working closely with their authorities and experts. Other industry as well as public and multilateral organizations can also provide expertise and resources. *See also the separate section at the end of this Guide on the IDF, publisher of this Guide; other organizations which can provide support also are listed in the Resources section.*

In this context, global re/insurance providers can work closely with the government, local insurers and experts, in order to develop the insurance programme and enable its execution. If required, governments should seek to involve global experts early on in the process of setting up the PAIP, so that the programme can benefit from their input and insights for its design.

Alternatively, or in addition, reinsurance brokers can also perform an advisory task. For example, reinsurance brokers have been advising the New Zealand Earthquake commission for over 40 years, providing modelling and technical advice including designing a rolling reinsurance structure that provided guaranteed coverage and damped price increases after the 2010/2011 earthquakes.

Activities global experts could contribute to set up a PAIP:

- Capturing and/or modelling the relevant data on asset quality/conditions and risk exposures;
- Design of insurance structures, possibly including different options;
- Recommendations on risk mitigation and risk management;
- Development of claims protocols to govern the flow of claim reports and payouts;
- Pilot use of technology to improve and/or scale up specific areas of insurance operations;
- Reviewing the local legal framework and providing recommendations to enable the creation of an effective insurance programme;
- Design recommendations on the structure and processes for an agency to manage the programme;
- Recommendations for capacity building/up-skilling; and
- Hand-over of the programme for implementation before its placement in the market through public tender.

Capacity building/up-skilling

If capacity building/up-skilling needs are identified early on, the relevant mechanisms can be included as part of the design phase of developing a PAIP.

Up-skilling takes place naturally through a PPP project where global and local experts work together. However, more dedicated capacity building may be needed for the skills listed in the box above, especially to ensure continuity of the insurance programme.

In considering capacity building activities, it is important to ensure that these be relevant, efficient and sustainable, as well as based on local ownership, demand driven processes and that they respond to the expressed needs of the government and/or other relevant stakeholders.

While certain skills require the pursuit of a professional or technical degree, the knowledge of local experts can be enhanced with specific activities supported and/or provided by global organizations.

For developing countries where there is limited access to insurance-specific know-how, in addition to a longer course of studies in specific technical areas, there are also other options which can be considered, as indicated in the box on the right.

Possible approaches for up-skilling insurance know-how:

- Use of professional training organizations outside the country but within the region.
- Development of training materials by the local or regional association, with help from the global reinsurers.
- Access to existing, or development of online training, materials and courses.
- Internships or secondments of local talent to global organizations.

e. Making the PAIP sustainable over time

In many instances, a government looking to establish a PAIP will focus initially on the insurance solution and how it is structured, and place lesser emphasis on how the scheme will be managed and by which entity, representing the needs and interests of the sovereign or sub-sovereign government. However, defining the insurance solution is only the beginning of the process.

Managing the insurance programme effectively over time to ensure its sustainability is critical; from procuring the first insurance contract to effectively executing all other aspects of the programme in the months and years ahead. Doing so requires specific know-how as well as the ability to manage a complex and multi-faceted undertaking.

A complex insurance client

A PAIP can often include many assets or properties as well as a variety of asset owners and administrators. Also, if the programme requires substantial insurance capacity, more than one insurer may be involved. All this entails a certain level of complexity and requires an effective set up to run its administration, or what we call here an insurance programme manager.

A dedicated insurance programme manager

While there are no set formulas for the organizational structure best suited to managing the PAIP, it will almost always need a dedicated programme manager. This is why it is recommended that the project to develop the PAIP include defining up-front which entity will take on this responsibility.

Possible options include:

- A governmental department or agency legally allowed to procure insurance for one or different national or subnational entities, which already exists or is newly created for this purpose, e.g., within the ministry of finance or ministry of the interior;
- A national public organization such as an insurance association;
- This task may be delegated to a private third party organization.

Requirements and responsibilities of an insurance programme manager include:

- Having an in-depth understanding of all elements of the public assets insurance programme;
- Ensuring premium payments are made promptly to secure cover;
- Managing claims reporting and the appropriate flow of claims payouts to the correct beneficiaries;
- Making sure that the insurance contract is adapted as the portfolio of assets changes;
- Handling the renewal process.

Creating a government entity to act as insurance programme manager

Such an entity can be created by statute, as an act of government policy, or it may be created by its participants. Whether it then takes the form of a contractual relationship between the participants, or of a legal entity type, depends on the legal framework under which it is formed, the available alternatives and the benefits or drawbacks of a particular legal form.

Balancing continuity and efficiency

Given the complexity of PAIPs, the benefits they can bring to governments and the multiplicity of stakeholders involved, continuity of the programme should be a priority. However, attention must also be paid to ensuring that a balance is struck between programme continuity and efficiency.

Working with the same providers over time allows for them to better understand different aspects of the PAIP, which can lead to greater efficiencies. The same is true for non-executive directors if the entity that is established to manage the PAIP includes such roles. In contrast, the injection of new ideas through the appointment of new providers – or of new non-executive directors, can also add value and contribute to the quality of the programme.

For markets where the expertise is available, it is especially recommended to appoint new non-executive directors to the PAIP manager entity on a regular basis to ensure the inflow of varying and fresh perspectives.

Benefits of continuity of service providers

Continuity of service providers, including reinsurance brokers and re/insurance companies, has many benefits. For example, a core panel of reinsurers are likely to better understand the PAIP's policies, its risks and its needs. With this greater knowledge they are less likely to be as reactive after a loss, giving a greater probability of price stability – and contributing to the sustainability of the programme. They also will be able to support the PAIP with advice and training, as appropriate.

The same is true of a reinsurance broker. Continuity in a programme breeds greater understanding and so quality of advice.

Benefits of attracting new service providers

The need for continuity must be balanced against continued value for money and the injection of fresh ideas. Service providers should be regularly refreshed to access to the most up to date expertise.

The business should be regularly re-tendered, perhaps every three to five years. Preferably, that tender process should be weighted to criteria other than just price, but rather experience, expertise and services offered.

Reinsurance premium shocks and sustainability

One important consideration affecting continuity and in fact, sustainability of the programme, is exposure to **reinsurance premium price shocks**. That is, the possibility that reinsurance premiums will spike following an unusually bad loss year. In countries where the PAIP's insurer(s) may rely more heavily on reinsurance, whether these are local private insurers or private consortia, or state-owned insurers or government pools, these will be more exposed to the reinsurance premium price shocks.

Considering in advance how to such a situation will be addressed is important, as the impact of reinsurance premium spikes will affect the insurance pricing. For PAIPs where participation of asset owners/managers is voluntary, this can impact participation in the programme.

Insurance entities especially created to insure public assets will, typically, look at sustainability over a multi-year period and be set-up not only to cope with one bad year, but also longer; say, three consecutive moderately bad years, or two very bad years out of five.

Either way, insurers should work with their broker or adviser to have at least a directional understanding about how reinsurance premium price spikes may be addressed for the PAIP.

4.2: The institutional basis for implementing the programme

To ensure a consistent and cohesive approach to public assets insurance, it is important to establish a strong institutional basis for implementing and managing the programme. This should include: sufficient statutory, regulatory or executive orders regarding the programme; governance which provides clear direction on who is authorized to do what; and the process for proceeding. The legal framework will be the foundation for the programme and enable the applicable national/local public authorities and the re/insurance industry to take a harmonised approach.

a. Legal framework

Legislation relating to public procurement

As a starting point, the government should consider whether existing statutes or regulations are adequate for procuring insurance, or whether new ones need to be established. General procurement authority for a public entity may also apply specifically to the procurement of the insurance services relevant to a PAIP. If it does not apply, but there is other public procurement legislation in place, it may be that this could be extended or used as a basis for the PAIP's legal framework.

Whether via existing or new legislation/regulations, the legal framework should seek to establish clearly:

- What insurable risks and related services are covered by the legislation;
- Who is responsible and has the authority for procuring such services, insuring the risks and funding the insurance premium payments and ancillary costs;
- The process for identifying relevant risks and procuring relevant insurance/risk management services;
- Establishing a clear audit trail for the expenditure of money for the cost of insurance and related insurance services and the receipt and distribution of any claims payments;
- How tenders are to be evaluated and awarded;
- Any minimum criteria for risk carriers (e.g., if they are subject to ratings by rating agencies, a minimum rating);
- The procedure for challenging tender awards under the procurement process;
- The appropriate budget authority for the procurement;
- Appropriate anti-corruption provisions;
- An appropriate dispute resolution process, whether litigation, arbitration, mediation of combination of these. Also, consideration must be given as to who can bring an action under the coverage, and whether there are any relevant sovereign immunity laws that need to be addressed.

For example, to facilitate access to the insurance market, the Crown Commercial Service in the UK has set up a framework agreement with insurance providers under which authorities can access insurance or broking services directly or via a mini-competition.

Benefits of framework arrangements

Framework arrangements with insurance providers, such as the one mentioned above, alongside a clear and structured governance process, help create a streamlined and flexible process for procuring services. This provides the contracting authority with a facility for procurement and a roadmap for their PAIP.

The advantages of framework arrangements are that they:

— permit a governmental body to undertake a single procurement exercise for the supply of insurance services; and

— save time, cost and resources that otherwise would need to be spent by the parties to the arrangement if multiple local competitive tendering exercises were conducted.

The development of any new framework ideally would be a collaborative process between the relevant government and the insurance industry. In this way, a public entity can ensure that the legal framework is suitable for its needs and that the insurance market can meet its requirements.

b. Governance management when setting up a PAIP

Implementing a PAIP effectively and transparently requires proper governance procedures, either existing or newly established, that are followed correctly and consistently.

This section sets out some of the key governance and process considerations that should be considered by both the procuring body (i.e., the relevant public sector authority responsible for a risk) seeking to buy insurance, and by the insurer(s) participating in a tender process.

Governance management should enable the procuring body to: effectively manage the process to identify the risks it needs to insure; identify appropriate insurance providers capable of underwriting these particular risks; and to manage the insurance programme effectively over time. Establishing and communicating these governance procedures will help orient the insurance providers to the requirements of the process and inform them about how to engage properly with different public sector bodies.

The following checklist sets out some of the key governance issues to consider and address when setting up a PAIP, while the following chapters go into critical aspects of the programme itself in greater detail.

Checklist of governance issues to address in setting up a PAIP

Steps and key considerations

1. Establish insurable interest

Government/public entity:

1. Who owns the physical assets in question – federal, state or local governmental entities (In some cases, these interests may be overlapping)?
2. Regardless of ownership, what implicit or political expectation (and hence necessity) will there be for the insured to reconstruct an asset?

Re/Insurance providers:

— Which entity is legally entitled to buy the insurance cover for the assets that need to be covered?

2. Identify relevant risks

Government/public entity:

— Who is responsible for identifying the risk?

— Does a separate procurement process need to be performed for any risk assessments or risk modelling that may be required?

3. Identify and access relevant cover for the risks

Government/public entity:

— What products are available in the market?

— If no relevant products are available in the market, which international organizations, either private or public, have product development programmes that could provide support, e.g., InsuResilience?

— Would the risk be appropriate for a catastrophe bond or more traditional insurance policy?

— Are there public funds/mechanisms available to allow for self-insurance and reinsurance of the risk?

— Is there a national insurance procurement framework agreement in place via which the government can access services, or would it need to run a tender exercise?

Consider engaging early on, even before the tender process, with a selection of insurance providers to avoid accepting the appetite of a single provider. Also, if a relevant product/cover is not available, the product development effort should be initiated as soon as possible. Also, engaging the services of a broker can help to ensure price transparency and value for money for the taxpayers.

Re/insurance providers:

— Would any restrictions or additional regulations apply to you with respect to the provision of any of the relevant products/cover?

— What are the licensing requirements in the jurisdiction and are there any other restrictions to consider, e.g., sanctions or currency controls?

— What are the tax implications of providing different products/cover?

While the actual purchase of services will have to be open to competition, engaging before the tender process to begin a product development effort if necessary will help gain time.

However, note that typically there will be a point where authorities will be concerned that informal discussions could be misconstrued or be viewed as giving a re/insurer an unfair advantage.

4. Approvals required

Government/public entity:

— What approvals are required within the government in order to initiate the PAIP process?

— Are these local, regional or national and do they vary according to, e.g., the type of product, monetary thresholds or the duration of the contract?

Re/Insurance providers:

— Are you appropriately licensed in the jurisdiction?

5. Source of funding

Government/public entity:

— How will the insurance programme and its different components – i.e., set up, ongoing management and the premiums – be funded?

— Does the nature of the insurance cover/product affect the funding?

— If government funding is not available, or the available funds are not sufficient, can a public-private partnership help finance the PAIP in whole or part?

Re/insurance providers:

— For offshore providers, are there any additional requirements to hold collateral in the relevant jurisdiction?

— Would providing these coverages impact your existing solvency requirements?

6. Prepare tender invitation

Government/public entity:

— Consider engaging an insurance broker or another specialist to assist in preparing the technical elements of the tender and engaging with the insurance market.

— Consider also how the tender will be publicised and interest solicited. Will it be made publicly available?

7. Identify key criteria for evaluating insurance provider(s)

Government/public entity:

An IDF Working Group has developed criteria for evaluating re/insurers and brokers to engage with in the design and subsequent tender process. These include:

- Experience/proven track record in public asset insurance and advisory of government sponsored schemes, including modelling and risk analytics;
- Familiarity with local circumstances and needs;
- Experience in solution design in emerging/developing countries;
- Capability to provide technical and training support;
- Capacity to stem the extra-workload (dedicated department, size of company, etc.);
- Minimum credit rating;
- Measure of minimum capacity to ensure "skin in the game" (e.g., minimum of 10% total capacity).

In addition to these, other criteria that should be considered when evaluating different insurance offerings include:

- Are the insurers appropriately licensed in the relevant jurisdiction(s)?
- How is the proposal structured?
- Will one insurer assume the full risk, or will there be a coinsurance arrangement and/or reinsurance programme?
- Does the insurer need to post collateral in your jurisdiction, and if so, how much?

8. Running the tender process

Government/public entity:

— Developing the tender process at an early stage alongside the legal and governance framework can help to promote transparency and engagement.

— Consider soliciting input from re/insurers that have participated in similar tender efforts for their input on how to best structure the process to help ensure the government can objectively assess the merits of each proposal.

— The tender document should provide a clear roadmap for the tender process setting out the procedures for engagement between insurance providers and the relevant public entity:

  — Deadlines for submission of tenders;

  — Contact details for the person responsible for assessing or managing the tenders;

  — Details of the evaluation process and criteria, and the process for clarifying information contained in the tenders;

  — Milestones for decisions during the process;

  — How any challenges to the process will be addressed.

Re/insurance providers:

— As well as on legal structuring and product types, you should work with the government to agree on a tender process framework that is suitable and appropriate for the provision of insurance services and allows the public body to objectively assess the merits of each tender.

9. How brokers can support the placement process

Brokers can also assist in the placement process. Their role in the process typically is as follows:

— The broker will recommend a panel of re/insurers to approach based on the criteria above and the broker's knowledge of different re/insurers' market appetite and the likelihood of quoting.

— Quotes will be sought for the chosen re/insurance structure(s) along with the maximum limit the re/insurer is prepared to offer for a given price.

— The broker will advise what it believes the minimum price would be that could result in 100% placement of the risk. This is typically based on the lowest quote obtained although it could be pegged higher if the lowest quoted price is believed to be unable to command enough support to place 100% of the cover. Alternatively, in some instances, it will be lower if the broker feels confident that enough markets will follow a lower price.

— The client typically will accept the broker's advice and instruct placement at this "firm order" price.

— The re/insurers, including all those that quoted and, if necessary others, will then be asked to commit their capacity at this price, which for many will be below their quoted price. Some will stand by the capacity they originally advised with their quotations, some will reduce their capacity, some will decline, and some may increase.

— If the sum of committed capacity is more than 100% of the required sum insured, the broker will agree to a "signing down" of re/insurers such that total capacity equals 100%.

That signing down may be non-proportional, based upon the factors outlined earlier. Also, some cedants value some of the factors more than others; for example, where some value continuity and support more than price, it's the opposite for others.

10. Appointing an insurance provider/purchasing a product

It is important for the government/public entity to consider the criteria that it wants to apply when appointing an insurance provider. While there often are some hard criteria, for example, minimum financial strength ratings, others are less prescriptive. The insured typically will give a greater share of the policy to re/insurers that:

- Gave the lowest quotation.
- Committed the most capacity.
- Offered long-term support, especially post loss.
- Have a history of paying quickly after a loss.
- Provide value in kind, for example, product development support, training, etc.
- Have proven expertise and/or reputation in the market.

While most commercial tender processes are not explicitly rule driven, public sector entities use rule driven placement processes to enhance transparency and incentivize insurance providers to support the long-term development of the programme.

For instance, UK municipality business, Flood Re and the Kenya Livestock Insurance Programme all use pre-defined scoring systems which assign weights to criteria such as price, familiarity with local circumstances, claims handling experience and the provision of additional services such as risk analytics, training and education.

11. Managing the insurance programme

Government/public entity:

An important decision is who will manage the insurance program. Consider these options:

- Is there already a governmental agency tasked with managing other public asset insurance programmes; i.e., procuring insurance, managing claims processes, etc.? *See also following points 11.1–11.3 in this section.*

If not:

- Can an agency be created and tasked with this responsibility?
  - If so, should it be created by statutory arrangements or by multilateral contract?
- Should a state-owned legal entity be created?
  - If so, should it be for-profit or not-for-profit?
- Or, can management of the insurance programme be delegated to an external provider?
  - Are there private organizations that can take on this role?
  - Is there a national insurance association or association of insurers that this task can be delegated to?

11.1 Record keeping

Government/public entity:

It is important to ensure that the process and coverage are fully documented to avoid over-reliance on individuals and in the event pertinent details need to be quickly accessed in a crisis scenario.

Also consider whether:

- The re/insurance provider should be required to retain a back-up of all relevant information; and
- A protocol with the insurer needs to be established so that it can manage any crisis proactively.

Re/insurance providers:

- If insuring against significant risks involving potential disasters, consider whether any records kept locally will be accessible after the event.
- You should work closely with the relevant public body to ensure there is a response programme in place that either the insured or you can initiate if the insured is unable to do so.

11.2 Monitoring and renewal

Government/public entity:

— Build in regular review periods to ensure that the insurance cover/products remain relevant and are appropriate for its needs.

11.3 Managing cash flows from claims payments

Government/public entity:

A process must be established for when the coverage is triggered, and claim proceeds are paid to the public entity. Accordingly, procedures and safeguards must be established concerning e.g.:

— identification of the payee;

— appropriate use of the claims proceeds;

— audit trails regarding the payments as well as any disbursements or transfer of insurance claims proceeds.

See also chapter 6, "Claims Management", for more details on the issues and considerations involved in determining where and how a government uses claims payments, including options for apportioning payments when multiple assets have been damaged/destroyed.

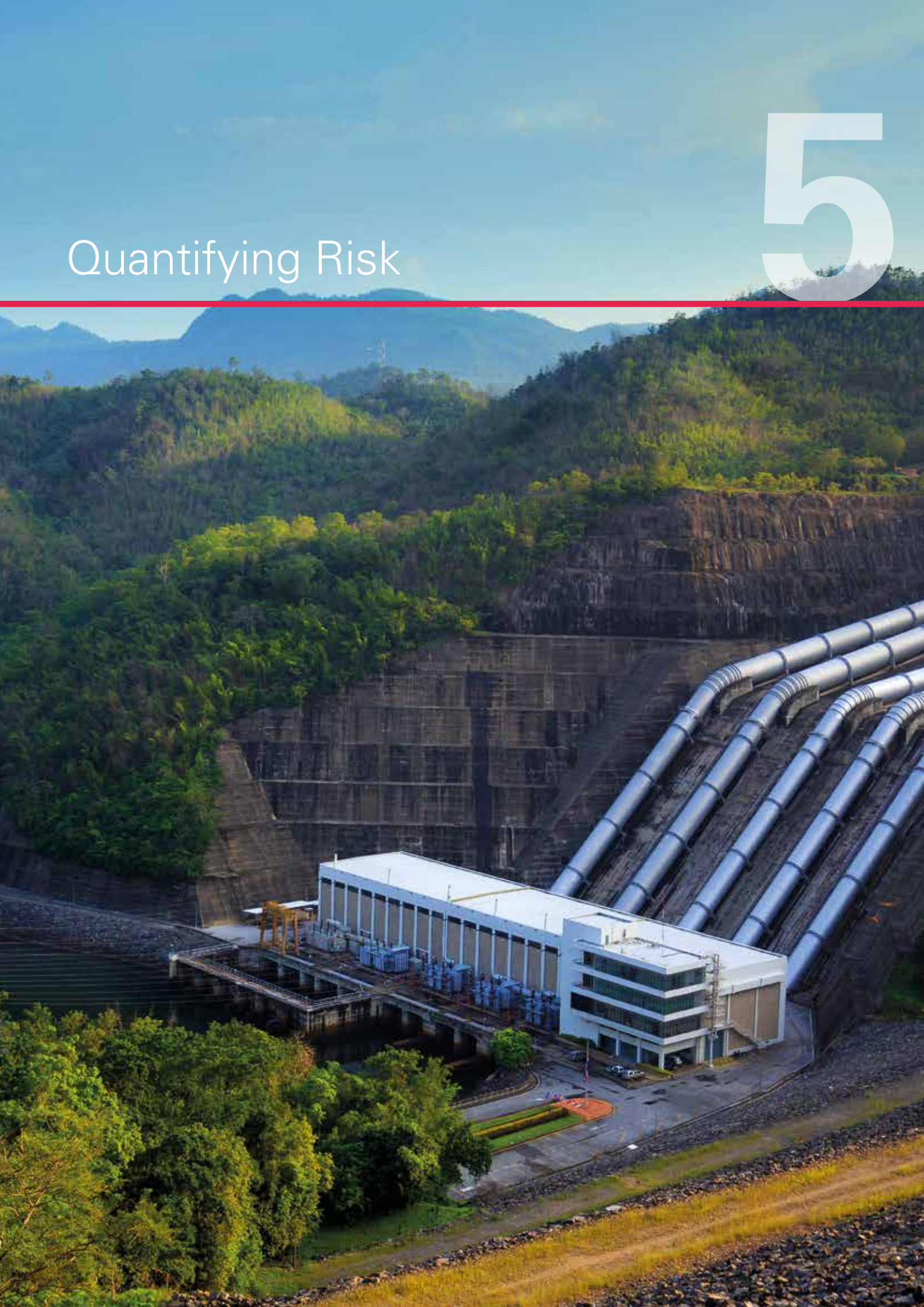
11.4 Dispute resolution

Government/public entity:

Despite all best intentions, there is a risk that conflict can arise between the government and its insurer(s) in the claims settling process and develop into a formal dispute.

As a result, it is important for the entity managing the programme to put an appropriate dispute resolution procedure in place for such cases, whether litigation, arbitration, mediation or a combination of these. Also, consideration must be given as to who can bring an action under the coverage and whether there are any relevant sovereign immunity laws that need to be addressed.

5 Quantifying Risk



5

Quantifying Risk

Converting the assets to be covered by the insurance programme to a quantification of risk is necessary to inform the nature and size of any insurance requirements.

Risk can be quantified in many ways including based on the number or value of assets exposed to one or more hazards, or in terms of monetary losses incurred after events causing damage to those assets.

Only by quantifying the risk on an annual and longer-term basis, can an insurance programme be robustly designed to cover the risks in line with the government's goals, available budget and risk appetite.

5.1: Risk valuation

With *loss exposure-based risk valuation*, risk is quantified using a model-based approach, by which an inventory of assets is analysed against estimated hazard severity and frequency to determine which of those assets are exposed to one or more hazards, and to estimate the cost of the damages that could be expected from different types of events.

Alternatively, when there are sufficient records of previous damage to the public assets, that loss experience can be used to design a suitable insurance programme. This is called *loss experience-based risk valuation*.

a. Loss exposure-based risk valuation

Quantification of risk to public assets using a model-based approach follows the same general framework as that which is applied in common natural catastrophe risk modelling of private property portfolios.

Disaster risk is a function of three interlinked components: hazard, exposure and vulnerability, and requires an initial definition of the scope of coverage in terms of geography, perils and assets.

Risk can be quantified probabilistically or deterministically. A necessary step in the probabilistic modelling chain is estimating the severity and frequency of hazards in the area to be assessed – for example, how frequently would we expect cyclone-strength wind speeds to occur?

In a deterministic analysis, selected historical events are used to illustrate plausible or maximum credible losses, based on experience. The deterministic approach is useful in communicating potential losses if an event similar to a historically well-recognized large event were to occur in the future.

It is preferable, however, to design insurance schemes using a probabilistic assessment which provides an estimate of how frequently losses of a given size are expected. This can represent losses from possible extreme events that have not occurred before, at least not in recorded history.

For both approaches, insurers require a definition of the types of assets to be modelled. Insurers must first understand the location of assets, to understand the simulated intensity of the hazard on those assets in each modelled event.

By defining information on the usage and construction of the assets, a vulnerability relationship can be applied to estimate the amount of damage likely to be suffered in each event when the asset is affected by, for example, a certain depth of flooding or strength of wind speed. When the replacement cost of an asset (or type of asset) is known, the extent of damage can be used to estimate the cost to repair or replace that asset.

These calculations can be performed for every asset in a portfolio to estimate the total potential loss from the hazards present.

Deterministic losses would be presented as an expected loss for each event modelled.

Understanding loss probability

Probabilistic risk models are constructed to produce the **exceedance probability (EP)** distribution; that's the probability that losses (or damages) will equal or exceed a certain amount in any given year. This is often expressed as a loss at a specified "**return period**" or "**recurrence interval**". For example, the "1 in 100-year loss" is equivalent to a 1% chance of the loss occurring in any given year and has an exceedance probability of 1%. The one-year return period loss is expected to be equalled or exceeded every year, and its exceedance probability is 100% in any given year. The 250-year return period loss has an exceedance probability of 0.4%.

It is also possible that two 1 in 100-year losses will occur in in sequential years and therefore thinking about loss exceedance probability is a more suitable way of contextualising the risk than using return period statements. The exceedance probability, or return period, of a loss is very different to the return period of an event itself; for example, a category 4 cyclone striking a particular part of the coastline.

A loss exceedance probability of 1% for a country can be driven by many different types of events which can generate the same total loss due to different combinations of severity and the area affected. For example, even moderate severity events striking high-value assets can cause significant loss, compared to high severity events striking areas with few assets.

Exceedance probability losses are typically used for understanding how much reinsurance to buy and how much capital needs to be held to cover losses in a particularly bad year. For example, commercial insurance companies in Europe are required to hold capital to the 1-in-250-year level under EU insurance regulations.

Loss probability and price

The other main output of probabilistic risk models is the "**average annual loss" (AAL),** which is the expected loss per year averaged over the many years of the risk model simulation. This is also sometimes called the "pure premium", "technical premium" or the "catastrophe load", and represents the amount of premium required to cover losses from the modelled risk over time, excluding losses from other causes as well as operating expenses and any profit.

Together with a measure of uncertainty calculated by the standard deviation, the AAL estimates can be used to calculate the technical component of premiums. It also should be noted that the standard deviation rarely captures all the uncertainty in a risk model, so underwriters often add multiples of the standard deviation to the AAL to establish the technical price.

Also, the ultimate price for covering the asset will incorporate other risk elements that are not included in the risk model. Namely factors to cover the cost of capital, and additional costs like, e.g., taxes, expected claims management expenses and related items.

Typically, a collection of assets, e.g., all the municipally owned buildings in a specific region or country, is modelled to give an aggregate EP curve and AAL across the whole portfolio. These modelled losses can be broken down by geographic area, event type (e.g., storms above a certain category) and/or asset class (e.g., schools or hospitals). Applying these relevant filters to the model enables asset owners to design an insurance programme that protects particular types of assets or to prioritise cover for a given peril or area.

b. Loss experience-based risk valuation

When there is sufficient historically recorded loss experience, a picture can be developed of the average expected loss per year and, in some cases, over several decades. The assumption in using these calculations is that the past loss history can provide an expectation of future losses. However, there are several limitations to this approach which make it impractical in many cases for infrastructure.

Limitations to the loss experience-based risk valuation

In many parts of the world, historical data on losses are often not widely available. Despite the availability of a large amount of claims records, several issues pose challenges, including the length of records and event catalogues, the location of the observations and the consistency and reliability of the loss estimates.

Since the 1980s, commercial catastrophe model vendors and the meteorological/climate and geological scientific communities have worked in concert to compile, from multiple sources, as complete a historical meteorological and geological event records as possible. The data are usually a mix of hard-copy and digitised forms from public and private enterprises as well as scientific and academic institutions. Availability, quality and accessibility of observed hazard data and event catalogues (defining location and magnitude of events) are typically limited to relatively recent history (40–50 years) and vary considerably around the world.

However, such records often do not contain an estimate of the losses to public assets and are more likely to encompass a property catastrophe portfolio loss to residential and commercial buildings in regions with well-established insurance markets.

Outside of the insurance industry, post-disaster impact and needs assessments are becoming more common, and while these provide estimates of the impact to public assets, they are event-specific and few in number. More broadly, there has only recently been a concerted effort to collect disaster loss data under the *Sendai Framework*, and this could be a valuable resource in the future.

However, it will take hundreds of events and many years to build up a database from which expected losses can be extrapolated. For example, there have been only eight M8 or above known earthquakes to strike China since the early 1300s. The number of casualties caused by these similar magnitude earthquakes range from 6,000 to approximately 830,000 given the different areas struck by each earthquake as well as population changes over time.

Thus, using an average of causalities from past M8 earthquakes to estimate future losses is not reliable. In addition, where such historical loss records are available, they are often as a generic loss total, rather than disaggregated by asset type and can be one of a wide range of estimates from different sources.

Recommendations for relying on loss experience

- Loss experience should be directly related to the public assets under consideration for cover. For example, if cover for education facilities is being considered, loss experience for private building stock should not be used as a proxy, unless well-justified.
- For hydro-meteorological hazards, it is important to recognise that the hazard and risk are non-stationary: the changing climate is altering the severity and frequency of floods, droughts and windstorms, among other perils. Past loss experience for these hazards is unlikely to remain the same in the future, with losses likely to increase in many parts of the world.
- It is important to account for changes in the public asset portfolio (if buildings are being added or removed from the inventory), pro-rating past losses to reflect the change in number and density of assets between each recorded loss and the present day.
- It is important to adjust past loss amounts to represent the loss consistently, for example, in the current currency value.
- To form a reliable estimate of loss frequency and expected loss, the record of loss experience should be as long as possible or contain as many events as possible. Given the low frequency (decades to centuries) of geophysical events, they are unlikely to be represented well enough in any country to provide sufficient experience for robust estimation of future risk. Flood and drought are more frequent, although still limited in terms of the more severe events which need to be quantified. Also, as noted above, the effects of climate change and the increasing occurrence of unusual and extreme events suggest that the historical records will become less reliable as a predictor of future events.

5.2: Data requirements

This section describes the key categories of information needed for the design of the insurance programme. Although the details can be somewhat complex, understanding and addressing these aspects is essential to the creation of a suitable and sustainable scheme.

From a re/insurers' point of view, these are the elements that are central to understanding the risks to be covered, in order to establish a sustainable public asset insurance scheme, irrespective of its ultimate purpose and objective.

a. Asset information

Understanding the characteristics of the assets to be insured is essential as these attributes influence both their exposure to various hazards as well as their vulnerability to damages resulting from those hazards. There is minimum information that is vital to providing indemnity insurance cover (see box).

Minimum asset information needed:

- Where the asset is located (location coordinates);
- Whether it is a single structure, or a complex of facilities on the same site or whether it is a network with different components or nodes;
- Insurable/replacement value.

For example: a portfolio of schools or individual school buildings on a given site; a network of linear infrastructure like a road or rail transport network, or a water supply pipeline; or a collection of electrical transmission lines and substations.

Based on this level of information alone, it is possible to analyse an asset's exposure to various hazards, providing those have been mapped. A geospatial analysis overlaying the road network with a flood inundation map, for instance, can inform infrastructure owners about where the network is most vulnerable given the potential for flooding along different parts of the network.

Relevance of data on usage and construction

For more detailed analyses, additional information on the asset's usage and construction are important. These factors not only reflect the vulnerability of an asset – the likely damage expected, given a certain level of hazard intensity experienced – they also influence its replacement cost. *See the following section 5.2 d, "Replacement value", for more details on determining replacement costs.*

In many countries, structures in the same asset class often adhere to a standard design and use similar materials; Japanese schools, for instance, are typically multi-storey and built with reinforced concrete to withstand earthquakes. At the same time, the construction attributes can vary considerably between different types of assets, especially complex infrastructure such as large industrial sites where there may be great variation in construction methods and materials among significant buildings within the same facility.

Road networks

In the case of road networks, the construction practices and materials may be common across a country, but the road structure will differ according to road category; that is, national/regional motorways designed to accommodate heavier vehicles and greater traffic volumes will be more substantial compared to local roadways. (That also means that national/regional motorways typically have higher replacement costs, but lesser vulnerability compared to local roads.)

Construction methods and materials

For more significant facilities that may be insured on a specific policy basis, such as with facultative cover; or for assets exposed to seismic risks, re/insurance underwriters typically require more specific information on the construction methods and materials. That could include, for instance, surveying the structure to assess its column and beam connections, or roof tie-down practices, as well as any specific functions that influence the vulnerability of specific buildings or features of a single site, such as pumping facilities versus treatment ponds in a wastewater treatment facility.

Bridges

With bridges, the design and materials significantly affect their costs and vulnerability, and it is vitally important to understand the construction in detail to quantify the risks. The relevant factors here include the bridge type (e.g., beam, arch, suspension), usage (e.g., road, rail, mixed), dimensions (i.e., length, width, number and length of spans) as well as the construction details of each component such as the bridge deck and columns.

Asset condition

Estimating the risks to significant and long-lasting infrastructure also must take into consideration an assessment of an asset's current condition and, where possible, how it was impacted by previous disasters. Accordingly, engagement with infrastructure owners and maintenance engineers is essential.

Use of technology

The increasing availability of sensor data is becoming more relevant in the insurance sector. For example, self-reporting sensors embedded in a structure enable engineers to monitor the condition and performance of the public asset over time; this approach can be especially relevant, for instance, in areas where relatively small seismic events could cause structural damages that are not readily apparent. As these technologies become more widely implemented and connected, the resulting information will help architects, engineers and construction companies to erect safer, more resilient structures, and better enable insurers to factor the impact of deterioration (or the effects of regular maintenance) in their risk estimation and pricing.

For indemnity-based solutions

Indemnity-based insurance solutions require accurate, detailed information about the public assets to price cover for the risk. This information is also central for an efficient claims management process geared towards financing the repair or reconstruction values of heavily damaged or destroyed assets.

Determining the reconstruction values of thousands of governmental assets – as in the case of the Mexican National Disaster Risk Fund FONDEN– can be a challenge. *See also chapter 9 for a description of FONDEN.* The lessons learned from FONDEN resulted in an agreement to use volumetric reconstruction values of insured assets. This is an option that can be explored when the data are either insufficient or difficult to obtain.

For parametric solutions

For parametric solutions, it is possible to approximate the values and distribution of assets to some extent; for example, by using the population density or average crop yields in a given district or country. As noted above, parametric solutions are chosen most often in instances when the insurance payout will be used primarily if not exclusively 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, this could include installing urgently needed temporary infrastructure, for example, bridges or portable water treatment facilities.

b. Hazard information

A primary requirement for insuring public assets is a robust understanding of the frequency and intensity of the hazards (perils) that could affect the assets to be insured. *See also the description of natural and man-made hazards in chapter 3.*

Different types of hazard data can be drawn from a number of sources. A catalogue of historical events can indicate how many floods, earthquakes, typhoons/hurricanes, etc. have occurred at or near an asset's location in the past. This provides an initial estimate of how frequently the location has been affected during or possibly before the asset was in place and can sometimes provide an indication of the magnitude or intensity of an event.

For frequent events such as floods and storms, and where a historical catalogue of events is deemed sufficiently complete, it is possible to statistically derive the frequency and intensity of likely future events. *See the following section f. "Data sources" for more details.*

Hazard data challenges

In many parts of the world, especially in developing countries, the historical record provides an incomplete picture of the potential hazards. They often extend only several decades into the past and since disasters causing widespread damage occur infrequently, the data covering these events – including important parameters such as level of ground shaking, flood depths or precipitation – typically are not extensive. Also, the data sets may be biased towards extreme events and don't include statistics on smaller, more frequent yet damaging events. As a result, the availability data may not reflect the full hazard experience at the location.

More detailed information may be available from the asset owners, who may be able to expand the records with details on past events and, more importantly, the observed impacts on the infrastructure.

Site-specific hazard assessments

At similar granularity, a site-specific hazard or risk assessment may be conducted by specialist engineers to understand the sources and potential for a hazard at one or more sites. For large and new infrastructure, a site assessment may be required during its design stage and may include hazard assessment of the site, and any impact that the infrastructure has in modifying the hazard there.

c. Vulnerability information

Vulnerability relationships are the component of risk quantification that estimates the impact of a hazard on an asset type.

If the construction type of a building is known, it is sometimes possible to find an existing general vulnerability relationship to use in the analysis, although relationships that have been developed specifically for assets in the country where a programme is being developed and specifically for that asset type are preferred.

Vulnerability relationships are developed using historical loss data linked to the hazard severity experienced, e.g., windspeeds or ground-shaking measure. This information is not always available, and thus engineering analysis and modelling may be used, based on expert judgement about construction quality and performance in specific countries and regions.

d. Replacement/reconstruction value

For all assets to be insured, a replacement value is required to estimate monetary loss. This represents the cost to repair the damages to an asset, or the cost to rebuild/replace an asset damaged beyond repair.

Building back better

In this context, the option to replace destroyed assets with a more robust, resilient building quality and more environmentally friendly features (in the context of the "*build back better*" framework) can be considered, and this aspect can be integrated into the premium calculation.

While premium levels that include a build back better aspect may be higher, this approach can deliver significant benefits.

Benefits of build back better

- Premium discounts on the newly reconstructed asset compared to the price of insuring a structure repaired or rebuilt to the prior standard.
- Increased resilience from assets built to a higher standard.
- Reduction of risk to users; this is especially relevant for schools and hospitals.

Relevance of local experts to determining replacement costs

While replacement costs can be difficult to estimate, they typically rely on the cost of the materials and labour needed to repair or reconstruct the asset.

Since estimating replacement costs can be a large source of uncertainty in risk estimation, it is important that any estimate of replacement costs be well informed by local engineers and building owners. And when these estimates are developed without those inputs, they should be carefully validated by other sources.

Experience demonstrates that, for much of the world, it can be difficult to accurately estimate infrastructure replacement costs without understanding local material and labour costs. In many low- and middle-income countries, there often is little readily available information on these topics. Hence, to develop robust estimates, it is important to engage local construction experts to avoid over-reliance on unit cost estimates that are biased towards high income countries as that can lead to overestimation of replacement costs elsewhere.

For a portfolio analysis, it's generally important to know what the structure comprises in terms of wall and roof construction type and material. Replacement costs typically are estimated based on standard factors reflecting the construction methods and materials. For example: the cost per square meter of a building constructed with steel versus reinforced concrete; or the cost per meter of a water or irrigation network using plastic versus concrete pipe.

Replacement values for complex facilities

Where a complex facility is under consideration for insurance, e.g., a power station with many different types of buildings and components on a large site, it is important to have well-defined construction information and replacement costs for that facility or, better, each component of that facility. Also, highly complex and valuable facilities may be more suited to facultative re/insurance rather than inclusion in a broader public asset portfolio. *See also appendix 1 for a listing of the types.*

Replacement costs spikes

In determining replacement costs, it is important to consider that it's not uncommon for replacement costs to spike after a major disaster, particularly on islands where local materials and labour are limited and must be shipped in, or in severely damaged areas where the demand for materials and labour exceeds the readily available supplies. These effects are further amplified if the event has impacted the transportation networks and/or if workers who otherwise would be assigned to the recovery effort must attend to their own personal needs.

e. Modelling hazards and vulnerability

Stochastic hazard modelling can be used to estimate the frequency and severity of events for a large region, which is suitable for assessing the hazard across a large infrastructure portfolio. Stochastic analysis uses information about the physical environment to simulate the extent, frequency and intensity of physically possible individual events over a long period, e.g., thousands of years, which are then be combined statistically to estimate the overall hazard across a large region.

For example, flood events are simulated by modelling the flow of water over and through the landscape, then into and along river channels, estimating any resulting floods when the water flows out of the channel. To do this, the models use simulated rainfall events, and/or records of rainfall and river flow from physical gauges, in combination with maps of soil, vegetation, the river network and terrain data. Similarly, physical based processes are applied in the simulation of other hazards.

What data are needed

Robust modelling of building assets also requires data describing the asset distribution (the number of assets of a given type in a given administrative unit or cell of a defined grid for modelling; equivalent to a geographical area) or the location of each asset (detailed data with each asset geo-located with address or longitude/latitude information).

More accurate results will be returned if additional information about the assets is also incorporated into the model including:

- the occupancy type (e.g., office, school, wastewater treatment plant)
- year of construction
- construction material
- characteristics such as building height and roof type.

Even more detailed analyses can be conducted with more information about specific risk resilient characteristics; for example, if older-buildings have been retrofitted to newer building codes.

Complexes such as energy plants also can be broken down into their individual components such as offices, generators and transmission lines – each of which has a different vulnerability to the same level of hazard.

Specific data needs

Higher accuracy location information is necessary for risk analysis of localised hazards such as flood where water levels can change considerably across short distances. Similarly, for modelling of network infrastructure, the location of each link and node of the network is needed to perform a robust risk assessment.

Modelling risk mitigation measures

If sufficient high-resolution data are available, the benefits to infrastructure of risk minimization measures like enhanced flood defences also can be modelled. That is, the models can be run with and without the impact of enhanced defences and the observed changes in the AAL and EP curves can help to quantify the potential value of such protection measures.

f. Data sources

Official government inventories of public assets are typically the most appropriate source of information on asset location. However, especially in developing economies, official data sources cannot be updated regularly, for example due to resource constraints.

Hence, to increase the underwriters' confidence, other data sources may be used to supplement the data when geolocation information is lacking, or where the official data are not comprehensive or up-to-date. Or, given dynamic developments, correction and simulations may be necessary.

Alternative data sources can include:

- Open data mapping platforms such as OpenStreetMap
- Development banks
- Academics (e.g., global road network data)
- Specific industry sources (e.g., regional databases of power stations maintained by the energy industry).

Significance of detailed data

It is important when presenting aggregate data to maintain information on each asset type. As an example, educational facilities would be one asset type, and government offices would be another. This is because each asset type would be associated with a different usage ("occupancy") and construction characteristics – primarily a description of its wall and roof construction and its height for buildings. Further construction information can be accepted by most models if available.

Detailed data would describe the occupancy and construction of every asset individually, and it is most important to distinguish this if assets within the same asset type vary significantly in their construction.

Network infrastructure

For network infrastructure, asset type and construction are again an important distinction (e.g., paved or unpaved road, or voltage and underground or elevated electrical cable) that influences the vulnerability of the asset to a hazard.

Benefits of more versus less data

While it can be difficult to provide a complete data set for a portfolio of assets, providing more data will help reduce uncertainties about expected losses, and will aid the insurance provider in offering coverage at a fair and adequate price.

The primary information about the assets that should be collected and provided to insurance providers include occupancy type (how the facility is being used), construction type, year built, and number of stories/floor levels.

While the above primary characteristics will provide the minimum information needed to evaluate an asset, additional information will be required to provide greater insight into the assets, including a better understanding of the vulnerability of the asset to a given physical peril.

Significance of more data

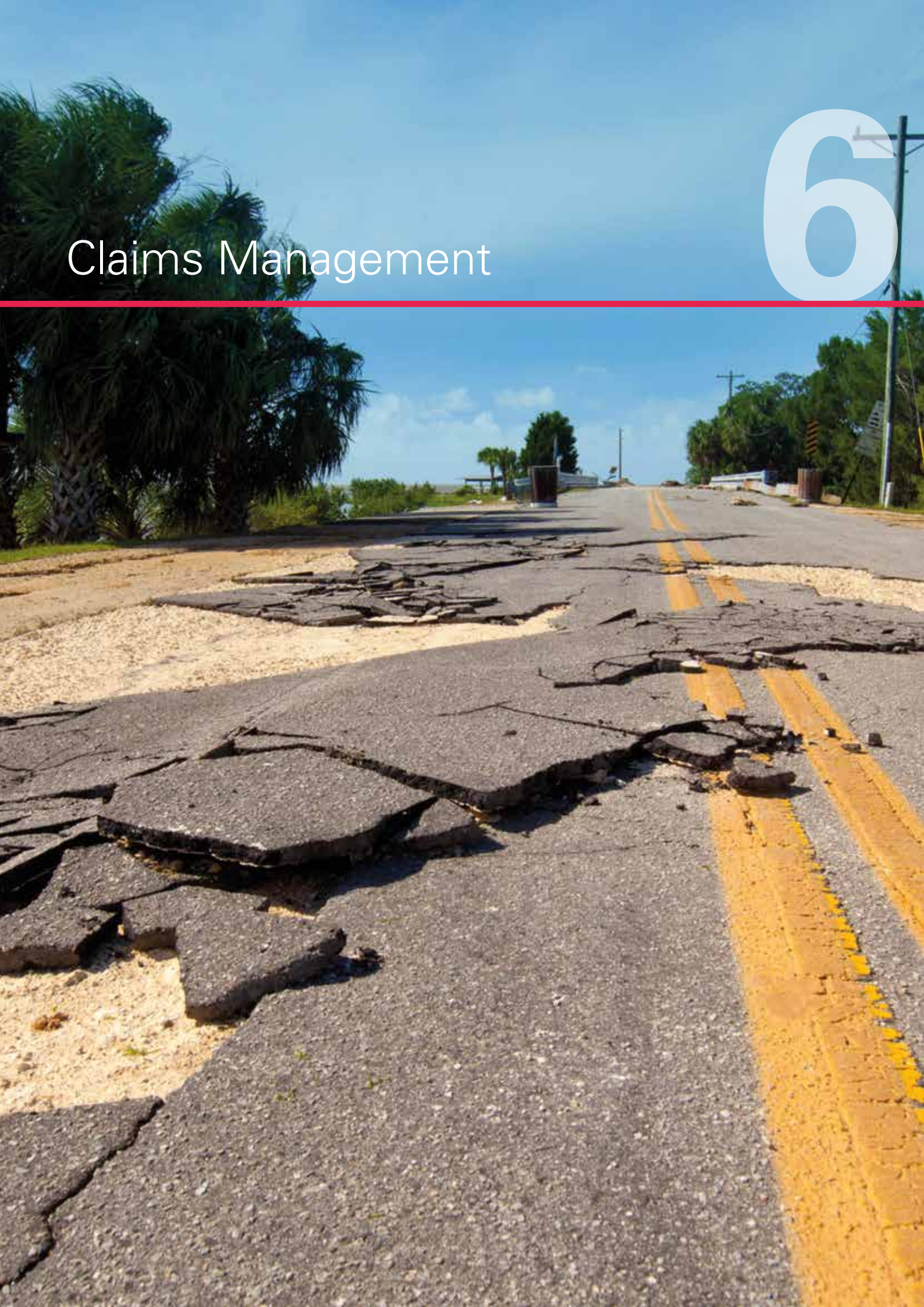
As the understanding of the asset increases, the uncertainty of the loss estimate is reduced leading to greater confidence in both structuring and pricing an insurance programme.

The type of additional information that is recommended is dependent on the peril impacting the asset. For example:

- When evaluating risk vulnerability from both wind and earthquake events: Construction quality and cladding type are useful.
- For assets subject to earthquake risk: Detailed information about an asset's foundation, such as frame-foundation connection and engineered vs non-engineered are more applicable.
- For assets exposed to wind risk: Additional information about the asset roof is beneficial, such as roof geometry, age, covering and condition.

In summary, the more information an underwriter has, the more confidence s/he can have in the analysis. However, it is important to understand what data are applicable to the risk being evaluated, to ensure data collection efforts are leading to an increased understanding of the vulnerability of the assets with respect to specific risks.

6 Claims Management



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Claims Management

As outlined in chapter 2, insuring public assets can help governments: cope with unexpected shocks; enable more effective and faster repair/reconstruction; promote more holistic risk management practices; and support economic development. With insurance, claims are "the moment of truth" when the benefits of premium payments are delivered. However, careful preplanning on how claims will be managed following a covered loss is vital and will help ensure that governments realize the benefits of insurance and a PAIP.

The dimensions of speed of claim payment and planned use of claims payments are important elements to consider when deciding how to structure a PAIP – these are addressed in *chapter 3.3, section d, "Defining the intended purpose for claims payments"*.

The following material highlights the significant issues and considerations that apply to claims management. Some of these are common to all losses involving property assets while others reflect issues unique to PAIPs.

Government's main concerns about claims

There are a series of issues or challenges that governments will face in relation to claims handling for an insured portfolio of public assets. As a start, it will help to understand how claims will be handled depending on the insurance type chosen for the PAIP. The following sections includes this information and a series of recommendations to help governments address claims handing for their PAIP effectively.

Claims management challenges

- Securing skills/resources for claims administration and loss adjusting
- Planning for necessary ancillary budgets
- Ensuring efficient remediation processes
- Loss control
- Effective claims record keeping by asset owners/ managers
- Efficient repair/reconstruction processes
- Fair distribution of retentions and claims payouts
- Resolving disputes
- Effective communications with all stakeholders

a. Claims handling for different scheme types

Up-front, it is important that governments understand how the type of insurance they choose (indemnity or parametric – *see also chapter 3.4, section a "Type of insurance: indemnity, parametric or hybrid"*.) impacts the claims capabilities needed to manage the PAIP.

Claims handling for parametric schemes

Claims handling for parametric schemes is generally straight-forward, based on the pre-agreed relationship of a triggering event and the corresponding claims payout. That is, parametric schemes do not require an evaluation of the damages vis a vis the insurance cover (or "loss adjusting") as the basis for the insurer(s) to activate the claims payouts.

Addressing claims payout conflicts with parametric PAIPs

However, the entity managing the PAIP for the government (the "programme manager") which receives the payouts, then has to allocate them to individual asset owners/managers. The programme manager could face challenging issues regarding how to disperse the payouts if a parametric scheme covers a broad geographic area and different assets within the programme are disproportionately impacted, given differing needs and other considerations.

The potential for disputes about apportioned claims payouts can be amplified with parametric schemes where a lump sum payout is made to the programme administrator based on the agreed triggers, yet some asset owners/managers within the coverage area may have experienced much more extensive damages compared to others.

In order to ensure the claims payouts are apportioned fairly, in these situations, the usual practice that claims in parametric programmes don't need to be adjusted may need to be suspended, and loss adjustors dispatched to assess the actual damages. Based on the results of those on-the-ground assessments, the adjustors also can recommend a formula for allocating the payouts so that these reflect the damages.

Claims handling for indemnity-based public asset insurance schemes

In contrast, claims handling for indemnity-based public asset insurance schemes can be both a challenge as well as an important contributor to more effective loss control. Both aspects – resolving the challenges and realizing the positive contributions – underscore the importance of defining an effective and efficient *claims protocol*, ensuring that the necessary processes and information are in place.

Because indemnity insurance schemes compensate the insured for the specific damage suffered by specific assets, ensuring that claims payments are made efficiently and accurately requires:

— Knowing the condition and reconstruction value of an insured asset before the event: This means that changes to the condition of individual assets after the first insurance policy is issued – for example, damages not covered by the insurance or retro-fitting/repairs completed subsequently – need to be registered and notified at the time that the policy is renewed.

— In the case of a covered event, the actual damages need to be verified and assessed. This is the responsibility of the insurer's property claims team, often with support from local engineers and related professionals operating under contract to the insurer.

Simplified indemnity schemes

There are also simplified indemnity schemes, like the Japanese Residential Earthquake scheme. Under this scheme, the percentage of assessed damage determines coverage.

For example, damages assessed over 50% of the sum insured would generate a full payout of earthquake coverage while damages assessed from 25% to 50% would produce a 50% payout, and damages from 10% to 25% would yield a payout of 25%.

This means that, post-disaster, it is possible to use satellite, overflight, drone and even social media/insured photos to determine the category of loss and release payments in many cases, especially for those experiencing the worst damage.

b. Securing skills/resources for claims handling

Having access to the right skills, as well as the appropriate processes and protocols in place is central to ensuring that claims are assessed promptly and accurately, benefits are distributed fairly and repair/reconstruction is managed effectively.

Claims handling skills in the programme management entity

Managing the inflow of claims reports and outflow of claims payouts effectively for a portfolio of assets, especially if these are spread out across a country or vast region, can be a complex undertaking. Accordingly, it is important that the public or private sector entity responsible for administering the programme has the right skills and expertise for managing this aspect of the process.

Relevant qualifications include previous experience with claims management and some familiarity with construction practices, as well as with accounting. Also, depending on the type of public assets being insured, experience with specific sectors such health or energy may be helpful.

Planning for timely loss adjusting resources

With indemnity insurance schemes, when losses occur loss adjusters are needed to visit the relevant sites and assess damages before claims payments can be made. When disasters causing wide-spread damages occur, many countries have found that there are simply not enough loss adjusters available to get the work done quickly.

For example, in the aftermath of the February 2010, 8.8 magnitude earthquake in Chile, damage assessments needed to activate claims payments were slowed since the available loss adjusting resources in the country were over-burdened by the magnitude of the losses.

Developing countries may be especially susceptible to this challenge and it is important for those managing a PAIP to plan ahead.

The following measures should be considered to alleviate the strains:

— Establishing a process to allow fast entry into the country for loss adjustors from abroad. In this regard, some countries have given loss adjusting professionals from different countries the chance to register in advance to secure fast entry in the aftermath of a severe event.

— Encouraging insurers to identify organizations where they can enlist professionals from outside the industry, who can assess and document damages locally, so that the data they collect can then be validated by professional loss adjustors. This can include local universities who can enrol e.g. senior construction/ engineering students.

— Encouraging insurers to pre-register companies that use drones for commercial purposes so that they can be quickly enlisted to capture at least initial images of damaged areas. Drone imagery is proving to be extremely effective in helping loss adjusters conduct initial assessments and prioritize locations for on-the-ground inspections.

c. Securing necessary budgets

Managed efficiently, insurance payouts can aide governments to address repair/reconstruction effectively. However, there are also costs in relation to claims that should be considered and planned for. For example, whatever insurance claims funds are received following a covered loss, the payouts will be less than the actual losses since, at a minimum, a portion of the costs will be allocated to the deduction/retention.

Assigning budget to maintenance

Regular maintenance is an effective way to prevent excessive damage to assets from normal wear and tear and weathering. Such measures can help reduce claims and hence also avoid growing insurance costs. Maintenance work can go a long way in helping to maintain a structure's resilience and assigning budget for it, which is sometimes seen as "nice to have", should be prioritised.

A separate budget for retentions/deductibles

Because public entities usually receive budgeted funds once per year, it is important to specifically earmark a portion of the budget for insurance retentions/deductibles, even if they are not needed every year, in whole or part.

This budget for retentions/deductibles needs to be in addition to, and separate from, the funds allocated to pay the premium and also separate from the entity's operating budget, to ensure the funds are available when needed.

The funds may be apportioned to each asset owner/manager, or handled centrally by the overall programme administrator.

This approach can reduce the potential for protracted and challenging disputes once losses occur.

d. Developing a claims protocol

Planning for effective remediation

It is essential that the asset owners and/or claims beneficiaries are able to use the funds as effectively and productively as possible. One way that can be supported is by planning ahead.

Planning should include identifying the actions that will need to be taken, creating mechanisms that support the recovery effort and the likely costs, to repair/reconstruct the assets, e.g., installing/erecting temporary solutions, commissioning engineering/architectural designs, hiring contractors and procuring necessary materials, and so on.

While this initial preplanning will typically be at a high level and based on certain assumptions and caveats, it can still help to identify potential constraints or "pinch points" where the recovery effort could encounter delays or face additional costs.

Such preplanning efforts will be particularly beneficial in the aftermath of a major event triggering a massive process of evaluating losses to a large number of diverse assets at numerous locations and within a short period.

Claims protocol

Based on the decisions taken during the process of planning for remediation, it is recommended to establish a claims protocol that outlines how claims will be managed, from communicating coverage to asset owners/managers, to documenting claims reporting to managing cash flows from claims payments (the latter is touched on in *chapter 4.2, section b. "Governance management when setting up a PAIP"; item 11.3*).

A claims protocol for a PAIP should encompass all relevant information and issues, and especially the responsibilities of the different stakeholders, as well as the processes to follow, to facilitate an effective recovery effort. Claims protocols or agreements established in advance by the various stakeholders can greatly reduce potential conflicts or delays for repair/reconstruction efforts.

e. Controlling losses

A challenge which governments will often face when insuring a portfolio of assets, especially if these are spread over a vast geographical space, is the risk of losses or damages escalating significantly once insurance is in place. This can occur for varied reasons.

For instance, asset owners/managers may neglect the need to properly maintain the infrastructure, thinking that insurance will cover any and all damages. Or they may report false claims. For example, a municipality with a building in need of light repairs after a hurricane could inflate the claim by, say, reporting that a building wall had collapsed, thus gaining access to a larger insurance payout.

There are some measures which governments can take to exercise loss control.

Agreeing minimum damage thresholds for indemnity cover

In order to control losses but also to minimize the burden of claims handling, it can be helpful to agree minimum damage thresholds that have to be reached before filing a claim, since that leads to loss adjusters being sent to sites of damaged public assets. With this approach, damages under the threshold are covered by the local asset owner or asset administrator.

As an incentive for risk mitigation in the form of proper up-keep of the property or asset, governments may consider requiring asset owners/managers to document that the appropriate maintenance/up-keep of the assets has been conducted as a condition to providing insurance cover.

Maintaining accurate asset information

One important way governments can take control of losses and avoid these issues is by having accurate information on the insured assets. That baseline information enables the claims management process to avoid losses that are inflated in order to use artificially high claims payouts for improvements to, rather than replacement of, the assets. If a government chooses an indemnity insurance scheme, information on the assets will be collected as the basis to provide insurance cover. However, it is important for this information to be updated on a yearly basis.

Conducting a yearly asset census is a best practice many governments use to ensure that asset data are accurate and up-to-date. Also, capturing this data in an online tool with pre-defined parameters can help preclude errors from creeping in; for example, prohibiting entries in which the building's footprint (the amount of land it occupies) is larger than the plot of land on which it sits.

Using technology

If means allow, the use of technology, such as asset administrators providing photographs of the assets which include a date and a geo-location, can also help to prevent inflated claims and fraud.

Developing countries may consider accessing donor help to gain access to simple technology, such as mobile phones, which can greatly contribute to this goal (see the list of organizations in the section *Resources* at the end of this Guide).

f. Defining the responsibilities of asset owners/managers

Asset owners/managers will need to play an active role in working with the PAIP manager to handle claims effectively. The appropriate mechanisms need to be created for them to carry out the tasks easily and effectively and these need to be outlined in the claims protocol and communicated clearly.

Asset owner/manager responsibilities should include:

— Insurance cover: Taking note of which coverages have been bought for their respective assets, so that they know what type of damages they can or should report to the programme manager in relation to a potential insurance claim – and which are not covered.

— Claims notifications: Reporting losses/damages to their assets for which they could potentially receive an insurance claim payout, and communicating these claims notification procedures to the asset owners/managers.

— Record keeping: Documenting and tracking costs related to a potential claim.

— Escalating issues appropriately.

Efficient claims record keeping

For an effective collaboration with the asset owners/managers within the PAIP, it is necessary to create mechanisms that enable them, after a loss, to track *and separate* those costs that could be reimbursable under the insurance from other repair costs, and to do so accurately and consistently. Without such controls, it can be difficult to segregate costs covered by the insurance from non-covered expenses; the resolution of this issue also can lead to delays in funds being released.

Making sure that the documentation and tracking of losses and costs that could be covered by insurance are kept separately from those which are definitely not covered is especially important. Many insurance programme administrators in both the public and private sectors demand that all losses be recorded as part of an overall risk management strategy. However, the re/insurer has an obligation to review all reported losses to confirm whether they are covered or not. The administrative burdens on the re/insurer as well as the programme administrator for the PAIP can be lessened considerably by only reporting damages covered by the insurance, as opposed to reporting all incidents involving losses.

g. Ensuring efficient repair/reconstruction processes

Securing materials and services for repair/reconstruction

A common feature of preplanning exercises for claims handling is identifying in advance the sources for needed materials and professional services, and agreeing pricing, so that these can be mobilized quickly and cost-effectively after a loss.

An expedited procurement process

The entities responsible for managing the repair/reconstruction efforts also should consider adopting an expedited procurement process to help speed up the recovery effort. Especially as, in some cases, this will be central to limiting the potential for the losses to mount over time.

For instance, with some types of networked infrastructure like energy production and distribution, or water treatment systems, un- or minimally-damaged nodes may degrade over time if maintenance activities have to be suspended while the damages to other parts of the network are addressed. This is especially relevant since such ancillary losses typically would not be covered by the PAIP.

Pre-selecting and pre-contracting providers

Government procurement processes usually include thorough vetting and selection processes for providers and often several levels of approvals, in order to avoid fraud or even the impression of arbitrarily benefitting one provider over another. While this is laudable, it can often be cumbersome, and after a disaster it can significantly delay the start of repair or reconstruction activities.

Also, some government practices such as using contractors from a region that has been affected by a disaster in order to support the local economy, can sometimes lead to problems with delivery if the contractors selected do not have the skills or the means to complete the works to the required specifications.

Pre-selecting contractors who have the experience and resources to deliver the required works can be helpful in order to accelerate repair/reconstruction work. It is also advisable to include a check on providers' financial health. To support the economy of a region affected by a disaster, pre-selected larger companies can be asked to work with appropriate local sub-providers as part of contract fulfilment.

In addition, if the government can provide (a series of) standard requirements for the repair/reconstruction of their assets, it can also pre-agree the pricing for both the work and the necessary materials.

Benefits and costs of pre-agreed provider contracts

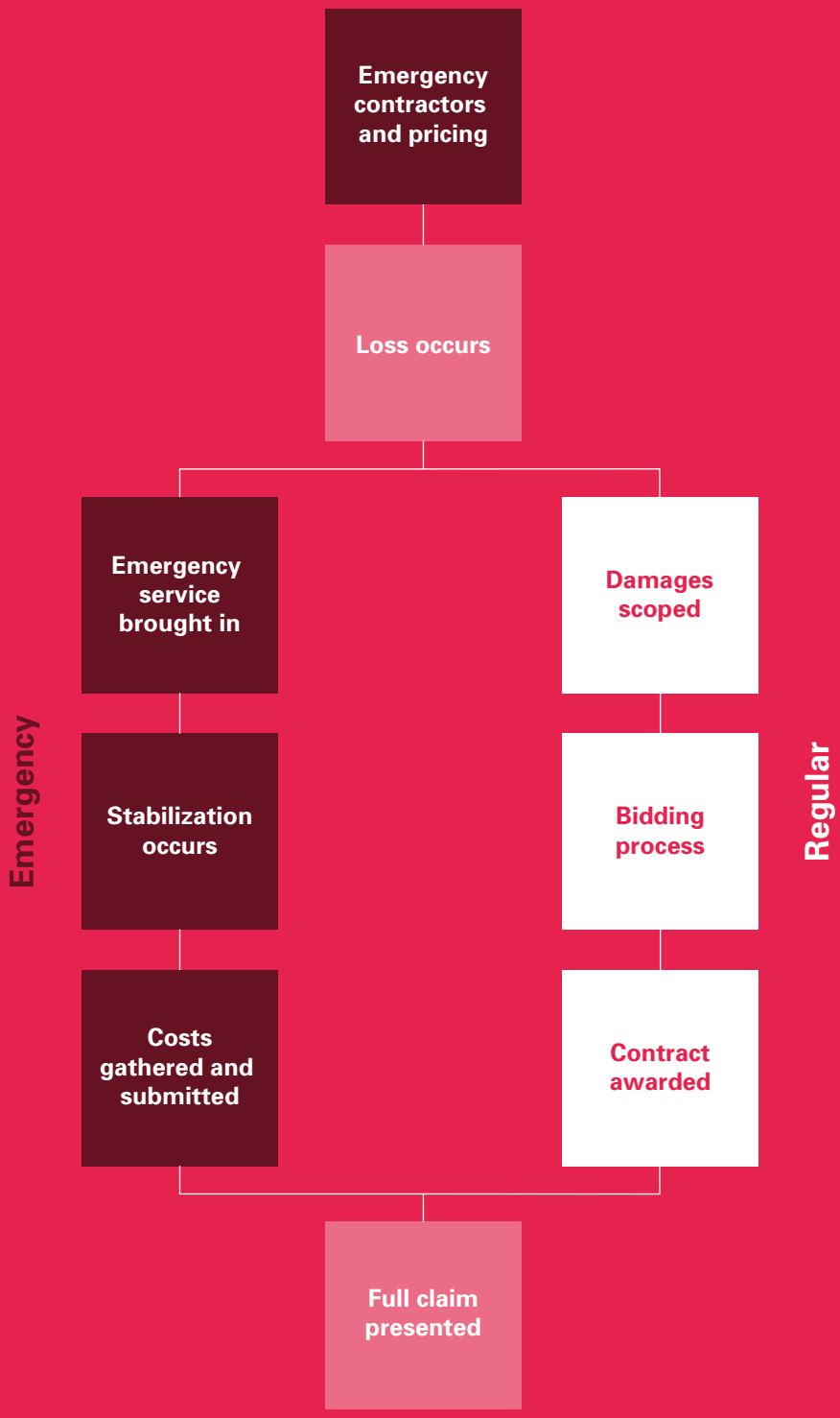
It's not unusual for labour and material costs to spike after a major disaster as demand outstrips supply. In addition to speeding up the process of repair/reconstruction after a loss, pre-agreed contracts also have the benefit of avoiding spikes in the cost for services as well as for materials that commonly occur after a disaster.

On the other hand, some providers may charge for committing a priori to make their resources available with priority for when a loss, and especially a major disaster, occurs. While this could represent an additional cost, it is one that can be planned for as an agreed yearly charge, versus the uncertainty about being able to access the necessary services and materials, at a reasonable time and price. In addition, yearly charges can be negotiated to count towards regular repair or retro-fitting work.

Benefitting from the re/insurers' experience

Re/insurer's claims teams should have considerable experience evaluating providers and pricing for repair/reconstruction work. Hence the government's re/insurers can offer useful guidance and support and bring their experience to bear to help the government avoid costs that are outside the norm that re/insurers usually secure for similar types of materials/work.

The graphic represents a high-level example of how an expedited procurement process can be structured for emergency scenarios.



h. Fair distribution of retentions and claims payouts

Other specific operational considerations related to claims handling with multiple asset owners/managers must be addressed as the programme is implemented. These include:

— How should retentions/deductibles be allocated across various asset managers/owners operating with fixed annual budgets?

— When multiple asset owners/managers experience losses, how should the claims payments be apportioned, especially in instances in which the total damages greatly exceed the insurance limits?

In both instances, resolving these issues can involve potentially fraught negotiations as asset owners/managers will have competing interests, differing needs, authority, political clout, etc.

Allocating retentions/deductibles fairly

To allocate retentions or deductibles to multiple assets owners, the PAIP manager can draw upon the experience of the re/insurers. They are often asked to propose a formula for allocating retentions/deductibles based on projected losses for the various entities. The re/insurers can usually make these calculations based on the data collected in order to provide indemnity insurance cover.

This approach provides a neutral and reliable basis for the allocation which should help avoid conflicts.

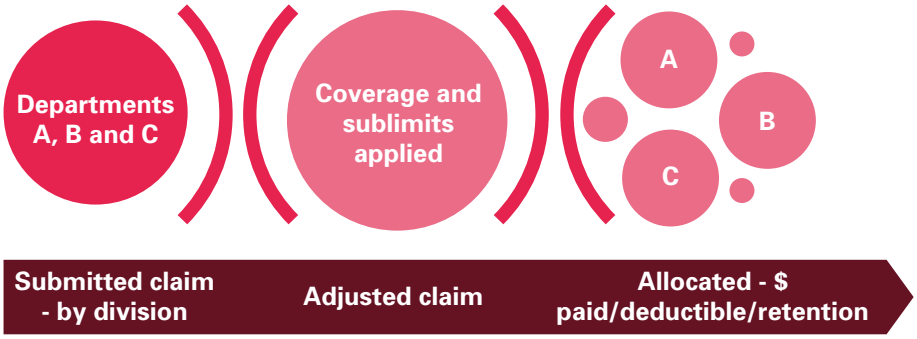
Apportioning claims payouts and avoiding disputes

When claims are submitted, the re/insurer will adjust the claim based on the policy terms and conditions and including applicable sub-limits. The amount of the payout – known as the "net recoverable claim" – is then communicated to the insured.

Disputes can occur, however, about how the insured – which in the case of a PAIP may be represented by the central programme manager but will include various national, regional and local asset managers/owners – divides the payout among the various entities which sustained losses.

One way programme administrators can avoid or limit such disputes is by deferring to the re/insurer's loss adjustors. They typically have vast experience appraising a wide variety of property losses and can offer an independent recommendation on how to apportion the payouts based on an objective assessment of the damages and the relative value of allocating greater or lesser amounts to different entities, within the context of the overall response effort.

Alternatively, some governments have had success using a "first in" policy in which priority access to the payouts is given to asset managers/owners that are at the head of the queue in documenting their losses; that approach, however, also assumes that the documentation not only is submitted quickly but is also complete and accurate.



Addressing claims payout conflicts related to limits

A particular challenge with PAIPs involving multiple assets owners/managers is how to address situations where an asset owner/manager incurs losses but an aggregate sublimit has already been exhausted as a result of losses experienced by other asset owners/managers. If, for example, a local school district sustains a loss and the coverage sublimit is exhausted, what do other asset owners/managers do if they then have a subsequent loss? With no remaining sublimit and direct tie to the initial losses, does the asset owner/manager hit by the second loss get any allocation from the local school district having the first loss?

While the answers to these questions will depend on various factors, including the local context and political considerations, at a minimum a protocol should be established in which all the participating entities are notified after an aggregate sublimit is exhausted. These nuances and elements should also be actively shared with all stakeholders through the structuring of a PAIP.

i. Dispute resolution

Even if the PAIP has been designed through a thorough dialogue aiming to understand and reflect the government needs in its design, there is always a chance that, in the claims settling process, conflict can arise between the government and its insurer(s) and develop into a formal dispute.

For such cases, it is important for the entity managing the programme to include an appropriate dispute resolution procedure in the claims protocol. This may be litigation, arbitration, mediation or a combination of these. This should include consideration as to who can bring an action under the coverage and whether there are any relevant sovereign immunity laws that need to be addressed.

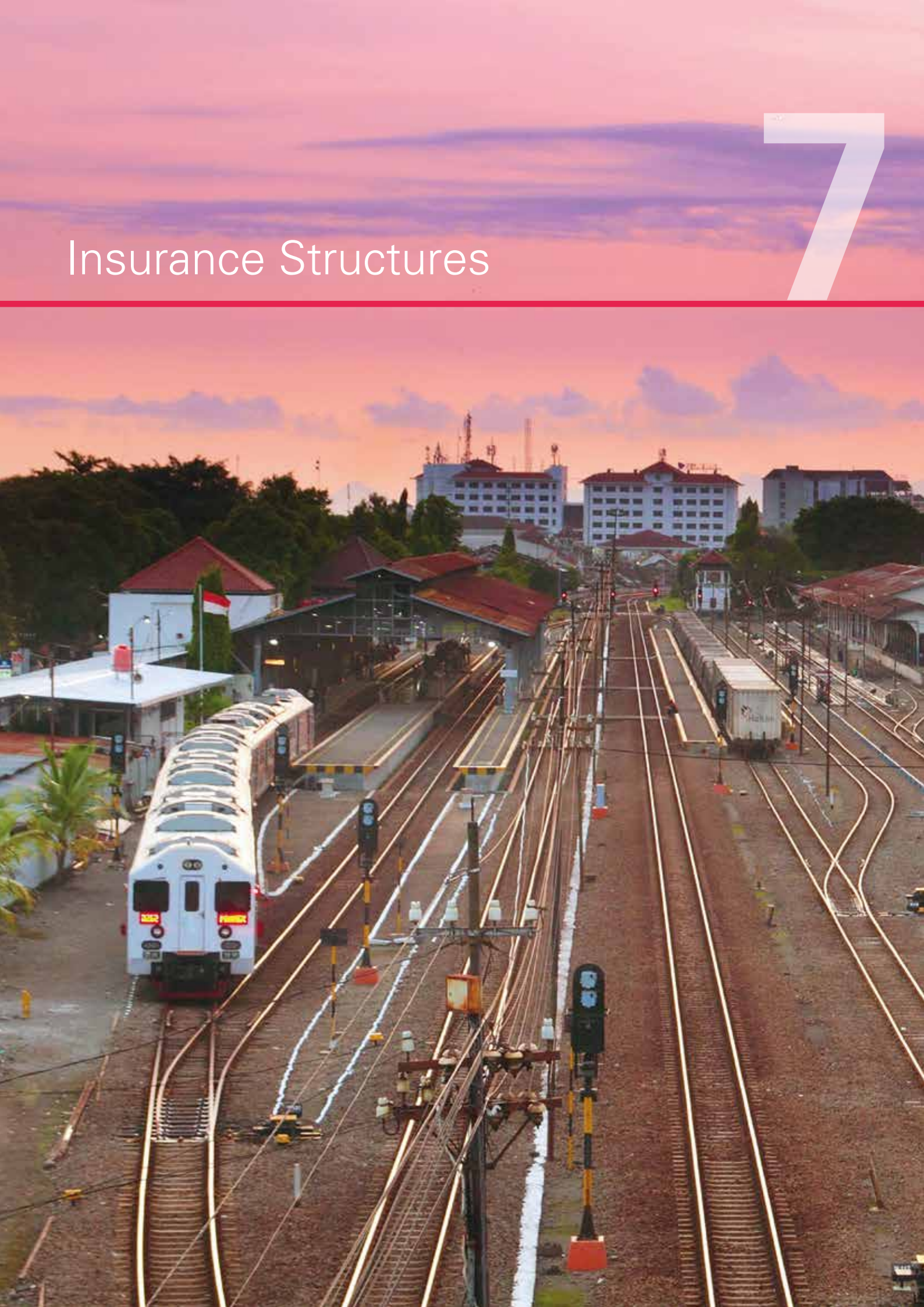
j. Effective communication and coordination

A key responsibility of a PAIP manager is to communicate effectively with the various entities involved with handling claims, including those who own and/or manage the insured assets. The claims protocol should document the process for communicating with the various entities.

Communications and coordination responsibilities for the PAIP manager include:

- Keeping – and as appropriately, sharing – a list of all the relevant contacts and stakeholders, so that these can be contacted quickly.
- Informing the asset owners/managers about which coverages have been bought for their respective assets.
- Ensuring the asset owners/managers are familiar with the claims notification procedures and know how to report losses/damages to their assets.
- Keeping and sharing a list of any contractors/service providers who have been pre-screened and qualified, and sharing it as relevant.
- Informing about the processes for escalating and resolving disputes.

7 Insurance Structures



7

Insurance Structures

Insurance can be specifically tailored to suit the needs of the entity seeking protection. There are several basic structures that insurance programmes can follow depending on the risks to be covered, the programme objectives, and the government's financial circumstances.

The following is intended to provide an overview on different structures to help a government better understand the options it has and how each could work in the context of a PAIP.

Since this Guide is intended to support sovereign and sub-sovereign governments considering or planning to insure a portfolio of public assets, this section goes into greater depth on treaty insurance and excess of loss insurance. Nonetheless, choosing the most appropriate insurance structure for a PAIP is best achieved through in-depth dialogue between government representatives and their re/insurance advisers.

a. Facultative versus treaty insurance

Facultative Insurance applies to individual risks and the insured can select which risks to cede to the insurer, while the insurer has the right to accept or deny each risk.

Treaty insurance groups several risks and cedes the entire portfolio to the insurer(s). The insurer(s) must accept all risks that are included in the group of ceded risks, as detailed within the insurance contract.

		Facultative	Treaty
Risks included	Individual Risks	x	
	Portfolio of Risks		x
Ability to accept or reject individual risks		x	

This chapter focusses on treaty insurance, assuming a schedule of included public assets will be provided to an insurer at the inception of a treaty.

b. Pro rata versus excess of loss insurance

Pro rata insurance transfers both risk and rewards proportionally, based on a predetermined percentage, between the insured and the insurer. Characteristics of a pro rata structure include recovery starting at the first-dollar of loss as well as protection against all events, regardless of severity.

Conversely, excess of loss insurance transfers risk on a disproportionate basis. As the name suggests, excess of loss insurance will indemnify the insured only after a specific loss amount has been exceeded, making this type of insurance particularly effective in protecting against natural catastrophes.

Given that the IDF aims 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, **this document will focus on excess of loss insurance.**

		Pro rata	Excess of Loss
Risk sharing	Proportional	x	
	Non-Proportional		x
Losses paid	First-Dollar of Loss	x	
	Excess a specific retention		x
Protection for catastrophic events		x*	x

*There will be coverage – indeed if 10% Quota Share ("QS") or a high percentage cession, a lot of Quota Share (Pro Rata) cover, but for a lower cession and/or if an event limit is imposed, then coverage likely significantly less than an Excess of Loss ("XL"). However, Excess of Loss is more efficient at coverage against catastrophes and hence is the focus of this chapter.

c. Excess of loss insurance

Working excess treaty

Working excess treaties apply to individual risks. Although still placed on a treaty basis, such that all qualifying risks are automatically subject to the term of a treaty, a working excess layer will indemnify the insured for a loss which affects an individual risk. The treaty terms will define how many risk limits will be available within the treaty period.

Reinstatements can either be prepaid by the government, leading to a higher initial premium, or paid post-loss, which allows for a lower initial premium. Although in the private sector most reinstatements are paid after a loss, most governments want budget certainty and so prefer to pre-pay for reinstatements.

Example:

Public Assets Owner A has entered into a working excess treaty with Insurance Company B.

— The treaty has a per-risk retention of USD 100,000.

— And a per-risk limit of USD 500,000.

Scenario 1: Loss less than retention

— The damage to the hospital is USD 99,000.

— Therefore, Public Asset Owner A does not recover under the terms of the treaty, as the USD 100,000 per-risk retention has not been reached.

Scenario 2: Loss greater than retention, less than limit

— A windstorm impacts a sparsely populated area impacting a single hospital which is owned by Public Asset Owner A. The total damage to the hospital is USD 400,000.

— Public Assets Owner A retains (covers) the first USD 100,000 of loss, being the per-risk retention as defined by the treaty.

— Insurance Company B pays USD 300,000 in excess of per-risk retention.

Scenario 3: Loss greater than retention plus limit

— The damage to the hospital is USD 900,000.

— Therefore, Public Asset Owner A retains (covers) the USD 100,000 retention.

— Insurance Company B pays the full limit of USD 500,000 in excess of per-risk retention.

— The remaining USD 300,000 loss in excess of both the retention and the limit is borne by Public Asset Owner A.

This scenario stresses the importance of selecting an adequate per risk limit – as well as a retention – that balances the insured's risk appetite and budget. As the retention of an excess of loss treaty increases, the cost associated with that treaty will decrease, as the amount of risk being transferred to the insurer(s) is reduced.

For each and every asset that has a loss, the insured is responsible for paying a portion of the loss; this is referred to as the retention or deductible. Since there may be several insured losses in a given year, it is important for the insured to set the retention at a level that is suitable given the budget for risk transfer and its ability to retain (pay for) losses under the retention.

Subject to the number of risk limits defined in the treaty, should a second or subsequent event impact a covered asset within the treaty period, the treaty will pay in the same manner as described above.

Catastrophe (per-occurrence) treaty

Catastrophe (per-occurrence) treaties apply to all losses caused by a single event. Losses sustained by properties subject to the treaty, which are the result of a single event, are aggregated and applied against the treaty limit and retention. The treaty terms will define how many occurrence limits will be available within the treaty period.

Reinstatements can either be prepaid by the government, leading to a higher initial premium, or paid post-loss, which allows for a lower initial premium. Although in the private sector most reinstatements are paid after a loss, most governments want budget certainty and so prefer to pre-pay for reinstatements.

Example:
Public Assets Owner A has entered into a catastrophe (per-occurrence) treaty with Insurance Company B.

- The treaty has a per-occurrence retention of USD 1,000,000.
- And a per-occurrence limit of USD 5,000,000.

Scenario 1: Loss less than retention

- The sum of all damages to covered assets is USD 999,000.
- Therefore, Public Asset Owner A would not recover under the terms of the treaty as the per-occurrence retention has not been reached.

Scenario 2: Loss greater than retention, less than limit

- A windstorm hits a densely populated area impacting several assets which are owned by Public Asset Owner A.
- The sum of damage sustained by all owned assets totals USD 4,000,000.
- Public Assets Owner A retains (covers) the first USD 1,000,000 of loss, being the per-occurrence retention as defined by the treaty.
- Insurance Company B pays the USD 3,000,000 in excess of the per-occurrence retention.

Scenario 3: Loss greater than retention plus limit

- The sum of all damages to covered assets is USD 9,000,000.
- Therefore, Public Asset Owner A retains (covers) the USD 1,000,000 per-occurrence retention.
- Insurance Company B pays the full limit of USD 5,000,000 in excess of the per-occurrence retention.
- The remaining USD 3,000,000 loss in excess of both the retention and the limit is borne by Public Asset Owner A.

As with the working excess example, this example also stresses the importance of selecting an adequate per occurrence limit as well as a retention that balances the insured's risk appetite and budget. As the retention of an excess of loss treaty increases, the premium cost associated with that treaty will decrease as the amount of risk being transferred to the insurer(s) is reduced.

For each and every event that occurs in a given year, the insured will retain/pay for the loss up to the level of the retention. Since there may be several insured losses in a given year, it is important for the insured to set the retention at a level that is suitable given the budget for risk transfer and its ability to retain (pay for) losses under the retention.

Should a second or subsequent event impact covered assets within the treaty period, the treaty will pay in the same manner as described above, subject to the number of occurrence limits defined in the treaty.

Typically, and subject to payment of additional premium, a catastrophe (per-occurrence) treaty allows for the per-occurrence limit to be reinstated once during the treaty period. Such reinstatements can be either prepaid (higher initial premium) or paid post-loss (lower initial premium). Since most governments want budget certainty, reinstatements are usually prepaid in PAIPs.

Catastrophe aggregate treaty

Catastrophe aggregate treaties apply to all losses sustained, by all covered events within the treaty period. Losses sustained by properties subject to the treaty, for all events covered under the treaty, are aggregated and applied against the treaty limit and retention.

Reinstatements can either be prepaid by the government, leading to a higher initial premium, or paid post-loss, which allows for a lower initial premium. Although in the private sector most reinstatements are paid after a loss, most governments want budget certainty and so prefer to pre-pay for reinstatements.

Example:

Public Assets Owner A has entered into a catastrophe aggregate treaty with Insurance Company B. The treaty has:

— An aggregate retention of USD 1,000,000.

— An aggregate limit of USD 5,000,000.

Scenario 1: Loss less than retention

A windstorm hits a densely populated area impacting several assets owned by Public Asset Owner A.

— The sum of all damages to the owned assets from this event totals USD 100,000.

— Public Asset Owner A retains the USD 100,000 loss.

A few weeks later, a second windstorm strikes the same area:

— Causing USD 200,000 in total damages to several assets.

— Public Asset Owner A also retains the USD 200,000 loss.

However, a few months later, and still within the treaty period:

— An earthquake causes USD 650,000 in damages to Public Asset Owner A's assets.

— As the sum of all losses from all events within the treaty period does not exceed the aggregate retention of USD 1,000,000, no recovery is made under the treaty.

Catastrophe aggregate scenario 1: $5M excess $1M

	Event loss	Within aggregate retention $1,000,000	Within aggregate limit $5,000,000
Windstorm 1	$100,000	$100,000	–
Windstorm 2	$200,000	$200,000	–
Earthquake	$650,000	$650,000	–
TOTAL:	**$950,000**	**$950,000**	**$0**

Scenario 2: Loss greater than retention, less than limit

A windstorm hits a densely populated area impacting several assets which are owned by Public Asset Owner A.

— The sum of all damage from this event sustained by covered assets totals USD 700,000.

— Public Asset Owner A retains (covers) the USD 700,000 loss.

A few weeks later, a second windstorm strikes the same area, causing USD 800,000 in total damage to several assets.

— Public Asset Owner A retains USD 300,000 of the loss after which the USD 1,000,000 aggregate retention is satisfied.

— Public Asset Owner A recovers USD 500,000 for this event, which results from the event loss minus the loss retained to satisfy the aggregate retention.

However, a few months later, and still within the treaty period, an earthquake causes USD 2,500,000 in damages to Public Asset Owner A's assets.

— The aggregate retention had been satisfied by the two prior events.

— Therefore, the loss from the earthquake is paid subject to the limit of the treaty.

Catastrophe aggregate scenario 2: $5M excess $1M

	Event loss	Within aggregate retention $1,000,000	Within aggregate limit $5,000,000
Windstorm 1	$700,000	$700,000	–
Windstorm 2	$800,000	$300,000	$500,000
Earthquake	$2,500,000	–	$2,500,000
TOTAL:	**$4,000,000**	**$1,000,000**	**$3,000,000**

Scenario 3: Loss greater than retention plus limit

A windstorm hits a densely populated area impacting several assets owned by Public Asset Owner A.

— The sum of all damages to the owned assets from this event totals USD 700,000.

— Public Asset Owner A retains the USD 700,000 loss.

A few weeks later, a second windstorm strikes the same area:

— Causing USD 1,500,000 in total damages to several assets.

— Public Asset Owner A retains a USD 300,000 loss after which the USD 1,000,000 aggregate retention is satisfied.

— Public Asset Owner A also recovers USD 1,200,000 for this event resulting from the event loss minus the loss retained to satisfy the aggregate retention.

However, a few months later, and still within the treaty period:

— An earthquake causes USD 4,500,000 in damages to Public Asset Owner A's assets.

— The aggregate retention had been satisfied by the two prior events.

— Therefore, the loss from the earthquake is paid subject to the limit of the treaty.

In this scenario, the combined losses from all of the events exceed the retention and treaty limits. As such, Public Asset Owner A bears the cost of losses that exceed the retention and limit.

Establishing the retention of an aggregate programme provides the insured with greater certainly around the amount of loss they will retain (pay for) throughout the entire risk period.

As losses from multiple events are aggregated until the insurance limit provided is reached, those losses are also aggregated to satisfy the retention. For the duration of the coverage period, the insured will retain the aggregated loss up to the level of the retention. Therefore, the retention should be set at a level that is suitable given the budget for risk transfer and the ability to retain (pay for) losses under the retention.

Catastrophe aggregate scenario 3: $5M excess $1M				
	Event loss	Within aggregate retention $1,000,000	Within aggregate limit $5,000,000	Above aggregate limit
Windstorm 1	$700,000	$700,000	–	–
Windstorm 2	$1,500,000	$300,000	$1,200,000	–
Earthquake	$4,500,000	–	$3,800,000	$700,000
TOTAL:	**$6,700,000**	**$1,000,000**	**$5,000,000**	**$700,000**

> “Choosing the most appropriate insurance structure is best achieved through in-depth dialogue between government representatives and re/insurers.”

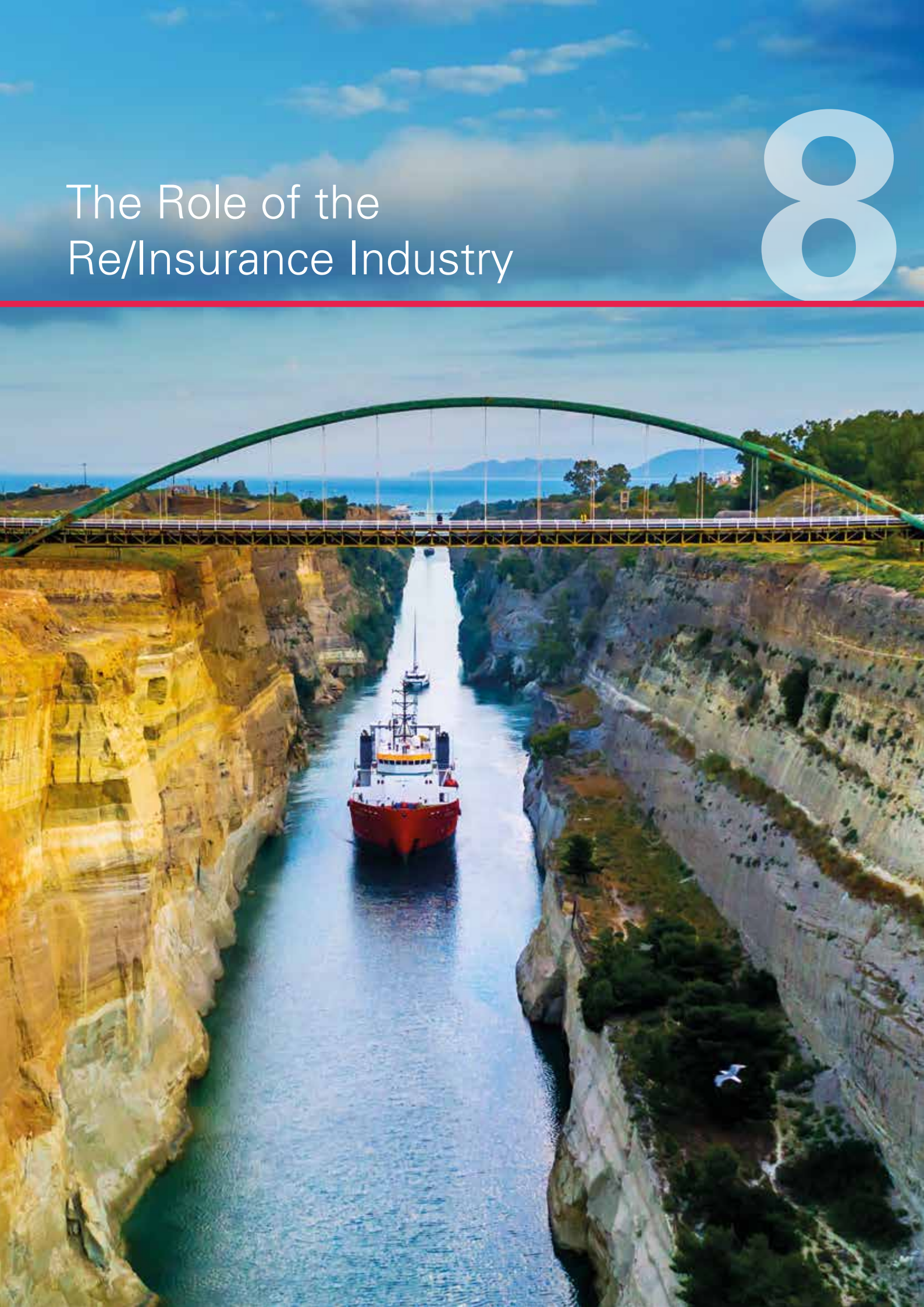
Comparison

Below is a comparison of each the treaties side by side for a hypothetical year in which three events occur, causing losses to a portfolio of three properties.

			Working excess treaty			Catastrophe, per occurrence			Catastrophe, aggregate		
		Loss	Retention	Limit	Loss excess of treaty terms	Retention	Limit	Loss excess of treaty terms	Retention	Limit	Loss excess of treaty terms
Treaty terms			**$100,000**	**$500,000**		**$1,000,000**	**$5,000,000**		**$1,000,000**	**$5,000,000**	
Event 1: Windstorm	Property 1	$200,000	$100,000	$100,000	$0						
	Property 2	$300,000	$100,000	$200,000	$0						
	Property 3	$200,000	$100,000	$100,000	$0						
	Total event loss	**$700,000**	**$300,000**	**$400,000**	**$0**	**$700,000**	**$0**	**$0**	**$700,000**		
Event 2: Windstorm	Property 1	$500,000	$100,000	$400,000	$0						
	Property 2	$500,000	$100,000	$400,000	$0						
	Property 3	$500,000	$100,000	$400,000	$0						
	Total event loss	**$1,500,000**	**$300,000**	**$1,200,000**	**$0**	**$1,000,000**	**$500,000**	**$0**	**$300,000**		
Event 3: Earthquake	Property 1	$1,000,000	$100,000	$500,000	$400,000						
	Property 2	$2,000,000	$100,000	$500,000	$1,400,000						
	Property 3	$1,500,000	$100,000	$500,000	$900,000						
	Total event loss	**$4,500,000**	**$300,000**	**$1,500,000**	**$2,700,000**	**$1,000,000**	**$3,500,000**	**$0**	**$0**		
TOTAL ANNUAL LOSS:		**$6,700,000**	**$900,000**	**$3,100,000**	**$2,700,000**	**$2,700,000**	**$4,000,000**	**$0**	**$1,000,000**	**$5,000,000**	**$700,000**
Loss Borne by Insured					$3,600,000			$2,700,000			$1,700,000
Loss Bourne by Insurer					$3,100,000			$4,000,000			$5,000,000

8

The Role of the Re/Insurance Industry



8

The Role of the Re/Insurance Industry

There is a common misperception that the re/insurance industry's role is limited to financing risk. That is, the client pays a premium and when a covered event or disaster happens, the re/insurer delivers a claims payout. Given that risk transfer is only one option available to governments looking to finance their risk, it is important to understand the value that re/insurance can deliver compared to other ex-ante and ex-post risk financing options (*See also Chapter 3, "Up-Front Considerations"*).

In chapter 2: *The Rationale for a Public Asset Insurance Programme (PAIP)* and throughout this Guide, we have outlined the specific contributions that the re/insurance industry can make to help public entities develop and implement insurance programmes to protect their public assets. In this chapter we first outline the function of re/insurance and its impact on national economies and then summarize the main aspects that define the role that the industry can play in helping governments to address their risks, specifically in the broader context of the risk management framework which governments need to work with.

a. Promoting economic development and stability

The fundamental function of insurance is to enable development and progress by making funds available to provide financial compensation for the effects of misfortune or disasters. In doing so, the re/insurance industry contributes to national economies in different ways, and this capital underpins economic growth.

Importantly, by reducing the level of capital that needs to be put aside in case a disaster strikes, insurance frees up funds – be it for governments, companies or individuals, and hence stimulates investment and consumption. For governments, having insurance to repair or reconstruct their assets after disasters means they can avoid having to use funds otherwise earmarked for investments in other important areas such as health or education, which promote social and economic development.

Building stability

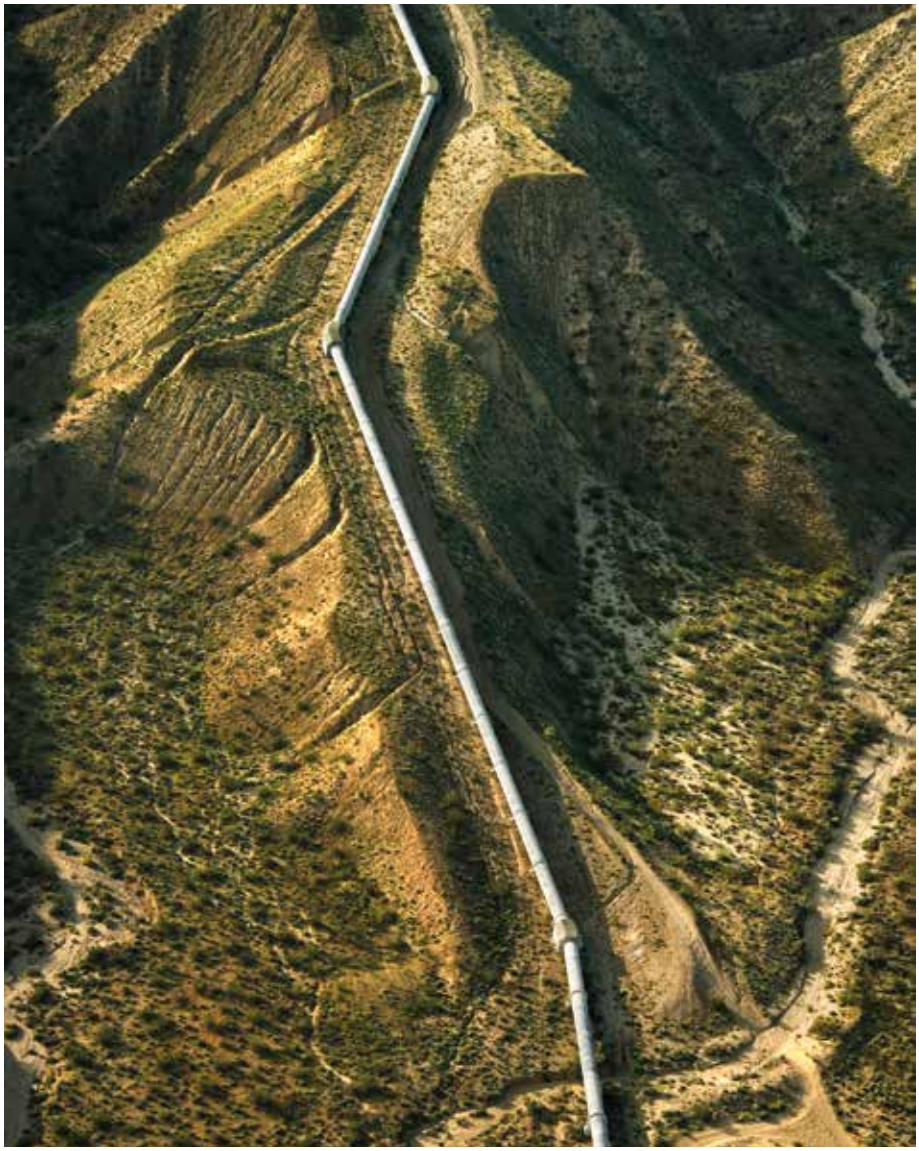
Insurance also allows those who take it up, by paying a set amount of money over time, to plan ahead with more certainty or to initiate new enterprises by reducing concerns about possible risks, if these are covered by insurance. For low income households, access to such security can have profound impacts, for example limiting the likelihood of falling back into poverty. Equally, a country is more likely to attract foreign investment for infrastructure projects if these are protected by insurance.

By avoiding unexpected shocks to public or private budgets, insurance can help support virtuous circles of development. This is demonstrated by the fact that, with the exception of the least developed countries, the insurance sector regularly outgrows the general economy, as more insurance is demanded when the income of individuals improves and their interest in protecting assets increases. This underlines the increasing importance of insurance to national economies as they develop and raise the standard of living. Fundamentally, ensuring growth – be it at the household or sovereign level – requires active risk management, and insurance is one of the tools available to manage risks.

Developing domestic insurance markets

The re/insurance industry can help build up expertise essential for risk management across many different areas, from know-how about building codes and construction materials, to meteorological and financial skills. In this way, the industry not only employs and develops an expert workforce that is beneficial for a country, but also helps create jobs in ancillary areas; for example for damage assessments, legal advice, claims handling, etc. In addition, insurance capital usually stays in an economy for a significant amount of time, as investments in insurance are oriented toward the medium to long term.

For all these reasons, working with the global re/insurance industry to develop insurance programmes that create or grow insurance markets can have beneficial effects on a country's economy.



b. Strengthening governments' broader risk management

As indicated in chapter 4, the re/insurance industry has clearly expressed its interest in supporting the development of insurance markets to help close the protection gap and increase resilience, especially for developing countries.

Supporting the development of insurance programmes

Specifically, IDF and its members strongly focus their efforts on closing the protection gap and supporting the development of insurance programmes (schemes) for sovereigns and sub-sovereigns through private-public partnership projects, working closely with the local insurance industry and other technical experts. It is in this context that we believe the re/insurance industry can play a role in helping to strengthen governments' risk management and deliver the benefits outlined in this section.

Working across a risk management framework

The role that the re/insurance industry can play in helping governments to address their risks also has to be considered in the broader context of the risk management framework which governments need to work with.

Risk management focuses on two fundamental objectives:

1. Preventing or reducing risk through mitigation and adaptation.
2. Managing risks that cannot be avoided by improving preparedness and response capacity.

Risk management framework

Risk prevention through mitigation and adaptation	Understanding risk
	Risk prevention/mitigation
Managing risk through preparedness and response capacity	Action plans
	Risk transfer
	Damage assessment and loss adjustment

Re/insurers have the experience and the expertise to contribute and help governments address each of the elements of a broad risk management framework. Especially in the context of designing and implementing a PAIP, they can bring these capabilities to bear to strengthen governments' risk management.

Risk prevention through mitigation and adaptation

Understanding risk

A frequent challenge for government decision-makers in developing countries is limited "risk management literacy". In this context, the knowledge and expertise the re/insurance industry contributes can be especially valuable in helping to inform government decision-makers about the risks they face from the economic impacts following natural catastrophes.

Re/insurers can provide transparency about how hazards turn exposure into loss for the assets governments own, by building comprehensive exposure data bases and understanding vulnerabilities. As a result, a price tag can be put on the risk. *See more on chapter 5: Quantifying Risk.*

Risk prevention/mitigation

Understanding risk is central to inform risk prevention and mitigation measures. Putting a price tag on relevant catastrophic risks also helps governments to determine the appropriate balance and level of investment for risk reduction (e.g., dykes, flood walls, retrofitting of public buildings, etc.). Especially, the risk information that re/insurers provide can enable prioritization of investment in this area.

For example, re/insurers' risk engineering experts can contribute guidance on:

- Location selection for new assets, based on an analysis of different locations' exposure to natural hazards.
- Effective reinforcement or retrofitting measures relevant to the asset location's exposure to specific hazards. For example, public buildings may need different reinforcement in areas exposed to earthquake risk versus flood.

Managing risk through preparedness and response capacity

Action plan preparation

Re/insurance payouts can be used more effectively for repair/reconstruction if action plans with clear procedures for post-disaster work are developed, pre-agreed upon and shared with all stakeholders before disasters occur. In this regard, the experience of the private re/insurance sector can support public sector plans with best practices, execution discipline and hence enhance transparency and predictability in post-disaster spending. On this, *see more in-depth commentary in chapter 6: Claims Management.*

Risk transfer

The re/insurance industry has the ability to provide significant risk transfer. What is the most efficient and effective mix of ex-ante and ex-post risk-financing and risk transfer mechanisms a government may choose will vary from case to case and needs a thorough assessment of the different options. *Also see in chapter 3, section 3:1 b "Benefits and limitations of a PAIP in the context of other risk financing options"* and the section *d. Access to capacity* in this chapter.

Generally, governments are advised to insure their assets for what is called "residual risk", which are the larger, lower frequency risks that cannot be efficiently covered from a dedicated budget or avoided/reduced by other means, such as risk mitigation measures. For example, the risk of very strong earthquakes or of high intensity storms, which are likely to occur less often but cause more devastating damage when they do. In contrast, high frequency/low severity risks (those which occur more often but cause less damage) may be more efficiently addressed through an annual maintenance and repair budget.

Damage assessment and loss adjustment

Assessing damages for insurance companies (loss adjustment) requires specialised technical know-how and is one of the core capabilities of the re/insurance industry. In some countries however, this know-how can be scarce. In developing a PAIP, re/insurers can help align interests to achieve fair results while controlling losses, by developing and implementing a rule-based, transparent and robust approach for loss adjustment, documented in a "loss protocol".

c. Advice based on experience and expertise

In summary, globally active re/insurance companies and brokers have experience working with a variety of public sector entities around the world, which they can share as they help to put in place effective and practical solutions to manage and mitigate risk depending on the context and particulars of the partner's situation.

Re/insurance companies also have broad and deep expertise in diverse fields relevant to re/insurance. Their employees include finance professionals and actuaries; scientists in such fields as meteorology, geology, or agricultural sciences; computer scientists, data modellers and engineers. Their research departments and risk modelling experts work to better understand traditional natural catastrophe (nat cat) risks such as earthquakes, windstorms, tropical cyclones, hail, floods, extreme precipitation and drought as well as new and emerging risks. Finally, these companies have access to academic researchers, independent data providers and professional catastrophe-risk-modelling companies which are also working to advance the industry's understanding of the earth's natural systems and how various events could affect people in different regions and countries.

While there are different ways governments can access the latest research or connect with particular subject-matter experts, re/insurance companies and brokers can often expedite this process via their extensive networks in all of the various communities.

Given this experience and expertise, companies working in and with the re/insurance industry can provide expert advice, often on-site, to manage complex projects with multiple stakeholders in order to develop risk transfer and risk-reducing solutions and help build know-how locally.

In some countries, global re/insurance companies and their local subsidiaries also have become shareholders of mandatory catastrophic risk pools; they provide the necessary insurance capacity and are responsible for underwriting and claims (e.g., *PAID* in Romania, *TCIP* in Turkey, *Maipark* in Indonesia, *Elementarschadenpool* in Switzerland).

d. Access to capacity

The most obvious good that re/insurance provides for insuring public assets is capacity (i.e., capital). There is clearly no lack of supply or willingness among international re/insurance companies to re/insure catastrophic risk in both mature and developing countries. The latter represent a focus for global insurers, reflecting the effort to reduce the protection gap. Due to the accumulation of risk in developed countries like the U.S., in parts of Europe, Australia and Japan, globally operating re/insurers are generally interested in assuming catastrophic risk from other jurisdictions given the diversifying impact this can have on their global portfolios. Moreover, this capacity is often offered with competitive terms and conditions.

Hence it is clear that the significant protection gap in most low – and middle-income countries is rooted in a limited take-up as opposed to a lack of supply of re/insurance capacity. This guide aims to address this, as far as that limited take-up reflects less awareness of the contributions re/insurers can make to promote greater risk know-how.

Some risks are not insurable

Still, at this point it is important to point out that some risks cannot be insured, either because they cannot be reliably measured, or because they may be too large for the industry to assume. To address those uninsurable risks, governments can seek support from a range of organizations committed to help countries increase their resilience to catastrophes by other means than insurance. On this, please see the section *Resources* at the end of this guide.

e. Cooperation

The IDF's *Sovereign and Humanitarian Solutions (SHS)* working group is a good example demonstrating how cooperation between global and local re/insurers, brokers, domestic insurance associations, multilateral development banks and public sector representatives can support government entities in promoting resilience and reducing the protection gap.

In providing advice to countries seeking to increase resilience, this IDF working group follows two objectives. First, to demonstrate the value-adding impact of insurance in highly risk-exposed developing countries. Second, to develop future stable local insurance markets that, in turn, can help to stimulate progressive economic development.

These objectives are aligned with those of public authorities in developing countries vulnerable to disasters, as well as with those of multilateral development banks, public development organizations, and donors who often provide funding to help enable this work.

There are examples which demonstrate how the re/insurance sector can support and work in conjunction with governments to implement policies to reduce the protection gap through the use insurance. FONDEN in Mexico is a prominent example (*see chapter 10: Examples of Public Assets Insurance Programmes*).

It is too early to determine whether the collaboration approach enabling FONDEN can be easily replicated in other jurisdictions. However, the IDF hopes this alignment of interests will increasingly drive the creation of powerful consortia of public and private stakeholders working together to enhance insurance penetration and market development to the ultimate benefit of all stakeholders.

Examples of Public Assets Insurance Programmes

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Examples of Public Assets Insurance Programmes

For developing countries, the impact of natural disasters on public assets represents one of the main sources of fiscal vulnerability. Over time, as these disasters have become more frequent and/or more severe, governments have had to develop strategies and the necessary legal frameworks to increase their financial resilience, and seek various means to finance the costs of repair and reconstruction of their assets. These strategies are often coupled in parallel with investments in risk mitigation measures.

Insurance is one of the risk financing mechanisms which countries use to protect their fiscal budgets and their assets, especially when they actively consider the enhancement of risk management capabilities in-country.

How they finance premium payments, set up and manage their insurance programmes and identify which public assets and risks they cover, varies from country to country. For example, according to the World Bank, all twelve APEC economies reviewed through a 2017 survey use indemnity insurance to finance residual risk of public assets; six of them pool their public assets domestically, while insurance of public assets is legally compulsory in five of them, albeit with a low take-up (for a link to the report, *see the section Resources*).

There are learnings to be had from the experience of those countries which have been using insurance for several years. Literature is available on many of their programmes, published either by their governments, re/insurance companies, or the multilateral development banks. *See also chapter 10.*

This chapter presents some examples of sovereign and sub-sovereign insurance programmes. For more information, *see the section Resources* at the end of this guide.

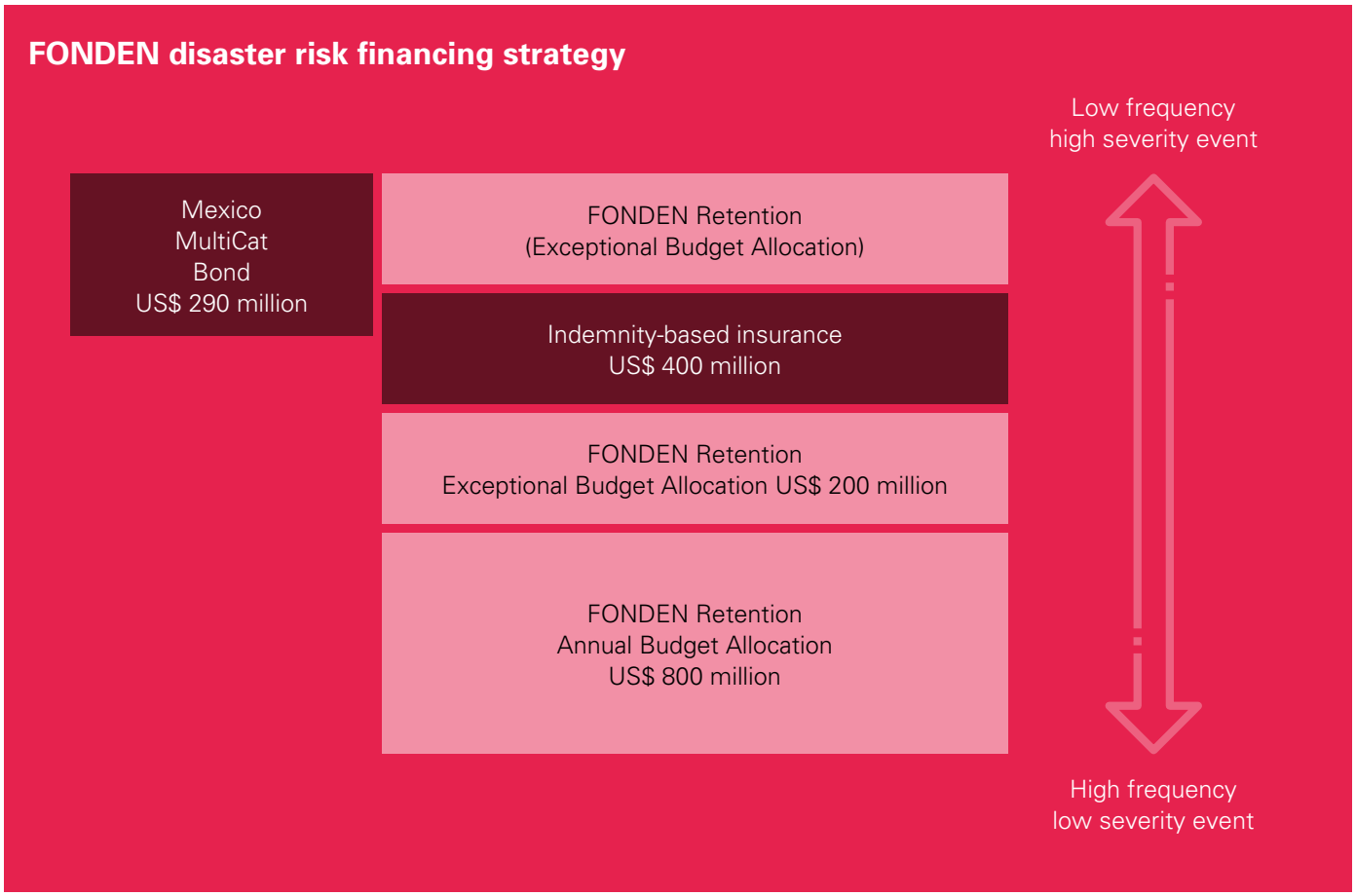
a. Mexico

FONDEN – Mexico's natural disaster fund

With the Fondo de Desastres Naturales (FONDEN) the Federal Government of Mexico has a financial vehicle through which it allocates budget ex-ante (i.e., before disasters happen) for post-disaster relief, rehabilitation, and reconstruction of public infrastructure such as roads, hospitals, and schools. FONDEN also provides resources to finance the reconstruction of low-income housing.

Funding sources – FONDEN's disaster risk financing strategy

FONDEN is funded through the Federal Expenditure Budget. By law and under the FONDEN Operating Rules, FONDEN and its related funds receive no less than 0.4% of the annual Federal budget, around USD 800 million, including any uncommitted funds in the FONDEN Trust from the previous fiscal year.



Source: Authors, from FONDEN: Mexico's Natural Disaster Fund – A Review (2012). The International Bank for Reconstruction and Development/ The World Bank

A layered financial risk management strategy

FONDEN has a layered financial risk management strategy. The bottom layer of risk amounts to up to USD 1 billion. This layer of risk is financed with FONDEN's annual budget appropriation (as mentioned above, by law FONDEN and its related funds receive no less than 0.4% of the annual budget, around USD 800 million) and, if necessary, with an exceptional additional federal budget allocation of approximately USD 200 million.

FONDEN is allowed to transfer risks through insurance and other risk transfer mechanisms such as catastrophe bonds. It can also buy traditional indemnity-based reinsurance programmes both at the federal and state levels.

For higher risk layers, FONDEN has concluded a USD 400 million indemnity-based insurance contract on the entire FONDEN portfolio and placed a three-year parametric catastrophe bond worth up to USD 360 million in August 2017, facilitated by the World Bank Group's multilateral development bank, the International Bank for Reconstruction and Development (IBRD).

Use of funding

FONDEN maintains two complementary budget accounts:

— The primary account, the FONDEN Program for Reconstruction

— This is supported by the FOPREDEN Program for Prevention, which funds activities related to risk assessment, risk reduction and capacity building (or skill building) on disaster prevention.

Operating on insurance principles

For the reconstruction of public assets, FONDEN operates on insurance principles: a transparent damage reporting system, rules for how funds are disbursed, a clear plan for how money is spent, and a credible monitoring system for expenditures. It thereby provides a rules-based framework that coordinates the post-disaster activities of the federal, state, and municipal governments and the private sector.

FONDEN's financing of insured and uninsured federal and state assets

	Insured federal asset	Insured local asset	Uninsured federal asset	Uninsured local asset
First disaster	100%	50%	100%	50%
Second disaster	100%	50%	50%	25%
Third and subsequent disasters	100%	50%	0%	0%

Source: World Bank, Washington D.C., 2017: Financial Risk Management of Public Assets in APEC Economies

Clear disbursement rules public assets

The disbursement rules for public assets stipulate:

— FONDEN pays for 100% of the post-disaster rehabilitation and reconstruction cost of Federal public assets or infrastructure and

— 50% of the cost of local assets; the states are responsible for the remaining 50%.

FONDEN's guidelines to access funds

When a disaster occurs, the local government must request that the relevant federal agency confirm if the disaster was severe enough to merit recovery under FONDEN's guidelines. Once verified and confirmed by Mexico's Interior Ministry, SEGOB, it is published in the Official Journal of the Mexican Federation, and a series of steps ensue including the damage assessment process. Resources are then transferred to a specific account earmarked for the specific disaster.

By facilitating faster reconstruction of infrastructure assets, FONDEN has contributed to increasing local post-disaster economic activity by 2–4% on average (*De Janvry, del Valle, and Sadoulet 2016*).

Technical assistance by Mexico's ministry of finance for subnational governments seeking to procure public asset insurance

According to a report prepared by the World Bank, "the Risk Analysis Division of the Directorate of Insurance, Securities, and Pensions within Mexico's Ministry of Finance (MOF) supports local governments in securing the appropriate protection for their respective public assets. It does so through a mix of measures:

— It advises local governments on the analysis and selection of the model required for risk transfer.

— It proposes the models for the acquisition of insurance and financial instruments for risk management, seeking best conditions (price, quality, financing, etc.).

— It issues insurance guidelines for asset insurance at the local level, i.e., (1) develops insurance programmes, (2) develops manuals for purchasing insurance, (3) establishes maximum retention levels for local governments, and (4) defines the claims process."

R-FONDEN: Catastrophe risk modelling for public assets in Mexico

With the objective to establish a comprehensive financial protection strategy relying on risk retention and transfer mechanisms, Mexico found it was necessary to develop an in-depth understanding of the risks to which the government is exposed, particularly to access international reinsurance and capital markets.

To support the development of this strategy and its ongoing implementation, the Mexican Ministry of Finance created the probabilistic catastrophe risk model called R-FONDEN, the Loss Estimation for Federal Risk System for its national disaster fund, FONDEN. The creation of R-FONDEN closely followed the development of an asset inventory.

R-FONDEN analyses four perils (earthquake, flood, tropical cyclone and storm surge) potentially impacting infrastructure in key sectors (roads and bridges, hospitals, schools, hydraulic infrastructure, and low-income housing) – at national, state, and sub-state levels.

It takes as input a detailed exposure database (including details of buildings, roads, and other public assets) and produces as outputs risk metrics, including Annual Expected Loss (AEL) and Probable Maximum Loss (PML). The Ministry of Finance uses the model together with actuarial analyses of historical loss data to monitor the disaster risk exposure of FONDEN's portfolio and to design disaster risk transfer strategies.

R-FONDEN was developed in three steps:

Data gathering
The required database was prepared, including hazard information, an asset inventory with the key variables (such as building characteristics) required for evaluating vulnerability and loss of infrastructure, and historical loss data to complement simulated data.

Catastrophe risk modelling
The government, working with the Universidad Nacional Autónoma de México (UNAM), developed hazard models for earthquakes, tropical cyclones, and floods, and vulnerability functions for all types of infrastructure. In conjunction with the exposure database, this enabled the government of Mexico to carry out deterministic and probabilistic risk modelling used to inform financial analysis of probable disaster loss.

Financial analysis
Finally, the government carried out an actuarial analysis of the simulated risk data and historical losses to develop and fine-tune the federal disaster risk financing strategy for public infrastructure, including both risk retention and risk transfer. This step also included the development of a decision support tool to facilitate this process in the future.

b. Colombia

The Colombian government decided in 2012 to pursue a collective approach to purchasing insurance to pool risk and further lower insurance premiums.

National insurance guidelines and objectives were developed for improving the level and quality of the insurance of public assets in the event of natural disasters.

The main recommendations were:

— Specify relevant information required by (re)insurers to execute an appropriate underwriting process (e.g., location of buildings);

— Organize and protect data of insurance policies by updating the insurance policies database; and

— Ensure that robust risk management procedures are in place, for example by establishing a contingency plan.

As of December 2016, public assets are insured collectively under the umbrella of a framework agreement.

c. Australia

The Natural Disaster Relief and Recovery Arrangements (NDRRA) in Australia

In Australia, responding to disasters is primarily the responsibility of state and territory governments. However, the Australian Government established the Natural Disaster Relief and Recovery Arrangements (NDRRA) to help ease the financial burden on the states and to facilitate the early provision of assistance to affected communities after a disaster occurs.

While the NDRRA is primarily focused on providing relief and recovery assistance to communities relating to people and businesses affected by a disaster, it also provides funds for the "the restoration or replacement of essential public assets" such as roads, bridges and schools.

To this end, the NDRRA requires that states establish risk mitigation strategies and measures before being eligible to receive assistance from the Australian government for public asset recovery and reconstruction.

Australia's state governments' captive insurance and reinsurance arrangements

In addition, Australia's state governments have established captive insurance and reinsurance arrangements.

All Australian states and territories have a captive insurer. These are agencies established with the specific objective of financing risks to state government assets from public and products liability and special industrial risks (including disasters). Covered agencies pay premiums to the captive insurer, which then pays to replace public assets when needed.

The Queensland Government Insurance Fund (QGIF)

QGIF is a captive insurance pool under Queensland Treasury that covers all state government budget-dependent agencies. It works as follows.

- Excepting roads, it covers all the physical assets that the covered entity owns (or is responsible for) against declared disasters. Bridges and tunnels are not covered by QGIF but are covered under its reinsurance policy with sub-limits.
- QGIF charges risk-based premiums to agencies to collect sufficient contributions to fund the following year's expected claims (net of any reinsurance recoveries), reinsurance costs, and other administrative expenses.
- It retains $A 20 million for a single risk loss or $A 50 million for an event (multiple risk) loss and provides unlimited reinstatements at no additional cost.
- Currently, QGIF has purchased $A 1.43 billion of property catastrophe cover. The retention and limits selected were based on advice from the QGIF reinsurance advisor, which in turn was based on modelling of the QGIF portfolio, among other things.
- Modelling approaches included third-party natural hazard vendor models and statistical-based loss models using historical claims experience. Catastrophe modelling indicated that the limit of cover purchased by QGIF is more than the estimated 1-in-250-year event loss.
- QGIF also maintains a centralized georeferenced database for all state government assets, which is updated every year.

iCare in New South Wales – overview

- Formed in September 2015 through the commencement of the State Insurance and Care Governance Act.
- Insures over 310,000 NSW businesses and 193 NSW Government agencies.
- Within the public sector, the scheme is focused primarily on protecting workers and also construction projects.
- However, it also covers many of the state's major public assets buildings.

iCare's Insurance for NSW (IfNSW) – Scheme overview

— The largest public sector managed fund scheme in Australia.

— $A 9.4 billion in assets and 193 contributing members.

— Risk advisor to the NSW Government, provides tailored risk solutions, insurance cover and advice to NSW Government agencies.

— Protects over $A 184 billion of the state's key assets, including the Sydney Opera House and the Harbour Bridge.

— Hospitals and schools, and infrastructure projects like the building of roads, rail lines and dams are also insured against the consequences of loss and damage during their construction.

Reinsurance to protect NSW government agencies

— The Treasury Managed Fund (TMF) is the largest fund administered by IfNSW and offers government agencies, including budget sector and non-budget agencies, the broadest possible asset and liability protection (except compulsory third-party insurance) available worldwide.

— Throughout May and June 2018, with the guidance of the iCare reinsurance broker, it engaged with domestic and international insurers and reinsurers to secure its programme of reinsurance for the 2018-19 financial year.

— The TMF reinsurance programme includes insurance for workers compensation, property, fine arts, cybercrime, marine, aviation, medical malpractice, general liability and terrorism, ensuring it is well-placed to provide substantial financial support to the NSW Government against the costs of large-scale insurance losses following a catastrophic event.

d. The Philippines

The Philippines' National Disaster Risk Reduction and Management Fund (NDRRMF) is a line item in the national budget that provides national government agencies and local governments with funding for risk reduction, relief, recovery, and reconstruction after natural and man-made disasters.

- Some 30% of NDRRMF funds are embedded within nine national government agencies as Quick Response Funds that can be used immediately for emergency relief, including for public asset works.
- The remaining 70% of NDRRMF funds can be accessed if approved by the president and are used after disasters that occurred within that budget year or the preceding year.
- NDRRMF funds can also be used to pay insurance premiums for coverage of public assets, particularly at the local government level.

A national financial protection strategy

Through the national financial protection strategy adopted by the Department of Finance in 2015, the Philippines pursues an integrated financial risk management strategy at the national, subnational, and local levels.

The Philippines operates national and local disaster funds that provide government agencies and subnational governments with funding for relief, recovery, reconstruction, and risk reduction in response to natural and manmade disasters.

To cover the higher risk layers, the Philippines uses contingent credit and risk transfer mechanisms.

An insurance programme for catastrophe risk insurance

In August 2017, the government launched a new insurance programme, under which the Government Service Insurance System (GSIS), a government-owned insurance agency, provides the government and the 25 participating provinces with catastrophe risk insurance. The World Bank acted as an intermediary to transfer GSIS's risk to a panel of international reinsurers selected through a competitive bidding process.

Local governments obliged to insure public assets, but low take up

While local governments are obliged to purchase insurance for public assets from the government-owned insurer GSIS, a lack of competition and key role of a public entity have led to numerous inefficiencies, including lack of insurance and widespread underinsurance.

Also, as the law fails to specify what assets need to be insured and against what perils, local governments often insure as little as possible and do not insure against disaster risk. Also, the relevant law governing reinsurance procurement does not match international standards, making procurement slow and impeding negotiations with reinsurers.

Conclusions and Learnings from Economies Already Insuring Public Assets

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Conclusions and Learnings from Economies Already Insuring Public Assets

In working with countries which have set up insurance programmes to protect their public assets, either helping them set these up or participating in those programmes as reinsurers over the years, members of the IDF have been able to observe what has worked well and where some of the challenges lie. Observations are publicly available on these programmes and also on public sector supported programmes to insure low-income housing, low-income farmers' production and similar schemes.

The conclusions and learnings presented in this chapter are based on both direct observation and review of available literature.

A sustainable premium funding source is key to the continuity of the insurance programme

Learning 1: Securing the funds to cover yearly premiums avoids coverage interruption and supports continuity of the programme

Developing countries can apply to receive donor contributions to fund the premium for their public asset insurance programmes in an initial phase. However, to make these programmes sustainable and worth the investment of setting them up, the government needs to make a commitment to fund the premium in the long term.

The best way to secure funds for the premium costs is to make it a permanent item in the national budget and preferably, to establish this in a legal framework. A good example for this approach is Mexico, which finances its FONDEN natural disaster fund through the Federal Expenditure Budget and which has established by law that the fund receives no less than 0.4% of the annual federal budget.

Conversely, we have seen programmes which find themselves unable to renew their policies because of delays or interruptions to their funding. This leads to insurance cover being interrupted but, more importantly, it can lead to a lack of trust in those involved in the programme.

Securing access to technical expertise is a key requirement for an effective PAIP

Learning 2: Governments need access to insurance and risk management skills; up-skilling needs to be addressed

Setting up a PAIP requires significant technical expertise and access to these skills is central not only to designing it, but also to managing a PAIP effectively over the years. From technical risk management skills, including for the collection and analysis of data on the assets, to legal and administrative expertise. For countries that do not have strong insurance markets, global re/insurers and multilaterals cite lack of know-how features among the most significant challenges governments face in this context.

Where these skills are lacking, governments can access the global re/insurers through institutions such as the IDF (see contact details at the back of this guide) as well as other insurance industry or development organizations to access support not only with the necessary skills, but also with funding considerations to help set up the programmes.

Also, in this situation governments are well advised to consider capacity building (up-skilling) to ensure that public officials who will manage the programme once implemented get access to relevant training.

This can be built into the design of the PAIP and can be supported by the insurance industry or development organizations involved in helping set up the programme. Capacity building and upskilling should not been seen as static, but rather should be considered as a regular and central aspect of managing these programmes.

This is also an area where new, innovative approaches for sharing expertise and building know-how could be considered, e.g., via online training, regional hubs and/or partnerships with national insurance institutes.

Investment in data on public assets and its accessibility – A critical requirement

Learning 3: Investment in collecting data about public assets and ensuring its accessibility is central to governments' ability to effectively protect their assets

As noted in chapter 5, *Quantifying Risks*, access to specific data is necessary to inform the nature and size of any insurance requirements. Yet experience shows that data on public assets is often lacking or is stored in different formats by different asset owners and hence cannot be accessed. Some countries have a central data base, but this is not updated regularly or carefully enough.

In addition to collecting data on their assets more regularly, governments could help to facilitate the use of insurance by expanding the type of information that is collected.

Apart from documenting the size and location of public buildings and structures, information should also be collected on how requisite infrastructure have been affected by disasters in the past and the costs of any repairs and/or reconstruction.

In the experience of the IDF, there is often a more basic need in many countries to create public asset inventories detailing not only their number but also vital information about individual assets including:

— building characteristics and quality, geolocation, occupancy;

— existing and historical insurance coverages; and

— data relating to the budgetary impact of disasters on public assets: baseline data, historical loss information, policies and expenditure data.

Improving risk information and pooling assets have a positive impact for governments

Learning 4: Risk information and pooling has a positive impact on administration costs and insurance premium

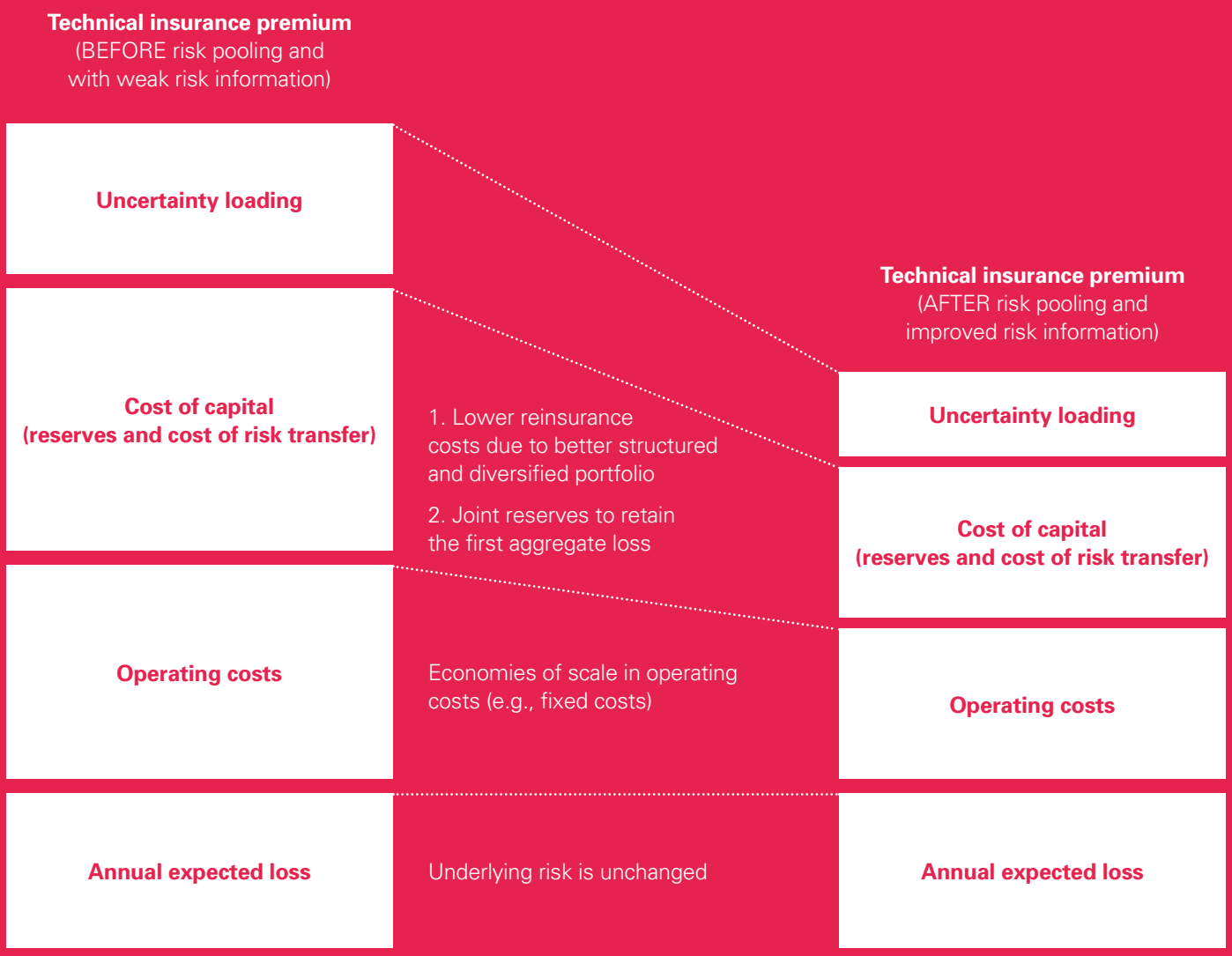
In chapter 2, *Rationale for a Public Assets Insurance Programme*, we highlighted two fundamental principles of insurance: diversification of risk and the theory of large numbers, and the fact that the larger and more diversified a risk portfolio is, the more cost-efficient it should be.

Thus, governments should consider creating insurance programmes which pool public assets into a diversified portfolio, as this leads to lower operating costs and can enhance the government's bargaining power.

The World Bank's 2013 report "Colombia: Implementing a collective, standardized approach to catastrophe insurance of public buildings" highlights that "improving information on the buildings, insurance policies and historical disaster damages to the assets" could lead to lower insurance premium, especially as improved information on the assets helps by embedding "lower uncertainty costs in the premium".

The effect of these two elements on pricing is shown on the illustration on the right.

Conceptual impacts of risk information and pooling on insurance pricing



Source: World Bank 2013: "Colombia: Implementing a Collective, Standardized Approach to Catastrophe Insurance of Public Buildings"

Insurance programmes require a legal and institutional framework

Learning 5: An appropriate legal and institutional framework is central to enabling the set-up and effective management of a Public Asset Insurance Programme

As demonstrated with the examples of Mexico's FONDEN and the Philippines (see chapter 9), and as noted in chapter 4, section 4.2 *The Institutional Basis for Implementing the Programme*, putting an insurance programme in place requires a legal and institutional framework. This framework, which can include statutes, regulations and executive orders, will play an essential part in providing guidance to the relevant stakeholders setting up the programme, and in ensuring transparency and alignment in its ongoing implementation.

An appropriate legal framework not only enables the creation of a PAIP, but also ensures that all stakeholders take an informed, harmonised approach.

In supporting countries to set up new insurance programmes, IDF members have seen progress interrupted due to a relevant law not being in place. Rectifying this situation can take time. Hence, a country's existing legal and institutional landscape should be assessed early on in the process of setting up a programme, to identify and address any potential shortcomings or conflicts that could create roadblocks or otherwise impede the development of the programme.

Insurance represents an effective option for transferring public asset risks – Dedicated budgetary funds are central but not enough on their own

Learning 6: Using funds provided ex-ante (i.e., before a disaster occurs) to buy insurance is well suited to cover the large costs required to reconstruct public assets

As mentioned in chapter 2, *Rationale for a Public Assets Insurance Programme*, when a government transfers its risk to a third party, this allows it to avoid sudden large budget/fiscal shocks, instead making regular payment of smaller amounts; in the case of insurance, these are premium payments.

The effectiveness of insurance to protect public assets and enable its repair or reconstruction after a natural catastrophe is confirmed by the fact that, of the countries covered in the 2017 World Bank report "Financial Risk Management of Public Assets Against Natural Disasters in APEC Economies", virtually all of those covered by the report have some sort of insurance solution in place. The report highlights that premium payments are comparatively small given the large funding insurance can unlock, as well as the speed of payment that parametric insurance can provide.

The same report also highlights that dedicated budgetary funds are necessary but, on their own, are often not enough to finance rehabilitation and reconstruction of public assets. While it found that APEC economies often relied on budgetary funds such as contingency budgets, dedicated disaster reserves, and budget (re)allocations to rehabilitate or reconstruct their public assets following natural disasters, it also highlights that experience from catastrophe events in those economies has shown that, for the recovery and reconstruction of public assets, these sources are often insufficient.

The reality is that the rehabilitation or reconstruction of major public assets and infrastructure such as hospitals, roads and bridges often require large sums and at a time when governments also have to address and fund other urgent and significant needs such as housing for low-income populations. Thus, insurance should be actively considered in developing robust risk financing systems.

Insuring public assets can also provide added benefits. These include:

- driving growth in the local insurance industry;
- building know-how and expertise in the domestic insurance market and ancillary sectors;
- helping drive the process of putting in place the administrative and legal systems necessary to ensure that the funds for rehabilitation and reconstruction of public assets, stemming from claims payments, reach beneficiaries in a structured, transparent and accountable manner; and
- boosting the local economy through investments in reconstruction efforts, post disaster.

On the latter point, a case study of Mexico's Fund for Natural Disasters (FONDEN) has provided an early indication that access to funding for the reconstruction of roads, infrastructure (and housing) boosts local economic activity by up to 4% in the year following the disaster.

Public-private partnerships effective in setting up insurance programmes

Learning 7: Public-private partnerships (PPPs) contribute to the creation of PAIPs, benefitting from private sector capabilities

Chapter 8 of this guide, *The Role of the Re/Insurance Industry*, outlines the contributions which the re/insurance industry can make towards the creation of PAIPs. The World Bank's 2017 report "Financial Risk Management of Public Assets Against Natural Disasters in APEC Economies" also highlights how the private sector can bring "…vast capabilities in risk management and data analytics as well as financial capacity for risk bearing…" to the table. Especially as governments seek to "develop legal and institutional frameworks that foster sound and innovative catastrophe risk insurance solutions, thus facilitating risk pooling or centralized insurance procurement to achieve greater efficiency gains", the private sector has an important role to play.

In this regard, it must be emphasized that there is tremendous value in having the private re/insurance sector at the table as early as possible when governments are looking to set up an insurance programme for their public assets.

Given the size and complexity of the task involved in establishing PAIP's, the number of issues to be addressed and the varying levels of insurance know-how available in any given country, having a direct and open dialogue early in the process can facilitate a more informed and effective collaborative process for all stakeholders.

Governments across the world which may be starting the work to set up a public assets insurance programme face a broad, complex task. We hope that having access to these learnings may help them to avoid some pitfalls or possibly accelerate their work by enabling greater focus.

We encourage direct dialogue between governments and the private re/insurance sector. A direct exchange is an extremely effective way for the industry to understand specific domestic needs and for governments to benefit from the experience the industry can contribute towards developing effective and efficient programmes tailored to the needs and interests of the government.

The Insurance Development Forum - IDF

Who we are

The Insurance Development Forum (IDF) is an industry-led public-private partnership supporting the growth and development of insurance-related resources and capabilities to help achieve the objectives of the Sustainable Development Goals (SDGs) and related U.N. Agreements of 2015-2016 (Sendai-Disaster Risk), Addis Ababa (Finance for Development), Paris (Climate), Istanbul (Humanitarian System), collectively known as the U.N. Global 2030 Agenda.

It is currently chaired by Denis Duverne, Chairman, AXA, representing the re/insurance industry, and co-chaired by Achim Steiner, UNDP Administrator, and Keiko Honda, CEO MIGA, World Bank Group.

The IDF aims 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.

It enables (i) the optimal coordination of insurance-related activities; (ii) the development of shared priorities; (iii) the mobilization of resources; (iv) the promotion of strategic and operational relationships within and between governments, industry, and international institutions; and (v) safeguards the integrity and effectiveness of joint efforts and collective resources.

As the first insurance industry led public-private partnership, the IDF was conceived and proposed by the Political Champions Group for Disaster Resilience (PCG) during the 2013 UN General Assembly. It was first announced at the United Nations Conference of the Parties (COP21) Paris Climate summit in 2015 and officially launched in 2016 by leaders of the United Nations, the World Bank and the insurance industry.

Membership

The Membership of the IDF is open to all industry participants (insurers, reinsurers, brokers, etc.) multilateral organizations, non-governmental organizations and public sector institutions that share the same objective of optimising and extending 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 climate change and disasters and their associated economic shocks.

Structure

The IDF is governed by a four-tiered decision-making structure. The **Steering Group** provides overall strategic direction and oversight; its members include leaders of multilateral organizations, non-governmental organizations and global industry participants who are selected based on their, and their organizations', commitment to the cause and principles of the IDF. It meets twice per year.

The IDF's implementation efforts are led and directed by the **IDF Operating Committee** of the **International Insurance Society (IIS)** comprising senior executives and officers from the insurance industry, public sector institutions, NGOs and academia, supported and managed by the IDF Secretary General and hosted by the IIS.

The IDF's programmes and initiatives are driven through specific **Working Groups** established to deliver IDF priorities and objectives. Approximately 250 public and private sector experts have been engaged with IDF Working Groups to deliver practical outcomes. These are described in more detail overleaf.

The **Secretariat** supports the day-to-day activities and needs of the IDF.

Working groups

The **IDF Working Groups** include experts and practitioners from industry, governments, international institutions, NGOs and academia that have been engaged across different priority areas since April 2016. These priorities are assessed and driven forward by five dedicated working groups whose evolving membership is drawn from private and public institutions.

I. **Sovereign and Humanitarian Solutions (SHS):** The SHS is dedicated to focusing on the needs of sovereigns, sub-sovereigns, international institutions, and humanitarian agencies in programmes and territories that are usually supported by donors or developments banks. The SHS oversees a portfolio of advisory engagements that aim to foster information flows and coordination between industry, civil society, multilaterals and relevant government entities on "macro" solutions.

II. **Risk Modelling & Mapping Steering Group (RMSG):** The RMSG is dedicated to improving global understanding and quantification of natural hazards disaster risk, through use, development and sharing of the re/insurance sector's catastrophe risk modelling capability.

III. **Law, Regulation and Resilience Policies (LRRP):** The LRRP is dedicated to developing accessible insurance regulation and public policy frameworks that enable and enhance sustainable development and economic and social resilience to large-scale disasters.

IV. **Inclusive Insurance:** The Inclusive Insurance Group is dedicated to driving and enhancing coordination and collaboration on inclusive insurance projects and to maximize the impact and efficiency, both in technical assistance and funding, of resilience-building programmes which are operating in local communities vulnerable to climate change.

V. **Investments:** The Investments Working Group has the overall objective of increasing the sectors and countries in which insurance investments could operate by exploring how insurers, working with development banks and others, can support the requirements for investment in resilient and sustainable infrastructure in emerging and developing countries.

Looking to build resilience? Contact the IDF

When disaster strikes, it impacts not only buildings but whole cities, regions or countries – and their economies. More tragically, without the right preventive and protective measures in place, citizens suffer the impact of disasters in their daily lives, often dramatically and for an extremely long period.

Protecting public assets is a critical aspect of the IDF's mission to help close the protection gap by driving the use of insurance and its related risk management capabilities to build greater resilience. Yet, as highlighted at the front of this guide, setting up and managing a PAIP can be a complex undertaking. This document reflects the insights and experience of many contributors and, we believe, clearly demonstrates the support that the re/insurance industry can provide to governments looking to use re/insurance as a valuable tool in protecting their assets.

In providing this guide, we hope that more governments will reach out to us, directly or through our re/insurance industry members. Nothing replaces face-to-face discussions, where both government and re/insurance industry representatives can ask questions and begin a dialogue towards finding the right solutions to a government's risks.

We encourage governments to contact us so that we can draw on available resources to support them in setting up their programmes. We hope that the guide will become a valuable tool to enable the effective use of re/insurance for the benefit of their citizens and their economies.

Contact information

Please address all enquiries and communication to:

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For more information see:
www.insdevforum.org

Appendix 1 – Comparison of Triggers for Insurance Schemes

	Pure parametric	Modelled loss	Indemnity
Definition	Pure parametric (or index based) solutions are a type of insurance that covers the probability of a pre-defined event happening rather than indemnifying actual loss incurred. Payouts are triggered on hazard data alone. E.g., Parametric hurricane cover: payout is triggered if wind speed in a predefined geographical area exceeds a pre-defined threshold e.g., 200km/h.	Modelled loss solutions are a type of parametric insurance that covers the probability of a pre-defined event happening. Payouts are triggered on a model's estimate of loss which is based on hazard and exposure/vulnerability data. E.g., Parametric modelled loss - hurricane cover: payout is triggered if the modelled loss due to a hurricane exceeds a pre-defined threshold e.g., USD 20mn. The modelled loss is estimated by the model based on the wind speed of the hurricane and the type of exposure is assumed by the model in the affected area.	Indemnity insurance indemnifies the actual loss incurred. Payouts are triggered when damage occurs to covered property as a result of a covered peril. E.g., Indemnity hurricane cover: payout is triggered if the insured suffers property damage or loss of business as a result of damage to property due to a hurricane which exceeds the deductible e.g., USD 10mn on their policy.
Basis for payments	Payment is made on the occurrence of a triggering event. Payment is not linked to damage suffered by an underlying physical asset/infrastructure. The payment amount is based on hazard data and does not take into account actual exposure or vulnerability of underlying assets.	Payment is made upon the occurrence of a triggering event. Payment is not linked to damage suffered by an underlying physical asset/infrastructure. The payment amount is the model's estimate of loss incurred based on actual hazard data, the exposure and vulnerability of the underlying assets.	Payment is made based on actual loss incurred by the policyholder as determined by a claims adjustor. Payment is directly linked to damage suffered by the underlying physical asset/infrastructure and is dependent on the limit of insurance purchased in relation to value of the building.

	Pure parametric	Modelled loss	Indemnity
Data needs	**Hazard data:** At least ten years of historic hazard data at a sufficiently high temporal and spatial resolution (e.g., Every 6 hours at 10kmx10km gridded basis). Typically provided by third parties – preference for publicly-subsidised data providers (e.g., US National Oceanid and Atmospheric Administration or Japanese Meteorology Agency) as data is then free which reduces costs. **Data on actual losses:** Not critical if not available but would need at least ten years of data (used to ensure close correlation between hazard data index and actual losses suffered and therefore ensure basis risk is minimised).	**Hazard data:** At least ten years of historic hazard data at a sufficiently high temporal and spatial resolution (e.g., Every 6 hours at 10kmx10km gridded basis). Typically provided by third parties – preference for publicly-subsidised data providers (e.g., US National Oceanic and Atmospheric Administration or Philippines' PAGASA) as data is then free which reduces costs. **High-level exposure data**: High-level data on buildings and infrastructure, e.g., geolocation, height, square meterage, occupancy, construction class, year built, etc. **Vulnerability data:** Data on how vulnerable each building type is to the hazard. **Data on actual losses:** Not critical if not available but would need at least ten years of data (used to ensure close correlation between hazard data index and actual losses suffered and therefore ensure basis risk is minimised).	**Data on actual historical losses:** Historical loss data for the properties subject to the cover. **Detailed exposure data:** Detailed data on buildings and infrastructure including but not limited to: replacement value, geolocation, construction type, occupancy type, year built, square meterage, and Number of Stories. In the absence of a third-party vendor model for a given region and peril, the below data is desirable. **Hazard data:** At least ten years of historic hazard data specific to the perils covered. **Vulnerability data:** Data on how vulnerable each building type is to the hazard.
Speed of insurance scheme set up	Quick due to less data being needed.	Longer as need exposure/ vulnerability data. Can also be lengthened if a model needs to be constructed.	Longer as data requirements and analysis are more individualized.

	Pure parametric	Modelled loss	Indemnity
Speed of payout	Payouts can be made within a few working days of the event. **Time to receive hazard data:** Nearly real-time (e.g., every 6 hours for cyclone data) or up to a few days after the event. **Time to calculate payout:** Finalised same day as hazard data is received. **Time to make payout:** 3-5 working days (may be longer or split in two tranches if very large sums need to be released by each insurer).	Payouts can be made within two weeks of the event. **Time to receive hazard data:** Nearly real-time (e.g., every 6 hours for cyclone data) or up to a few days after the event. **Time to calculate payout:** 5-10 working days to calculate modelled loss estimate by running hazard data through the model. **Time to make payout:** 3-5 working days (may be longer or split in two tranches if very large sums need to be released by each insurer).	Payouts typically made several months after the event. **Time to calculate payout:** Lengthy payout process, up to several months. Losses are assessed by the insurer, and loss assessment process can vary according to the size of the loss. The ultimate loss may not be known for some time after the date of the loss as the extent of the damage may not be known immediately, and the cost of rebuilding will not be known for certain until the repairs are complete. **Time to make payout:** 3-5 working days (may be longer or split into two tranches if very large sums need to be released by each insurer).
Basis risk (the difference between the actual loss suffered by the insured and the payout. Positive basis risk = payout higher than the actual loss suffered; Negative basis risk = payout lower than the actual loss suffered)	Potentially high if: — Raw input data is not sufficiently granular (over time and space). — The index is badly designed and therefore not well correlated to the insured's actual losses.	Potentially high due to the same reasons as a pure parametric trigger. However, integrating actual exposure and vulnerability data should help to lower basis risk.	It is commonly said that indemnity solutions have "no basis risk". However, important to remind here that cover is defined by the clauses and conditions and other details in the insurance contract, and so "full payment" for damages suffered is not guaranteed either. Also, both moral and morale hazard exists and can be reflected in the cost of coverage.

	Pure parametric	Modelled loss	Indemnity
Transparency	Fully transparent for the client as compensation is triggered by independent meteorological and geological/hazard parameter. Triggering data can be viewed by the policyholder.	Slightly less transparent for the client. Compensation is triggered by independent meteorological or geological parameter as well as public exposure and vulnerability data; however in some cases vulnerability data is not public, e.g., model vendors like AIR/RMS.	Less transparent as cost of coverage is assessed by the insurer and can be perceived as biased. Claims settlements and interpretation of cover also may be less than transparent given asymmetric information flows.
Cost-effectiveness	High-cost effectiveness: — No claims handling costs. — No uncertainty loading (insurers don't add a buffer on pricing as risk is based purely on a pre-defined model).	Good cost effectiveness. Pros: — No claims handling costs. — No uncertainty loading (insurers don't add a buffer on pricing as risk is based purely on a pre-defined model). Cons: — Costs for developing/ licensing a model if one doesn't already exist. — Additional analytical costs for assessing exposure and vulnerability.	Potentially highly cost-effective, given the specific resiliency of properties and risk mitigation practices of the insured. — Potentially lower cost-effectiveness due to the cost of claims handling and uncertainty loading dependent on availability and quality of data provided.
Geographic availability	Available wherever hazard data is available. E.g., Global coverage for wind speed covers and for earthquake magnitude covers.	Available wherever hazard data and high-level exposure data is available. However, note that a lot of the world is as yet un-modelled, so additional time and costs may be needed to construct a model.	Available wherever detailed exposure and/or historical loss data is available.

Appendix 2 – List of Key Terms

All risks coverage	Property insurance covering losses arising from any fortuitous cause except those that are specifically excluded.
Adverse selection	Adverse selection occurs when someone who is buying insurance has access to more information than the insurer and, as a result, the insurer underestimates the risk of insuring that person, or of insuring a specific thing the person is looking to insure such as a building. To address adverse selection, insurance companies reduce exposure to large claims by limiting coverage or raising premiums.
Average Expected Loss (AEL)	Expected loss per year when averaged over a very long period (for example, 1,000 years). Computationally, AEL is the summation of products of event losses and event occurrence probabilities for all stochastic events in a loss model.
Basis risk	In parametric or index-based insurance, basis risk refers to the possibility that the index value(s) doesn't accurately capture the actual situation on the ground; it can be either positive or negative. For example, drought-like conditions may affect some farmers even though the precipitation data doesn't show that drought has occurred. Or the opposite: payouts may be made to farmers who nonetheless brought in reasonable harvests.
Build Back Better (BBB)	A holistic concept using post-disaster reconstruction and recovery as an opportunity to improve a community's physical, social, environmental and economic conditions to create a more resilient community in an effective and efficient way. International research has shown that BBB is a three-pronged approach encompassing: 1. Disaster Risk Reduction – Putting measures in place to improve the structural resilience of the built environment; land-use planning based on multi-hazard analysis; and Disaster Risk Reduction and early warning education for communities. 2. Community Recovery – Supporting the psycho-social recovery and economic recovery of affected communities as a priority during the rebuild. 3. Effective Implementation – Implementing appropriate institutional mechanisms; legislation and regulation; and monitoring and evaluation to improve the effectiveness and efficiency of recovery.
Capacity	1. **In the re/insurance industry:** The term capacity is used to refer to capital (money). 2. **In the context of international development:** Know-how or skills.

Capacity building/ capacity development	Capacity building is the process by which individuals and organizations obtain, improve, and retain the skills, knowledge, tools, equipment and other resources needed to do their jobs competently or to a greater capacity. Capacity building and capacity development are often used interchangeably. Community capacity building is a conceptual approach to social, behavioural change and leads to infrastructure development. It simultaneously focuses on understanding the obstacles that inhibit people, governments, international organizations and non-governmental organizations (NGOs) from realizing their development goals and enhancing the abilities that will allow them to achieve measurable and sustainable results. This term is part of the lexicon of international development and is used in the programmes of most international organizations that work in development, such as the World Bank, the United Nations and non-governmental organizations.
Catastrophe (CAT) bond	A high-yielding, insurance-linked security providing for payment of interest and/or principal to be suspended or cancelled in the event of a specified catastrophe, such as an earthquake of a certain magnitude within a predefined geographical area.
Catastrophe reinsurance	A form of reinsurance whereby the reinsured is protected against an accumulation of losses from the same event, e.g., a cyclone.
Cedant/Ceding insurer	An insurer who transfers all or part of a risk to a reinsurer. It is the original insurance company which deals with the client and reinsures part or all of the risk.
Cede	To transfer risk from an insurer to a reinsurer. A 'cession' is a particular reinsurance transaction. Normally, this refers to the proportional insurance of a risk.
Cession	The portion of the sum insured of a risk ceded to a reinsurer. A Cession is a particular reinsurance transaction.
Claims leakage	Dollars lost through claims management inefficiencies that ultimately result from failures in existing processes (manual and automated). In other words, it's the difference between what you did spend and what you should have spent on a claim. The cause can be procedural, such as from inefficient claim processing or improper/ errant payments, or from human error, such as poor decision-making, customer service, or even fraud. CL is often discovered through an audit of closed claim files.
Contingent liability	Possible obligation that can be confirmed only by the occurrence or not of one or more uncertain future events that are beyond the full control of the public entity.
Deductible/excess/ retention	A sum of money that must be paid by the insured before the insurance policy will respond to a loss and pay a claim.
Deterministic risk modelling or analysis	In a deterministic analysis, a controlling fault (earthquake) or hurricane (extreme wind) for a site is specified. An event with specified parameters (such as magnitude for earthquakes or wind speed for hurricanes) for the desired return period is assumed to have occurred. This approach can be expected to generate a conservative "worst-case" scenario for loss, especially when combined with a 90% confidence level on the loss estimate. Deterministic events may include either scenario or historic events. From an extreme wind perspective, the historical analysis will typically focus on a relatively recent period of time (i.e., the past 100 years).
Ex-ante risk management	Action taken before a potential risk event. Making preparations before a disaster helps avoid inefficient and hasty coping decisions. If ex-ante strategies are not in place, governments will resort to short-term coping strategies that have no significant benefit in the long run.

Ex-post risk management	Risk management strategies that are developed in reaction to an event, without prior planning. Although ex-post strategies have a role to play in a risk management program, risk management mechanisms can be more effective when introduced ex-ante.
Excess	See deductible.
Exclusion	A term in an insurance or reinsurance contract that excludes the insurer or reinsurer from liability for specified types of loss. An exclusion may apply throughout a policy, or it may be limited to specific sections of it. In certain circumstances, an exclusion may be limited or removed altogether following the payment of an additional premium.
Exposure	The amount (sum insured) exposed to the insured peril(s) at any one time.
Framework agreements or arrangements	An agreement that is put in place with a provider or range of providers that enables buyers to place orders for services without running lengthy full tendering exercises. Frameworks often are based on enabling recurring purchases from a limited number of pre-qualified suppliers.
Facultative reinsurance	A form of reinsurance whereby each exposure the ceding company wishes to reinsure is offered to the reinsurer and is contained in a single transaction. The submission, acceptance, and resulting agreement are required on each risk that the ceding company seeks to reinsure. That is, the ceding company negotiates an individual reinsurance agreement for every policy it will reinsure. However, the reinsurer is not obliged to accept any or every submission.
Geo-reference, geocoding	To establish something's location in terms of map projections or a coordinate system (e.g., the position of an aerial photograph within a map or the geographical coordinates of a physical asset).
Hazard	Potentially harmful natural or human-induced phenomenon that can occur in a specific location with certain intensity and within a definite period or at a given frequency.
Indemnity	The amount payable by the insurer to the insured, in the form of cash, repair, replacement, or reinstatement, in the event of an insured loss. This amount is measured by the extent of the insured's monetary loss. It is set at a figure equal to but not more than the actual value of the objects insured just before the loss, subject to the adequacy of the sum insured. The concept of indemnity is based on a contractual agreement made between two parties in which one party (the indemnitor) agrees to pay for potential losses or damages caused by the other party (the indemnitee).
Indemnity insurance	Traditional indemnity-based insurance contracts pay claims based on an assessment of the damage suffered by the insured.
Index value	In parametric or index-insurance, the independent parameter, or set of parameters, that is highly correlated to a particular risk. Payouts are triggered in a parametric policy when, based on objective data, the index value exceeds or falls below pre-established levels or thresholds.
Insurance	A financial mechanism that aims to reduce the uncertainty of loss by pooling a large number of uncertainties, so that the burden of loss is distributed. Generally, policyholders pay a contribution to a fund, in the form of a premium, commensurate with the risk they introduce. The insurer uses these funds to pay the losses (indemnities) suffered by any of the insured.

Insurable interest	An entity/person has an insurable interest in something when loss of or damage to that thing would cause the entity/person to suffer a financial or other kind of loss. Normally, insurable interest is established by ownership, possession or direct relationship. For example, people have insurable interests in their own homes and vehicles, but not in their neighbours' homes and vehicles. Insurable interest is an essential requirement for issuing an insurance policy which makes the entity or event legal, valid and protected against intentionally harmful acts. Entities/People not subject to financial loss do not have an insurable interest.
Insurance Linked Securities (ILS)	Financial instruments that are sold to investors and in which their value is affected by an insured loss event. As such, the term insurance-linked security encompasses catastrophe bonds and other forms of risk-linked securitization.
Limit	The total amount of losses to be paid under an insurance policy or reinsurance agreement, expressed either on a per-occurrence basis (e.g., per accident or event) or on an aggregate basis (e.g., all losses under a single policy, or for all policies during an underwriting period).
Loss adjustors	The recognised industry experts in the handling of insurance claims, typically appointed by insurance companies but can also be appointed by policyholders. Loss adjusters need expert knowledge and skills, along with a full understanding of the insurance cover and the circumstances of the claim. What loss adjusters do: 1. Verify whether the policy covers the loss or damage. 2. Confirm the circumstances of the claim and the extent of any damage. 3. Verify the amount (if any) the policy should pay out.
Man-made perils/ hazards	The wide assortment of threats caused by humans. These include war and political violence, environmental contamination, cyber-attacks, pandemics, arson, bribery and extortion and a long list of other ways people can be harmed, and properties can be damaged by the actions of others.
Maximum Foreseeable Loss (MFL)	The most substantial financial hit a policyholder could potentially experience when an insured property has been harmed or destroyed by an adverse event, such as a fire. Maximum foreseeable loss assumes a malfunction and non-response of the usual safeguards, like sprinklers and professional firefighters, which would typically limit such a loss.
Moral hazard	Those personal characteristics of a prospective insured or its employees or associates that may increase the probability or size of an insurance loss.
Named perils coverage	A property insurance term referring to policies that provide coverage only for losses caused by the perils specifically listed as covered.
Natural perils/hazards	Damaging events potentially affecting widespread areas that are related to the Earth's climate systems and geology. These include earthquake, windstorm, tropical cyclone, hail, flood, extreme precipitation and extreme heat.
Normal Loss Expectancies (NLE) or expected loss	The losses an insurance company expects to incur during standard conditions. Normal loss expectancy represents the amount of loss an insurer may face if, despite all risk mitigation systems and processes working correctly, damages still occur.

Occupancy	How a property is being used.
Parametric insurance or index-based insurance	Non-indemnity insurance that makes payouts based on an index or parameter established in the contract. Claims payments are triggered automatically once an agreed-upon threshold is reached. With parametric policies, payouts are not based on loss or damage assessments, but instead on a pre-agreed formula reflecting the severity/intensity of the event as derived from independent and objectives data. These coverages are based on three factors: 1. The index value: one or more variables that are tightly correlated with the client's revenues or costs. 2. The threshold level/deductible: the point at which the insurance kicks in. These can be structured in different ways. In a purely binary structure, the full limit is paid when an index value above or below a pre-defined threshold is recorded. Alternatively, the payout size can be linked to the severity or magnitude of an event; for instance, a Category 4 cyclone triggers XX% of the limit while a Category 5 cyclone pays YY%. With a linear structure, the payout size increases incrementally as the index value changes. 3. The limit: the maximum payout that will be made. And for it to be insurance, the limit has to be less than or equal to the client's actual losses.
Peril	See hazard.
Policy limit/limit of indemnity	It refers to the maximum amount payable under a policy of insurance or reinsurance, either overall or with reference to a particular section of the policy.
Probable Maximum Loss (PML)	The maximum loss that an insurer would be expected to incur on a policy. Insurance companies sometimes differ on what probable maximum loss means. These can include: — The maximum percentage of risk that could be subject to a loss at a given point in time. — The maximum amount of loss that an insurer could handle in a particular area before being insolvent. — The total loss that an insurer would expect to incur on a particular policy.
Probabilistic catastrophe risk modelling	A detailed computer simulation of natural disaster scenarios to quantify loss that could be sustained from them. These models were developed by the insurance industry to assess the risk of certain assets and to price insurance contracts. Today, such models are mostly tailored for private sector needs. However, they are increasingly being used by governments that wish to understand better how future disasters could impact them and what the associated economic and fiscal cost would be.
Public assets	Physical assets owned by a public (governmental or state) entity at national or subnational level, including public buildings, infrastructure, fixed structures and contents.

Public-Private Partnerships (PPPs)	Cooperative agreements between two or more public and private sector entities. Public-private partnerships involve collaboration between government agencies and private-sector companies that are used to finance, build, and operate projects, such as public transportation networks, parks – and insurance programmes. Financing a project through a public-private partnership can allow a project to be completed sooner or make it a possibility in the first place.
Reinstatement	1. **In personal insurance:** If an insured person or entity fails to pay the premium due to various circumstances and as a result the insurance policy gets terminated, then the insurance coverage can be renewed. This process of putting the insurance policy back after a lapse is known as reinstatement. 2. **In commercial insurance:** The option to restore a policy, for an additional premium, to provide cover for a subsequent event when the limit had been exhausted by a first event. 3. **In an indemnity insurance contract covering physical assets:** Also refers to the insurer's responsibility to cover the insured's financial interest by paying for the reinstatement of the value of a damaged or destroyed asset through repair or reconstruction.
Reinstatement basis of settlement	In an insurance contract, defines the basis on which the indemnity amount to be paid by the insurer will be calculated, as refers to the value of repairing or reconstructing a specific physical asset.
Reinsurance	Insurance contract under which a reinsurance company insures an insurance company's portfolio of policies (reinsurance treaty) or an individual policy (facultative contract).
Replacement cost	Represents the cost to rebuild/replace an asset if it were damaged beyond repair, or the cost to repair damage to an asset.
Retention	See deductible.
Risk	This term may variously refer to: (a) the possibility of some event occurring which causes injury or loss; (b) the subject-matter of an insurance or reinsurance contract; or (c) an insured peril.
Risk financing	The process of managing risk and the consequences of residual risk through products such as insurance contracts, CAT bonds, reinsurance, or options.
Risk layering	The process of separating risk into tiers that allow for more efficient financing and management of risks.
Sendai framework	The Sendai Framework for Disaster Risk Reduction 2015-2030 (Sendai Framework) is the first major agreement of the post-2015 development agenda, with seven targets and four priorities for action. It was endorsed by the UN General Assembly following the 2015 Third UN World Conference on Disaster Risk Reduction (WCDRR). A 15-year, voluntary, non-binding agreement, it recognizes that the State has the primary role in reducing disaster risk but that responsibility should be shared with other stakeholders including local government, the private sector and other stakeholders. It aims for the following outcomes: The substantial reduction of disaster risk and losses in lives, livelihoods and health and the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries.

Stop-loss reinsurance	Stop-loss reinsurance is a type of excess of loss reinsurance wherein the reinsurer is liable for the losses an entity (e.g., a primary insurer, government authority or captive insurance company) incurs over a certain period (usually a year) and that exceed a specified amount, up to the policy limit.
Sum insured	The maximum amount an insurer will pay under the coverage. This is not necessarily the same as the total value of the asset; i.e., there is no guarantee that the sum insured will be sufficient to cover the costs of repairing/replacing the asset.
Treaty reinsurance	A reinsurance contract under which the reassured agrees to offer and the reinsurer agrees to accept all risks of certain size within a defined class.
Volatility or risk volatility	Volatility is associated with big swings in either direction (up or down) of an average value. It is a measure of the distance between an expected result and its standard deviation. The further this distance, the greater the volatility, and vice versa. In insurance, it defines the difference between the historically documented average size of claims for a given asset type, or portfolio of assets, and the real size of claims that have to be expected. For example, a building in a region affected by strong earthquakes may have a low average claim size for earthquake risk for the last twenty years but given the intensity of earthquakes measured in that region over a period longer than twenty years, the building will have a high (earthquake) risk volatility.

Sources: ABI; Build Back Better; Investopedia; International Risk Management Institute, Inc. (IRMI); Lloyd's; Chartered Institute of Loss Adjusters; authors.

Resources

The following is a partial listing of organizations and programmes that offer information and/ or support as well as resources related to climate risk insurance and with experience in emerging markets/developing countries. This list is not exhaustive.

For additional information please contact the IDF's Secretariat at: info@insdevforum.org

Organizations and programmes

Access to Insurance Initiative (a2ii): https://a2ii.org/

African Risk Capacity (ARC): www.africanriskcapacity.org

Asian Development Bank (ADB): https://www.adb.org/about/main - See also the **ADB's BMU IKI:** https://www.international-climate-initiative.com/en/about-the-iki/iki-funding-instrument/

Asia-Pacific Climate Finance Fund (ACLIFF) of the Asian Development Bank (ADB): https://www.adb.org/site/funds/funds/asia-pacific-climate-finance-fund

The Caribbean Catastrophe Risk Insurance Facility (CCRIF): https://www.insuresilience.org/the-caribbean-catastrophe-risk-insurance-facility-ccrif/ and http://www.ccrif.org/

Centre for Disaster Protection: https://www.disasterprotection.org/

FONDEN/Mexico Natural Disaster Fund: http://www.proteccioncivil.gob.mx/en/ProteccionCivil/INSTRUMENTO_FINANCIERO_FONDEN

Geneva Association: https://www.genevaassociation.org/

The Global Index Insurance Facility (GIIF): https://www.insuresilience.org/global-index-insurance-facility-giif/ and https://www.indexinsuranceforum.org/

Insurance Development Forum (IDF). https://www.insdevforum.org/

InsuResilience Global Partnership: https://www.insuresilience.org/

InsuResilience Investment Fund: http://www.insuresilienceinvestment.fund/

InsuResilience Solutions Fund: https://www.insuresilience-solutions-fund.org/en

The NDC Partnership: http://ndcpartnership.org/about-us - See also its Climate Action Enhancement Package (CAEP): http://ndcpartnership.org/caep

The Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI): https://www.insuresilience.org/the-pacific-catastrophe-risk-insurance-facility-pcrafi/ and http://pcrafi.spc.int/

Strategic Alliance on Climate Risk Transfer Solutions: https://climate-risk-transfer.org/about-sta/

UN Office for Disaster Risk Reduction (UNDRR): https://www.unisdr.org/

UNOPS: https://www.unops.org/

Organisation for Economic Co-operation and Development (OECD): http://www.oecd.org/finance/insurance/

The World Bank: https://www.worldbank.org/

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