

Global Infrastructure Resilience
Capturing the Resilience Dividend

Landscape of disaster risk financing and insurance mechanisms

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INTRODUCTION

Disaster risks intersect with a wide range of environmental, social, and governance risks causing human, economic and financial losses, and social impacts. Disasters have the highest impact on the poor and the vulnerable sections as they lack resources to ward off the various challenges or alternatively settle in safer places. Government relief efforts and interventions from humanitarian agencies may not suffice for the extent of damages caused. In addition to the fatalities and damages to productive assets, losses to public properties can push governments to restore the infrastructure facilities at the earliest and provide rehabilitation measures to the affected populace. Developing countries are vulnerable to meeting these challenges and need significant time to recover from such impacts.

The 'risk' and its quantification and structuring need to be understood first while studying disaster risk financing and insurance. This includes a variety of measurements to evaluate the capacity to understand and reduce risks, respond, recover from catastrophes and provide financial protection and risk transfer. The various risk modeling methodologies that are useful and help in risk quantification are discussed in the next section including the limitations and aspects of climate change.

RISK QUANTIFICATION AND STRUCTURING

RISK MODELS

Quantification of risks from natural perils and calculation of risk transfer pricing, insurance, particularly reinsurance companies being the ultimate risk takers, began in the second half of the 20th century. The methodology was assessing simple worst-case scenarios and applying mathematical probability distributions like the Pareto distribution.

It was around 1990 that companies like AIR (currently known as Verisk), RMS, or EQE specializing in risk calculation emerged. They used higher computer power to run thousands of scenarios for calculating loss distribution, which became a standard reference in the insurance industry. The sophistication of the models is constantly increasing, including secondary uncertainties in the early 1990s and secondary perils or post-loss amplification in the second half of the 1990s and early 2000s. Though the models have become very sophisticated over the years, there is a caveat- a lack of transparency and the need to have more detailed information on the risks.

RESTRICTED ON KEY PERILS

First-generation models had been created for critical perils like earthquakes and hurricanes, followed by floods. However, the current models comprise multiple perils, including terrorism and while these models for less relevant perils are vastly improving, they often lack in the phase where each event contains new lessons to be learned.

Restricted countries

It has to be kept in mind that the quality of most models varies depending on various factors, among them economic interest. Developing complex models is expensive and requires significant specialized expertise and information. Maintaining or updating such models, incorporating the latest scientific findings, is equally costly. Therefore, it is only realistic to invest in leading-edge models when there is a sufficient (insurance) market (sustainable).

For Low and Middle-Income Countries (LMIC), this is not always the case, resulting in models of less degree of sophistication, fewer data underlying some of the model assumptions, or even a slower update cycle, resulting in models of older legacy.

This puts LMIC at a disadvantage, as risk transfer based on models of older legacy will more often than not result in higher loadings by the risk-taking company. In addition, not all perils will be covered in such models.

However, the situation is improving quickly. In recent times, smaller companies, born and nurtured by universities and special research projects, are gaining traction, filling specific gaps in the model world. These include specialization in parametric insurance as a new field and creating special indices, which may be used for assessing the impacts of climate change or satellite data in the loss calculation.

Changing climate, changing risk

Climate change is also resulting in greater atmospheric perils. and a growing understanding of the impacts being seen.

Firstly, efforts are being made to include recent scientific findings in the models underpinning financial risk transfer in the insurance industry. Most models continue to use assumptions based on average rainfall, or the average frequency of hurricane events observed over decades, ignoring the change in physical parameters. In case they are included, it is only a general implementation of the trend. Global weather models are used to model the new environment, but the spatial resolution of these global models is not sufficient to break this down to local effects yet.

More sophisticated models will emerge over time enabling quantification of the impact as hazards evolve and build into the models of how secondary perils will develop. These include —changing climate resulting in heat waves of longer duration and higher maximum temperatures causing all kinds of social impacts and additional physical perils, which had limited importance in the recent past. The wildfires observed in California and southern Europe in the summer of 2022 are just one indication.

Apart from the uncertainty of changes in physical parameters due to climate change, the impact these changes have on the losses related to disasters is still subject to research. How do longer and stronger heat waves modify losses? How do induced secondary effects like scarcity of water or wildfires add to the loss? These kinds of additional perils, often with a non-linear relation to the main peril, are not sufficiently well understood and, hence, are not yet part of the available risk models used in quantifying risk.

Non-modeled losses

The main strength of catastrophe models' is estimating physical damage to exposed buildings. Though enough experience exists on how the loss develops for most installations, this isn't the case for complex infrastructure systems, where damage to one element of the system can produce a very high loss. . However, the physical damage might not be dramatic as such. Replacement of special turbines or machines that must be shipped from afar could be an example. It is virtually impossible to model all these cases in a detailed manner Therefore, these models only consider the loss potential in a generalized and limited form. Loss of profit or advanced loss of profit is weakly modeled.

Multi-peril approaches

Insurance coverage against all natural perils is frequently requested, rather than just the major perils in the region. Sophisticated, probabilistic risk models usually only cover one peril – this is the case even for hurricanes and typhoons, where either wind or the associated precipitation is explicitly modeled as a peril. In the summer of 2022, cooperation between two renowned modeling firms on a combined probabilistic model was announced.

DISASTER RISK TRANSFER

Disaster Risk Transfer is defined as the formal or informal transfer of the financial consequences of specific risks from one party to another, (a household, community, organization, or state authority), obtaining resources from a different party after a disaster happens in return for ongoing or compensation social or economic benefits given to that other party. The knowledge and capacities of governments, professional response and recovery organizations, communities, and individuals to effectively anticipate, respond to and recover from the impacts of likely, imminent, or current disasters. (An example in preparedness: With free buses and WhatsApp in Southern Africa for storm preparedness)¹

The insurance industry comprehends disaster risks to manage them and provide adequate financial relief. The UN Conference on Sustainable Development launched the Principles for Sustainable Insurance in June 2012 in Rio De Janeiro (Brazil) as a framework for the global insurance industry to address environmental, social, and governance risks and opportunities as developed by the UN Environment Programme's Finance Initiative.

The United Nations Office for Disaster Risk Reduction (UNDRR and formerly UNISDR) is the United Nations' focal point for disaster risk reduction. It aims to systematically avoid, lessen, or transfer the adverse impacts of hazards and the possibility of disaster and brings governments, partners, and communities together to reduce disaster risk and losses to ensure a safer, more sustainable future².

However, insurance and other risk transfer mechanisms cannot provide shelter to the population and protect assets from the destruction caused by extreme weather events unless a functional comprehensive disaster risk reduction (DRR) strategy is in use. The embedding of insurance in a well-designed comprehensive DRR strategy can make it accessible, affordable, and viable in the long run³.

The Munich Climate Insurance Initiative (MCII) broadly classified catastrophe risk transfer mechanisms into five categories as shown in *Table 1* in its submission to the June session of the UNFCCC Climate talks in 2009.

Table 1 Catastrophe Risk Transfer Mechanism categories

Risk transfer tools- an introduction

Catastrophe risk financing frameworks must be highly specialized to the type of coverage required and the local risk and social conditions. Broad types of catastrophe risk financing include:

(Traditional) Insurance

Insurance is a contractual transaction that guarantees financial protection against potentially large losses in return for a premium; if the insured experiences a loss, then the insurer pays out a previously agreed amount. Insurance is common across developed countries and covers many types of 'peril,' like fire and theft and to protect properties.

Micro-insurance

Micro-insurance is characterized by low-premiums or coverage, typically targeted at lower income individuals unable to afford or access more traditional insurance. Micro-insurance tends to be provided by local insurance companies with some external insurance backstop (e.g., reinsurance). Micro-insurance can cover a broad range of risks, including health and weather risks (e.g., crop and livestock insurance). Weather insurance typically takes in the form of a parametric (or index-based) transaction,

¹ UNDRR, 2017

² United Nations Office for Disaster Risk Reduction, <https://www.undrr.org/about-undrr>

³ UNISDR (2015b). The human costs of weather-related disasters 1995-2015. Geneva. Available on: [UNISDR](#)

where payment is made if a chosen weather index, such as 5-day rainfall amounts, exceeds some threshold. One of the largest micro-insurance schemes, the Weather-based Crop Insurance Scheme, was established by the Government of India and currently protects more than 700,000 farmers against drought. (The scheme covered approx. 29.16 crore farmers cumulatively in five years, from Kharif 2016 till Rabi 2020-21)

Reserve fund

Catastrophe reserve funds are typically set up by the governments or may be donated, to cover the costs of unexpected losses.

Risk pooling

Risk pools aggregate risks regionally (or nationally) allowing individual risk holders to spread their risk geographically. Through spreading risks, pooling allows participants to gain catastrophe insurance on better terms and provides access to the collective reserves in the event of a disaster. The Caribbean Catastrophe Risk Insurance Facility (CCRIF) could be a good example of risk pooling that secured \$500 million of reinsurance capacity in addition to its own reserves. CCRIF SPC provides its members with over \$500 million in joint reserves and claims-paying capacity backed by international reinsurance.

Insurance-linked securities

Insurance-linked securities, most commonly catastrophe (cat) bonds, offer an avenue to share risk more broadly with the capital markets. Cat bonds are issued by the risk holder (usually a government or insurance company) and trigger payments on the occurrence of a specified event. This event may be a specified loss or maybe a parametric trigger, such as the wind speed at a location. In 2006, the Government of Mexico issued a cat bond (the Cat-Mex bond) that transfers earthquake risk to investors by allowing the government not to repay the bond principal if a major earthquake were to hit Mexico⁴.

Disaster Risk Financing (DRF) Mechanisms

The regular occurrence of natural disasters and at times pandemics like COVID-19 put a significant fiscal burden on governments, creating major budget volatility. With rapid changes in climatic conditions, the fiscal burden of natural disasters on developing countries is expected to continue to rise. These issues force countries to look for innovative solutions for risk mitigation and disaster risk transfer mechanisms. These efforts led to the setting up of various forms of public-private support systems to manage disaster risks involving varying levels of intervention. Countries have their way of addressing the issue by employing varying mechanisms involving interested agencies for partnership in the endeavor. The instruments of finance adopted are different based on their local needs and available resources.

The United Nations and its specialized agencies have been supporting countries evincing interest to develop local or regional solutions to manage these risks through various risk financing models. The Disaster Risk Financing and Insurance (DRFI) Programme was set up in 2010 to help countries ensure that their populations are protected financially in the event of a disaster and improve the financial resilience of governments, businesses, and households against natural disasters. This is a joint initiative of the World Bank Group's Finance, Competitiveness, and Innovation Global Practice and the Global Facility for Disaster Reduction and Recovery (GFDRR)⁵.

The World Bank has classified 'Disaster risk financing and insurance' into four broad categories: Sovereign disaster risk financing, property catastrophe risk insurance, agricultural insurance, and disaster micro-

⁴ UNFCCC (2009). Adaptation to Climate Change: Linking Disaster Risk Reduction and Insurance - Paper submitted to the UNFCCC for the 6th session of the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA 6) from 1 until 12 June in Bonn by the Munich Climate Insurance Initiative (MCII), 6th June 2009. Available at: [UNFCCC](#)

⁵ [World bank insurance programme](#)

insurance. Although there is an overlap among the categories, they are useful for distinguishing the objectives and the scope of DRFI projects. The World Bank has defined them as follows⁶:

- **Sovereign disaster risk financing:** Financial strategies to increase the financial response capacity of governments in the aftermath of natural disasters, while protecting their long-term fiscal balances.
- **Property catastrophe risk insurance:** Develop catastrophe insurance markets and increase property catastrophe insurance penetration among homeowners, small and medium enterprises, and public entities.
- **Agricultural insurance:** Develop programs for farmers, herders, and agricultural financing institutions (e.g., rural banks, and microfinance institutions) to increase their financial resilience to adverse natural hazards.
- **Disaster micro-insurance:** Facilitate access to disaster insurance products to protect the livelihood of the poor against extreme weather events and promote disaster risk reduction in conjunction with social programs such as conditional cash transfer programs.

These four-disaster risk finance and insurance pillars⁷ are depicted in Figure 1.



Figure 1 Four Pillars of Disaster Risk Finance and Insurance

The World Bank Group's Finance, Competitiveness, and Innovation Global Practice and the Global Facility for Disaster Reduction and Recovery (GFDRR) have joined to assist governments to implement comprehensive financial protection strategies and combine sovereign disaster risk financing, agricultural insurance, property catastrophe risk insurance, and scalable social protection programs. It may occasionally assist governments in collaborating with the private sector to facilitate public-private partnerships⁸.

The examples of various Climate and Disaster Risk Finance (CDRF) Instruments are shown in

⁶ The World Bank; Disaster Risk Financing & Insurance in the Disaster Risk Management Framework;2012; [World bank \(https://documents1.worldbank.org/curated/en/330121467997014193/pdf/97452-BRI-Box391476B-PUBLIC-framework-DRFI-DRM-Concept.pdf\)](https://documents1.worldbank.org/curated/en/330121467997014193/pdf/97452-BRI-Box391476B-PUBLIC-framework-DRFI-DRM-Concept.pdf)

⁷ Adapted from The World Bank; Disaster Risk Financing & Insurance in the Disaster Risk Management Framework;2012, [World bank](https://documents1.worldbank.org/curated/en/330121467997014193/pdf/97452-BRI-Box391476B-PUBLIC-framework-DRFI-DRM-Concept.pdf)

<https://documents1.worldbank.org/curated/en/330121467997014193/pdf/97452-BRI-Box391476B-PUBLIC-framework-DRFI-DRM-Concept.pdf>

⁸[World bank disaster risk program](https://documents1.worldbank.org/curated/en/330121467997014193/pdf/97452-BRI-Box391476B-PUBLIC-framework-DRFI-DRM-Concept.pdf)

ANNEXURE - 1.

While financing the risks, various risk transfer mechanisms are employed by countries and agencies availing possible options. The Table 2 below provides the GFDRR ways of assessing the leveraging contribution of its activities in three ways: (i) instrumental; (ii) informational; or (iii) influential, in decreasing order of impact.

more information with examples.

Table 2 Types of Leveraging by GFDRR⁹

Type of Leveraging	Characteristics	Examples
Co-financing	The activity is part of a larger financing arrangement. This may include a World Bank project, together with World Bank's own resources, Trust Fund resources, and/ or government resources. It often covers technical assistance activities.	<p>In Tonga, the \$16 million Cyclone Ian Reconstruction and Climate Resilience Project, includes co-financing of \$2 million from GFDRR, \$12 million from the World Bank, and \$2 million in government funding.</p> <p>The Serbia National Disaster Risk Management Program (NDRMP) benefits from a total of more than \$60 million from government resources as well as several funding partners including GFDRR, the European Union, Switzerland, Japan, and the United Nations Development Program.</p>
Instrumental in leveraging	The activity can trigger financing that would not have happened in the absence of the said activity. The activity is a pre-requirement to inform and enable additional financing from other sources.	<p>World Bank operation (DPO) (Development Policy Operation provides World Bank loan, credit/grant, and guarantee budget support to a government for a program of policy and institutional actions to help achieve sustainable, shared growth and poverty reduction. Prior Actions are policy and institutional actions deemed critical to achieving the objectives of a program supported by the development policy operation).</p> <p>Where a GFDRR financed activity is a pre-requisite for disbursement:</p> <p>Fiji Post-Cyclone Winston Emergency DPO, totalling \$50 million. The completion of the GFDRR-financed PDNA (\$216,000) was set as a condition for triggering the ensuing \$50 million DPO</p> <p>World Bank operation where a GFDRR funding is a condition for other sources of funding:</p> <p>Togo Integrated Disaster and Land Management (\$16.44 million). The package includes co-financing from various sources, including \$9.1 million from GEF (Global Environment Facility https://www.thegef.org/about/funding) as well as a \$3 million GFDRR grant.</p>

⁹ Understanding Leveraging, Spring 2017 Meeting of the Consultative Group, [GFDRR](#)

Type of Leveraging	Characteristics	Examples
Informational in leveraging	The activity has the ability to directly inform the design of a World Bank investment project.	Belize Climate Resilient Infrastructure (\$30 million). Due to the challenge of a data scarcity, a GFDRR grant (\$1.15 million) supported the rolling out of a unique multi-criteria evaluation process, engaging a wide range of stakeholders across seven indicators to help prioritize the socio-economic and climate-risk impact of roadways. Teams also worked with engineers from the Government to analyse flood susceptibility. The methodology was tailored to draw from existing data, expert and local knowledge, and strategic survey processes to make up for information gaps, ultimately leading to the creation of a robust geospatial model to further enable decision-making.
Influential in leveraging	The activity has the ability to create awareness and advocacy about the need for additional financing and the subsequent World Bank project (e.g., a PDNA funded by GFDRR, whose recommendations identify sectors to be financed and type of arrangement to be considered.	In Bangladesh, GFDRR activities to improve emergency management systems and enhance building regulation, as well as construction practices, were influential in the design of the \$170 million Bangladesh Urban Resilience Project, as the project appraisal document clearly mentions.

Risk transfer is a mechanism to transfer risks from one party to another a consideration. While insurance is a traditional way of transferring risks, alternative risk transfer mechanisms are needed to handle risks of catastrophic in nature. Alternative Risk Transfer (ART) is a risk protection that is done outside of the traditional models of an insurance programme. The ART blends risk retention and risk transfer at the lowest total cost of risk and results in mutually aligning the financial interests of both the insurer and the insured.

The ART market is classified into two primary categories. Risk transfer via alternative carriers and risk transfer via alternative products are the two segments. Self-insurance, pools, captives, and risk retention groups (RRGs) are all examples of alternative carriers. Transactions such as integrated multiline products, insurance-linked securities (or CAT bonds as they are often known), credit securitization, committed capital, weather derivatives, and finite risk products are examples of risk transfer through alternative products¹⁰.

Table 3 gives some of the risk transfer and management tools that are available with their advantages and challenges duly enumerated¹¹:

¹⁰ Ian Giddy at [NYU Stern](#)

¹¹ United Nations University-Institute for Environment and Human Security (UNU-EHS); The Role of Insurance in Integrated Disaster & Climate Risk Management: Evidence and Lessons Learned; Report No.22, October 2017

Table 3 Disaster Risk Management Tools

Name of the tool	Category	Description	Application examples	Advantages	Challenges
Indemnity insurance: (a) Single Peril (b) Multi-Perils	Traditional insurance	Insurance in which the claim is calculated by measuring the degree of damage to the insured asset soon after the event occurs	Many examples in the developed countries, include hail insurance, flood insurance and multi-peril agricultural insurance. Limited examples in developing countries, mainly from big government schemes in Latin America (e.g., ProAgro Brazil and Mexico).	Indemnity based on actual damage. Established distribution pathways. Proven scalability	High transaction costs, including moral hazard and adverse selection. High barriers to entry in some cases, so excludes vulnerable population groups.
a) Area-yield (b) Weather-indexed (c) NDVI/satellite-based	Index insurance	Pay-out calculated according to what is usually an independently verified proxy (index), rather than the actual damage to the specific asset.	Limited examples in both developed and developing world. But pilots are increasingly common in developing countries, with the following schemes operating at scale: (a) The Indian National Agriculture Insurance Scheme. (b) The Ghana Agricultural Insurance Pool. (c) Kenya and Ethiopia Index-Based Livestock Insurance.	Lower transaction costs than indemnity insurance. Less demanding of institutional capacity, monitoring capacity and financial literacy than indemnity insurance.	Weak farmer demand and first-mover problems. Basis risk. Insufficient public investment in necessary infrastructure (i.e., weather stations, etc.). Not a 'profitable' form of risk transfer so would have to be substantially reliant on government or donor funding.
Natural Catastrophe Bonds	Alternative risk transfer tools/ insurance-linked	Securities that transfer natural catastrophe (re)insurance risks to the	Many examples in developed regions. World Bank's Multi-Cat programme facilitated CAT bonds for sponsors	For investors: relatively high returns and low correlation with other	Significant barriers to entry for developing country government-s

Name of the tool	Category	Description	Application examples	Advantages	Challenges
	securities (ILS)	capital market	including the Government of Mexico. Additionally, Munich Re recently expanded its third-party capital ILS investor base for catastrophe bond issues.	asset classes means promise of diversification. For sponsors: CAT bonds allow access to a much bigger pool of capital, and longer coverage periods, than conventional re-insurance.	e.g., lack of familiarity with reinsurance and CAT bonds; lack of resources to deal with complex legal documentation and high transaction costs; limited or non-existing modelling of disaster exposure; other political disincentives linked to insurance (see elsewhere in the paper).
<p>Sidecars (Side car is a financial structure established to allow investors ,often external or third-party, to take on the risk and benefit from the return of specific books of insurance or reinsurance business).</p>	Alternative risk transfer tools (ILS)	Securities that transfer a quota-share portion of the risk to the outside investors in the capital market. Generally, have a limited lifespan and used to capture the increase in rates after a major catastrophe.	Many examples of this in (re)insurance companies. Munich Re recently expanded its third-party capital ILS investor base for collateralised sidecar issues (Eden Re II sidecar)	For investors: relatively high returns and low correlation with other asset classes means promise of diversification, while the quota set-up limits the extent of the risk. For insurers: sidecars allow access to a much bigger pool of capital, the limited lifespan offers quick access to capital and the quota-	Significant barriers to entry for developing country governments (see above). No focus on vulnerable populations.

Name of the tool	Category	Description	Application examples	Advantages	Challenges
				system allows for splitting up of larger risks.	
Weather Derivatives	Alternative risk transfer tools (ILS)	Intermediation services that provide options on weather indices (i.e., a rainfall index) for specific sectors	Weather derivatives have become common in the U.S. and other developed countries, linked to performance of specific industries or sectors (i.e., agriculture). However, there have been efforts to build the weather derivatives market in developing countries, one of the first being in Malawi to protect maize production from drought (rainfall index)	Can be used at a sector or company level. Enables access to financial markets. Can allow better planning and budgeting at the national and company level.	Significant barriers to entry for developing country governments (see above). No necessary focus on vulnerable populations. Requires pre-existing weather index.
Early Recovery vouchers	Hybrid tool	Early recovery vouchers (a) provide eligible households with an insurance policy guaranteeing immediate disaster payments in cash following disasters caused by natural hazards and (b) can be conditional on recipient households participating in risk reduction	ERVO-like schemes are being piloted in China, Peru, Mexico's CADENA system.	Specifically target poor households to ensure direct and timely assistance. Have resilience building measures as a precondition to receiving the vouchers. Can be integrated into existing safety-net and cash-transfer programmes, especially for the	Not a 'profitable' form of risk transfer so would have to be substantially reliant on government or donor funding. The challenge of finding an appropriate index with a low basis risk for the recipient households

Name of the tool	Category	Description	Application examples	Advantages	Challenges
		and resilience building measures.		identification of eligible households. Lower basis risk than Index-Based Insurance, as it focuses on high covariate risk and can be used for entire regions regardless of economic sector	
Informal risk pooling	Alternative risk transfer tools	Informal risk transfer tools in the form of community risk pools.	Informal caste-based risk pools in India.	Highly tailored to existing institutions, norms, and practices of communities. Wide scope – can insure against aggregate risks as well as idiosyncratic risks (though far less common). Flexible	Unlikely to insure against aggregate risks.

Disaster Risk Protection Gaps

From sovereign nations to individuals, there is a wide range of protection gap financing needs. Government needs may include access to immediate payments for emergency relief measures or obvious tax revenues, while for individuals they may include loss of property/assets or income. The available solutions to bridge the insurance protection gap need to be expansive and extend from the micro level (individuals) to the macro level (sovereign states). A collaborative approach between the public sector and private-sector insurance industry is crucial, especially in regions where the insurance protection gap is wide.

Protection gaps and typical underlying exposures/loss drivers are described in *Figure* .

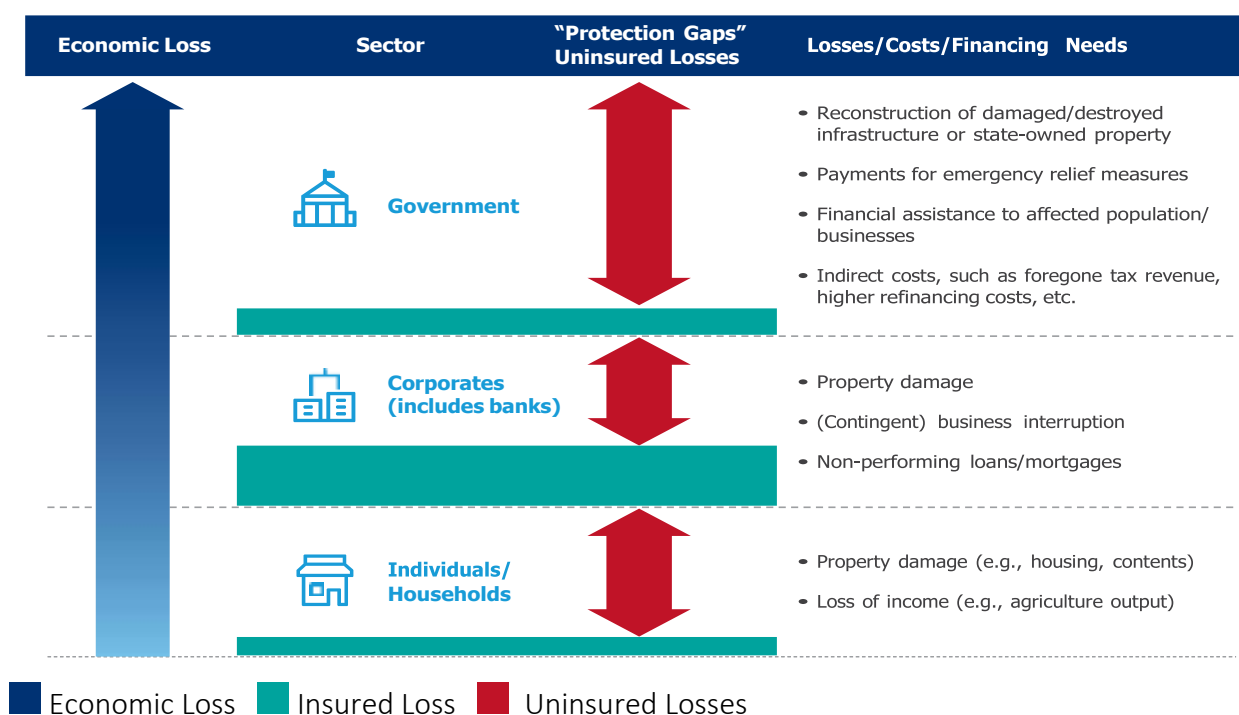


Figure 2 Protection gaps and underlying exposures/loss drivers¹²

Robustness of data

The growth of numerous domains of expertise within the Disaster Risk Finance (DRF) community has significantly improved both the quantity and quality of data, creating a vital foundation for the creation of effective financial protection solutions against disaster risk. However, the highly complex nature of disasters and crises, new trends and shifting patterns associated with climate change, and constantly changing socio-economic levels of exposure entail that technical data must be aggregated, analyzed, and refined into actionable information, which stakeholders can use to develop and implement risk-financing strategies.

Governments are unlikely to adequately decide whether certain measures provide more effective financial protection than others, their cost-effectiveness, and suitability in a country-specific setting without appropriate background knowledge and relevant quantitative tools. As a result, a vacuum has formed between the availability of raw technical data and stakeholders' ability to effectively use this data to develop the optimum financial resilience strategy. There is a large demand from governments and other DRF stakeholders for high-quality analytics translating technical data into usable information, allowing them to make decisions based on robust economic, financial, and disaster data analysis.

"In December 2015, the European Union and the Disaster Risk Financing and Insurance Program of the World Bank, through the Global Facility for Disaster Reduction and Recovery (GFDRR), signed a partnership on DRF Analytics in order to help improve the understanding and increase the capacity of governments to make informed decisions on DRF based on sound financial analysis. The project expects to catalyze the uptake of innovative risk identification, assessment, and financing tools within the development policy frameworks and agenda of several middle-income and low-income countries. The DRF analytics function is

¹² Adapted from Guy Carpenter Report, 2022

funded by the European Union and brings together the fields of insurance, risk management, catastrophe risk modeling and development economics together with academic disciplines such as economics, actuarial mathematics, statistics, and finance”¹³.

However, the availability of data is still the single greatest test firms expect to face over the next five years in order to address climate risk, according to a survey of leading financial institutions by Willis Towers Watson. This report of May 2021 revealed that 80% of respondents reported data as their top concern in the transition to a Net Zero economy while difficulty in making quantitative assessments (75%) and insufficient expertise in the actions required (62%) were mentioned as other major challenges¹⁴.

A global coalition of 10 organisations launched the Global Resilience Index Initiative (GRII) on November 9, 2021, to build a universal model for assessing resilience to climate risks. The curated, open-source resource can be used in aggregated risk management across sectors and geographies.

The model is expected to help countries focus on national adaptation investments. The tool is aimed to provide high-level metrics “across the built environment, infrastructure, agriculture and societal exposures”. CGFI stated that “the model will help global economic sectors understand, in concrete terms, the value of building climate resilience and the costs of doing nothing” and added that the model will “address the data emergency that is contributing to the climate crisis”. GRII partners and supporters include the Coalition for Disaster Resilient Infrastructure (CDRI), Coalition for Climate Resilient Investment (CCRI) 7, Fathom, GEM Foundation, Insurance Development Forum (IDF), Oasis Loss Modelling Framework, UK Centre for Greening Finance, and Investment (CGFI), United Nations office for Disaster Risk Reduction (UNDRR), University of Oxford and Willis Towers Watson (primary and reinsurance brokers and risk advisers).

The GRII desires to provide global open reference risk data developed using insurance risk modeling principles and provide shared standards and facilities applicable to a wide range of uses like corporate climate risk disclosure, national adaptation planning and reporting, and the planning of pre-arranged humanitarian finance¹⁵.

Tool Kit for DRF

The Asian Development Bank (ADB) has developed a diagnostic framework with a tool kit to provide the basis for new or deepened DRF engagement by international partners, as part of the broader DRM and/or public financial management dialogue. It focuses on the following six axes of relevance for the development of disaster insurance and capital market solutions:

- government policy in the development of risk transfer instruments for DRF.
- economic conditions and other support functions that influence the decision for retaining the risk;
- disaster risk product availability and affordability;
- the credibility of the private sector offering risk transfer solutions, covering aspects such as the regulatory environment, the solvency of risk carriers, the reputation of insurance and capital markets, and the availability of infrastructure;
- social protection policy; and

¹³ [GFDRR](https://www.gfdr.org/sites/default/files/publication/Brochure%20Analytics)

<https://www.gfdr.org/sites/default/files/publication/Brochure%20Analytics>

¹⁴ [WTWCO](https://www.wtwco.com/en-BE/News/2021/05/lack-of-data-is-single-greatest-challenge-for-uk-financial-sector-to-address-climate-risk)

<https://www.wtwco.com/en-BE/News/2021/05/lack-of-data-is-single-greatest-challenge-for-uk-financial-sector-to-address-climate-risk>

¹⁵ [Downtoearth.org](https://www.downtoearth.org)

<https://www.downtoearth.org.in/news/climate-change/towards-better-adaptation-global-model-to-assess-resilience-to-climate-risks-launched-80116>

- competition to the formal sector from informal and unlicensed providers, recognizing that insurance credibility and resilient insurance providers are important, and examining licensing and supervision of insurance providers by the regulator¹⁶.

The detailed diagnosis tool kit collects information as shown in [ANNEXURE - 2](#).

The ADB report presented a comprehensive country diagnostics framework that can be applied to support countries in assessing and strengthening their financial management of disaster risks. It focuses on the state of the enabling environment and opportunities for its enhancement to support increased availability and uptake of insurance and other risk-transfer instruments. The framework enables the identification of gaps between international good practices in disaster risk financing and its application in a particular country. It further provides an enhanced understanding of the demand and supply factors shaping the related enabling environment, including potential barriers to the more effective use of disaster risk financing instruments¹⁷.

This framework is useful for all countries including India, to identify the gaps in disaster risk financing mechanisms while following international good practices.

Insurance-Linked Securities

Insurance-linked securities (ILS) are investment assets generally thought to have little or no correlation with the wider financial markets as their value is linked to insurance-related, non-financial risks such as natural disasters, other insurable specialty risks, and life and health insurance risks including mortality or longevity. They allow insurance and reinsurance carriers to transfer risk to the capital markets and raise capital or capacity. They also allow life insurers to release the value in their policies by packaging them up and issuing them as asset-backed notes.

The market for insurance-linked securities (ILS) emerged in the mid-1990s as a mechanism for insurance and reinsurance companies to access the deepest and most liquid pool of capital available, the global capital markets.

Now an established alternative asset class, insurance-linked securities (ILS) are typically invested in by large institutional investors such as pension funds, sovereign wealth funds, multi-asset investment firms endowments, as well as some family office investors.

A part of the spectrum of pure reinsurance risk transfer tools available to the global insurance market, insurance-linked securities (ILS) is also used by some large corporates to access insurance capacity from the capital markets and by governments to secure disaster risk financing¹⁸.

Catastrophe Bonds (CAT Bonds)

Catastrophe Bonds or CAT Bonds are a type of Insurance-Linked (Investment) Securities (ILS) allowing the transfer of risks to investors. The issuers are normally - governments, insurance, and reinsurance companies. These Bonds can be used to manage risks that are associated with catastrophic events. For the investor, buying the Bonds means that they may get high returns for their investment, which is not subject to financial market fluctuations. In case a catastrophe or event occurs, investors will lose the principal they invested, and the issuer (often insurance or reinsurance companies) will receive that money to cover their losses.

With insurance and CAT bonds, countries can transfer some of their disaster risk exposure to insurance and capital markets without increasing their sovereign debt. A country pays an insurance premium and in return receives a pay-out if a specified disaster event occurs. These pay-out provide much-needed liquidity quickly after a disaster occurs. These bonds allow countries to access a much bigger pool of capital, and in general,

¹⁶ Assessing the enabling environment for Disaster Risk financing: A Country Diagnostics Tool Kit, ADB, June,2020; pp.3-4

¹⁷ ADB: Assessing the enabling environment for Disaster Risk financing: A Country Diagnostics Tool Kit, ADB, June,2020; p.vii

¹⁸Adopted from: [Artemis](#)

longer coverage periods, than conventional insurance. Any counterparty credit risk concerns are eliminated as CAT bonds are fully-funded transactions without any default risk.

It is understood from various reports of Aon Securities that the CAT bond sector has surpassed US\$100 billion in cumulative issuance since its inception more than 20 years ago. The sector, which began with the placement of a US\$45 million all-peril catastrophe bond in 1996, has since seen a gradual increase in the use of insurance-linked securities (ILS) by the (re)insurance market, with frequent new records being set in terms of annual issuance volumes.

Though Insurance and reinsurance companies are active participants in the CAT-bond market, an increasing number of sovereign CAT bonds have been issued as governments seek ways to transfer risks amid the increasing frequency of catastrophic events. The advantages include that they don't impact the credit risk of the issuer.

Green Bonds

These bonds are a type of debt issued by public or private institutions to finance themselves and, unlike other credit instruments, they commit the use of the funds obtained to an environmental project or related to climate change. There are various types of green bonds issued serving different purposes. The rapid growth of green bonds in the capital markets has attracted attention from investors.

Blue Bonds

A Blue Bond is a relatively new form of a sustainability bond, which is a debt instrument issued for supporting investments in oceans and blue economies. In a blue bond, earnings are generated from investments in sustainable blue economy projects. These bonds can be issued by governments, banks, or corporations. This quick-start guide focuses on sovereign blue bonds, which can be issued by governments or affiliated institutions.

Green Bonds and Blue Bonds and their features are further discussed separately in another chapter.

Sovereign Risk Transfer

The sovereign risk transfer generally takes a layered approach, providing flexibility through a range of mechanisms to respond to events with different levels of severity as shown in *Table 4*.

Table 4 Simplified concepts of layering of financial tools to manage the sovereign risk of different frequencies and severities¹⁹

Low frequency/ High severity [^]	Sovereign Risk Transfer - Insurance (including through risk pools) Derivatives Cat bonds	Not all instruments serve the same purpose and governments can take a layered approach to financial protection by combining Instruments with different characteristics. Such risk layering ensures that cheaper sources of money are used first, with the most expensive instruments used only in exceptional circumstances.
	Contingent Credits Financial instruments that provide access to liquidity immediately after an exogenous shock	
High frequency/ Low severity	Budget Reserves/ Budget Reallocations	
HAZARD TYPE		

¹⁹ "Sovereign Catastrophe Risk Pools: World Bank Technical Contribution to the G20", Report (Washington D.C., World Bank, 2017). Available from [WB](#), quoted in page 14 of the publication –Disaster Risk Financing :Opportunities for Regional Co-operation in Asia and the Pacific ,UN ESCAP, Thailand, May 2018

The parametric insurance solutions allow for rapid pay-outs in the event of a disaster, providing liquidity within a couple of weeks. In addition to parametric insurance, other financial instruments can also be structured and offered by risk pools. For example, Mexico's disaster fund, which acts as a national-level risk pool, provides indemnity coverage, where pay-outs are based on actual losses on public infrastructure. The catastrophe risk pools could also be used to aggregate insurance of public infrastructure, or to manage the contingent liability from shock-responsive social protection schemes more cost-effectively. Some countries in Southeast Asia are also exploring risk pools as a more effective approach to reserves as standby financing. A decade of experience has shown that political commitment, sound operational design, and financial sustainability are at the foundation of successful risk pools. When those foundations are in place, risk pools can in turn generate positive externalities that further enhance their impact, by fostering political, operational, and financial effectiveness. The long-term sustainability of sovereign catastrophe risk pools depends on their ability to generate regular and large enough premium income, possibly with financial support from donor partners; broaden the set of financial instruments offered beyond parametric insurance; maintain strong political commitment; and link financial instruments to pre-agreed post-disaster programs, such as shock-responsive social protection programmes or critical infrastructure recovery programs, to ensure that funds can be efficiently channelled to support targeted post-disaster responses.

The catastrophe risk pools have significantly relied on donor partners for their technical and financing capacity. All sovereign catastrophe risk pools have benefited from donor support to start operations and to remain sustainable during their first years. The donor financing has covered start-up costs, capitalization, and sometimes (partial) premium financing in different stages.

The existing regional sovereign catastrophe risk pools have also required many years of sustained technical assistance from credible third parties; the World Bank Group has assisted the Caribbean Catastrophe Risk Insurance Facility (CCRIF), Pacific Catastrophe Risk Assessment Finance Initiative (PCRAFI), Southeast Asia Disaster Risk Insurance Facility (SEADRIF), and the World Food Program has assisted African Risk Capacity (ARC). These risk pools require a regional partner organization to facilitate the political and policy dialogue and coordination between participating governments. Given the level of cross-country coordination required to establish and manage such a pool, regional political bodies are essential to facilitate the process. The sovereign pools have relied on their respective regional political organization at various levels.

The regional sovereign catastrophe risk pools—and disaster risk financing solutions more generally—require that participating countries be committed to implementing necessary policy reforms. The private sector has contributed to making these risk pools cost-effective. The private insurance industry has been heavily involved in the preparation and implementation of sovereign catastrophe risk pools. It provides not only risk capital but also technical expertise to inform the design of effective risk pools²⁰.

Over the past decade, 26 countries in four regions—Africa, the Pacific, South-East Asia, the Caribbean, and Central America—have joined as groups and set up sovereign catastrophe risk pools. The details of these schemes are shown in [ANNEXURE - 3](#).

SOUTHEAST ASIA DISASTER RISK INSURANCE FACILITY (SEADRIF)

In Asia, very recently efforts were made by the Association of Southeast Asian Nations (ASEAN) to set up a Pool for their group countries. The Southeast Asia Disaster Risk Insurance Facility (SEADRIF) was agreed in December 2018 to launch as an ASEAN+3 initiative, to help member countries in ASEAN enhance their financial resilience against disasters. The initiative was supported by the technical assistance of the World Bank and the financial and political support of Japan and Singapore. The SEADRIF is designed as a platform that offers members customized financial solutions to disaster shocks as well as knowledge sharing and technical assistance, including for insurance market development. The first financial program developed

²⁰ Sovereign Climate and Disaster Risk pooling: World Bank Technical Contribution to the G20; IBRD;2017

under SEADRIF is a regional catastrophe risk pool, currently with only one policy for the Lao People's Democratic Republic, The SEADRIF is also starting to work with middle-income countries in ASEAN ²¹. The details are provided in [ANNEXURE - 4](#).

Southeast Europe and the Caucasus Catastrophe Risk Insurance Facility (SEEC CRIF)

Countries of Southeast Europe and the Caucasus (SEEC) are highly vulnerable to natural disasters. Since ninety percent of the area of Southeast Europe is located within transboundary river basins, thus the region is highly prone to floods. Due to climate change, natural disaster frequency and severity are rising in all SEEC countries, particularly those that are weather-related.

The objective of the Southeast Europe and Caucasus Catastrophe Risk Insurance Facility Project for Europe and Central Asia is to help increase access of homeowners, farmers, the enterprise sector, and government agencies to financial protection from losses caused by climate change and geological hazards. There are two components to the project, the first component being participation in the Southeast Europe and the Caucasus (SEEC) Catastrophe Risk Insurance Facility (CRIF).

The program will support Southeast Europe and Caucasus (SEEC) countries' efforts to join Europa Reinsurance Facility, Ltd. (Europa Re) by financing their membership contributions to the Facility. Europa Re, in turn, will facilitate the growth of catastrophe risk insurance markets in member countries. During the program's first phase (this project) the component was financed by International Bank for Reconstruction and Development (IBRD) loans to FYR Macedonia and Serbia. During the program's second phase, this component was financed by International Development Association (IDA) credits to Bosnia and Herzegovina and Georgia and an IBRD loan to Montenegro. Finally, the second component was technical assistance.

This component, financed by donor funds and implemented by Europa Re, includes: (i) risk mapping and modeling for participating countries; (ii) design and pricing of appropriate catastrophe risk insurance products; (iii) small weather monitoring stations to support parametric weather insurance; and (iv) technical assistance for regulatory and policy reforms to create an enabling market environment²².

SEEC TA CRIF

To address the problem of low catastrophe and weather insurance penetration in Southeast Europe (SEE), the World Bank, initiated a catastrophe and weather risk reinsurance program called South-Eastern Europe Catastrophe Risk Insurance Facility (SEEC CRIF). The main rationale of this initiative is to promote the development of local catastrophe and weather risk insurance markets that will enable local businesses and populations to buy affordable catastrophe and weather risk insurance products that couldn't be founded in the commercial local markets.

During the implementation of the SEEC TA CRIF program which ended on June 30, 2020,

Europa Re achieved the following main outcomes:

- developed high-resolution catastrophe-risk models exclusively designed for the local markets;
- endorsed sound and reliable pricing catastrophe and weather insurance products to encourage massive participation;
- increased access to financial protection through affordable individual catastrophe and weather-risk insurance products as well on the sovereign/sub-sovereign level;
- provided dedicated reinsurance capacity for the risks arising out of sales of its endorsed insurance products;

²¹ World Bank; Boosting Financial Resilience to Disaster Shocks: Good Practices and New Frontiers; World Bank Technical Contribution to the 2019 G20 Finance Ministers' and Central Bank Governors' Meeting; @2019 International Bank for Reconstruction and Development / International Development Association or The World Bank; p.28

²² <https://projects.worldbank.org/en/projects-operations/project-detail/P110910>

- developed a web-based automated production platform on the most advanced and innovative technologies to enable automated sales of insurance policies and ensured quick and proper payments of claims;
- supported the local insurance companies by providing training for their sales force;
- enabled the first online sales platform for insurance products in the markets of operation;
- developed a unique interactive awareness and education consumer platform to raise public awareness and provide families and businesses with informed decisions about their catastrophe risk mitigation;
- increased public awareness against earthquakes and floods through an extensive awareness campaign via mass media channels and launching the CAT Monitor²³

Joint Catastrophe Bond for the Pacific Alliance

Before providing the information on Pacific Alliance, it is worth knowing about the most recent CAT Bond for Jamaica as it is planned to expand in the Caribbean. According to World Bank documents, In the month of July 2021, the WB issued to capital market investors a cat bond that provides the Government of Jamaica with US\$185 million of insurance cover for tropical cyclone events for 2021, '22, and '23 hurricane seasons.

The World Bank (International Bank for Reconstruction and Development) issued sustainable development bonds that collectively provide US\$1.36 billion in earthquake protection to Chile, Colombia, Mexico, and Peru in the year 2018. This is the largest sovereign risk insurance transaction ever and the second-largest issuance in the history of the catastrophe bond market. It is the first time that Chile, Colombia, and Peru access the capital markets to obtain insurance for natural disasters.

The issuance consists of five classes of World Bank bonds: one each for Chile, Colombia, and Peru, and two classes for Mexico. Under the respective classes, Chile receives US\$500 million, Colombia US\$400 million, Mexico US\$260 million, and Peru US\$200 million in risk insurance. Each class has different terms, and all are designed to cover earthquake risks. The triggers are parametric and depend on data provided by the US Geological Survey. The classes for Chile, Colombia, and Peru will provide coverage for three years. The classes for Mexico will provide coverage for two years.

The transaction received a very strong demand, offering a new diversification to the market in the form of uncorrelated risks from four different geographies. There were more than 45 investors from around the world, and the transaction attracted almost US\$2.5 billion in investor orders. The joint leads on the transaction were Swiss Re, Aon, and Citi. AIR Worldwide is the modeling agent and calculation agent in support of this transaction.

Lessons on Risk Pools

Policy makers have been advised by the World Bank to keep in mind certain lessons to reap the benefits of risk pools and they are shown in the following *Table 5*.

Table 5 10 Lessons on Risk pools²⁴

1. Pools can succeed only with strong political commitment. Strong political momentum and coordination among participating countries are essential, especially during the design and preparation stage. A strong regional organization is often critical to facilitate the political and policy coordination needed between participating governments.
2. Pools often rely on strong donor support. Donors have a key role to play in supporting the development of risk pools with financial and technical resources, and in reducing reliance on unpredictable post-disaster humanitarian assistance.

²³ <http://www.europa-re.com/seec-ta-crif>

²⁴ [World Bank Report](#); Sovereign Climate and Disaster Risk Pooling: World Bank Technical Contribution to the G20; IBRD/IDA or World Bank;2017

3. Pools can strengthen disaster preparedness and crisis response. Policy makers need to be ready to manage the impacts of residual risks through pre-agreed post-disaster plans, backed by pre-planned financing.
4. Pools can foster policy dialogue on risk management and risk ownership. They offer a vehicle to anchor financial planning; contingency planning; ownership of and collaboration on the climate risk management agenda between and within countries; and risk-informed investments.
5. Pools can maximize impact by developing pre-agreed disaster response plans. Linking financial instruments, including risk pools, to pre-agreed post-disaster programs, can help ensure that funds are disbursed rapidly and effectively.
6. Pools can create public goods. Risk pools can drive improved insurance literacy, increased institutional capacity, and the availability of disaster risk data and modeling. For example, the Pacific Risk Information System (a platform that includes an exposure database of over 4 million assets in the region) and its associated catastrophe risk model have been used by domestic insurers and brokers to inform their underwriting and pricing decisions. In Fiji for example, the model was used to inform the provision of catastrophe risk insurance for hotels and resorts.
7. Pools can offer cost-effective insurance solutions. By helping countries develop standard products based on their respective needs, and structuring a portfolio of diversified country risks, risk pools offer larger transaction sizes that are more attractive to global reinsurance and capital markets. Additionally, risk pools can reduce premiums by reducing the cost of capital, operating costs, and the cost of risk information.
8. Pools should be part of a comprehensive financial protection strategy. The parametric insurance products offered by risk pools provide rapid (but limited) liquidity in the immediate aftermath of infrequent and severe disasters. Other financial instruments, such as contingency funds and contingent loans, can be used to finance recovery and reconstruction efforts, as well as the cost of more frequent disasters. Governments can strengthen financial resilience by combining financial instruments that address unique needs and have different cost implications.
9. Pools require up-front payment of an insurance premium, facilitating a shift toward proactive risk management. Participating countries must pay upfront an insurance premium that reflects their actual risk exposure in exchange for the insurance coverage, thereby shifting payments to take place in predictable instalments before disaster strikes. It may be challenging for countries that previously relied on donor support to start paying an insurance premium for disaster risks with national resources. However, moving in this direction, even partially, can provide the right incentives for proactive planning and risk-informed investments in risk reduction.
10. Pools can be sustainable only with more formal and predictable approaches to premium financing. Policy makers tend to see allocating budget for the payment of premiums as not a permanent part of budgetary processes. This is when concessional insurance through targeted premium subsidies or concessional loans can be useful. Concessional insurance can help countries secure premium financing for several years while they progressively include premiums as an item in their national budget.

National Disaster Risk Finance and Insurance Schemes

There are many national schemes to manage disaster risks besides the regional (sovereign) risk pools. These schemes are designed to meet the country's specific requirements making the schemes either mandatory or voluntary and premiums are either subsidised or otherwise - based on the country's overall objectives.

The catastrophe programme design variables are shown separately in [ANNEXURE - 5](#). Most of these schemes are doing well and are bring in operation for a good number of years. These schemes are getting modified depending on the experience/s.

A few national schemes are discussed below:

Indonesia

Indonesia State Asset Insurance Program (ABMN): As a part of the Indonesian government's strategy to build resiliency against natural disasters, the vice president of the Republic of Indonesia launched the Disaster Risk Financing and Insurance (DRFI) Strategy for Indonesia in 2018. The strategy aims to obtain timely, targeted, sustainable, and transparent disaster-risk funding schemes.

One of the government's priorities is to protect state and regional assets. To facilitate this, a legal framework was established to provide insurance covering state assets state asset management information system is in development for capturing data around risk and claims, ensuring proper insurance coverage and premium. The state insurance pilot project started with a disaster insurance program for the buildings of the Ministry of Finance, which were insured with a total value of IDR 10.84 trillion (USD.770 million). A consortium of 56 general insurance companies and 6 reinsurance companies agreed to provide insurance at a premium of IDR 21billion (USD 1.5 Million).

Philippines

The **first sovereign catastrophe bond in Southeast Asia** was issued by the World Bank in 2019. It provided the Government of the Philippines with USD 225 million in protection against earthquake and tropical cyclone risks over 3 years. The Philippines' disaster-risk financing and insurance strategy follow a multi-tiered and multi-layered approach by addressing disaster-risk financing needs on national, local, and individual levels. It also combines different financial instruments, including dedicated disaster funds, contingent credit lines, and risk transfer to the international reinsurance and capital markets.

This Philippines' catastrophe bond, listed on the Singapore Exchange in November 2019, was a landmark transaction being the first catastrophe bond ever directly sponsored by an Asian sovereign. The bond covered the country with USD.225 million of disaster risk financing, USD.75 million of which covers impacts from earthquakes and the remaining USD.150 million covers impacts from cyclones.

This bond recently triggered a pay-out of USD 52.5 million to the Government of the Philippines after super typhoon Rai (locally known as Odette) hit the country in December 2021.

Thus, the insurance industry is capable and well-resourced to develop the technology and products needed to cover the protection gap. Industry innovators must meet people's needs and balance affordability. Bespoke micro-insurance products are one example that can provide much-needed relief after a disaster. Parametric-based products and solutions are evolving, with a focus on reducing the basis risk. They provide immediate relief after a severe event and can be developed at any level—macro to micro. An important role of the industry is to build trust in insurance by advising and educating the public.

Risk mitigation remains among the most essential tasks for governments. It helps to reduce losses and aids in the availability and affordability of insurance. Government schemes, such as mandatory insurance for specific sectors and perils, and public insurance initiatives are also effective in reducing the protection gap.

However, it is the cooperation between the private and public sectors, through public-private partnerships, that may be the most-effective solution. Government distribution networks and infrastructure can be used by private institutions to channel their products and solutions. The government, in partnership with the private sector, may develop subsidized schemes, helping individuals obtain necessary protections. With the support of the insurance industry, governments can introduce ex-

ante solutions at sovereign and sub-sovereign levels. Another example of a public-private partnership is the establishment of a (re)insurance pool with a government guarantee²⁵.

AGRICULTURE INSURANCE IN INDIA

The Economic Survey of Govt of India for 2017-2018, a report the Government presents before the annual budget in the Parliament, said that climate change will induce a decrease in the incomes of farmers of the country by as much as 25% in some parts of the country. According to this report, “climate change could reduce annual agricultural incomes in the range of 15% to 18% on average, and up to 20% to 25% for unirrigated areas.”

While there are several schemes that both the Central (federal) government as well as State (provincial) governments are running to increase the income of the farmers, a crucial aspect where the governments have tried to address the vulnerability of farmers to climate variability and related distress, through crop failure – is ‘crop insurance.

There is only one standalone public-sector agriculture insurance company in India. There is no standalone private agriculture insurance company in India even though the sector was liberalized two decades back.. The private insurance players limit their role only to participating in subsidy-driven government schemes.

Currently, there are two main crop insurance schemes in the country. The first one is the Central government’s prestigious crop insurance scheme, namely the Pradhan Mantri Fasal Bima Yojana (PMFBY) which was introduced on April 01, 2016. The second, Restructured Weather-Based Insurance Coverage Scheme (RWBICS) was launched on 18th February 2016. However, both these schemes are mired in several problems and have not been able to provide the related succor to the farmers against climate-related crop losses they face. The PMFBY initially faced problems such as the delay in crop-cutting experiments and its associated high costs, delayed/non-payment of insurance claims to farmers, and lack of transparency. The RWBICS, has faced many problems such as a lack of automatic weather stations (AWS) to monitor the real loss, controversial rules to determine loss, etc. as a result of which the enrolment in this scheme has been falling. There is discontent among the farmers on these schemes throughout the nation.

The PMFBY and RWBICS schemes were last revamped in 2020 to allow farmers to participate on a voluntary basis and allow for the reporting of crop loss within 72 hours of the occurrence of any calamity. However, insurance companies’ exposure to the PMFBY was declining.

The Government of India has constituted a Working Group to roll out an overhauled PMFBY from *Khariff* 2022. After the Government of India’s approval, significant adjustments to the plan are expected to be implemented starting from 2023–24.

Issues in Agriculture Insurance in India

- Most of the agriculture insurance initiatives in India are government driven.
- Most of the vegetable crops are outside the scope of the government schemes, as such, there is no underwriter in the market for insuring them.
- Most of the agriculture insurance activity is meant to support agriculture credit (in the form of agriculture insurance), as it serves as collateral for agriculture loans.
- The risks covered are standard ones wherein the underwriters try to protect more of their risks rather than the risks of the farmers or that of their crops. So, most of agriculture insurance has eventually lost its focus.

Challenges in Agriculture Insurance

Indian Agriculture Insurance needs the following challenges to be addressed on a priority basis:

²⁵ Guy Carpenter Report,2022

- Creating insurance solutions that address farmers' distinctive needs and risks. This involves composable participatory design processes as well as an understanding of the products required by various farmer groups.
- Increasing data availability to tailor insurance to farmers' needs and the risks that concern them (e.g., data to design and validate indexes).
- Insurance should be extended to include non-farm actors throughout the agricultural value chain.
- Increasing the capacity of existing local distribution networks and potential aggregators (e.g., farmers organizations) known by farmers in order to distribute appropriate micro- or meso-level insurance for farmers, as well as meso- and macro-insurance for businesses and governments.
- Integrating climate-smart technologies, credit, value chains, and development strategies to add value.
- Creating an enabling environment for public-private partnerships.
- Intensifying the evidence base to rationalize and guide investment, identifying and addressing market failures, and advising the smart use of funds to catalyze insurance schemes.

To compensate for the uncertainty caused by climate change, an effective crop insurance program is required to protect farmers from bad yields. There is a strong feeling amongst farmers that agriculture insurance programs are meant for lending institutions to cover their credit requirements and not to cover their crop losses.

Solutions for increasing agriculture insurance

- The solutions include data availability, targeting the right farmers with the right products, and distribution channels, bundling insurance with climate-smart agriculture, evidence of impact, and expanding insurance to other actors in the agricultural value chain.
- There is an immediate need to develop successful and scalable models for agriculture insurance and find solutions to the challenges and inspire investors to launch viable products that mitigate ever-changing climate risks by adapting suitable climate adaptation policies to support the marginalized farmers and growers of various crops that failed to get the attention of the risk carriers.

Insurance has the potential to prepare agriculture to face the challenges of climate change and provides an opportunity to scale up climate adaptation. There is a lot of scope for bringing out new technologies to monitor crops and prevent loss control, design better products, participate in farm mechanization to support agriculture, enhance customer sensitization, and creation of new distribution channels.

KEY CONSIDERATIONS

Finance for resilient infrastructure

In order to assist governments, multilateral development banks, and private financial institutions in trying to ensure that investments are designed, developed, financed, and operated with the highest potential to withstand future impacts from climate change, Willis Towers Watson (WTW) released its thorough understanding of physical climate risks and analysis. This procedure is accomplished by²⁶:

- Incentivization of resilience through accurately pricing climate risk into the financial structuring (debt and equity) of the project;
- Resilience is encouraged by appropriately including climate risk into the project's financial structure (debt and equity).

²⁶ WTWCO [Climate resilience finance](https://www.wtwco.com/en-US/Insights/trending-topics/csp-climate-resilience-finance)

<https://www.wtwco.com/en-US/Insights/trending-topics/csp-climate-resilience-finance>

- Allocating and sharing risks among financial sources, including using blended and/or public/private partnerships (PPP) approaches to efficiently deploy public capital to catalyze private investment in resilient infrastructure;
- Distributing risk across different financial sources, particularly through the use of hybrid and/or public-private partnership (PPP) strategies to effectively use public funds to encourage private investment in resilient infrastructure.
- Ensuring adequate risk transfer mechanisms, such as insurance, is part of the full spectrum of climate risk management for these projects.
- The complete range of climate risk management for these projects should include suitable risk transfer instruments, such as insurance.

The outbreak of the COVID-19 pandemic and associated lockdowns highlighted significant vulnerabilities in the health and financial security of many economies. Businesses of all sizes and sectors were impacted by the crisis resulting from the substantial protection gap. There were no instruments in place for future pandemics. Since the risks were too large to be assumed by the private insurance sector alone or governments alone, several public-private initiatives commenced, such as the introduction of the Pandemic Risk Reinsurance Program in the US or Chubb's Pandemic Business Interruption Program. Few reinsurance Brokers like, Marsh McLennan quickly established over 30 national "Pandemic Re" teams to support discussions at national levels around the design and delivery of pandemic risk insurance solutions. All these initiatives are at different stages, but more significant is the effort put in place to develop solutions for one of the largest economic losses ever seen, using public-private partnerships.

CONCLUSION

While the economic dislocations caused by COVID-19 had a negative impact on government budgets, this pandemic event highlighted the importance of risk management and the value of insuring against events that can have significant shocks on a nation's economy. Many emerging economies facing the challenge of COVID-19 are also exposed to natural disasters and catastrophic events. concerns about growing compound shocks make it imperative for governments to place greater emphasis on disaster risk financing. Challenges such as stretched country budgets, reductions in revenues and increases in public health expenditures, benefits of financial support for CAT bonds, related insurance programs and the emergence of regional sovereign risk pools have become imminent. Furthermore, reduced fiscal budgets make financial protection indispensable against future shocks like natural disasters.

Governments should explore ways to identify and reduce the underlying drivers of disaster risk to reduce the impact. The risk pools (with sovereign risk pools) along with other disaster risk finance and insurance solutions, complement risk reduction by helping governments address those risks that can't be mitigated. These measures work proactively for risk management rather than raising funds after a disaster strikes.

The Working Group of the Insurance Regulatory Authority of India's recommendation to set up an Indian Pandemic Risk Pool is the right step taken in that direction at an appropriate time.

Diversification among participating countries in the regional risk pools can create a more stable and less capital-intensive portfolio as it is unlikely on several countries face the same challenge (risk) in the same year. This will become cheaper to reinsure. These regional risk pools can create some incentives for countries to invest in risk reduction since the risk is priced. This act may evoke some interest among donor countries to provide assistance wherever possible.

Disaster risk financing and transfer to capital markets can help in transferring considerable risk when capital markets are well-matured. The authorities need to take steps to develop a framework for implementation with due regulatory support and approvals along with legal authority. This may be an immediate necessity to manage the DRF. Needless to mention that India directly falls into this category.

Regional sovereign risk facilities are needed for countries as these facilities can provide a better risk spread and aggregation.

It is relevant to conclude that a country like India in South Asia is well poised as the best country to take a lead in this regard and initiate a dialogue with like-minded disaster-prone countries of the region right away, especially in the South and Central Asian Region. Factors like its geographical position and well-equipped administrative structure is a positive factor for such an endeavor. Climatic challenges and disastrous events in the region provide an opportunity to draw the attention of the specialized agencies of the United Nations and the international or regional financial institutions for possible technical expertise and financial support through a regional risk pool.

There is a good number of schemes locally, and nationally apart from well-known regional programs for the provision of disaster risk insurance and financing. Even the specialized agencies of the United Nations and other institutions in the public as well as the private sector have designed programs on disaster risk mitigation and are supporting similar schemes. However, the information on these schemes is not available in one repository. It is strongly recommended that Coalition for Disaster Resilience Initiatives (CDRI) take lead to set up a separate division for collecting the entire information on the subject from all the countries and institutions wherever these schemes are in operation, create a repository for the countries to use its database and share the knowledge.

ANNEXURE - 1

Examples on Climate and Disaster Risk Finance (CDRF) Instruments²⁷

CDRF Instrument	Integrated Climate Risk Management (ICRM) cycle	Example
Government Revenue & Budget Allocation (including Ex-Ante Taxation)	Prevention, Preparedness	Fiji has set up an Environment & Climate Adaptation Levy to fund environmental, carbon-reducing and climate adaptation projects. The levy is a tax on prescribed services, items and income and is administered by the Ministry of Economy. The funds are used to support disaster relief and response, meteorology services, rural development, cyclone rehabilitation, urban development, agricultural development, sustainable resource management, infrastructure development, energy conservation, and environmental conservation. ²⁸
Bonds (excluding Cat Bonds)	Prevention, Preparedness, Recovery	Fiji issued a sovereign green bond in 2017 to close its climate-resilient development resourcing gap. The approximately USD 50 million bond was one of the first issued by an emerging market country. Over 90% of the bond proceeds focus on adaptation projects. ²⁹
Traditional DRR, Development, and Climate Finance	Prevention, Preparedness	<p>In 2020, the Cook Islands received a USD 10 million loan from the ADB for their Disaster Resilience Program to support the government's their disaster risk management activities.³⁰</p> <p>In Vanuatu, the National Green Energy Fund was launched in 2018 to support financial and non-financial intermediaries in the provisioning of affordable, sustainable energy. The fund was created with the support of the Global Green Growth</p>

²⁷ Adapted from: Climate and Disaster Risk Financing Instruments: An Overview; United Nations University Institute for Environment and Human Security (UNU-EHS); Published online, May 2021; pp. 30-31 as Annexure-1.

²⁸ Munich Climate Insurance Initiative, "Increasing Resilience through Integrated Climate Risk Management (ICRM)."

²⁹ Ministry of Economic of Fiji, "The Fiji Sovereign Green Bond: 2019 Update."

³⁰ Asian Development Bank, "Cook Islands: Disaster Resilience Program (Phase 2)."

		Initiative and with the intention of attracting capitalization from the Green Climate Fund. ³¹
Sovereign Risk Insurance	Transfer	PCRIC is a regional sovereign risk pool that was designed to increase the financial resilience of Pacific Island countries by improving their capacity to meet post-disaster funding needs. During the pilot phase (2013-2015), PCRIC provided sovereign risk insurance to Cook Islands, the Marshall Islands, Samoa, Solomon Islands, Tonga, and Vanuatu. Tonga received a USD 1.27 million in 2014 following Tropical Cyclone Ian and Vanuatu received a USD 1.9 million payout in 2015 following Tropical Cyclone Pam. ³²
Public Assets Insurance	Transfer	In 2019, Indonesia implemented the State Assets Insurance Policy Phase II. This Property All Risk coverage includes earth-quake, volcano, tsunami, flood, typhoon, landslide, and terrorism and insures government buildings that provide public services and governance tasks, such as office buildings, education buildings and hospitals. ³³
Microinsurance	Transfer	The Pacific Financial Inclusion Programme has helped over two million low-income Pacific Islanders access formal financial services and financial education. In 2017, PFIP worked with FijiCare to launch a bundled micro insurance product that includes term life, funeral expenses, personal accident, and fire coverage. An annual combined cover limit of about USD 5000 costs only USD 25, or about one Fijian dollar per week. ³⁴
CAT Bonds	Transfer	The Philippines sponsored a CAT bond with annual coverage of USD 206 million for protection of national government assets against earthquakes and severe typhoons, and USD 390 million in protection against severe typhoons for 25 local government units in 2018. ³⁵ In late 2019, the Philippines sponsored a new three-year cat bond.

³¹ Pacific Islands Forum, “Pacific Experiences with Options Relevant to Climate Change and Disaster Risk Finance.”

³² World Bank Group, “Pacific Catastrophe Risk Insurance Pilot – From Design to Implementation.”

³³ World Bank Group, “SEADRIF Knowledge Series – Financial Protection of Public Assets.”

³⁴ Pacific Financial Inclusion Programme, “The Road to Launching ‘Bundled Micro Insurance’ in Fiji – Key Lessons.”

³⁵ Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH, “The Landscape of Climate and Disaster Risk Insurance (CDRI) in South and Southeast Asia and Oceania.”

Forecast-based Finance (FbF)	Preparedness, Response	In 2017, the International Federation of Red Cross and Red Crescent Societies developed Early Action Protocols for the Philippines in collaboration with the Philippine Red Cross. Those protocols covered typhoons and floods in 22 provinces of the Philippines, allowing FbF recipients to strengthen shelters ahead of typhoons, evacuate of livestock and harvest crops, and temporarily relocate small business stocks ahead of urban flooding. Starting in 2019 the project was expanded to also include drought. ³⁶
Contingency and Reserve Funds	Preparedness, Response, Recovery	<p>The Tuvalu Climate Change and Disaster Survival Fund is a nationally driven and nationally owned fund that provides a sustainable, predictable, and accessible source of finance for Climate Change and Disaster Risk Management activities.³⁷</p> <p>Tonga’s emergency fund was established in June 2008. An appropriation up to USD 2.79 million can be placed into the fund in any fiscal year. The fund can accrue, and the resources are used exclusively for the purpose of providing timely and efficient relief and reconstruction following an emergency.³⁸</p>
Extrabudgetary Funds	Response, Recovery	<p>While some Pacific Islands countries, including Tonga, Tuvalu, and Kiribati, have long-term dedicated national funds to help absorb the financial costs of climate change and disaster-related losses (see above), other Pacific countries have more general sovereign wealth funds—to manage revenue from non-renewable sources, revenue windfalls, and donor contributions—that can be drawn upon in the event of an emergency.³⁹</p> <p>In the wake of Tropical Cyclone Winston in 2016, the Fiji government allowed pre-retirement pension withdrawals as a way to smooth consumption and rebuild assets. Pension fund members were allowed to withdraw up to around USD 3,000 if it was within the cumulative cap on withdrawals of</p>

³⁶ Philippine Red Cross, “August 2020 FbF newsmagazine.”

³⁷ Pacific Islands Forum, “Pacific Experiences with Options Relevant to Climate Change and Disaster Risk Finance.”

³⁸ World Bank Group, “PCRAFI Country Note Tonga.”

³⁹ Pacific Islands Forum, “An Overview of Climate and Disaster Risk Financing Options for Pacific Islands Countries”; Le Borgne and Medas, “Sovereign Wealth Funds in the Pacific Island Countries: Macro-Fiscal Linkages.”

		30% of the total. About 180,000 applications were approved and the average amount withdrawn was about USD 750. Vanuatu has also allowed early withdrawals; in the aftermath of Cyclone Pam, 40,000 members were allowed to withdraw up to 20% of their retirement savings. ⁴⁰
Budget Reallocation and Realignment	Response, Recovery	Governments often realign budgets for a variety of reasons. In the Solomon Islands, for example, there are three options for acquiring additional funds to facilitate response activities. 1) Transfer funds between accounts within an agency, which requires approval of the head of agency and the minister of finance. 2) Seek a contingency warrant, subject to cabinet approval and in the event that the contingency warrant allocated for that financial year is depleted. 3) Request a supplementary budget allocation from the contingency warrant. According to the Public Financial Management Bill, the finance minister may seek supplementary appropriations when an urgent and unforeseen need has arisen, and the cabinet has granted its approval. ⁴¹
Ex-Post Taxation	Response, Recovery	After Tropical Cyclone Evan, Fiji provided a tax incentive (a 200% tax deduction) on donations for to the “Prime Minister’s Fund” (the National Disaster Relief and Rehabilitation Fund) to help finance the recovery. ⁴² After the Great East Japan Earthquake in 2011, Japan issued Japanese Government Bonds to finance the reconstruction costs. The repayment costs of those were mostly financed by an increase in income and per capita local tax with a duration of 25 years starting in 2013. ⁴³
Contingent Credit/Cat DDO	Response, Recovery	The ADB in 2018 approved USD 24 million on catastrophe triggered contingent disaster financing for Pacific islands, the Federated States of Micronesia, the Marshall Islands, Solomon Islands and Tonga. Disbursements are triggered when a state of disaster or emergency is declared by the respective government, enabling quick payout.. This follows a contingent credit

⁴⁰ Ramachandran and Masood, “Are the Pacific Islands Insurable? Challenges and Opportunities for Disaster Risk Finance.”

⁴¹ World Bank Group “PCRAFI Country Note Solomon Islands.”

⁴² World Bank Group, “PCRAFI Country Note Fiji.”

⁴³ Sato and Boudreau, “The Financial and Fiscal Impacts.”

		drawdown from the ADB in 2018 by Tonga following Tropical Cyclone Gita. ⁴⁴
Disaster Response Banking Instruments	Response, Recovery	In 2015, Tuvalu was hit by tropical cyclone Pam, resulting in over USD 10 million in damages and threatening its long-term fiscal sustainability. The World Bank's IDA committed USD 3 million through the Crisis Response Window to reduce fiscal pressure and assist in infrastructure reconstruction. ⁴⁵
Disaster Risk Finance Facilities	Response, Recovery	In 2020, the World Bank's Pandemic Emergency Financing Facility provided Fiji with a USD 1 million grant from its insurance fund to enable Fiji strengthen its health system.. This was in addition to a USD 6.4 million concessional IDA loan. ⁴⁶

⁴⁴ ARTEMIS, "ADB Provides Catastrophe Triggered Financing for Pacific Islands."

⁴⁵ World Bank Group, "IDA17 Mid-Term Review: Update on IDA's Crisis Response Window."

⁴⁶ World Bank Group, "Covid-19: World Bank Boost for Fiji's Health Sector."

ANNEXURE - 2

Diagnosis tool kit for Disaster Risk Financing

Disaster Risk Financing Diagnostic Tool⁴⁷ examining the Full Sovereign Disaster Risk Financing Landscape

The disaster risk financing diagnostic tool developed by the Asian Development Bank and the World Bank assesses levels of financial protection against disasters and identifies opportunities for enhancement. It contains questions for finance ministries to extend and expand on country analyses performed under the technical assistance projects. These help build a more complete picture of the state of sovereign disaster risk financing arrangements, including risk retention mechanisms.

The questions cover the following issues:

- 1. Assessment of fiscal shocks associated with disasters:**
 - a. contingent liability of the government,
 - b. fiscal risk assessment of disaster shocks, and
 - c. public disclosure of disaster-related fiscal exposure.
- 2. Ex ante disaster risk financing:**
 - a. annual contingency budget,
 - b. dedicated budget lines for disaster risk reduction,
 - c. dedicated disaster reserve funds,
 - d. line agency funding,
 - e. contingent financing arrangements,
 - f. insurance of public assets,
 - g. any other forms of sovereign insurance, and
 - h. risk transfer arrangements through capital markets.
- 3. Ex post disaster risk financing:**
 - a. post-disaster budget reallocations,
 - b. external assistance, and
 - c. other ex post mechanisms.

⁴⁷ Asian Development Bank and World Bank (2017)

ANNEXURE - 3

Detailed Overview of Existing Regional Sovereign Catastrophe Risk Pools (as of December 2016)⁴⁸

ITEM	CCRIF (Caribbean)	CCRIF -CA (Central America)	ARC	PCRAFI
Perils	Earthquake, tropical cyclone, extreme rainfall	Earthquake, tropical cyclone, extreme rainfall	Drought, tropical cyclone, flood	Earthquake, tropical cyclone, extreme rainfall
Initial capital	Multi-donor grants via World Bank	Multi- donor grants via World Bank	Interest free loan from 2 partners	Multi-donor grants via World Bank
Participating countries	20 eligible; 16 have participated, 14 have purchased coverage in 2016	6 eligible; 1 has purchased coverage	32 signatories; 8 have participated, 6 in 2016/17	15 eligible; 6 have participated, 5 have purchased coverage in 2016/17
Operational entity	Segregated portfolio company, multiple cells	Cell in CCRIF SPC	Class 2 captive insurer	Captive insurance company
Domicile	Cayman Islands	Cayman Islands	Bermuda	Cook Islands
Governance	Board of 5 directors, 2 appointed by Caribbean Development Bank, 2 by CARICOM, and 1 by other 4 Directors	Management Committee for CA cell, under CCRIF SPC board	Board of 7 Directors, appointed by the members	Board of 5 Directors appointed by Council of Members
Ownership	Purpose trust	CCRIF Purpose trust	Mutual insurance company formed at direction of ARC	Foundation

⁴⁸ Sovereign Climate and Disaster Risk Pooling: World Bank Technical Contribution to the G20; IBRD/IDA; 2017 or World Bank; merging Tables in Page: 5 and 35-37

ITEM	CCRIF (Caribbean)	CCRIF -CA (Central America)	ARC	PCRAFI
			Conference of the Parties	
Operational staffing	CEO and COO on staff, remainder outsourced to service providers	Operated by CCRIF SPC	CEO and small technical/ operations support team, remainder outsourced to service providers	Operated by Pacific Catastrophe Risk Insurance Company (PCRIC). CEO, remainder outsourced to service providers
Source of Premiums	Initial IDA credits for 4 countries for 3.5 years premium. CDB credits for 0.5 years premium for 8 countries, full grant of premium each year for 1 country	IDA credit for sole current participant (3-5 years premium)	National budgets, grants (1 country)	Grants (first 3 years), national budget, IDA credits
Date of first policies	2007	2015	2014	2013
Cumulative payouts	US\$67.3 million	US\$0.7 million	US\$34 million	US\$3.2 million
Avg. aggregate coverage	US\$622 million	US\$28 million	US\$50 million	US\$45 million
Source of premiums	IDA credits, CDB credits, grants	IDA credit	National budgets, grants	Grants, national budgets, IDA credits
Reserves	US\$117 million	US\$1.3 million	US\$98.5 million	US\$6 million
Form of insurance	Modelled loss parametric	Modelled loss parametric	Modelled loss parametric	Modelled loss parametric
Modelling	EQ/TC - built for and licensed by	EQ/TC - built for	In-house (license owned by ARC)	AIR Worldwide model

ITEM	CCRIF (Caribbean)	CCRIF -CA (Central America)	ARC	PCRAFI
	CCRIF, available to participants for non-commercial use. XSR - in-house	and licensed by CCRIF, available to participants for non-commercial use. XSR - in-house	Agency), TC and FL will use licensed feed for hazard data	
Pay-out process	Initial estimate in 3-5 days, pay-out made after 14 days (Partial pay-outs have been made sooner). Self-certification of loss required.	Initial estimate in 3-5 days, pay-out made after 14 days (Partial pay-outs have been made sooner). Self-certification of loss required.	Pay-out calculated within 10 days of end of risk period (for drought), 7 days for TC/FL. Self-certification of loss required. Certified contingency plan also required before pay-out is made.	Pay-outs made within 10 business days.
Reinsurance summary	Panel of traditional reinsurers and capital market element, most recently via World Bank CAT Bond	Traditional reinsurers, separate placement for CA cell	Traditional reinsurance agreement with 24 participants, multi-peril	Panel of 5 reinsurers
Portion of Agg. Limit reinsured (2016/17)	25%	66%	41%	90% (to decrease significantly once the facility is fully capitalized in

ITEM	CCRIF (Caribbean)	CCRIF -CA (Central America)	ARC	PCRAFI
				2017)
Capital/ Reserves (2016)	US\$117 million	US\$1.3 million	US\$98.5 million (Statutory Capital & Surplus as of end- 2015)	US\$6 million (to increase to US\$25 million in 2017)
Associated meso or micro schemes	Two products co-developed by CCRIF, one meso (inactive) and one micro (active), both utilize CCRIF model to some extent, no risk taken by CCRIF to date	n.a.	Licensing for Development initiative allows for use of ARC model to underpin commercial transactions. Revenue to L4D Trust to support ARC, ARC Ltd. could take some risk	n.a.

Note: IDA: International Development Association; CDB: Caribbean Development Bank; Note: EQ = Earthquake; TC = Tropical Cyclone; XSR = Excess Rainfall; FL = Flood; L4D = Licensing for Development.

ANNEXURE - 4

Southeast Asia Disaster Risk Insurance Facility⁴⁹

SEADRIF is composed of these four tracks:

The SEADRIF Trust: a legal arrangement for SEADRIF open to all ASEAN+3 countries and governed by the Council of Members that will provide overall strategic direction for SEADRIF.

SEADRIF Sub-Trust(s): an arrangement(s) for a sub-group(s) of SEADRIF member countries and development partners to develop and govern specific initiatives.

The SEADRIF Trustee: holds the legal title to the assets of SEADRIF Trust and is the sole shareholder of the SEADRIF Insurance Company.

The SEADRIF Insurance Company: a general insurance company registered in Singapore.

SEADRIF member countries:

All ASEAN+3 countries can join SEADRIF and become members. There are no membership fees to join. Currently, the following countries are members: Cambodia, Indonesia, Lao PDR, Myanmar, Philippines, Singapore, Japan, Viet Nam.

All participating countries sign the SEADRIF Memorandum of Understanding. SEADRIF is an ASEAN+3 initiative in partnership with the World Bank.

The SEADRIF Insurance Company was incorporated in Singapore in April 2019 as a licensed insurance company under the Singapore Insurance Act. The Insurance Company is fully owned by SEADRIF member countries through Inter-trust acting as Trustee of the SEADRIF Trust and regulated by the Monetary Authority of Singapore. It is governed by a Board of Directors comprising three professionals with decades of experience in the insurance industry.

SEADRIF Work:

SEADRIF's first product provides insurance to Lao PDR against climate shocks and natural disasters. The insurance policy has a three-year period and consists of two complementary components: the parametric component and the finite risk component.

The core feature of SEADRIF's first insurance product is its parametric component which uses a stepped payout structure. The structure has fixed parameters that correspond to predefined levels of the modeled number of people affected by a flood, which trigger pre-agreed payout amounts. Specifically, 40% of the policy limit is payable in the event of a 'medium' disaster, and 100% of the policy limit is payable in the case of a 'severe' disaster. The parametric component must comprise a minimum of 50% of the total premium paid.

The finite risk component provides countries with protection against events that might not trigger a payout under the strictly objective rules of the parametric component. This could be due to:

- 1) basis risk;
- 2) small flood events that don't trigger a payout under the parametric component; or
- 3) losses that are caused by natural disasters which are not flood-related, but for which the insured country requires a degree of financial support. To qualify for a payout under this component, the insured country is required to provide evidence that a disaster event has occurred.

SEADRIF is also starting to work with middle-income countries in ASEAN. While discussions with ASEAN middle-income countries such as Indonesia, the Philippines, and Vietnam are just starting, indicative analysis can illustrate the potential benefits of developing a joint catastrophe risk program under SEADRIF.

⁴⁹ Seadrif.org

SEADRIF works on a commercial-basis Public-Private Partnership (PPP) model with reinsurers to maintain long-term sustainability of the initiative.

In a report prepared by the World Bank as a technical contribution to the 2019, G20 Finance Ministers' and Central Bank Governors' Meeting, it was observed that "If countries pooled their risk and purchased insurance jointly under SEADRIF, the reduced capital requirement, combined with potential reduction in operating and transaction costs, could result in significant premium savings. Such analysis could be refined and applied to various potential schemes, including a joint risk pool for public assets."⁵⁰

⁵⁰ Boosting Financial Resilience to Disaster Shocks: Good Practices and New Frontiers; World Bank Technical Contribution to the 2019 G20 Finance Ministers' and Central Bank Governors' Meeting; The report was prepared during the period September 2018–May 2019 by World Bank. [document](#).

ANNEXURE - 5

Catastrophe Programme Design Variables⁵¹

Program variables	Design choices
Management	Public/Private
Governance	Public/Private/Mixed
Funding	Public/Private/Mixed
Insurance vehicle	Insurance pool/reinsurance pool/insurance companies
Coverage	Buildings; contents; business interruption
Lines of Business	Residential/commercial (SMEs)
Rates	Flat/risk-based/mitigation incentives
Distribution	Insurance companies/alternatives
Retention by insurance companies	Zero to risk-based solvency margin
Geographical coverage	National/regional/inter-country
Participation	Compulsory/voluntary
Reinsurance	Private/public mix

⁵¹ Adapted from : Gurenko, Eugene, Rodney Lester, Olivier Mahul, and Serap Oguz Gonulal, eds.; Earthquake Insurance in Turkey: History of the Turkish Catastrophe Insurance Pool. Washington, DC: IBRD/World Bank;2006; page:103