Disaster Risk Finance Strategy

Guideline Document for Pacific Island Countries (PICs)

This publication is brought to you by the Pacific Insurance and Climate Adaptation Programme (PICAP) which is jointly administered by the United Nations Capital Development Fund (UNCDF), the United Nations Development Programme (UNDP) and the United Nations University Institute for Environment and Human Security (UNU-EHS).

The Programme receives financial support from the Governments of New Zealand, Australia and Luxembourg. The Fiji component receives additional funding from the India UN Partnership Fund administered through the UN Office of South South Cooperation (UNOSSC).

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June 2023

Supported by:

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List of Abbreviations

AEP	Aggregate Exceedance Probability
AHRA	All Risk Hazard Assessment
ADB	Asian Development Bank
Cat DDO	Catastrophe Deferred Draw Down Option
CAT	Catastrophe Risk
CDRFI	Climate Disaster Risk Finance Instruments
DRF	Disaster Risk Finance
DRM	Disaster Risk Management
EBRD	European Bank for Reconstruction and Development
FbF	Forecast-based Finance
GAR	Global Assessment Report
GDP	Gross Domestic Product
IBRD	International Bank for Reconstruction and Development
OEP	Occurrence Exceedance Probability
PICs	Pacific Island Countries
PFM	Public Finance Management
PPCR	Pilot Program for Climate Resilience
PFRA	Preliminary flood risk assessment
PSHM	Probabilistic Seismic Hazard Model
PTHA	Probabilistic Tsunami Hazard Assessment
TCHA	Tropical cyclone hazard assessment
USD	United States Dollar

Executive Summary

A Disaster Risk Financing (DRF) Strategy is an essential element that can help PICs develop ways to meet the costs associated with reducing and addressing economic and social losses from various types of disasters and climate change impacts. It primarily covers disasters caused by climate-related hazards (cyclones, droughts, flooding, etc.), disasters caused by geological hazards (earthquakes, tsunamis, and volcanoes), and disasters from other types of hazards like health pandemics. 'Disaster Risk Financing' denotes financial protection strategies including products and instruments that "aim to increase the resilience of vulnerable countries against the financial impact of disasters and to secure access to post-disaster financing before an event strikes, thus ensuring rapid, cost-effective resources to finance recovery and reconstruction efforts[1] ".

The disaster risk management plans only work when accompanied by finance and aligned to interests of multiple stakeholders including civil society and private sector. This cooperation facilitates and incentivizes activities that reduce risk. It also means that sufficient and reliable resources are available to respond when remaining risks materialize. Ensuring that such finance[2] is available in a timely fashion after a disaster is crucial for reducing the human cost of disasters.

Implementation of DRF strategy can be structured as a series of steps that those actors who hold risk, and the partners who support them in this role, can follow to better understand, reduce and manage these risks, and finance activities accordingly. The important steps for arriving a DRF strategy are:

- Step 1 : Inclusive national approach: Undertake multiple stakeholder engagement and economic analysis to identify actions that can reduce the risks in a cost-effective means.
- Step 2 : Understand the disaster risk: develop a sound understanding of the underlying risk. This consists of below components
    - (i) Define the exposure at risk – both in terms of people and assets - to understand what needs to be managed;
    - (ii) Identify what perils and hazards can impact that exposure,
    - (iii) Quantify the expected frequency and severity of impact from those perils, ideally using a probabilistic risk analysis
- Step 3 : Understand the Disaster Risk Finance: selecting the disaster risk financing instruments.
    - (i) Evaluate the range of financial instruments available, their strengths and weaknesses and applicability to different dimensions of financing needs.
    - (ii) Define the limit of liability as per the retention capability and cost of risk transfer. Risk layering ensures that cheaper sources of money are used first and that the most expensive instruments are used only in exceptional circumstances[3]
- Step 4 : Strengthen enabling environment: Establish enabling conditions for DRF from the highest levels, harmonize sectoral disaster management plans and develop local players' capabilities to implement disaster risk reduction and climate change adaptation at the local levels with those at government levels.
- Step 5 : Finalize the DRF strategy based on cost, bearer of cost, beneficiary, means of reaching out to beneficiary.
    - (i) Finalize the implementation roadmap and monitoring and evaluation mechanism to ensure sustainability

1 invalid source specified

2 (OECD, 2023)

3.World Bank, 2020)

Purpose

The main purpose of the Disaster Risk Finance (DRF) strategy guideline is to enable the design of feasible, effective, efficient, and adaptable financing mechanisms and formulate underlying financial instruments, for disaster risk reduction, retention and transfer. The guideline will provide a step-by-step account of how Pacific Island countries can develop national DRF strategies. It will touch upon the characteristics, strengths, and weaknesses of these instruments, and how they can be combined to develop a coherent, cost-effective approach. The guideline will enable the user to appreciate global practices and gauge their significance for their country based on the readiness of maturity of

a. Country-level risk profile: identification of perils and hazards, quantification of risk in terms of severity and frequency, define the exposure at risk, and setting resilience target
b. Disaster risk finance instruments: financial instruments and policy mechanisms that can be used consistent with the intent of the national disaster risk management policies and plans
c. Public finance mechanism: channels through which the funding will flow, core and interconnected stakeholders, a system of checks, regulations, and policies that may enable such funding to reach its intended destination
d. Market capabilities: Implementation capabilities of market players to develop and distribute the DRF instruments.

The guideline will help the stakeholders to improve their understanding of the potential impact of different shocks on different segments of the population, how these shocks are translated into financial cost estimates, and implementing the DRF instruments to enable social protection systems and other disaster recovery mechanisms to respond to and mitigate the impacts of climatic and potentially other shocks.

The litmus test of a DRF strategy is its ability to ensure that resources required to respond are in place, in turn ensuring that timely assistance reaches affected communities. This guideline will act as a reference document for all relevant stakeholders, plan prioritize and activate financial instruments on time—as soon as possible following a shock, or in the case of slow-onset disasters such as drought before communities are severely affected.

This guideline can be used by policymakers, humanitarian actors, and practitioners to harmonize sectoral disaster management plans such as disaster management strategies. On the implementation front, the guideline will enable ministries, authorities and other stakeholders to examine the financial instruments that allow the delivery of disaster risk management plans. This document highlights how and why a DRF strategy is critical in enhancing a government, institution and individual’s ability to respond effectively to crises.

A DRF strategy will also help the policymakers to formulate mechanisms for integrating disaster risk finance with other policy areas to help countries become more effective risk managers.

Importance of DRF strategy for Pacific Island countries

The economic cost of natural catastrophes has increased markedly for Pacific Island Countries (PICs). The average economic cost of disasters to PICs between 2018 and 2020 was USD 1.1 billion or nearly 5% of the combined GDP of PICs. The future trends of the economic impacts (total costs of climate change measured in percentage of GDP increase every year)[4] of climate change on the Pacific region as a whole under the models FUND3.6[5] and PAGE09[6] estimate costs ranging between 4.6% and 10.9% respectively by 2100. Depending on the economic scenarios, by 2100, the economic cost of disasters will range between 2.9% and 12.7% of the GDP.

Costs of inaction will be substantial for Pacific Island countries and will increase over time. The total value of infrastructure, buildings, and cash crops considered at some level of risk in the Pacific is estimated at over US$112 billion[7] . Inaction could therefore prove extremely costly and will only grow more expensive in the future (see table below for asset replacement costs and economic losses due to extreme events).

Well-designed DRF strategies can function as a prioritization tool for the allocation of scarce financial resources. Ensuring adequate funding to support relief, recovery, and reconstruction may play an important role in reducing catastrophe events' economic and social impacts. In the wake of a natural disaster, countries need to immediately access funds to rebuild damaged infrastructure and re-establish critical government services, but the immediate aftermath of a disaster is often when financial liquidity constraints are at their highest. The time gap between the occurrence of a natural disaster and access to funding can be costly, exacerbating poverty through impacts on health, mobility, and access to education. Timely assistance at the household level can greatly increase the impact and effectiveness of crisis response[8].

DRF can be a good investment from a fiscal point of view. Some extreme weather events may lead to an increase in government for a long duration after the event[9] . For low-income countries, climate disasters can lead to sovereign defaults and negatively impact their credit ratings[10]. Thus, more resilient countries can access capital at a cheaper price from the financial markets. This, in turn, affects the cost at which the private sector within the country can access capital[11].

A DRF strategy can maximize the utilization of the funding capacity to meet the spending needs that will materialize in the future. Risk financing helps strengthen the transparency, predictability, and effectiveness of spending while protecting the constrained fiscal space. Evidence shows[12] that when countries have a comprehensive disaster risk management (DRM) framework, including a disaster risk financing (DRF) component, the impact of direct damages and subsequent losses can be reduced.

4 (ADB, 2013)

5 (Tol, Richard, 2013)

6 (Hope, 2011)

7 (Pacific Catastrophe Risk Assessment and Financing Initiative, 2011)

8 (World Bank, 2021)

9 (Deryugina, 2017)

10 (IMF Working Paper, 2021)

11 (IMF Working Paper, 2012)

12 (World Bank, 2018)

Step 1: Inclusive National Approach

While the governments remain responsible for integrating disaster risk reduction in core social, economic and development planning, this also requires a change of behavior across all sectors and levels. Voluntary and collaborative relationships between various parties, both state and non-state concrete results and products measured against agreed outcomes.

The World Public Sector Report[13] underscored the importance of stakeholder engagement in the implementation of the 2030 Agenda for Sustainable Development.
The inclusion of a wide range of actors can help increase understanding, build capacities, and provide space for addressing different actor interests. Though the leadership for a DRF strategy must be from the Ministry of Finance, the decision around the choice of specific financing instruments as part of a DRF strategy should include input and consultations with multiple stakeholders. While governments are responsible for reducing loss of life, safeguarding property, and ensuring prosperity, other parts of society such as the private sector, civil society, academia, media, and other interests also need to be part of the conversation.

Decision-making should be delegated as closely as possible to where people are most affected which can help develop shared goals, coordinate action, and build on local knowledge. This can also help ensure that the needs of the most vulnerable, such as children, the disabled, the elderly, LGBTQ+, and women, with the least capacity to protect themselves are addressed. The inclusion of the private sector can allow them to develop solutions that target the needs of certain vulnerable segments of society. Similarly, civil society actors, who play an important role in humanitarian response, can bring forward the needs and considerations of different groups at the local levels.

- In the context of challenges around raising the adaptation finance, stakeholder participation have been presented as an opportunity to mobilise private sector finance to support adaptation[14]. The private sector can be activated as a as a tool for resourcing adaptation and for delivering privately provided adaptation goods and services to a wider community.

- Market-based development paradigms suggest that in mobilising the private sector, partnerships can offer a more sustainable model for implementing adaptation action, that does not rely on ongoing public or donor finance[15]

- The increasing recognition that the multidimensional challenges of climate change necessitate collaboration and communication across multiple sectors, scales and actors; partnerships at the core of a DRF strategy can enable developing integrated and holistic approaches to social challenges, that harness different actors' strengths, resources, knowledge and values to enable outcomes that single stakeholders could not achieve alone[16].

The implementing sovereign body or the designated government agency can build partnerships with various groups, including civil societies, business associations and individual private sector companies, and multi lateral agencies and development banks. Globally, the disaster management authorities have integrated the role of multiple stakeholders as part of overall strategy. There are significant 'value-add' that they bring to DRF.

13 (United Nations, 2018)

14 (Pauw, et al., 2018)

15 (Thorpe, 2018)

16 (Felix, 2015)

a. **Leverage civil society:** Establish partnerships with the community organisations, and facilitating the formation of a range of groups, including: community disaster management teams, water management committees, women's empowerment groups, farmer and business collectives. The local level consortiums can develop and implement the resilience initiatives. Effective partnerships can leverage the skills and local knowledge of partners, creating a bridge to local communities. For segments that require special attention, partnering with organisations that work with or represent people living with disabilities and other marginalised groups at community and national level can elevate their voices and promote inclusive approaches.

   An example of successful collaboration between international and national civil society actors in Vanuatu [17] that laid the foundation for effective collaboration in subsequent initiatives, including national scale emergency response.

b. **Engage private sector:** Engaging the private sector in resilience programming can result in improving the income (affordability) and market access to better financial instrumenst by the vulnerable communities. Partnership with private sector can enable to understand the gaps in demand and supply, and foster development of products and services with private sector providers on savings (pension) and insurance front. This engagement with the private sector is contributing to individual, community and small businesses capacity to absorb shocks.

c. **Collaboration with multilateral agencies and development banks:** The donors, multilateral agencies, and development banks are uniquely positioned to further advance the DRF strategy by integrating risk consideration in their own operations. These agencies have the opportunity to use their convening power to build strategic partnerships between governments, donor agencies, civil society, and the private sector. The range and reach of their services and programs provide incentives to proactively prevent and prepare for natural disasters.

   The scale, frequency and complexity of disasters as physical and social phenomena can only be addressed by deploying a wide range of knowledge, skills, methods and resources, both in development and emergency programming. This means that risk reduction initiatives must be multi-disciplinary partnerships involving a range of stakeholders. Such partnerships should be vertical (between national and local actors) and horizontal (between government, the private sector and civil society).

Implementing A Multistakeholder Partnership

To have a win-win association among the agencies, an understanding of stakeholder motivations, attitudes, and perceptions embedded in social norms and political economy is essential. When these stakeholder motivations lead to behaviors that undermine the public good, reformers within multiple partners must work together to champion change. These interventions succeed when those affected recognize that the benefits of change outweigh the costs of adopting new attitudes and behaviors.

17 (Oxfam Australia, 2016)

For the DRF implementing agency, some of the key considerations[18] while implementing the multistakeholder partnership involving different agencies.

a. **Stakeholder analysis.** Stakeholder analysis helps to identify the underlying interests of key stakeholders who have strong influence on the success of reform. These interests may be driven by external factors like social norms, culture, traditions, or rules established by government, the private sector, academia, and civil society organizations. They influence how transactions are dealt with, how resources are shared (or not), and what information is available to the public.

b. **Incentives for the partners.** Partnerships can fail if the interest of stakeholders and rules prevent the collective action needed. The implementation agency should predict the right incentives for which the stakeholders would tend to engage and support the change process. Strategic objectives cannot be achieved unless people are willing and able to learn new information, change long-standing attitudes, and adopt new practices.

c. **Adaptive leadership.** The stakeholders should be made aware that adaptive the problems at hand will require people to take proactive steps to discover solutions through individual and group action. Adaptive problems do not have ready-made solutions and there is no expert knowledge that can be uncovered. Rather, change agents will need to take action, mobilize support, and engage key stakeholders whose lives are affected by this problem.

d. **Negotiation.** Conflict is a natural consequence and indicator of progress, development, and change. It is neutral in how stakeholders, individually or collectively, manage their perception of incompatible goals. This will determine whether the conflict increases or decreases the prospect of reaching agreement. Conflict, therefore, can be a positive or a negative influence in reaching collective goals. The agency should manage the conflict to bring about positive engagement, while reducing the risk of hostile interactions, deadlocked positions, and destructive options.

e. **Strengthening capacities.** The implementing agency should undertake capacity assessment of the partners, especially private sector and civil society. Based on the the assessment, a combination of quick impact initiatives can be supported – such as a short training or workshop, or longer-term strategic initiatives which usually involve 'on-the-job' training throughout the various phases of the process. Multi lateral agencies and development banks as part of the strategy can play a vital role in enhancing the capacities of the stakeholders.

Key Takeaways:

Partnerships are at the core of sustainable and transformative change. Partnerships between governments, multi-lateral agencies, civil society, and the private sector is key to building resilience. Investment in these partnerships can deliver a positive impact, ensuring locally-relevant and innovative approaches to resilient development. Partnerships are most effective when they are grounded in a shared understanding of resilience, and future programs should invest more in strengthening the long-term capacity of local partners to advocate for change at the national level.

18 Adapted from ADB's "Negotiating Strategic Change" Framework

Step 2: Understand Disaster Risk

The foundation of effective disaster risk management (DRM) is information. The Sendai Framework [19] for Disaster Risk Reduction 2015–2030 identifies understanding disaster risk as one of its key priorities. For policy-makers, who may not be hazard specialists with an understanding of many of the concepts and issues related to the use of natural hazard information in country programming and project design. This will ensure that disaster risk is adequately addressed.

Natural Hazards and Climate Change

Natural hazards fall into two categories, reflecting their underlying natural causes:

(i) Geophysical hazards, such as earthquakes, tsunamis, and volcanic eruptions; and

(ii) Hydrometeorological hazards or extreme weather events, such as floods, drought, and tropical cyclones.

According to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)[20], Asia is anticipated to experience more frequent and intense heat waves and an increase in heavy rain events, both during monsoons and near the center of tropical cyclones making landfall, along with widespread issues related to water shortage. The IPCC expects major effects of climate change on Pacific Island countries to include sea-level rise, increased intensity and frequency of tropical cyclones, and more frequent extreme rainfall events.

Defining Risk Levels

A sound understanding of the underlying risk is fundamental to effective risk management. The stakeholders (including governments) who implicitly or explicitly bear the consequences if a risk materializes should collectively undertake a risk auditing process as the first step toward developing an effective risk management strategy.

Disaster risk[21]: The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined probabilistically as a function of hazard, exposure, vulnerability and capacity.

Hazard identification: A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards can be identified as a range of possible event types (perils) which include:

i. Shock events: rapid-onset events (for example tropical cyclones, floods, earthquakes)

ii. Strain events: slow-onset events (for example drought, pandemic)

Exposure: The location and characteristics of economic exposure (buildings, contents, crops, infrastructure, economic activity at risk of interruption) or human exposure (number and demographic of

19 (United Nations, 2015)

20 (IPCC, 2013)

12 (UNDRR, 2016)

people). The risk exposure can be defined in terms of its key characteristics:

i. Location
ii. Vulnerability
iii. Value

An example of exposure to commercial-type properties in a PICs should include information about:

1. The location of people
2. The location of assets (including residential property, business, and commercial properties, and infrastructure)
3. Key determinants of the vulnerability of people - including:
    a. Gender
    b. Age
    c. Proportion affected by disabilities
    d. Other vulnerable groups like the fishing communities, smallholder farmers, among others
4. Key asset characteristics, which inform their vulnerability – including
    a. Construction (dominant material used in constructing the building frame/structure)
    b. Occupancy (typical use of the building)
    c. Year built (captures building practices/regulation and deterioration)
    d. Number of stories
    e. Replacement value – in relation to assets, describes the cost to rebuild, including both the structure and value of contents
    f. Public utility infrastructure like electricity plant, or hospital

Vulnerability

It is defined as the degree of damage, or other forms of loss, as a result of the impact of the hazard. For example, vulnerability functions can convert a peak gust wind speed of 40m/s into average damage of 15% of the property's value for a given type of building, or be used to estimate the number of deaths and injuries.

Capacity

The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience.

Measuring Natural Hazard Risk

Measuring the risk is fundamental for developing a targeted risk management strategy[22]**.** Even though historical data is available to the governments, it is not enough to capture an accurate view of catastrophe

22 (GIZ, 2019)

risk simply because there have not been enough events to confidently quantify the likelihood and expected impact of future disasters. It is hence important to quantify the expected frequency and severity of impact from those perils, ideally using a probabilistic risk analysis. Probabilistic approaches, historically used by the insurance industry, can be leveraged to measure risk, and changes in risk over time, in villages, cities, and countries and for cost-benefit analyses of mitigation measures.

Catastrophe risk models [23] (or CAT models) quantify the risk of direct damage and loss to assets. Risk models allow a quantified understanding of the probability and severity of disaster impact using simulated events for thousands of possible years to capture the range and probability of catastrophes for a given set of exposure and hazard types. The CAT models can guide the stakeholders to quantify the limit of indemnity against disasters. Typically, insureds (like sovereign governments) buy to the 1-in-250-year return period, which is the generally accepted return period [24]. More conservative returns of 500 or 1,000 years also can be used.

Understanding the return period

The return period is an important concept when working with natural hazard information. It can appear as both a unit of analysis and a descriptor. For instance, hazard data for earthquakes labeled eq_500yr in the 2015 Global Assessment Report on Disaster Risk Reduction (GAR), describe the maximum probable earthquake intensity in a 500-year period for every location for which the dataset has coverage. In this case, the return period refers to the unit of analysis.

The second way in which the idea of return periods is used is to describe individual historical or potential natural hazard events. For example, a 100-year or a 1-in-100-year flood refers to a flood of an intensity that has a 1% likelihood of occurring in any given year. However, it is frequently understood to mean a flood of intensity that is likely to occur every 100 years. Over the very long term, however, they will occur once every 100 years on average and, hence, have a 1% probability of occurring in a given year. Having said that, it is possible to have two successive 100-year floods within two succeeding years, within 20 years of each other, or 150 or more years apart.

All models produce data in the form of tables. The below sample table [25] (Table 1) illustrates the expected losses to a particular exposure (like country, city or establishment) from various catastrophe events; thus, helping stakeholders to set acceptable program submits.

Return Period (in years)	Earthquake		Hurricane		Combined	
	AEP [26]	OEP [27]	AEP	OEP	AEP	OEP
1000	181,594,630	163,306,992	16,084,432	15,756,189	181,960,688	164,672,083

23 Computerized process that simulates potential catastrophic events based on historical events

24 (Marsh LLC, 2012)

25 (Marsh LLC, 2012)

26 AEP is the probability that the associated loss level will be exceeded by the aggregated losses in any given year, and is used when the insurance program is written on an aggregate basis

27 The OEP is the probability that the associated loss level will be exceeded by any event in any given year. It is used when the insurance program is written on an occurrence basis, or when the loss associated with one event is important.

500	142,713,867	134,761,313	11,884,434	11,520,877	140,748,670	134,730,931
250	134,742,676	134,729,905	8,531,243	8,220,634	132,177,226	129,272,979
100	102,406,446	99,082,900	5,253,313	5,023,187	101,873,595	98,582,031
AAL [28]	4,471,018	4,471,018	284,703	284,703	4,755,761	4,755,761
Standard Deviation	19,799,632	19,799,632	1,386,287	1,386,287	18,237,725	18,237,725

Table 1: Loss Summary - Post Deductible Loss (in USD)

As illustrated from the table, the expected loss from earthquake and hurricane for the 250-year return period is approximately USD 134.7 million and USD 8.5 million, respectively. The market practice in asset insurance relies on the aggregate exceedance probability (AEP) as compared to the occurrence exceedance probability (OEP).

The modeling results can help the stakeholders to design the program structure, as modeling can be performed on each layer [29] as well as the overall program. This allows the governments to analyze various options, such as reserves to be created that may be too costly or transferring risk via insurance.

Risk Assessment

Risk assessment is done by analyzing the potential frequency of hazard events and evaluating conditions of exposure/vulnerability that together could potentially harm exposed people, assets, and the environment. A risk assessment can be qualitative or quantitative. For example, the national all hazards risk assessment (AHRA) is a qualitative tool that will help identify, analyze, and prioritize a full range of potential threats. This type of tool can be completed relatively quickly and inexpensively. It was developed at a national scale and is invaluable for prioritization exercises.

A quantitative risk assessment is one that uses measurable, objective hazard, exposure/vulnerability and likelihood to calculate risk and consequence (i.e. damages or losses). The quantification of risk, although at times cumbersome, provides invaluable information for risk reduction through the provision of robust, transparent data for planning and decision making. The choice of assessment tool has direct connection to the overall objective of study. An insurance company underwriting micro or meso level cover would be interested in understanding of likelihood of damage and loss to a single unit or loaclised area only. Whereas, at the government or regional body level, the information available through assessment should help them prioritize the risk and expenditure of resources. A quick snapshot of hazard specific risk assessments is provided in the table below. The details action guidelines can be retrieved from United Nations Office for Disaster Risk Reduction's National Disaster Risk Assessment document.

28 AAL: Annual Average Loss

29 A term used in connection with insurance or reinsurance policies on larger risks or classes of risks whereby the risk or class is based in sections (layers).

Hazard	Assessment of Expected Losses
Earthquake	Probabilistic Seismic Hazard Model (PSHM) uses the location, size, and occurrence rate of earthquakes to estimate the frequency or probability of damaging or potentially damaging earthquake motions that may occur at a site.
Tsunami	Probabilistic Tsunami Hazard Assessment (PTHA) quantifies the probability of exceeding a specified inundation intensity at a given location within a given time interval.
Flood	Preliminary flood risk assessment (PFRA): PRFA uses approximated approaches to hazard and many times neglects vulnerability. PFRA helps to define priority areas for further characterization with advanced models using detailed information about topography, break lines and flood defenses.
Coastal Erosion	A risk assessment will typically be determined by combining the knowledge of the hazard, the elements at risk (e.g. built environment) and an understanding of the vulnerability of those elements. This vulnerability is often described by classes of damage, ranging from "no damage" through to "complete damage" (e.g. total destruction of an asset)
Tropical Cyclone	Tropical cyclone hazard assessment (TCHA): uses Australian observations and data to determine how quickly tropical cyclones dissipate after landfall. It further uses the latest scientific methods to create realistically sized simulated tropical cyclones, analysing both intensity and latitude leads to more authentic modelling of a cyclone's size over its lifetime.

Key Takeaways:

Data on hazards, exposures, vulnerabilities and losses enhance the accuracy of risk assessment, contributing to more effective measures to prevent, prepare for and financially manage disaster risk. Modern approaches to risk assessment include risk modelling, which came into being when computational resources became more powerful and available.

Step 3: Disaster Risk Finance

The Process of Developing a DRF Strategy

National and subnational development systems and processes in the Pacific Island Countries (PICs) need to ensure that future development is risk-informed. PICs are already pursuing various measures and interventions to increase climate resilience, reduce disaster risk, and strengthen mechanisms for disaster response and recovery.

A DRF strategy can enable national and provincial governments to improve coordination around disaster financing, enhance the institutional capacity of market players to respond to changing climate risks, and help various stakeholders understand the economic and fiscal risks of disasters. A DRF strategy is often led by the Ministry of Finance and will identify relevant financial instruments that can help identify the appropriate instruments, and help allocate resources for disaster risk management, including the optimization of the cost of public investment in disaster risk management.

A well-designed disaster risk financing tool can help the PICS with three important parameters: **cost, timeliness, and disbursal mechanism.** Reconstruction and recovery efforts after disasters reduce resources available for productive investment, further tighten limited government budgets, and create higher debt risk. Transferring such risks through available financial instruments can help reduce immediate pressures on public fiscal resources immediately after a disaster. Moreover, many ex-post disaster financing instruments like donor support, budget reallocation, international humanitarian aid, and external credit (emergency loans, bonds) can take anywhere between one to nine months to mobilise[30], with uncertainty in availability. Well-designed disaster risk financing instruments, backed by leading reinsurance and capital markets across the world, can provide additional predictability and timeliness for such funds. In most instances, national-level programs backed by "A"-rated markets have recovered claims between a 10 to 30-day period. And finally, certain DRF instruments, either indemnity or indexed-based, and part of international markets can help ensure a swift and transparent mechanism of claim disbursal for national governments.

Understand Disaster Risk Financing Instruments

This section highlights the various financial options available to countries to cope with disaster losses. Financial support may be needed by countries at different stages of a disaster event.

- **Ex-ante disaster financing (Pre-disaster):** Such type of finance is a pre-emptive action undertaken to minimize the potential economic losses before an event occurs. It reduces the potential for human, material, and environmental losses caused due to a disaster. This type of financing requires proactive planning and upfront investments.

- **Ex-post financing (Post-event):** Such type of finance is deployed after an event has occurred. These funds are mainly used to achieve rapid and sustainable recovery, rehabilitation, reconstruction, and development activities.

This next section explores a range of financial instruments and policy mechanisms along with the considerations around these instruments/mechanisms that can be used within a disaster risk finance strategy.

30 World Bank Technical contribution to G20: Sovereign climate and disaster risk pooling

Risk Reduction and Preparedness

Risk reduction are the investments that will reduce the risks that disasters cause. They are primarily used to finance investments that reduce risk in preparation for a disaster event but can also be used to finance reconstruction after a disaster event (where risk reduction is achieved by a commitment to 'build back better'). The risk reduction instruments can be categorized into bank loans, micro-credit, and bonds.

1. Bank Loans

Bank loans are one of the most common instruments for channeling capital into risk-reduction, and other types of, investments. Loans supporting investments that reduce risks are likely to be proportionally more effective at reducing risks from high-probability, low-severity events (annual or up to 1 in 10-year events); more extreme events are typically so devastating that risk-reduction investment is less effective[31]

Strategic Considerations around Loan Instruments

- Design: The key design characteristics influencing the nature of the loan are the amount advanced; the duration (tenor) of the loan; and the repayment schedule. Additional design considerations include loan securitization, that is, whether the loan is secured on the asset that it finances (or other collateral) such that the lender can claim the asset in the event that the borrower defaults; and the interest rate, and other pricing, charged on the loan.

- Challenges: if the borrower is unable to repay the loan, either because the asset does not perform or otherwise, then this can cause problems of indebtedness for the borrower and reduces the profitability of the financial institution, making it more reluctant to lend in the future.

Case-in-Point: EBRD Climadapt

The European Bank for Reconstruction and Development's (EBRD) ClimAdapt program in Tajikistan provides a good example of how loans, supported by an IFI credit line, can support risk reduction investment13. In this initiative, the EBRD, with the support of various donors, has advanced a $10m credit line to a selection of banks, who then provide loans to local businesses and households to invest in projects that reduce climate-related risks. At the time of writing, more than 3500 projects had been supported, with investments in water-efficient technologies, energy efficiency and sustainable land management practices.

2. Micro-Credit

Micro-credit involves the provision of relatively low-value, frequent repayment loans to individuals, households, SMEs, and communities. Micro-credit is typically provided by dedicated micro-finance institutions (MFIs) that are financed by commercial lenders and for-profit investors, multilateral and bilateral development banks, and donors.

31 (Lloyd of London, 2018)

Strategic Considerations around Micro-Credit

- Design: Microfinance loan is influenced by multiple design elements. These include whether the loans must be used for specific activities, the duration (tenor) of the loan, the interest rate charged, and the distribution channel. There is an increasing interest in using digital channels like mobile banking solutions to improve access to microcredit by lowering distribution costs.

- Challenges: There is an inconclusive correlation between to suggest the impact of micro finance on poverty or other development indicators; while there are also concerns about the potential indebtedness of consumers. On the other hand, microfinance (including microcredit) is associated with an enhanced ability of poor people to deal with shocks, but this is not universal[32]. In microcredit, the exposure is often capped for borrower, so loan assistance can be inadequate and may end up being used for consumption thereby leading to loan defaults

Case-in-Point: Jamaica PPCR

In Jamaica, the Pilot Program for Climate Resilience (PPCR), working through the Inter-American Development Bank, has underwritten microfinance loans extended to farmers and small enterprises in the tourism and agricultural sector16. These loans have, among other things, supported farmers in installing dams and grass and live vegetation barriers. However, even in cases where micro-credit is not explicitly targeted at investments that reduce climate risks, they can be an important tool to build livelihoods and assets that enhance broader adaptive capacity to climate risks15. The investments supported by micro-credit are most likely to be effective at reducing frequent, relatively low-intensity events.

3. Bonds

Bonds are issued by national and local governments, and other quasi-public organizations, as well as large companies, to finance investment. In exchange for the payment of the bond by the purchaser, the issuer agrees to pay the purchaser interest payments on a set schedule and repay the principal at maturity. As such, they are a form of debt instrument. Bonds are attractive to investors as low-risk securities, depending on the sponsor, that can be easily traded. Due to their expense, bonds are typically used for financing large-scale capital infrastructure, either supporting preparedness by reducing risks prior to an event, or for the less time-sensitive reconstruction of assets.

In recent years, there has been a significant growth in green bonds: bonds that are explicitly issued in order to finance projects that are environmentally sustainable or support the mitigation of or resilience to climate change. Climate Bonds Initiative reports that, as of 2018, there were around USD 1.45 trillionof bonds that claim links to addressing climate change, although less than 0.1% have an explicit focus on reducing risks to climate change[33]

Strategic Considerations around Bonds

- Design: A number of features define the specific characteristics of the bond. These include size; the use of proceeds; whether repayment will come from general sources (either corporate cashflow or tax revenues) or from the specific revenues generated by the financed asset(s); the duration of the bond; and the interest rate (coupon) that will be paid to investors.

32 (Rooyen, 2021)

33 (Climate Bonds, 2018)

For green bonds, the Green Bond Principles (GBP) provide voluntary process guidelines[34] to issuers for launching a credible Green Bond. The principles cover defining criteria for selecting green projects, the systems used to trace the green bond proceeds, and reporting guidelines. The principles also identify that issuers have the option to ask third parties to certify their green bond, using organizations such as the Climate Bonds Initiative. These organizations will assess the bonds against pre-agreed criteria, especially related to how the proceeds will be used. This increases the green credentials of a bond among investors but also increases transaction costs.

- Challenges: Bonds are expensive to structure, with transaction costs typically of 1% or more of the principal raised. Bonds take several months to structure. These costs and time increase further if the bond is certified. Bond issuance is typically regulated by the capital market authorities in the country where the bond is issued. Prudential regulation is required for investor protection and avoiding systemic risks, by identifying principles for, for example, issuance standards or trading norms.

Risk Retention

Risk-retention instruments are pre-arranged mechanisms that provide risk holders access to capital, where funds are sourced either from their own reserves or external capital that they are responsible for repaying. The resources provided through these instruments come from those affected by the disaster.
Reserves are suitable to finance low-severity, high- frequency events.

1. Budget Contingencies:

A budget contingency is a risk retention mechanism whereby a certain proportion of revenues within a budget are set aside for dealing with contingencies. These contingencies may be either explicitly defined or, more commonly, are simply left available to be used for undefined 'exceptional events'. The instrument is most typically used by, national or municipal governments but, in principle, could be used by any organization or household that face significant risks. In the case of governments, budget contingencies typically amount to 2-5% of the annual government budget[35].

The advantage of budget contingencies as compared to other risk retention or risk transfer mechanism is the low cost associated with the instrument, they are a relatively low-cost, flexible instrument for risk holders to manage their risks, and access to funds almost as soon as they are needed[36]. The main cost is the opportunity cost of the activities that are not supported because the money is being held as a contingency. This flexibility, combined with the fact that they are unlikely to be able to provide large sums of capital, means that they are best placed for dealing with the immediate, response costs during and following a disaster event, and for high-frequency, low-damage events (i.e. events that, on average, happen every 2 or 3 years)

Strategic Considerations around Budget Contingencies

- Design: The key design options relate to how much funding is placed in the contingency and whether there are any formal rules determining whether the funding can be accessed or how it can be spent.

- Challenges: The flexibility of the instrument is both its biggest advantage, but also its biggest disadvantage. As the arrangement is voluntary, it can be politically difficult for large sums of

34 (ICMA, 2021)

35 (World Bank, 2010)

36 Although this depends somewhat on the budget and spending rules of a jurisdiction; if these are cumbersome, it may take longer before budget contingency can be released. Ghesquierre and Mahul (2012) suggest that it can take up to nine months after an event to access resources from a budget contingency.

money to be placed in a contingency budget, and it can be politically tempting for governments to use whatever funding is placed in a contingency for other, non-disaster-related reasons.

Case-in-Point: National Budgets

A number of governments have budget contingencies in place including Japan, Vietnam, Indonesia, and Colombia. For example, in Vietnam, under the State Budget Law of 2002, Central and Local governments are required to allocate between 2 percent and 5 percent from their total planned budget for capital and recurrent expenditures to contingency budgets. However, these contingencies are not explicitly linked to disasters. This has led to situations where the country has experienced a major cyclone hit the country in November, but when the contingency budget had already been fully exhausted.

2. Reserve Funds

Reserves are annual budgetary allocations made by the government to respond to any disaster faced by the respective country. The difference between budget contingency and reserve funds is that the money that latter provides more formality concerning how the money can be accessed and where it can be spent. In Reserve funds, the money is transferred into a reserve account outside of the budget and the transfer of resources to the fund is recognized as a spending line in the budget. In addition, funds are typically not then transferred back to the budget if unspent in that year. Since reserves are majorly sourced from public funds, it allows the government the flexibility to manage the fund in conciliation with national objectives and national disaster legislation. These funds have low operational costs and are readily available in case of any emergency. However, the benefits come with the opportunity costs of holding public funds in low-interest-bearing accounts[37].

Reserve funds can be set up by national, city, or local governments. Informal reserving mechanisms can also support smaller-scale risk holders, at the individual and community levels. For example, the FAO has supported the establishment of Community Contingency Funds[38] whereby communities pay into a fund that then helps vulnerable households following an unexpected event such as drought, hurricane, flood earthquake, or other extreme events. Funds can be accessed, typically in the form of low-interest loans, for households too, for example, purchase supplies for the new agricultural season in the event of crop losses. In these cases, donors and international organizations might also support the setup or capitalization of such funds.

Strategic Considerations around Reserve Funds

- Design: most important design issues to consider in relation to a reserve fund: who should place how much money in the fund (and with what level of discretion); what determines whether the money can be accessed; and the rules governing what the money in the reserve fund can be spent on.

- Challenges: While reserve funds may provide more predictable funding than budget contingencies, it still remains politically challenging to allocate substantial funds to a reserve fund. They, therefore, remain better suited for providing capital to deal with relatively frequent, low-intensity events.

37 Invalid source specified

38 (FAO, 2014)

Local and Nation Level Reserve Funds

In the Philippines, cities are required under legislation to set up Local Disaster Risk Reduction and Management Funds (LDRRMF), which are the principal source of funding for all disaster risk events36. Cities are required to allocate at least 5% of their budget to these funds. 30% of the collected resources are allocated to a Quick Response Fund for past disaster financial liquidity, which is made available upon the declaration of a state of calamity at a local (city or higher) or national level by the relevant body. The remaining 70% is placed into a Mitigation Fund for prevention, response and recovery activities. Any unspent balances at the end of the year transferred to a Special Trust Fund for the sole purpose of funding disaster risk reduction.

Mexico's disaster fund, FONDEN, provides a further example of a reserve fund operating at a national level: this receives annual budget appropriations of around $800m per annum and covers 50% of the costs of reconstruction after disaster events.

3. Contingent Loan

Contingent finance includes pre-arranged loans or credit lines that are disbursed if the disaster's severity meets or exceeds a certain threshold (trigger). They are arranged ex-ante but disbursed quickly after the trigger occurs, providing instant liquidity to the disaster-stricken nation till the time other sources are mobilized. A typical trigger includes a declaration of a state of emergency by the nation. However, such finance comes along with annual upfront fees and interest payments. The ADB's Contingent Disaster Financing (CDF) provides a quick and flexible source of funds for developing member countries affected by disasters until funds from other sources become available.

Faster access to funds makes this instrument well suited to dealing with the immediate increases in costs, and liquidity challenges after the onset of a disaster. Reflecting this, analytical work suggests that they are typically well suited for 'medium' risks, in other words, risks with a relatively low impact but which happen quite frequently, perhaps once every five years or so.

Strategic Considerations around Contingent Loans

- Design: There are two main variants of contingent loans - soft trigger and hard trigger loans. A soft trigger is a subjective trigger mechanism whereby the sovereign government can determine whether or not an event in sufficiently severe to justify the loan being accessed – practically this is achieved by making the trigger the declaration of a state of emergency. A hard trigger is a parametric trigger, for example, relating to the wind speed of a tropical cyclone. Other design features include how much capital should be available to each country; the interest rate and other pricing conditions at which the loan will be made available; and the drawdown period (the period of time over which the loan can be drawn down).

- Challenges: Potential borrowers were sometimes reluctant to take out contingent loan products because of a fear that this would indicate they were vulnerable to the impacts of a disaster (especially compared to peer countries). The evaluation found this problem was exacerbated for products that had standby fees included and in cases where there was some uncertainty about whether the loan will actually be made available.

Case-in-Point: World Banks' CAT DDO

Catastrophe Deferred Draw Down Option (CAT-DDO), is a World Bank-linked contingent credit line. Under it, borrowers' countries can secure immediate access to financing up to US$500 million or 0.25% of GDP (whichever is less). For instance, Columbia has proactively used CAT DDOs as a part of the disaster risk management strategy. Cat DDO I was disbursed in 2011 during the La Niña 2010-11 phenomenon; Cat DDO II was disbursed in 2020 at the onset of the COVID-19 pandemic and CAT DDO III was approved in December 2017 to mitigate the disease outbreak. To date, many countries such as Costa Rica, the Dominican Republic, El Salvador, Guatemala, Kenya, Panama, Peru, Philippines, Romania, Serbia, Seychelles, Sri Lanka, etc

Risk Transfer Instruments

The risk transfer instruments place the obligation for providing (a certain amount of) capital in the event of a disaster onto third parties. The capital provider will receive a payment in exchange for accepting this risk.

1. Micro-Insurance (Including Agriculture Insurance)

Microinsurance is the provision of insurance to transfer risks associated with disasters from poor and vulnerable households who would otherwise not have access to insurance. Coverage and premium payments are, by design, low, with insurance payments intended to pay out for losses of life and property. Within the larger ecosystem of micro insurance for assets are agriculture insurance, livestock insurance and insurance of rural assets.

Strategic Considerations around Micro-Insurance

- Design: A key distinction is between products that have an indemnity trigger and those with a parametric trigger. Parametric triggers have become popular in many developing world contexts as they avoid costly assessments of losses. Indemnity triggers may be based on either yield or revenue losses. As with other forms of insurance, the type of trigger determines the speed of payout and hence the disaster risk financing phase to which they are best suited. Parametric triggers can pay out in less than 2 months, making them suitable to covering the response phase of a disaster; whereas indemnity schemes may take around 6 months to pay out but may be better for longer term asset acquisition.

- Challenges: A key challenge is whether premia are affordable for those targeted by the scheme as, relative to the ability to pay of typical customers, scheme set up and operation costs can be high. To address this challenge, donor and/or public funding may be made available. While parametric triggers are better suited to many developing world contexts, trigger design can be complicated, and basis risk substantial, if granular meteorological information is not available.

  Both parametric and indemnity products are relatively expensive[39]. One of the most significant is the cost associated with the products which may make them prohibitive, especially for individuals and households where distribution channels and intense marketing efforts may be required. These costs may be exacerbated by a lack of data, which makes it harder to price risks, and a lack of understanding/mistrust among potential consumers on the role and efficacy of the product[40].

39 (World Bank, 2010)

40 Invalid Source Specified

Quantifying Basis Risk

Parametric insurance is most commonly associated with basis risk. To quantify basis risk, it is first necessary to identify the primary sources of uncertainty with respect to each structure. Once identified, basis risk can often be quantified and communicated to the purchaser.

A range of methods have been developed to assess basis risk in parametric structures, these can also be applied in modelled loss and indemnity cover. Catastrophe models provide a useful tool for the assessment of basis risk. A simple assessment of the correlation between the modeled parametric index and indemnity loss can uncover if a trigger mechanism tends towards shortfall (no payout when expected) or overpayment (payout when not expected). Calculation of shortfall and overpayment with respect to a target covered layer can be done using the following equations – the process of basis risk calculation and trigger refinement is fundamental to the design of appropriate parametric instruments.

$$\textbf{Overpayment} = \left[\frac{\textbf{Loss}_{\text{Index}} - \textbf{Loss}_{\text{Indemnity}}}{\textbf{Exhaustion} - \textbf{Attachment}} \,,\ \textbf{0\%}\,,\textbf{100\%} \right]$$

$$\textbf{Shortfall} = \left[\frac{\textbf{Loss}_{\text{Indemnity}} - \textbf{Loss}_{\text{Index}}}{\textbf{Exhaustion} - \textbf{Attachment}} \,,\ \textbf{0\%}\,,\textbf{100\%} \right]$$

With the basis risk appropriately understood, the structure can then be tailored to modify the expectation as appropriate.

2. Catastrophe Bonds

Catastrophe (or CAT) bonds are short-term bonds (3–5 years) issued by a sponsor to investors in the capital markets. In contrast to normal bonds, they are 'triggered' by a catastrophe. Once triggered, the bond sponsor maintains a portion of the principal and consequently investors lose a portion of principal and interest payments. In this way, they transfer natural catastrophe risk to investors. The bond issuer can be a state (macro) or large enterprise (meso). Insurers, reserve funds, or risk pools can also issue catastrophe bonds, as an alternative to purchasing reinsurance, to lessen their risk exposures.

Another version of a CAT bond is a resilience bond. This is similar to a cat bond except that if risk reduction investments are undertaken, interest rates on the bond would fall to reflect the risk reduction[41].The anticipated benefit from interest rate reduction can help the financing of the risk-reduction investment. However, this is a complicated instrument as there are no reliable estimates from modeling agencies on the quantum of risk reduction. As yet, there are no examples of this instrument reaching the market

Strategic Considerations around Micro-Insurance

- A critical design consideration is whether the trigger mechanism should be indemnity-based or parametric. This has the same trade-offs between speed and basis risk identified for other

41 This would be easier to implement with an indemnity-based trigger mechanism

other instruments and accordingly, means that cat bonds can either be used to cover near-term response costs or longer-term reconstruction efforts. Other design questions include the size (value) of the issuance and the coupon on the bond.

- Challenges: Catastrophe bonds are relatively expensive risk transfer instruments: previous work suggest they may cost more than two times their expected pay out [42] . This reflects both that structuring and issuance cost of these bonds are more expensive [43] than for other bonds and because they tend to require relatively high interest rates to generate investor interest.

Case-in-Point: IBRD Supported CAT-Bonds

With support from the World Bank, Mexico, Peru, Chile, and Colombia all issued CAT bonds for earthquake risk in 2018. Collectively, these bonds had a value of around $1360m and with coupons of between 2.5% and 8.25% depending on the risk. They were all designed with tier structures, with the proportion of the principal that investors lost in the event of an earthquake, varying in discrete steps depending on the severity of the earthquake – for example in Peru the payout amounts were set at 30%, 70% or 100% of the bond principal.

3. Risk Pools

Through sovereign catastrophe risk pools, countries may pool risk in a diversified portfolio, retain some of the risks, and transfer excess risk to the reinsurance and capital markets. Since the likelihood of a major disaster afflicting several countries within the same year is low, diversification or "geographically spreading the risk" among participating countries creates a more stable and less capital-intensive portfolio. Hence, sovereign risk pools are therefore less expensive to reinsure.

Risk pools are better suited for the less frequent, high-severity events where relatively larger amounts of response costs need to be covered (which it will be more difficult for risk retention mechanisms to reliably provide) and where the economic and welfare costs of not having access to these resources will be very damaging. Risk pools typically use parametric triggers, allowing pay-out within 1–2 weeks, making them suitable instruments for providing liquidity during the response phase of a disaster

Strategic Considerations around Risk Pool

- Design: The parametric trigger needs to be designed carefully to avoid excessive basis risk. Other key design features include which products the pool should offer and the limits of retained risks versus transferring them to reinsurance markets or through the purchase of cat bonds/reinsurance.

- Challenges: Risk pools face the same types of challenges as other forms of insurance, namely that the premium costs may be too high, and not justifiable (given the risks they are expressed to) for potential members.

42 (World Bank, 2016)

43 Artemis report that average coupon returns range from 3% to 6%, but can sometimes be as high as 15% or higher

Innovation in Trigger-Based Mechanism

For risk retention and transfer instruments, a key design option is a mechanism by which the funds are accessed and distributed. The 'trigger mechanism' determines whether, and the volume of funds that are released from a DRF instrument for a given event. Conventionally, trigger mechanisms developed in the private markets have been responsive – they measure what has happened and make an appropriate payout. However, in a humanitarian context, the potential value of delivering funds prior to impact has spurred innovation in trigger design.

The need for rapid funding has led rise to an innovative form of DRF called Forecast-based Finance (FbF), enables anticipatory actions for disaster mitigation at the community and government level using credible seasonal and weather forecasts. FbF is deployed before the disaster/event is triggered based on the available climate/weather information, meteorological forecasts, and risk analysis. The FbF instruments are based on the anticipatory trigger mechanisms (like forecast data) combined with pre-arranged response plans, to deliver funds for particular activities prior to the main impact.

The information on forecast data and the potential severity of disaster impact are combined with pre-arranged response plans, to deliver funds for particular activities prior to the main impact. The upside of FbF a small injection of capital received before an event if placed in the hands of local responders, can support preparation and response activities that significantly reduce the eventual severity of impact.

Strategic Considerations around FbF

- Uncertainty & Flexibility: There are inherent uncertainties in the approach of using forecasts to trigger funding. Disaster events are a function of many complex interrelated factors, any one of which can make the difference between the event unfolding into a minor or major catastrophe. However, given that relatively small capital injections can have a profound impact on mitigating the overall severity of the disaster, the risks of this approach can be measured against the potential benefit. These uncertainties can be tackled through advances in forecasting and risk modeling techniques, and continuous improvements in trigger design and instrument mechanics.

- Shock and strain:
  - For **rapid-onset weather events** including typhoons, floods, and convective storms, climate variability means that forecasts may only provide actionable guidance shortly before impact (hours-days).
  - For slow-onset weather events it is important to define payout thresholds. The decision process should be strongly informed by risk modeling, and attention should be given to considering model and measurement uncertainty, as well as forecast skills.

- Delivery: The speed of forecast-based payouts should therefore be matched by the capacity of the recipient to use the funding efficiently and effectively. Clear disbarment mechanisms and spending plans are therefore fundamental to supporting forecast-based payouts in particular.

In the year 2017, the International Federation of Red Cross and Red Crescent Societies (IFRC) extended the scope of the Disaster relief emergency fund (DREF) by introducing Forecast based action (FbA) as a new and sustainable financial mechanism highlighting the growing emphasis on anticipation rather than reaction. National societies work with the government, meteorological agencies, and other stakeholders to define triggers and appropriate action that will be taken against each trigger. Funding is automatically released when the pre-defined triggers are met and action plans are implemented

International Emergency Financing

External finance for disaster risk[44] includes the grants, loans (credit), and other outside support that governments and their partners use to manage disaster risk. Some external risk finance—such as contingent credit—can be arranged ex-ante. For the purposes of this overview, external financial arrangements are only considered ex-ante finance if the government or humanitarian partner must make payments (such as standby fees) before an event occurs

Nonetheless, the impact of debt servicing on growth and economic stability are real, and governments must carefully weigh the extent to which external CDRF will help them reach their long-term resilience and fiscal goals. Ex-post financing may come at an increased cost (compared to ex-ante or non-emergency credit), and traditional post-disaster financing arrangements and practices are inefficient (in terms of cost and timeliness)

One such mechanism is ADB's Asia Pacific Disaster Response Fund is a special fund established in 2009 to provide fast-tracked grants to developing member countries (DMCs) for life-saving purposes in the immediate aftermath of major disasters triggered by a natural-hazards. The fund provides quick disbursing grants to assist DMCs meet immediate expenses to restore life-saving services to affected populations following a disaster and to augment aid provided by other donors in times of crisis.

Strategic Considerations around Emergency Financing

- Design: There are various modalities of externally sourced emergency finance in addition to ad hoc donor aid that can be arranged and disbursed during or after a disaster event. Administrative requirements vary and the level of contingent credit or grant amounts available will in some cases depend on eligibility pre-conditions and/or the severity of the disaster event.

- Challenges: The impact of debt servicing on growth and economic stability must carefully weigh the extent to which external aid will help them reach their long-term resilience and fiscal goals. Ex-post financing comes at an increased cost (compared to ex-ante or non-emergency credit), and traditional post-disaster financing arrangements and practices are inefficient (in terms of cost and timeliness)

Case-in-Point: Asia-Pacific Disaster Response Fund Grants and COVID-19

In order to support national health sector responses and prevent the spread of COVID-19, ADB allocated USD1.53m in small grants through the APDRF in March 2020. Small grants of USD0.3-0.4m were secured by the Federated States of Micronesia, Marshall Islands, Nauru, Tonga and Tuvalu. In each case, a state of emergency had been declared and funding was used to enhance preventative measures in partnership with Ministries of Health.

Budget Reallocation and Realignment

When contingency funds are lacking, the government can also reallocate in-year budget lines ex-post to manage the impacts of an event. These reallocated funds may be directed to the contingency fund or disbursed directly to the relevant ministry. In the years following an event, the government budget can be realigned to prioritize reconstruction, although these realignments may be insufficient and have a high opportunity cost. Budgets may also be cut, as necessary, particularly if government revenue is expected to be impacted by the event.

44 (UNCDF, 2021)

Step 4: Strengthen the Enabling Environment

Sound leadership and a strong commitment to quality data and knowledge are often fundamental to a DRF strategy. A DRF strategy is a core element of a larger disaster risk management planning process aimed at building the resilience of PICs to various types of shocks and stresses. Any DRF strategy thus will need to build on the core foundations of good governance central to policy formulation and implementation. The strategy should ensure that it helps build resilience and well-being of people, especially those that are on the frontlines of disaster impacts. Presence of platforms where different actors can share views and learn from each other with respect to the DRF will be critical to its success.

The planning process for a DRF strategy must build on and coordinate with existing national and sectoral development, adaptation, and disaster risk reduction institutions and planning processes already underway in each country. Establishing such enabling conditions for DRF requires political will from the highest levels as well as demands for effective results from civil society. A DRF strategy needs to harmonize sectoral disaster management plans and the efforts to implement disaster risk reduction and climate change adaptation at the local levels, with those at the central government's level. It also needs to ensure the flow of information and resources between central government ministries, sectoral ministries, and local governments, and meet their demands for financial, human, and technological resources.

Core principles that can provide a framework for evaluating policy decisions and financial instruments:

- Timeliness of funding
- Disbursement of funds
- Disaster risk layering
- Data and analytics

Timeliness of Funding:

When disaster strikes, the priority is to quickly deploy disaster recovery teams and resources in affected areas and save lives. Budgetary allocations and discretionary expenses may not be sufficient in extreme disaster events. This increases country's reliance on external aid, which is inconsistent and not immediate. After a disaster occurs, the nature and purpose of funds required to recover and rehabilitate vary. The short-term goal is to provide 'Relief' to the affected and create safe spaces. In the medium term, the focus is on the 'Rehabilitation' of the affected lives and infrastructure. In the long term, the focus is on 'Reconstruction' to build back better. Across these stages of disaster recovery, governments require financing in different forms.

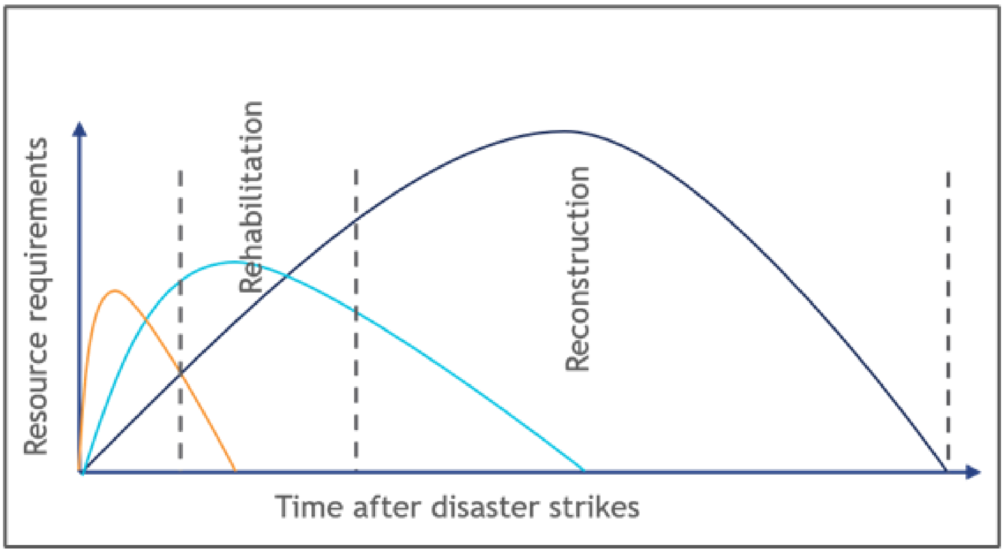

Figure 1: Post-disaster funding needs in a country

Disbursement of Funds:

Governments should deploy dedicated mechanisms and expertise to effectively allocate, disburse, and monitor recovery and reconstruction funds. Strong collaboration between the Ministry of Finance and the public entity tasked with spending post-disaster funds—such as local governments or agencies that maintain public infrastructure is critical for the success of DRF strategy. In addition, the disbursement system must balance policymakers' concern for fast disbursement with the transparency and accountability required by the public and donors.

Disaster Risk Layering

A layered approach not only allows the development of strategies and financial tools ex-ante, but also the protection of the government's budget through a better understanding of future financial needs related to potential disasters. Risk layering ensures that cheaper sources of money are used first and that the most expensive instruments are used only in exceptional circumstances. A layered approach to DRF using different financial instruments to bridge financial gaps identified according to the country's risk profile.

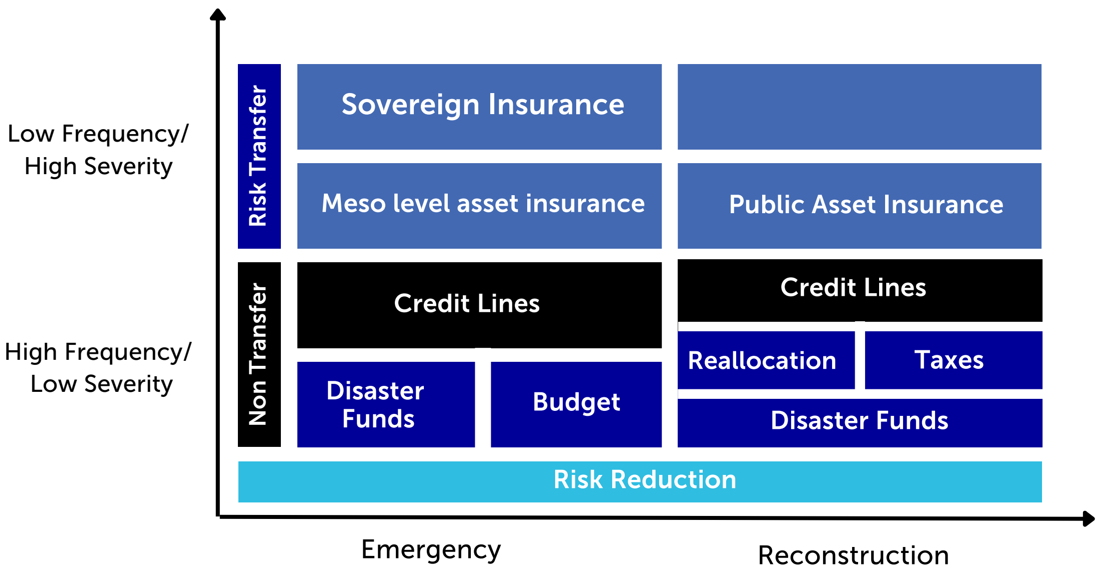

Figure 2: Layered DRF Approach

Use of Data and Analytics

Financial analysis of risk data and quantitative evidence empowers governments to take risk-informed decisions regarding their financial protection against disasters. Sound decision making requires actuarial analysis and tools to help governments understand and evaluate alternative financial instruments and strategies; user-friendly interfaces to bridge the gap between policy makers and underlying technical models; and quantitative analysis to leverage financial markets and private sector solutions.

Evaluating Insurance Market's Capabilities

This section provides an overview of the capabilities of insurance regulators and market players to implement insurance-based DRF instruments.

Regulatory (Ecosystem)-Level Readiness to Support DRF

A wide range of laws, regulations, and policies are needed to facilitate the deployment of insurance sector capacities – tax law, procurement and contractual law, commercial law, and budget-setting policies, amongst others. While insurance regulation is only a part of this broader ecosystem, it rests nevertheless at its center. As a starting point, regulators and supervisors must first examine the existing laws outlining their role, authority, mandate, powers, and responsibilities. The regulatory maturity of a country can be gauged/improved by focusing on below dimensions[45]:

- Regulatory certainty: A stable regulatory regime is a key success factor for ensuring that efforts to implement the DRF instruments effectively. Uncertainty on what rules, in terms of definition and application will create friction between stakeholders.

- Capacity to help coordinate responses: Insurance supervisors should have the ability to coordinate responses with the industry, government, and other key actors at the political and technical level to bring certainty and security to the market. Insurance regulators can play a leading role in bringing various parties together to make the best out of the diverse array of expertise and know-how.

- Cooperation role with governments and other regulators: The regulators and supervisors need to be part of the solution, not only in multi-stakeholder partnerships within the country but also in coordination with stakeholders (reinsurers, brokers, and multi-lateral agencies) at the regional and global level. It is important that such initiatives have a clear, strong push at the political level and that supervisors at all levels are part of the equation.

- Combining micro with macro-objectives: The regulator should be able to cater to disaster resilience at multiple levels in a joined-up manner whereby initiatives at the sovereign and sub-sovereign levels are complemented with initiatives at the regional, cross-country, and individual levels. As governments typically prioritize macro considerations (e.g. financial stability), insurance supervisors' tendency to focus on other dimensions (e.g. micro level, policyholder protection, competition) uniquely positions them to be at the center of a robust framework to combine both macro and micro realities.

Effective regulation should be able to provide relevant opportunities to leverage disaster risk finance to increase insurance penetration. When insurers align risk, service, and trust, the reputation of and confidence in the insurance sector is enhanced. Implementation of DRF presents a window of opportunity for supervisors to implement effective regulation and restore trust in business. When the perception and understanding of the role of insurance are increased, renewed confidence can catalyze other initiatives such as microinsurance.

45 (a2ii, 2017)

Institutional Strength to Support DRF

DRF instruments (especially catering to high-severity events) mean steep exposure levels for risk-takers (insurance providers). An insurer offering DRF instrument, face a variety of risks that can impact the financial position of the business. These risks include market or asset risk, insurance or underwriting risk, credit risk, operational risk, and group risk.

The framework for classifying the KPIs for the assessment of prudential risks relates the CARAMELS assessment framework[46] to the risks facing insurers

Broad Area of Assessment	Area of Assessment	Short Description
Financial Soundness (Solvency)	Capital Adequacy	Sufficiency of capital given the risks undertaken by the insurer
	Asset Quality	Asset quality and diversification, and suitability of assets for the liabilities of the insurer
	Reinsurance	Suitability of the level and type of reinsurance for the business written, including exposure to catastrophes
	Actuarial liabilities (separately for nonlife and life business)	Sufficiency of technical provisions or actuarial liabilities
Governance, Risk, Management and Operations	Management Soundness	Fit and proper persons, sound corporate governance practices, effective risk management and controls, as well as suitable organizational structure and operational efficiency
Financial Performance and Management	Earnings and Business Volumes (Separately for Non-Life and Life Business	Sustainability and stability of profitability
	Liquidity	Investment portfolio liquidity and profile of asset cashflows relative to liability cashflows

46 (a2ii, 2021)

Group Issues	Subsidiaries and related parties	Relationships between parent company and related parties, and transfer of funds between related parties

Table 4: Framework for assessment of prudential issues for insurers

Human Rights-Based Approach to Developing and Implementing A DRF Strategy

Climate change impacts on human rights can be direct with loss of life, shelter, habitat, and sources of livelihood. The strongest impacts of climate change and disasters are expected in countries where people are the most vulnerable, have the least capacity to adapt, and have contributed the least to the causes of climate change due to factors such as geography, poverty, gender, age, indigenous or minority status, and disability[47]. A clean, healthy, and functional environment is integral to the enjoyment of human rights, such as the rights to life, health, food, and an adequate standard of living. Climate change impacts and disasters can negatively affect the realization and enjoyment of a variety of human rights and they will increasingly do so in the future.

It is in fact the most pervasive threat to the natural environment and human rights. United Nations agencies and national governments have explicitly acknowledged the link between the potential denial of human rights due to the impacts of climate change and extreme events for example (HRC 2022[48], OHCHR 2009[49], OHCHR 2018[50], OHCHR 2013[51], OHCHR 2022[52], Paris Agreement 2015[53]). And it can also be indirect due to climate displacement, conflict, and the denial of economic and non-economic rights related to livelihoods, education, and health.

A human rights-based approach can ensure that the most vulnerable members of society (such as the poorest members of communities) benefit from DRF-related schemes. In 2018, Germanwatch developed a framework for setting up climate risk insurance schemes that protect and promote human rights and recognize people as individual holders of human rights and states and businesses as bearers of duties[54]. These guiding principles can be applied to all PICs countries as they develop their specific DRF strategies:

i. **Non-discrimination and equality:** Disaster risk financing instruments and activities seek to protect and promote the rights of all people, regardless of origin, age, sex, mental or physical health, ethnic or religious affiliation, sexual orientation, or any other such status. Inequalities, exclusion, and discriminatory practices are analyzed and taken into account during the development, implementation, and evaluation of such instruments and activities. Equal access to the development, implementation and evaluation process of the instruments and activities is ensured for all rights holders

ii. **Participation and empowerment:** Active, informed, meaningful, and inclusive participation of all rights holders and empowerment of the affected people is ensured during the development, implementation, and evaluation of any DRF instrument and activity.

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53 (United Nations, 2015)

54 Invalid source specified

iii. **Transparency:** Individuals and communities are adequately informed about DRF instruments, activities and their potential impacts. They are informed of meaningful and effective opportunities to participate in decisions on how these activities will be developed, implemented, and evaluated.

iv. **Accountability:** Disaster risk financing instruments and activities need to incorporate accessible and adequate compliance mechanisms and procedures for rights holders, should the instruments and activities cause social or environmental harm.

v. **Do Not Harm:** Disaster risk financing instruments and activities should include mechanisms to anticipate, avoid, or minimize unacceptable harm to communities or ecosystems. The development, implementation, and evaluation processes of such instruments and activities need to respect and build on existing structures and knowledge, such as traditional risk management and indigenous and local knowledge.

Role of Public Finance Management

Pacific Island countries are exposed to a range of hydro-metrological, geological, and health-related hazards. Climate change is also set to increase the frequency and severity of hydrological extreme events, raise sea levels, and disrupt existing weather patterns. These disasters will create huge challenges for PICs, increasing the vulnerabilities of their people and ecosystems, and creating tremendous pressures on national public finance management (PFM) systems through the creation of immediate demands for funds on the public exchequers, and by disrupting the normal operations of governments.

Disaster Resilience

When Hurricane Maria hit Dominica in 2017, it destroyed over 90 percent of the country's infrastructure. Electricity and communications networks were down for months. Losses and damage amounted to 226 percent of Dominica's GDP. The staff at the Ministry of Finance later reported that their public financial management (PFM) practices—while appropriate during normal operating times—were ill-suited for disasters.

Well Public finance management provide guidance for governments, regulators and relevant authorities to resilient and responvice against the climate-related losses and damages through:

a. Identifying and assessing climate related risks, and financial vulnerabilities, and financial implications for government;

b. Reporting climate-related fiscal risks to promote transparency in public financial management;

c. Promoting, investing, and financing risk prevention, risk reduction and adaptation to reduce exposure and vulnerability;

d. Protecting households and businesses through insurance and access to credit;

e. Aligning incentives across levels of government by encouraging active risk management;

f. Ensuring clarity in public financial assistance arrangements for households and businesses to mitigate future financial losses;

g. Assessing budgetary capacities to fund relief, recovery, and reconstruction, including through budget reallocation

h. Assessing debt market borrowing capacities, including speed of access; and,

i. Optimising financial tools under budgetary and financing constraints, within integrated frameworks of disaster risk management and reduction.

Building resilience towards such shocks and stresses requires a robust adaptation and disaster risk management strategy. The efficacy of such strategies however will depend on the maturity of the public financial management of the country. Ministries of Finance hold significant levers for accelerating climate action, but many are not being fully utilized[55]. To step up, Ministries of Finance need to look for opportunities to mainstream climate action within their core functions and to enhance their capabilities to act. This way, they can help ensure climate action is synonymous with sound economic policy.

To enhance these core functions, it is equally important that Ministries of Finance build their capability to act on the aspects[56] of:

a. Leadership capability: strengthening the range of champions for climate action at the political and officials level, strengthening the Ministry's vision, mission and mandate to drive climate action, and creating clear responsibilities and organizational structures for climate leadership.

b. Coordination capability:

    i. National level coordination: driving effective collaboration across government and with the private sector, civil society and international financial institutions, and multilateral platforms and processes supported by effective strategies for consultation and communication.

    ii. Inter-governmental relations. Due to the cross-sector nature of disaster risks and their management, the national level agencies may not be in a position to tackle the often-complex public finance regimes of funding into disaster risk reduction measures. On the other hand, governments with mature DRF strategy can lend guidance on good transparency and accountability in their spending often enjoy advantages in tracking, evaluating, and potentially redirecting funding for different disaster risk reduction measures.

c. Human and analytical capability: ensuring dedicated staffing resources for climate action, upgrading expertise in climate policy, and revamping tools and analytical approaches for data collection and economic decision-making.

A particularly important cross-cutting issue is the critical need for Ministries of Finance to drive forward a just transition to sustain public support and inform effective policy design. A just transition ensures a fair and wide distribution of the benefits of the transition as well as mitigating its social costs by targeted support for those individuals, businesses, organizations and communities that may be adversely impacted.

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55 (Coalition of Finance Ministers for Climate Change, 2023)

56 (Coalition of Finance Ministers for Climate Change, 2023)

Key Takeaway

While natural hazards are unavoidable, appropriate regulatory and institutional arrangements for disaster-resilience and responsive PFM (DRR-PFM) can help mitigate their impacts.

Ministries of finance should proactively assess risks and help ensure that funding mechanisms are available to address the foreseeable impacts of disaster events. Effective planning and budgeting can reduce the exposure of people and assets to disasters and improve resilience.

Step 5: National DRF Strategy/Policy

Selecting the Most Appropriate Instrument: Decision Tree

The disaster risk finance operational framework [57] entails a decision process for a government interested in financial protection. The process leads policymakers through a set of fundamental questions that determine the shape and direction of the country's disaster risk finance engagement, embedded within an overall risk management strategy.

i. The first step in implementing disaster risk finance solutions is for policymakers to clarify overall development goals and identify the intended beneficiary of their risk financing policy

ii. The second step is to use historical information and risk assessments to identify the financial impact on these groups and the underlying causes driving these effects

iii. The last step is to determine what mechanisms are appropriate for financing this risk and how funds will reach the intended beneficiaries

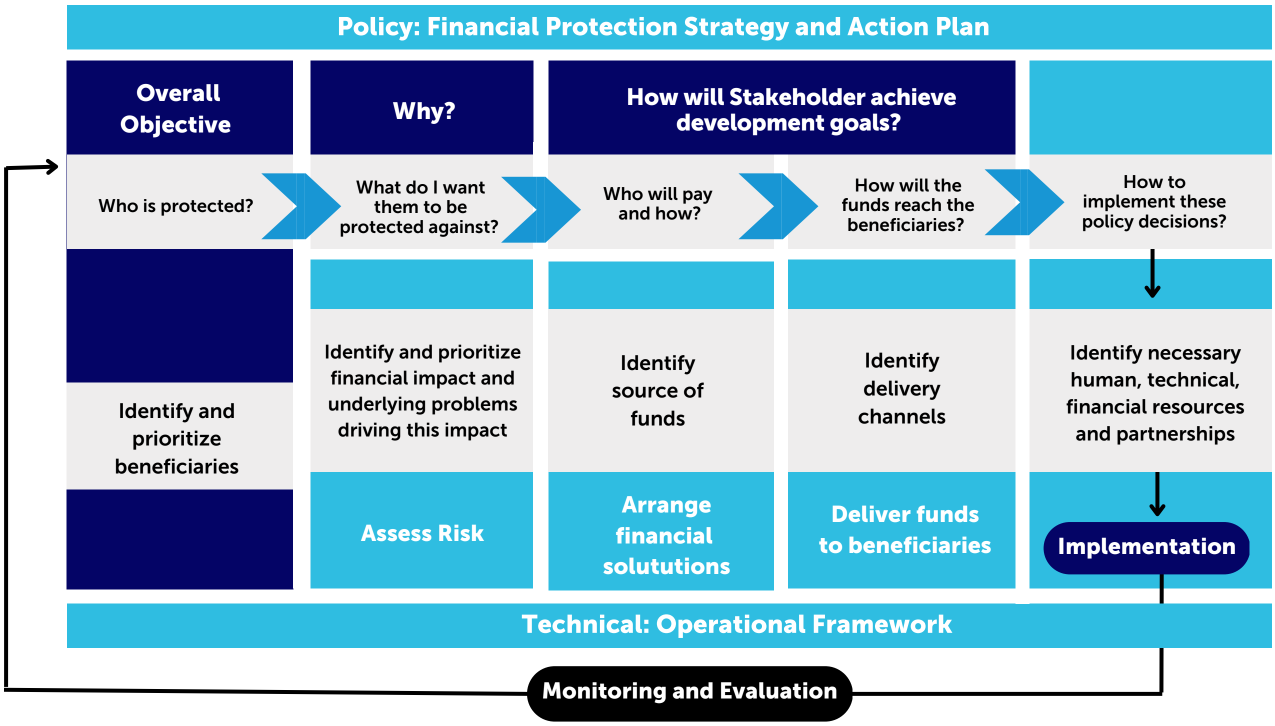

Figure 3: Operational Framework for DRF Strategy

57 (World Bank, 2020)

Monitoring and Evaluation of DRF Strategy

The development of a strategy is the first critical step in disaster risk financing. However, this cannot be achieved unless there is a framework for assessing progress in the implementation of the strategy and taking remedial measures where appropriate. Thus, monitoring should form an integral part in the strategy implementation in order to realize the intended results. The routine monitoring and reports should be produced will enable the Ministry to assess whether the strategy is being implemented according to plan, and address any challenges being encountered.

The monitoring and evaluation of a DRF strategy should be around three key factors considered while developing the DRF strategy (Step 3) - cost, timeliness, and disbursal mechanism. A yardstick to measure the effectiveness of DRF strategy would be to compare the cost, timeliness and disbursal mechanism that existed before the DRF implementation and those after the DRF strategy implementation.

In terms of the impact, the M&E should also consider thee protection gap reduced through indicators like:

- Number of homes insured
- Number of SMEs/ MSMEs insured against disaster
- Number of beneficiaries covered by DRF instrument benefit in event of disaster
- Volume of key infrastructure insured
- Impact on Government's contingent liability
- Sovereign credit rating / government cash or 'callable reserves
- Existence of business continuity planning for key infrastructure / SMEs / larger businesses

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The United Nations University – Institute for Environment and Human Security is based in Bonn, Germany and conducts research on risks and adaptation related to environmental hazards and global change. The institute's research promotes policies and programmes to reduce these risks, while taking into account the interplay between environmental and societal factors. Research areas include climate change adaptation by incorporating insurance-related approaches, environmentally induced migration and social vulnerability, ecosystem-based solutions to adaptation and disaster risk reduction, and models and tools to analyse vulnerability and risks linked to natural hazards, with a focus on urban space and rural-urban interfaces. UNU-EHS also offers the joint Master of Science degree programme "Geography of Environmental Risks and Human Security" with the University of Bonn and hosts international PhD projects and courses on global issues of environmental risks and sustainable development. http://ehs.unu.edu

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