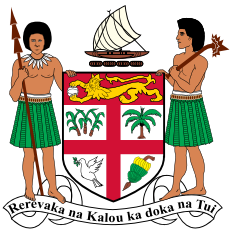
DISASTER FINANCIAL PREPAREDNESS ANALYSIS REPORT

Asian Development Bank (ADB) and United Nations Development Programme (UNDP)



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The United Nations Development Programme(UNDP) delivered output 3 of such Project with the aim to enhance technical capacities for recovery planning, and implementation, including adapting the Post Disaster Needs Assessment (PDNA) and Disaster Recovery Framework (DRF) guidelines to national contexts and specific infrastructure sectors, with the focus of this guidance being Fiji's WASH sector.

This publication has been developed with collaboration and input from various partners, including the Ministry of Finance, Ministry of Rural & Maritime Development and Disaster Management, the Ministry of Lands and Mineral Resources, the Ministry of Infrastructure and Meteorological Services, the Ministry of Health and Medical Services, Water Authority of Fiji and Fiji WaSH Cluster Partners including UNICEF.

This guidance has been prepared by independent consultant Mr. Victor Cardenas, under the overall supervision and technical guidance of Ms. Rita Missal - UNDP Recovery Advisor, Ms. Joana Sampainho - UNDP's Recovery Analyst, and in close collaboration with Mr. Paula Cirikiyasawa - the National Project Coordinator in Fiji.

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Acronyms

ADB	Asian Development Bank
CAT-DDO	Catastrophe Deferred Drawdown
CSF	Countercyclical Support Facility
DISMAC	Disaster Management Committees
DISMAC	Disaster Management and Emergency Management Committee
EM-DAT	Emergency Events Database
FMS	Fiji Meteorological Service
GoF	Government of Fiji
ICAO	International Civil Aviation Organization
IMF	International Monetary Fund
IMO	International Maritime Organization
IT	Information technology
JICA	Japan International Cooperation Agency
LWRM	Land and Water Resources Management
MDMMS	Ministry of Disaster Management and Meteorological Services
MOLG	Ministry of Local Government, Housing and Community Development
MORM	Ministry of Rural and Maritime Development
MRD	Mineral Resources Department
MRMDDM	Ministry of Rural and Maritime Development and Disaster Management
NDC	Nationally Determined Contributions
NDMA	Natural Disaster Management Act
NDMC	National Disaster Management Council
NDMO	National Disaster Management Office
NDRF	National Disaster Relief and Rehabilitation Fund
NEOC	National Emergency Operations Center
NFA	National Fire Authority
OCHA	Office for the Coordination of Humanitarian Affairs
PCRAFI	Pacific Catastrophe Risk Assessment and Financing Initiative
PCRIC	Pacific Catastrophe Risk Insurance Company
PFO	Precautionary Financing Option
PICAP	Pacific Insurance and Climate Adaptation Programme
PR	return of period
RSMC	Regional Specialised Meteorological Center
SECURE	Stand-by Emergency Credit for Urgent Recovery
SPV	special purpose vehicle
TC	Tropical cyclones
TCAC	Tropical Cyclone Advisory Centres
WMO	World Meteorological Organization

1. Executive Summary

Fiji has a high level of exposure to natural disasters and climate change impacts that threaten vital ecosystems: with tropical cyclones, droughts, and floods the most serious perils. In this respect, the country's ranking for INFORM, ND-GAIN and the Climate Risk indexes reflects, lack of coping capacity, high vulnerability and substantial exposure to climate change risks.

According to the World Bank, long-term warming due to climate change is expected to fall below the global average in Fiji: ranging between 0.6°C and 2.6°C by the 2090s (compared with the 1986–2005 baseline). The frequency of tropical cyclones affecting Fiji is projected to decrease, yet the magnitude of this decline remains uncertain while cyclone intensity (wind speed) may concurrently increase. In other words, strong tropical cyclones such as Winston (2016) or stronger could become the types of common catastrophic events that may occur in the future.

Considering disaster challenges faced by Fiji and the potential cost of damages being significantly higher than in the past, it is important that key stakeholders assess and implement strategic actions to respond efficiently to these challenges from a public finance point of view.

This report is intended to raise awareness of the fiscal impact that natural disasters have on the Fijian public finance. In this context, the report recommends ex-ante risk financing instruments as a part of disaster risk financing strategy, tailor made instruments such as reserve fund, contingent credit and parametric insurance enhance capabilities to manage contingent liabilities resulting from disasters. An ex-ante risk financing strategy, in contrast to ex-post financing, reduces liquidity risks and uncertainties around financing after a disaster, and avoids extra charges associated with funding, given that the sovereign risk profile could be negatively impacted. Thus, ex-ante risk financing instruments contribute to develop a resilient public finance against disasters.

The primary objective of this report is to provide technical input as the Government of Fiji looks to further develop the country's financial preparedness planning and assess post-disaster budget execution capabilities.

Primary report components include:

- → An analysis of disasters and the risk profile of Fiji, considering damage costs, affected people, and major hazards;
- → An overview of legal and institutional disaster management policies;
- → A review of current disaster budgetary processes, including case studies of financial instruments in place highlighting those focused in ex-ante and ex-post financing while estimating Fiji's financing gap;
- → Based on the estimated financing gap, an ex-ante risk financing instruments portfolio analysis, illustrated through a hypothetical disaster scenario of a given Tropical Cyclone (TC) event and providing insight into how different financial instruments may interact and help close—to a certain extent —the financing gap;
- → With respect to sovereign parametric insurance, the analysis sought to identify several trigger point metrics for a set of insurance schemes, illustrating the impact of a comprehensive disaster risk financing strategy across several levels of insurance.

Fiji's risk profile

Disaster occurrence in Fiji is not currently summarized in a comprehensive and up-to-date historical database spanning a long period. For the purposes of this report, data was collected from various sources including

Emergency Events Database (EM-DAT), DesInventar, and the Government of Fiji (GoF): providing insight into hazards facing the country.

According to EM-DAT, Fiji has been exposed to several hazards between 1931 and 2022; the most catastrophes included tropical cyclones (45 events, 1.9 million affected), floods (12 events, 0.3 million affected), droughts (3 events, 0.4 million affected), and earthquakes (2 events, unknown affected). Considering the cost of damages, tropical cyclones (TC) and floods were the most serious.

Given the high occurrence of TC (the most frequent peril between 1931 and 2021, occurring nearly every two years on average) with costs averaging US $88 million per event (Figure 5) and a total cost of US $3,964 million (2021 values). Floods and droughts, on the other hand, occur approximately every 8 to 30 years, with average costs reaching US $37 million and US $75 million, totaling US $445 million and US $224 million, respectively.

Despite the lack of data, a prospective analysis is presented based on data from Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), a World Bank initiative (estimating the costs of damages linked to several scenarios based on a probabilistic methodology). This assessment lays the groundwork to estimate the financing gap and analyze ex-ante risk financing instruments described below.

Fiscal disaster management in Fiji

Disaster risk management is perennially a top priority for Fiji. In this regard, catastrophic risk financing—as a national strategy—has experienced key advancements on the road to a comprehensive disaster risk financing strategy. These include the extensive use of budgetary mechanisms, supported by bilateral budget support, multilateral loans and the donor community. In addition, the country is beginning to venture into contingent financing facilities.

In Fiji there are several established financing instruments in place to respond to the effects of natural hazards: annual budget allocations, donor community support, emergency loans, the Prime Minister's Fund, and contingent credit. These financing instruments correspond to risk retention instruments, referring to instruments financed with resources owned by the government, which serve to pay for losses as they occur, rather than shifting the risk to a third party, such as an insurer.

The above-mentioned instruments in Fiji reflect important achievements in disaster risk management as well as the relevance of strengthening the agenda within this arena.

Considering international best practices in disaster risk financing, an explicit regulatory framework can strengthen budget allocations and disaster management funds while also reducing the role of ex-post emergency loans and donor community support: considering other sources of ex-ante funding such as contingent facilities and parametric sovereign insurance.

As a result of the existing PCRAFI study on Fiji, which estimates the potential damage of a portfolio of previously selected assets, an estimation of the financing gap was made. A multi-sectoral approach was used when estimating the damages at the national level, which is a multi-sectoral estimation of damages. Taking into account PCRAFI's estimate of the cost of damages, this report presents a methodology for disaggregating the cost of damages into relevant sectors for the GoF, such as infrastructure damages (transportation, water and sanitation, electricity, and communications) and social (education and health).

Financial instruments targeting disasters

Considering the financing gap estimated for the infrastructure (transportation, water and sanitation, electricity and communications) and social (education and health) sectors, and specifically for the subsector

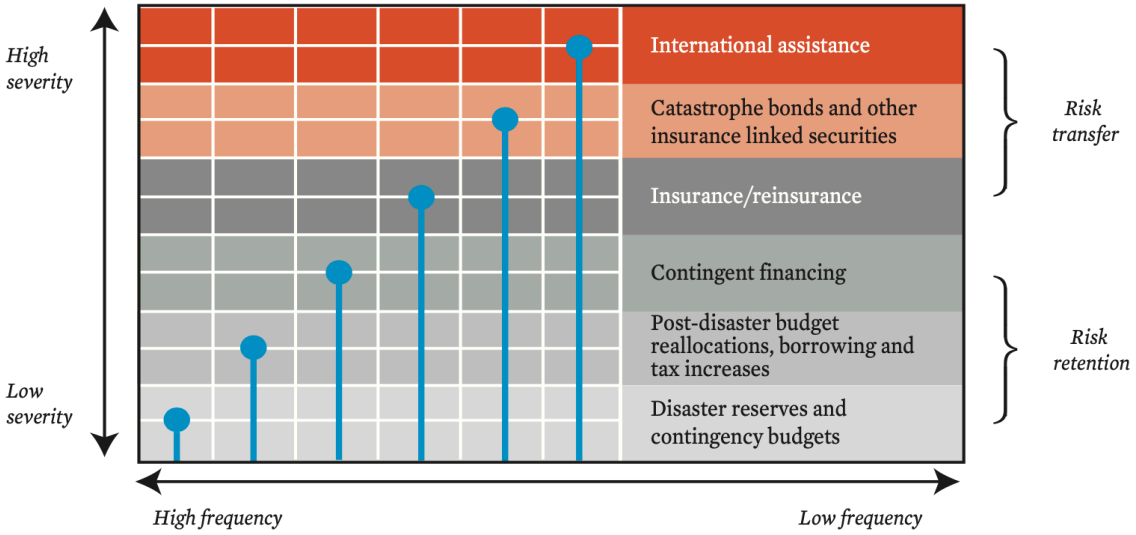
water and sanitation, the report assessed a hypothetical set of ex-ante disaster risk financing instruments including budget allocation, disaster funds, contingent loans, and sovereign parametric insurance.

Results suggest that ex-ante disaster risk financing instruments could provide funding to the GoF addressing costs of damages within the infrastructure and social sectors of US $61m for both sector, this funding is provided by a mix of the following instruments: budget allocation, reserve fund, contingent credit and parametric insurance; specifically for the water and sanitation sector of US $11m.

Considering the financial coverage for each risk financing instrument assessed, we found that the instruments could provide funding addressing several layers of risk. Given the financing gap estimated for the GoF, several risk layers were considered (low, and high frequency): each one linked to a specific cost of damages. As the risk grows, so does the cost. The analysis found that among the financial instruments considered, coverage could provide full and partial funding for low and high-risk events, respectively.

There is a risk layering approach embodied in the design of ex ante financing for disaster risk. As a result of this framework, risk-retention instruments are designed for events that are more frequent and less damaging (Figure 1). Among them are annual budgetary allocations, disaster funds, and contingent funding arrangements that are in place before a disaster strikes, all of which must be in place in case of disasters. A government may also be able to reallocate budgets, increase borrowings, and raise taxes after a disaster strikes to provide more resources to the affected area.

Figure 1. Risk Layering Approach



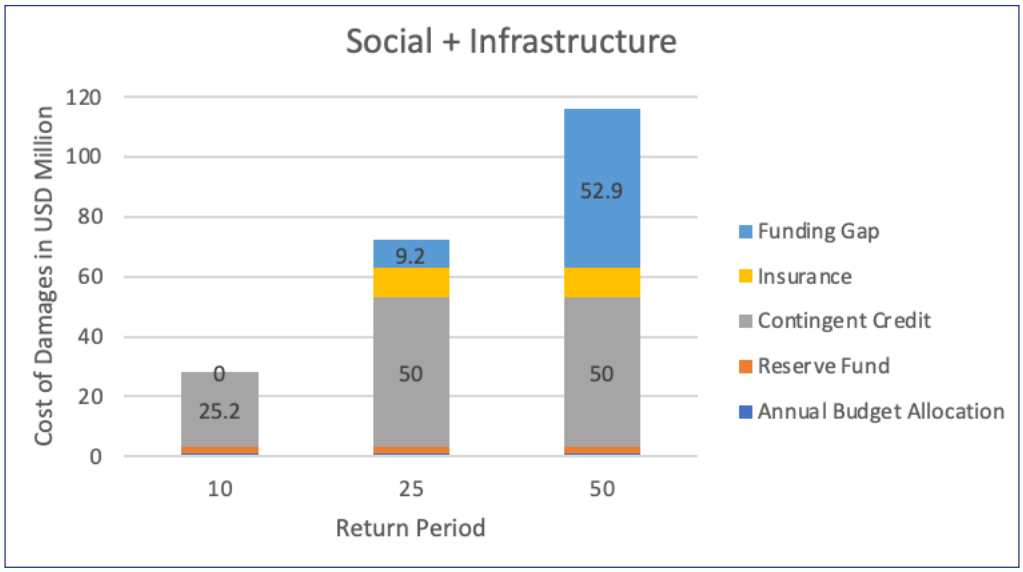
Source: Asian Development Bank (2013)

With respect to the water and sanitation sector, the ex-ante risk financing instruments (annual budget allocation, reserve fund and contingent credit) assessed for this analysis, could provide enough financing for the cost of damages by TC events from high frequency to low frequency.

The assessment concludes that ex-ante disaster risk financing instruments can strategically cover the costs of damage; thus, in the event of a disaster, the GoF can mitigate the uncertainty of funding after a disaster, alongside strengthening their resilient public finance strategy.

Figure 2 shows how the ex-ante financing strategy covers the financing gap, depending on the type of events classified by the return period.

Figure 2. Ex-ante risk financing instruments reducing fiscal exposure to TC damages (in US $m) by return of period type for social and infrastructure sectors



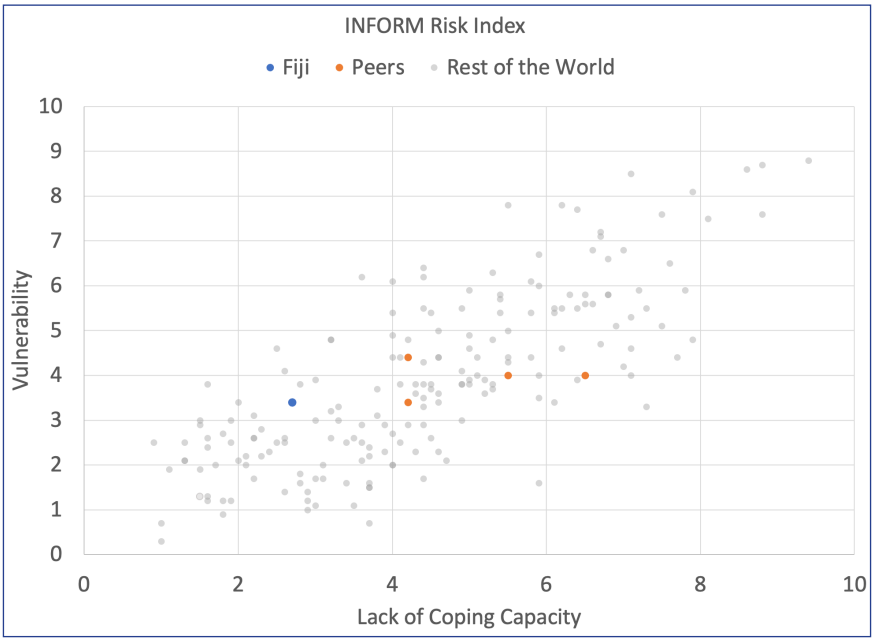
Source: Author's estimate using PCRAFI data

Throughout the course of this study, we highlight the importance of possessing a comprehensive ex-ante disaster risk financing strategy that considers a wide range of financial instruments. With this goal in mind, a coordinated strategy is proposed to be developed that mitigates financing risks in an appropriate and timely manner.

2. Introduction

Fiji is exposed to a wide range of natural hazards including tropical cyclones, floods, landslides, and droughts. According to the INFORM Risk Index, Fiji is ranked among the lower level of its regional peers in terms of lack of coping capacity[2]. **Figure 3** below, shows the Vulnerability and Lack of Coping Capacity (0 means no lack of coping capacity, 10 means strong lack of coping capacity) for all the countries assessed, regional peers in orange and Fiji in blue. For similar level of vulnerability among regional peers, Fiji has an enormous load work invested in disaster risk management, that is reflected in the indicator of lack of coping capacity.

Figure 3. INFORM Risk Index: Lack of Coping Capacity versus Vulnerability



Source: Author's estimates with data from 2021 INFORM Risk Index

Tropical cyclones are among the most significant natural hazards in Fiji, causing numerous fatalities, injuries, and significant economic losses over previous decades. According to EMDAT, 45 tropical cyclones affected Fiji from 1931 to 2022. Some of the most severe in recent years include Cyclone Winston in 2016 (which caused over US $782 million in damages) and Cyclone Evan in 2012 (which caused extensive infrastructure damage costing approximately US $139 million).

Floods are also a major hazard in Fiji, particularly in low-lying areas and river basins. In addition to these threats, Fiji also experiences droughts that can significantly impact agriculture, food security, and water resources.

While disaster risk management measures have improved in recent years, the need remains for increased investment in disaster preparedness, early warning systems, and infrastructure resilience to reduce natural hazard impacts on vulnerable populations.

Disaster management is considered a major issue, with the Ministry of Rural and Maritime Development and Disaster Management responsible for this at a national level. Accordingly, the Ministry is responsible for

2 According the INFORM index, the coping capacity dimension measures the ability of a country to cope with disasters in terms of formal, organized activities and the effort of the country's government as well as the existing infrastructure which contribute to the reduction of disaster risk. It is aggregated by a geometric mean of two categories: institutional and infrastructure.

coordinating and facilitating the development and implementation of national disaster risk reduction policies and plans while also coordinating disaster response and recovery efforts.

One key policy implemented by the Fijian government is the National Disaster Management Plan (NDMP): a comprehensive framework that outlines the roles and responsibilities of different agencies and stakeholders with respect to disaster management including disaster risk reduction, preparedness, response, and recovery.

The Disaster Risk Reduction and Management Act is another important policy, providing a legal framework for disaster risk reduction and management in Fiji and establishing a National Disaster Council responsible for coordinating risk reduction and management activities at the national level.

The Fijian government has also established a National Disaster Management Office (NDMO) responsible for coordinating disaster response and recovery efforts. The NDMO works closely with other government agencies, non-governmental organizations, and community-based organizations to ensure an effective and coordinated response to disasters.

In addition to these policies, the Fijian government has also implemented several initiatives to strengthen community resilience and reduce vulnerability to disasters. These include early warning systems, community-based disaster risk reduction programs, and training and capacity-building programs targeting disaster management professionals.

Given everything stated herein, disaster risk management—from a public finance perspective—is an endeavor that has in fact seen progress[3], but a pending agenda remains. International practice in disaster risk financing provides a framework for additional funding sources while also strengthening current options.

According to the framework mentioned above, retention instruments provide financing from the national budget using an ex-ante institutional and financial mechanism to reduce uncertainty and provide transparency and operational efficiency to all stakeholders. In regard to this framework, risk-transferring instruments provide the same benefits but are instead based on the national budget with funding provided by third-party entities (e.g., insurers or reinsurers).

In this report, we assess current instruments established in Fiji and assess alternative funding sources. Section 1 provides the executive summary; Section 2 provides the introduction; Section 3 provides the Fijian risk profile; Section 4 summarizes legal and institutional disaster risk management structures; Section 5 discusses fiscal disaster management in Fiji; Section 6 evaluates the risk-retention and risk-transferring instruments portfolio for tropical cyclones. The final sections, Section 7 and Section 8, provide limitations and recommendations resulting from the analysis.

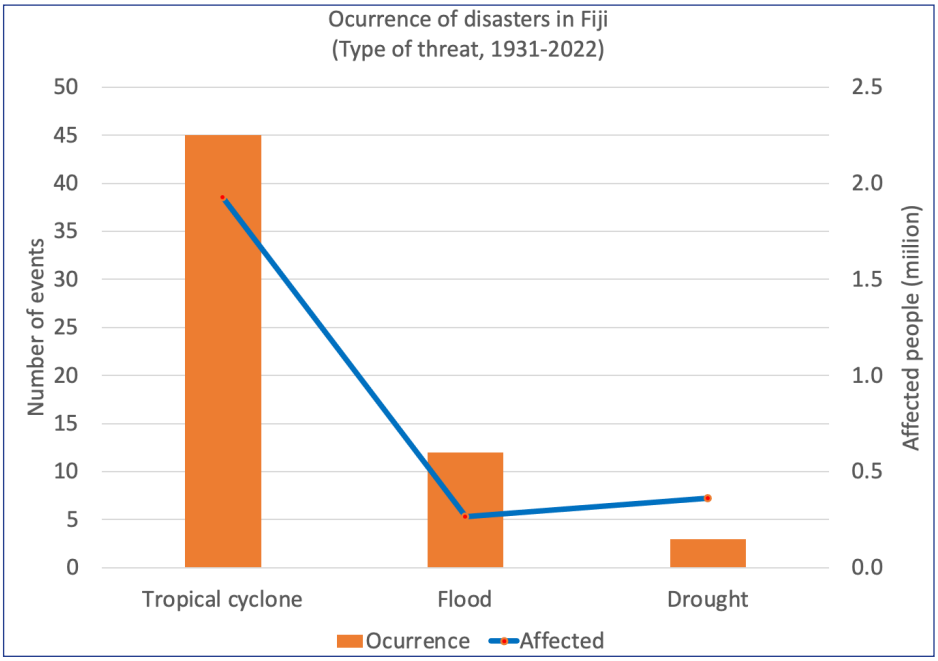
3 Government of the Republic of Fiji, Economic and Fiscal Update, Supplement to the 2017/2018 Budget Address, June 2017.

3. Risk Profile and Impacts of Disasters in Fiji

Data used in this report was collected from various sources including EM-DAT[4], DesInventar[5], and the Government of Fiji (GoF). Overall, the data provides insights into hazards facing the country.

According to EM-DAT, Fiji has been exposed to several hazards between 1931 and 2022 (see Figure 4); the most catastrophic included tropical cyclones (45 events, 1.9 million people affected), floods (12 events, 0.3 million people affected), droughts (3 events, 0.4 million people affected), and earthquakes (2 events, no available data on those affected). Tropical cyclones (TC) and floods were the most serious. The Figure 4 show in primary axe the number of events and in secondary axe the number of people affected.

Figure 4. Frequency by peril and impact size in US $Million

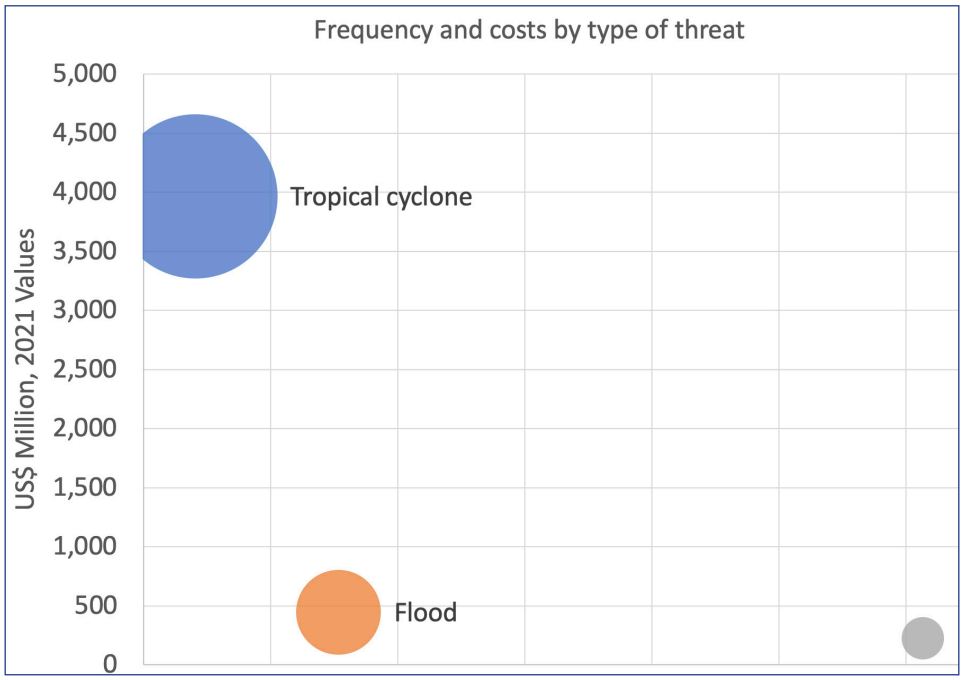


Source: EM-DAT data and estimation based on author methodology

As a result of the high frequency of TCs (the most frequent peril from 1931 to 2021), occurring nearly every two years and costing an average of US $88 million per event (Figure 5), with a total cost of US $3,964 million (2021, values[6]). Floods and droughts, meanwhile, occur approximately every 8 to 31 years, with an average cost reaching US $37 million and US $75 million, respectively (each totaling US $445 million and $224 million).

4 EM-DAT, https://public.emdat.be/data
5 https://www.desinventar.net/DesInventar/country_profile.jsp?countrycode=pac&lang=EN
6 Refers to the prices of the year of reference.

Figure 5. Frequency by peril and impact size in US $Million



Source: EM-DAT data and estimation based on author methodology

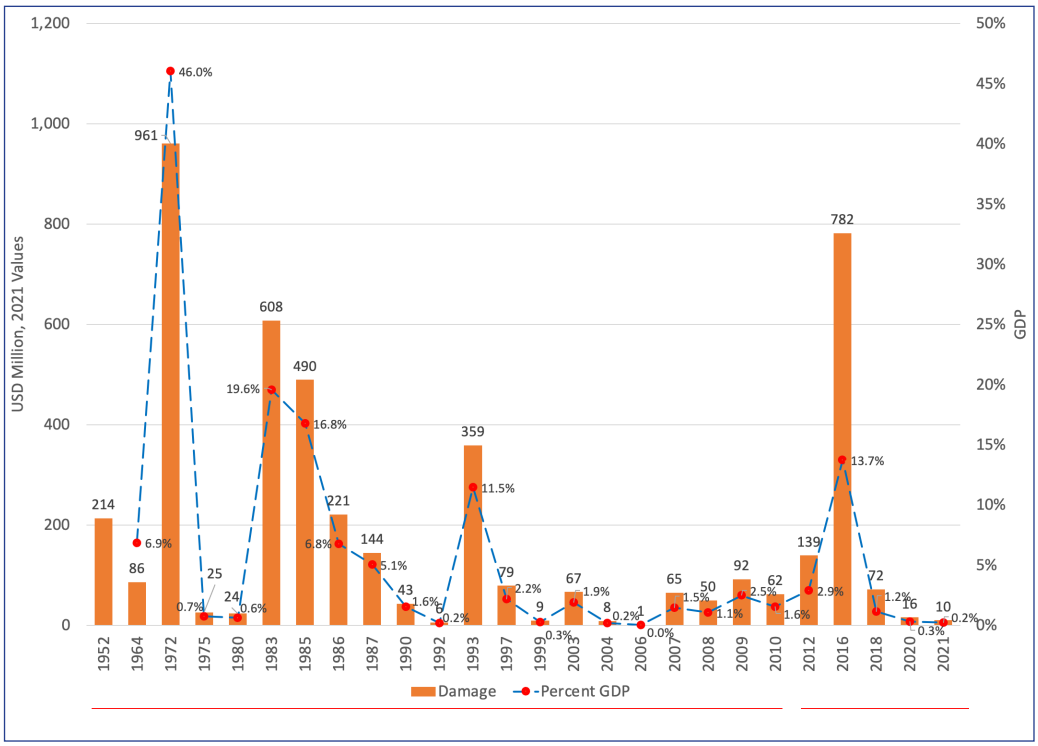
In Fiji, consolidated data regarding damages and losses caused by disasters over extended periods of time is not publicly available. In the following figures, the economic impacts of disasters are presented, based on consolidated data from EM-DAT, DesInventar, and GoF annual budgets, covering a period of approximately 90 years (1931-2021).

Despite challenges regarding disaster data collection and damages assessment in the country, this analysis reported an annual average cost of damages (see Figure 6) over the last decade (2011 to 2021) of US $124m (2021 values); however, considering the previous five decades (1952 to 2010), this indicator reached US $76m (2021 values)[7]. Thus, growth of the cost of damages over the last decade was about 60% relative to the five preceding it.

With respect to historical TC events, two events climb to the top as the most catastrophic: 1972's TC Bebe and 2016's TC Winston, which almost mirror 2016 damages (in same values of 2021). However, Winston occurred in a larger economy than the former event, with the size of the economy practically doubling between 1972 and 2021. Corresponding impacts (with respect to the size of the GDP) were 46% and 13.7%, respectively.

7 See in the bottom part of Figure 6 and 7, respectively, the average by period.

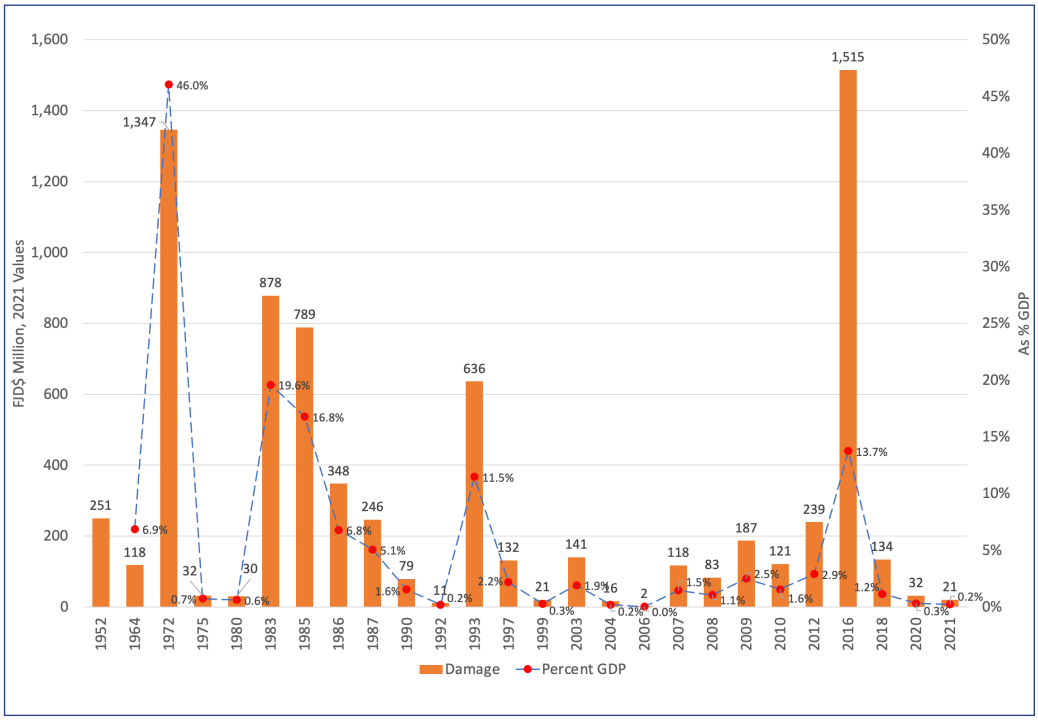
Figure 6. Cost of damages caused by disasters (US $Million, 2021 values)



Source: EM-DAT data and estimation based on author methodology

Figure 7 provides equivalent data in Fijian Dollars for 2021, with the impact of 1970s inflation magnifying the magnitude of damage costs. However, economic findings regarding event size remain; over the past decade, annual average damages reached roughly FJD $188m (2021 values), but over the previous five decades, it reached FJD $116m (2021 values).

Figure 7. Cost of damages caused by disasters (FJD $Million, 2021 values)



Source: EM-DAT data and estimation based on author methodology

4. Legal and institutional arrangement for disasters management

Disaster preparedness and response is governed by the Natural Disaster Management Act (NDMA) (1998) and National Disaster Risk Reduction Policy of the Republic of Fiji 2018-2030, which outline the governance, institutional arrangements and operational procedures for disaster risk management in Fiji. [8]

- The Natural Disaster Management Act (NDMA) (1998)[9] has overall responsibility for disaster risk management (including risk reduction, response, recovery and rehabilitation).[10]
- The overall objective of the National Disaster Risk Reduction Policy 2018-2030 is to enable Fiji to meet its priority of preventing new disaster risk and reducing existing disaster risk in line with relevant regional and global frameworks.[11]

Fiji has recognized national structures for disaster preparedness and emergency operations. Governing bodies for disaster response include:

- National Disaster Management Council (NDMC).
- National Disaster Management Office (NDMO).
- Disaster Management Committees (DISMAC) at departmental, provincial and district levels.

Disaster management policies are formulated by the National Disaster Management Council (NDMC), and responsibility for national disaster management rests with the National Disaster Controller (Permanent Secretary responsible for NDMO), who assumes powers upon formal declaration of a natural disaster.[12]

The National Disaster Management Office (NDMO) was established as the Government's focal point during national disasters, operating under the National Disaster Management Act to coordinate national disaster management and co-ordination of activities. The NDMO manages disaster activities through Disaster Preparedness, Disaster Mitigation, Disaster Response and Disaster Rehabilitation programs to restore normalcy after the effect of a disaster.[13]

During emergencies the NDMO is responsible for issuing early warning messages and establishes the National Emergency Operations Center (NEOC). The NDMO/NEOC is assisted by disaster services liaison officers from government agencies as the main points of contact for liaison and coordination.

Finally, regarding Disaster Management Committees (DISMAC), they are responsible for coordinating disaster response and management efforts in the country. Members of these groups represent different government agencies, nongovernmental organizations, and other stakeholders involved in disaster management.

Disaster planning, preparation, and response are the main responsibilities of DISMAC. Their role is to ensure that appropriate measures are taken to mitigate the effects of disasters on communities, infrastructure, and the environment in coordination with the National Disaster Management Office (NDMO).

8 Government of the Republic of Fiji, (2017). Climate Vulnerability Assessment - Making Fiji Climate Resilient. World Bank, Global Facility for Disaster Reduction and Recovery (GFDRR).https://documents1.worldbank.org/curated/en/163081509454340771/pdf/Climate-Vulnerability-Assessment-Making-Fiji-Climate-Resilient.pdf

9 currently under review.

10 JSTOR, (s.f). Appendix 2. Fiji's National Disaster Response Framework. https://www.jstor.org/stable/pdf/resrep16508.9.pdf?refreqid=excelsior%3Aa6532d18954ff740121ee315c61acae8&ab_segments=&origin=&acceptTC=1

11 Government of the Republic of Fiji, (2018). The Republic of Fiji National Disaster Risk Reduction Policy 2018-2030. https://www.rcrc-resilience-southeastasia.org/wp-content/uploads/2020/04/Natural-Disaster-Risk-Reduction-Policy-2018%E2%80%932030.pdf

12 Government of the Republic of Fiji, (2017). Climate Vulnerability Assessment - Making Fiji Climate Resilient. World Bank, Global Facility for Disaster Reduction and Recovery (GFDRR). https://documents1.worldbank.org/curated/en/163081509454340771/pdf/Climate-Vulnerability-Assessment-Making-Fiji-Climate-Resilient.pdf

13 Government of the Republic of Fiji, (s.f.). Overview Report on the National Disaster Management Office. https://www.un-spider.org/sites/default/files/Fiji%20Disaster%20Management%20Office%20(NDMO).pdf

It is the responsibility of the DISMACs to develop disaster management plans, conduct risk assessments, and coordinate emergency response efforts during times of disaster. Furthermore, they coordinate rescue and recovery efforts and distribute relief supplies to affected communities.

Disaster response efforts are coordinated and effective at all levels through DISMACs, created at the national, divisional, and district levels. As part of their role, they also coordinate disaster response efforts with international organizations and foreign countries.

5. Fiscal Disaster Management in Fiji

Disaster risk management continues to rank as one of Fiji's top priorities. In this regard, catastrophe risk financing has experienced advancements (e.g., the use of budgetary mechanisms and contingent financing facilities). These mechanisms are activated depending on disaster severity, coupled with international assistance as a means of catastrophe risk financing.

5.1 Sources of revenue

Table 1 shows the current state of several funding sources available to Fiji, divided into four columns that describe each instrument implemented. "Risk layer" refers to the level of risk covered by the instrument: low, medium, and/or high. "Mobilization timing" is the prospective timing for developing the instrument either before (ex-ante) or after (ex-post) the disaster occurs. The last column explains Fiji-centric findings regarding the instrument identified.

Table 1. Current state of several funding sources available for Fiji

Instrument	Risk Layer	Mobilization Timing	Additional Information
Budget Annual Allocation	Low, medium, and high risk	Ex-ante	Budget for the Ministry of Disaster Management and Meteorological Services, subsequently The Ministry of Rural and Maritime Development and Disaster Management (MRMDDM), has averaged F $14.5 million (roughly US $6.8 million) from 2017–2023*. As capital and operating expenses are included in MRMDDM expenditures, a specific reserve is not allocated for contingencies due to catastrophic events. Ministry resources are primarily allocated to operations.
Donor Community	Medium and high risk	Ex-post	Based on disaster severity, the donor community plays a key role in financing response and recovery. For example, according to the OCHA Financial Tracking Service**, Fiji received US $21.8 of US $38.6 required in 2016 (among grants and donations provided by development partners).
Emergency Loan	Medium and high risk	Ex-post	Recovery and reconstruction phases are significantly delayed by emergency loans, which are unpredictable and require long negotiations. For example, Budget Support – ADB Emergency Assistance for Recovery from TC Winston (US $50m), Budget Support – World Bank: Post-Winston Emergency (US $50m)*. EU Budget Support(2016) -$23m.

Prime Minister's Fund	Medium and high risk	Ex-ante	The GoF established the Prime Minister's Fund (PM), also known as the National Disaster Relief and Rehabilitation Fund (NDRF), as an annual appropriation to the National Disaster Management Office (NDMO). The NDRF is the post-disaster funding backbone for the GoF, from which budgetary resources and donor funding are received and allocated for disaster relief funding needs. Between 2017 and 2023, an yearly average of F $0.8 million (about US $0.4 million) was allocated from the budget to the PM's Fund.*
Contingent Credit	Medium and high risk	Ex-ante	In 2020, a standby loan agreement*** for roughly US$98m was signed with the Japan International Cooperation Agency, with the loan set for disbursal following a major catastrophic event.
Source: Fiscal year budget for 2017–2021, Republic of Fiji** ****https://fts.unocha.org/countries/74/summary/2016** / https://www.jica.go.jp/english/news/press/2019/20200221_11_en.html			

Table 2, with a similar structure to **Table 1**, provides instruments identified for either enhancement or implementation in Fiji. Further details on each instrument are below.

Table 2. Alternative funding sources suggested and considered for Fiji

Instrument	Risk Layer	Mobilization Timing	Additional information
Disaster Fund	Low, medium, and high risk	Ex-ante	In recent years, disaster risk management has made significant progress towards a comprehensive approach for managing catastrophe risk financing. Although there is room for improvement, establishing the Prime Minister's Fund outside of the annual budget cycle can strengthen it: making the remaining annual balance available for future events in subsequent fiscal years. A minimum annual contribution could also be established along with operating rules made public and distributed to key stakeholders.

Parametric Sovereign Insurance	High risk	Ex-ante	Several Pacific Island-States participated in PCFARI*, a World Bank initiative, using state-of-the-art probabilistic models to assess potential damage in those economies following large scale disasters. Currently, Fiji is a member of the board of PCRIC (recipient of PCRAFI studies), a special purpose insurer or captive insurance company that provides parametric catastrophe insurance to its members. PCRIC would provide parametric insurance alternatives affordable for Fiji.
Disaster Private Property Insurance and Microinsurance	Low, medium, and high risk	Ex-ante	According to the Reserve Bank of Fiji**, the UNCDF-led Pacific Insurance and Climate Adaptation Programme (PICAP) launched a parametric weather risk insurance policy through microinsurance in 2021. This pilot aims to develop a microinsurance scheme that compensates losses to farming communities, fisheries, and small businesses vulnerable to natural disasters.
***https://openknowledge.worldbank.org/handle/10986/21696 **Reserve Bank of Fiji (Parliamentary Paper No. 11, 2022)**			

5.1.1 Funding Sources Currently in Place

■ Annual allocation

In terms of international best practices, annual budget allocation consists of an instrument created through a specific line or item in the national budget labeled only for disasters, typically operated by the sector head or ministries related to disasters. There are two types of budget allocations: standby budget allocation is released only in the event of a disaster for different purposes linked to the disaster, while the second one is labeled for operating purposes only for those ministries responsible for disaster management.

Between 2017 and 2023, the budget for the Ministry of Disaster Management and Meteorological Services (subsequently the Ministry of Rural and Maritime Development and Disaster Management) averaged F $14.5 million, or roughly US $6.8 million.

Table 3. Expenditure allocated to the ministry in charge of disaster management

	Ministry of Disaster Management and Meteorological Services (MDMMS)/ Ministry of Rural and Maritime Development and Disaster Management (MRMDDM)				
	Fiscal year (F $million)				
	2017–2018	2019–2020	2021–2022	2022–2023	Average
Budget allocated	$15.2	$12.8	$14.8	$15.0	$14.5

Source: Budget for each fiscal year, Republic of Fiji

Expenditures allocated to the MRMDDM include capital and operating expenses; therefore, no specific reserve is allocated for contingencies due to catastrophic events in this ministry. Resources used by this ministry are primarily allocated to its own operation.

Donor community

Donor financing in the context of catastrophe risk financing refers to the financial resources from external actors to countries affected by major events such as disasters. This financing instrument is often a critical lifeline for countries affected as it helps to fill the gap between existing resources and those required to respond to the disaster effectively.

However, donor financing has several challenges: particularly in the context of least-developed countries. For example, funding is not always predictable and sustainable and can lead to a dependency on external resources, while donors are not always available to provide funding of a uniform size/type and on a long-term basis. Another challenge is the lack of coordination and alignment between various actors involved in the process necessary to contact international donors. This can result in a duplication of efforts and subsequent delays in providing support to affected communities.

Fiji has faced challenges obtaining sufficient support from the donor community in the wake of major catastrophes. For example, following the devastating impact of Tropical Cyclone Winston, the Asian Development Bank (ADB) reported the Fijian government had allocated F $134 million for reconstruction efforts, while donors were expected to provide F $23 million[14]. This reflects a significant funding gap of F $574 million, which was ultimately addressed in part through loans from multilateral financial institutions. Another example was a 2016, for the same event, request to the Office for the Coordination of Humanitarian Affairs (OCHA)[15], whereby Fiji received US $21.8 of US $38.6 originally required.

These type of funding gaps highlight the importance of developing effective disaster risk management strategies that reduce risk and build resilience while also ensuring adequate support is available to respond to disasters as soon as they occur.

Emergency loans

This financing instrument—typically offered by multilateral financial institutions—provides financial resources made available to countries in the aftermath of catastrophic events to help them cope with financial impacts of the disaster. These loans are negotiated and processed after the disaster, and can be disbursed quickly and help countries fund emergency response efforts, provide essential services and infrastructure, and address the immediate needs of affected populations. These types of loans could take from weeks to months to be processed and disbursed from the multilateral agency.

One critical role of emergency loans is to provide financing to countries lacking the financial resources necessary for effective disaster response. This type of financing is essential, as it can help bridge the gap between the resources countries already have and any others, they require to address disaster impacts. Emergency loans can also be used to fund longer-term recovery efforts, such as the reconstruction of damaged infrastructure and the restoration of economic activities.

14 https://www.adb.org/sites/default/files/publication/485561/fiji-environment-disaster-risk-financing.pdf
15 https://fts.unocha.org/countries/74/summary/2016

Multilateral financial institutions such as the World Bank, the International Monetary Fund (IMF), and the Asian Development Bank (ADB) as well as development agencies of developed economies (among others) play a crucial role in providing emergency loans to countries affected by disasters.

However, various costs are associated with preparing emergency loans ex-post a disaster (as opposed to ex-ante). For example, emergency loans are subject to interest rates, fees, and commissions. Damage assessment and recovery plan development may also summon additional costs, while potential delays in fund disbursement can arise as countries must first meet loan eligibility criteria.

To minimize these costs, it is essential to develop comprehensive disaster risk financing strategies that prioritize risk reduction and building resilience. These strategies should include contingency plan development and the establishment of emergency financing mechanisms ripe for quick activation in the event of a disaster.

In the case of Fiji, recently, two ex-post emergency loans were requested after TC Winston, identified in the annual budget as: 1) Budget Support – ADB Emergency Assistance for Recovery from TC Winston (US $50m), and 2) Budget Support – World Bank: Post-Winston Emergency (US $50m).

Prime Minister's Fund

A calamity fund or disaster fund is a financial mechanism designed to provide rapid and predictable financing to countries affected by catastrophic events. It is typically established and funded in advance of a disaster, with contributions originating from a variety of sources including governments, international organizations, and private sector partners. The fund is set for quick activation in the aftermath of a disaster, providing critical resources to support emergency response and early recovery efforts.

With respect to Fiji, the GoF established the Prime Minister's Fund—also known as the National Disaster Relief and Rehabilitation Fund (NDRF)—as an annual budget allocation for the National Disaster Management Office (NDMO). The NDRF is the post-disaster funding backbone for the GoF, from which budgetary resources and donor funding are received and allocated for disaster relief-funding needs.

Between 2017 and 2023, a yearly average of F $0.8 million (about US $0.4 million) was allocated from the budget to the PM's Fund.

Table 4. Expenditure allocated to the Prime Minister's Fund

	Disaster Relief and Rehabilitation Fund (PM's Fund)				
	Fiscal year (FJ $million)				
	2017–2018	2019–2020	2021–2022	2022–2023	Average
Budget allocated	$1.0	$0.8	$0.8	$0.5	$0.8

Source: Budget for each fiscal year, Republic of Fiji

Contingent credit

Contingency loans provided by multilateral financial institutions to developing and least developing economies are an ex-ante risk financing instrument made available to countries in advance of a catastrophic event to help them prepare for and respond to the disaster. These loans are designed to be quickly disbursed in the aftermath of a disaster to fund emergency response and early recovery efforts, helping to reduce associated financial impacts on the affected country. These types of loans could take from days to weeks to be disbursed from the multilateral agency.

Various costs are associated with this ex-ante risk financing instrument such as interest rate, fees, commissions, and repayment. Countries must also meet eligibility criteria for the loan, which may include demonstrating the capacity to manage financing and adhere to specific disaster risk management policy conditions, budgetary room, and borrowing capacity. Despite these costs, contingency loans can provide significant benefits to developing and least-developing economies: helping to build resilience and reduce the impact of disasters on vulnerable communities.

Interviews with Ministry of Economy officials revealed tepid enthusiasm regarding this ex-ante risk financing instrument, emphasizing the initial cost of these instruments coupled with a potential reduction in the capacity to request additional loans. However, the GoF signed standby loan agreement for roughly US $98m (¥5,000 million)[16] with the Japan International Cooperation Agency in 2020, set for disbursement after a major catastrophe event.

5.1.2 Suggested Funding Sources

Considering the state of disaster risk management policy implementation, analysis assessing current disaster risk financing funding sources identified windows of opportunity to improve financial GoF resilience to disasters framed in international practices[17] with respect to governmental disaster risk financing.

Disaster fund

The Prime Minister's Fund is not a proper fund as defined by international practices in catastrophe risk management, given that its structure more closely resembles an annual budget allocation rather than a disaster fund. There is therefore room to improve the approach in order to align it with international practices. For instance, establishing the Prime Minister's Fund outside of the annual budget cycle–thus strengthening it–and making the remaining annual balance available for future events in subsequent fiscal years. A minimum annual contribution could also be set to avoid volatility across fiscal years, along with operating rules made public and distributed to key stakeholders and donor community to strengthen transparency in lockstep with international practices[18].

Parametric Sovereign Insurance

Fiji was included in the scope of the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI), a regional endeavor aimed at improving the resilience of Pacific Island states against the impacts of natural disasters such as earthquakes, typhoons, and tsunamis.

16 https://www.jica.go.jp/english/news/press/2019/20200221_11_en.html
17 https://www.oecd.org/daf/fin/insurance/OECD-Disaster-Risk-Financing-a-global-survey-of-practices-and-challenges.pdf
18 https://www.oecd.org/finance/oecd-recommendation-disaster-risk-financing-strategies.htm

According to the World Bank, PCRAFI was launched in 2007 to provide disaster risk assessment and financing tools to Pacific Island Countries (PICs) in order to enhance disaster risk management and climate change adaptation. PCRAFI launched in January 2013 its insurance program to provide rapid response financing through immediate cash injection after a major tropical cyclone and/or earthquake/tsunami. Pilot programs have been run with five PICs: Vanuatu, Tonga, Marshall Islands, Samoa, and Cook Islands. Initially, PICs were able to secure an aggregate insurance coverage of more than US$43 million against tropical cyclones and earthquakes. Since PCRAFI was intended for IDA PICs, Fiji was not eligible for PCRAFI as an IBRD country. PICs have been paying their premiums in full since 2016.

As one of the key outcomes of the PCRAFI initiative was a study of Pacific Island states that aimed to provide a comprehensive assessment of catastrophe risks facing the region and identify the most effective and sustainable financing solutions to address this risk. The scope of the analysis included an assessment of the current state of disaster risk management, an evaluation of existing insurance and financial products, and an examination of innovative financing mechanisms such as catastrophe bonds and parametric insurance.

In this context, The Pacific Catastrophe Risk Insurance Company (PCRIC)—as a regional insurance company established to provide affordable insurance protection against the impacts of natural disasters to island states in the Pacific—was created as part of the Pacific PCRAFI with the aim of improving regional resilience against disasters.

Along with other island states in the Pacific, Fiji is a member of PCRIC and thus would enjoy access to affordable insurance coverage designed to protect against the financial impacts of natural disasters, complement existing risk mitigation efforts, and provide an additional layer of protection to the government, businesses, and communities in Fiji.

However, the GoF has not yet decided if it will contract insurance with PCRIC, based on the idea of possibly selecting a less-than-ideal insurance trigger. The decision of the GoF of adhering to PCRIC products should be informed by studies and analysis that would allow the GoF to select the adequate products to meet their needs.

It is important to note that the GoF's unique position regarding parametric insurance would enable it to achieve tailored insurance schemes according to its risk profile. Fiji represents an ideal insured to interact with PCRIC and reach points of agreement to develop products that meet their needs, restrictions, and specific features.

Box 1. Disaster private property insurance and microinsurance

The parametric insurance market, particularly weather insurance, is still in its infancy yet is displaying steady growth. According to the Reserve Bank of Fiji, the UNCDF-led Pacific Insurance and Climate Adaptation Programme (PICAP) launched a parametric weather risk insurance policy through microinsurance in 2021.

The aim of this pilot was to develop a microinsurance scheme that compensates losses to farming communities, fisheries, and small businesses vulnerable to natural disasters.

The insurance design is fully parametric and based on parameters measuring wind speed (in kilometers per hour) and rainfall (in millimeters) using remotely sensed weather data. It follows a predetermined pay-out structure that is independent of actual beneficiary losses.

In order to promote this scheme and strengthen the proposal, the GoF agreed to a VAT exemption for this type of insurance.

According to the Central Bank, PICAP—in partnership with two local insurance companies—was admitted into the Experimentation stage (Stage 3 of 4) of the FinTech Regulatory Sandbox (Sandbox) in 2021 to pilot a group of parametric insurance products with selected agri-based cooperatives across Fiji for a period of 12 months spanning from December 2021 to November 2022.

5.2 Disaster Management Resource Deficit Analysis

According to international best practices, post-disaster government resource deficits in developing and least-developed economies refers to the shortfall in funds and resources needed to respond to and recover from the impacts of natural hazards. These deficits can arise due to a number of factors including limited government resources, insufficient insurance coverage, and limited access to international aid and financing.

In many developing and least-developed economies, the government may lack the financial resources or infrastructure necessary to respond effectively to a disaster: potentially resulting in a slow and inadequate response, leading to further damage and loss of life as well as economic and social impacts that can last for years.

Resource deficits can also exacerbate existing inequalities and vulnerabilities, particularly in marginalized communities that may lack access to the resources and support needed to recover. This can lead to long-term economic and social impacts, including increased poverty and unemployment as well as reduced access to basic services.

Methodology to estimate resource deficits in Fiji

Considering the lack of estimate resources and fiscal vulnerability data, this analysis proposes a methodology to estimate potential resources needed for disaster recovery.

PCRAFI outcomes included estimated scenarios of damage costs by peril, utilizing the example of TC for the purposes of this analysis. The PCRAFI estimation provides a probabilistic[19] total cost of

19 Considering assets expose to natural hazards, this type of analysis simulates future events, and generate future damages, assigning a probability. Based in this probability and cost of damages build scenarios of damages. Probabilistic damages refers to the outcome of this analysis.

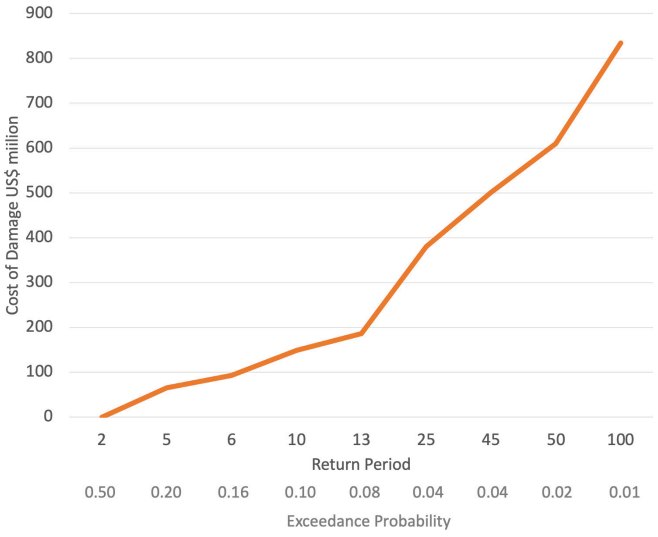
damages. **Figure 8** summarizes the exceedance probability20 and return of periods21, which is the likelihood that a specific loss level will be exceeded within a given period22. Table data indicates the indicative cost of damages linked to that probability and accordingly to its return periods.

Figure 8 and table 5 data also reveal the potential cost of damages from a probabilistic point of view for the Fijian economy, considering representative economic sectors.

The figure 8 indicates the probability of reaching a specific level of damages in US$ million based on the PCRAFI risk assessment for TC and TC Winston (2016)'s assumptions about the public sector's impact. TCs are classified by return of period. An TC like Winston has about 93 years of return of period. In terms of probability, it is 0.0108 (i.e., 1/93 years), since the probability is lower, the return of period is higher, and the potential damage costs are higher. In this regard, the graph would indicate Winston damages to the public sector close to 100 years of return period, around US $834 million in terms of cost of damages.

On the other hand, table 5, shows a summary of these indicators, in terms of the exceedance probability, return of period and cost of damages. This table then, provides an indicative amount of potential damages for the Fijian public sector by TCs.

Figure 8. Exceedance curve: probabilities and return of period for a tropical cyclone (total cost of damages in US $million)



Source: Author's estimates based on PCRAFI data

Table 5. Representative points of return of period (in years) (PR), exceedance probability (EP), and total tropical cyclone damages in US $million

PR	EP	Damages (US $M)
10	0.10	149
20	0.05	302
50	0.02	610
100	0.01	834

Source: Author's estimates based on PCRAFI data

The process to estimate required government resources is based on PCRAFI estimates, as a source of data, and specifically the estimation of resources would need by the GoF take as point of reference, the impact of TC Winston (2016) in public assets.

Considering the TC Winston Post-Disaster Needs Assessments (PNDA, 016), the breakdown of public sector impacts is summarized in the following table: providing damages in F $ and US $, highlighting the size of the impact by individual sector, and consolidating in two major sectors (the social sector representing 5.1% of

20 Exceedance probability in the context of disasters is the likelihood of a disaster event such as a flood, earthquake or hurricane exceeding a certain magnitude or threshold, which could cause significant damage or loss.

21 Refers to the **average** length of time between events of a certain magnitude or intensity, such as floods, earthquakes, or hurricanes. It is used to estimate the probability of a similar event happening again, and to assess the risk and vulnerability of an area to disasters.

22 Expressed as a percentage and indicating the chance the loss will exceed a specific threshold.

total damages and infrastructure representing 13.7%, with water and sanitation reaching only 1.1% of the total damages). Both sectors represent 18.8% of the grand total with respect to the total cost of damages, with all sectors totaling US $616.4 million (excluding environment).

Table 6. Total cost in damages (million)

	Damage (F $)	Damage (US $)*	As % of Grand Total
Social Sectors	**76.9**	**36.9**	**5.10%**
Education	*69.2*	33.2	4.6%
Health	*7.7*	3.7	0.5%
Infrastructure Sectors	**208.2**	**99.9**	**13.7%**
Transportation	*127.1*	61.0	8.4%
Water and Sanitation	*16.9*	8.1	1.1%
Electricity	*33.0*	15.8	2.2%
Communications	*31.2*	15.0	2.1%
Social + Infrastructure (total)	**285.1**	**136.8**	**18.8%**
*FJD to US annual 2016 average= 0.479666			

Source: PDNA Fiji 2016

Percentages extracted from the PDNA (2016) represent key inputs for the analysis developed here. These percentages (in red) are considered with respect to the previously defined exceedance curve and extrapolated in terms of probabilistic impact of total damage costs for a specific subsector such as water and sanitation or for any other sectors and subsectors assessed. In this sense, these percentages were taken as an input for this report, it will be assumed as percentage by sector and then, allow to breakdown modelled total cost of damages.

In other words, the percentage of total damage for each sector allows to estimate an exceedance probability curve for each sector and subsector, and to estimate the cost of damages linked to its probability for future events or type of severity of events.

The relevance of estimations by sector and subsector arises from links with the national government; therefore, disaster impacts in these sectors or subsectors represent a potential resource need for the government, particularly in light of major disasters.

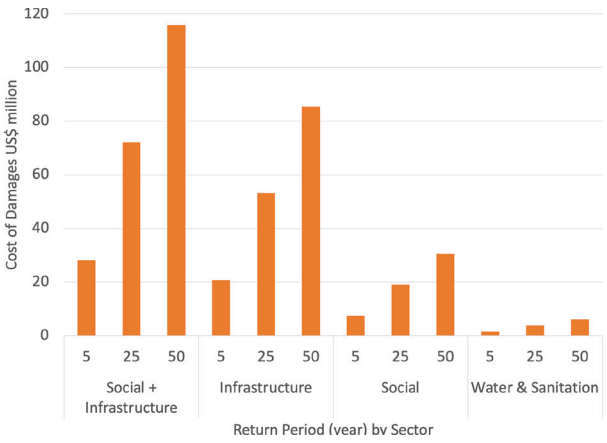
Based on the framework mentioned above, figures 9 and 10 show contingent resources that the government requires (by sector) in case of disaster: providing a breakdown by type of disaster with respect to the return of period (in years). The return period range is classified as either high frequency (5 and 25 years) to medium frequency (50 years).

High frequency refers to the level of frequency. In this sense, 5 and 25-year events are relatively recurrent and not necessarily significative considering the size of the GoF expenditure[23].

The impact of high frequency events (5 and 25 years or period of return) could exist in the range of 1.6% and 4.1% within the year of government expenditures (2022–2023) and reach 6.6% in the case of medium frequency (50 years of period of return).

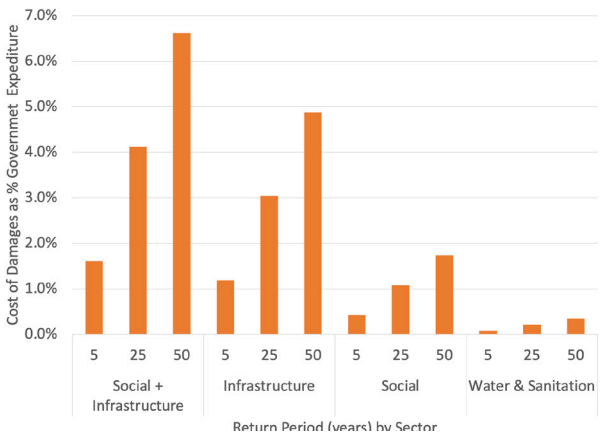
23 Fiscal year 2022–2023 total expenditures are projected as FJD $3,812 million (2022 values) and roughly US $1751 million.

Figure 9. Modelled costs of damage by TC event type (in period of return years), and sector (US $million, 2015 values)



Source: Author's estimates based on PCRAFI data

Figure 10. Modelled costs of damage by TC event type (in period of return years), as a percentage of government 2022–2023 expenditures by sector

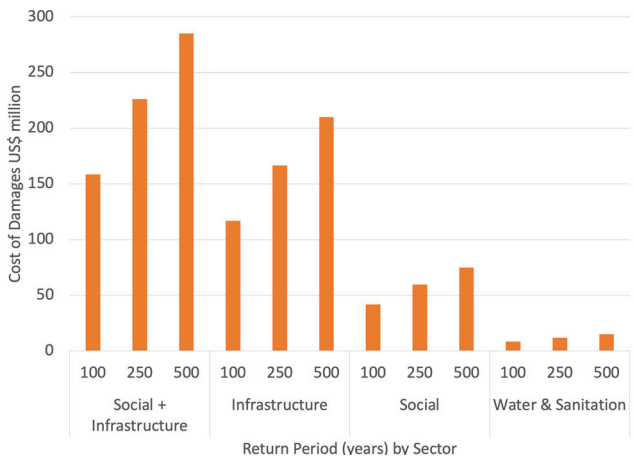


Source: Author's estimates based on PCRAFI data

Despite the size of probable events of high and medium frequency, low frequency and high severity could reach significative importance with respect to government expenditures.

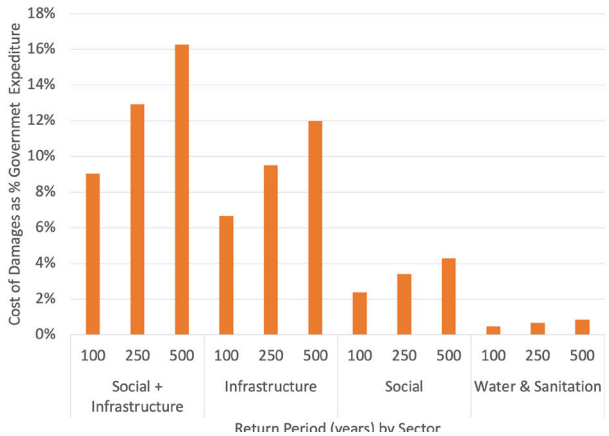
Figures 11 and 12 indicates damages in absolute values and relative to the size of government expenditures for both sectors and one subsector (water and sanitation). Impacts could fall in the range of 9.1% to 16.3% for events of a 100 and 500-year return of period, respectively. Even in the case of an individual sector such as water and sanitation, this could reach 0.5% and 0.9% of total government expenditures for events of a 100 and 500-year return of period, respectively.

Figure 11. Modelled cost of damage by TC event type (in period of return years) by sector (US $million, 2015 values)



Source: Author's estimates based on PCRAFI data

Figure 12. Modelled cost of damage by TC event type (in period of return years) as a percentage of 2022–2023 government expenditures by sector



Source: Author's estimates based on PCRAFI data

As part of disaster risk financing strategy, establishing ex-ante risk financing instruments requires an assessment of the potential costs of damages caused by disasters, in this case by TC, in order to develop ex-ante risk financing instruments. On the basis of the analysis of this section, relevant risk financing ex-ante instruments for the government are modeled based on the estimated financial impact on the public sector (infrastructure, social, and water and sanitation).

Consequently, we can observe that if disasters occur, such as those described here, the public finance could be significant impacted, for instance, events with a high to medium recurrence, could imply budgetary reallocations, which are expensive in terms of the disinvestment in priority areas affected for the reallocations. In the worst case scenario, considering catastrophic events with low recurrence (such as TC Winston in 2016 or worst) can compromise severly public finances when they occur.

6. Financial Instruments Against Disasters

Considering the analytical framework described in the previous section regarding the financing gap of the GoF, the aim of this section is to explore how ex ante disaster risk financing instruments can provide financial support to the potential cost of damage faced by the GoF.

The scope of this section is to analyze the following, specifically, as ex-ante financing instruments: budget allocation, disaster fund, contingent loan, and sovereign parametric insurance. Based on international practices, these instruments can provide financing support in the case of disaster: especially as part of a coordinated disaster risk financing strategy. The feature assumed for each instrument in this analysis is described below.

Budget allocation

This instrument is defined as an ex-ante budgetary line in addition to the regular budget allocation for operational purposes of ministries involved in disaster management. This allocation would be labeled for disasters only and regulated per publicly available norms for distribution to relevant key stakeholders. At the end of the fiscal year, any remaining balance would be transferred to a disaster trust fund managed by the GoF.

According to international practices, an annual budget allocation could be managed in three ways. Centralized by the budget authority and from that canalize to each ministry or agency affected. Semi-decentralized, in each sector ministry to be able to carry disaster recovery activities in their specific sectors, or a mix of both.

Disaster fund

The disaster fund would be created as trust fund, managed by the GoF, and set in a banking institution as the central bank. Fund regulation would be publicly available for all relevant stakeholders, with the fund fed through an annual fixed allocation per the national budget and supported by budget reallocations in the wake of major disasters. The remaining balance of each fiscal year would be retained in the fund until an ex-ante defined balance level.

Contingent loan

The contingent loan facility is proposed as a plain vanilla instrument: in other words, a contingent loan triggered for a specific damage amount for an ex-ante defined size of loan.

Sovereign parametric insurance

Parametric insurance is a contract whereby the insurer undertakes to compensate the contracting party when the previously agreed parameters or triggers of an event—generally quantitative, such as the intensity of the event or the amount of the loss—are met. This insurance is measured and/or calculated by a third party using a predetermined methodology of variables independent of the insured and the insurer.

Parametric insurance is based on the probability of occurrence of an event and not the loss it could cause, so no adjustments are made to these. Instead, once compliance with the parameter is corroborated, the insurer must compensate the insured in an almost expeditious manner, in accordance with the provisions of the contract. The indemnity may be staggered, associated with the value of the parameter.

While for traditional insurance schemes some catastrophic risk are not usually considered insurable, through parametric ones can be covered, and international experience shows that they are used for catastrophic events, such as tropical cyclones, earthquakes, and extreme rainfall, in order to limit the financial impact of the losses they could cause.

Through an insurance or reinsurance contract, or by issuing a catastrophic bond, parametric insurance coverage is granted. The difference between these mechanisms is the entity with whom the contract is made—considering its risk retention capacity—which could be an insurance company, a reinsurer, or the capital market.

Coverage proposed by the instrument for this analysis

Ex-ante instruments assessed were analyzed considering varied coverage sizes. Please note that the coverages shown here are examples; they are intended solely to illustrate the potential benefit of providing contingent resources to increase GoF's financial capacity to respond promptly in the event of a disaster. For infrastructure and social sectors, US $1m was assumed for an annual allocation and US $1m for the reserve fund, and US $50m and US $10m assumed for contingent credit and insurance, respectively.

The coverage works as described above: (1) for national coverage, the coverage is multipurpose, i.e. depending on the instrument, when the payment is triggered, it may be applied to the sector decided by the government, since the ultimate beneficiary is the government itself (the ministry of finance). In the case of insurance, if payment is triggered, the insurance pays and the insured sum is exhausted. There is no insurance amount reinstatement, i.e. it only works for a single event. Retention instruments may use partial or total coverage amounts, depending on the severity of the event. (2) For sectoral coverage, only water and sanitation is considered for retention and insurance.

With respect to the water and sanitation sector, we have considered the same type of instruments, but customizing the level of financial coverage.

As indicated, the proposed coverage sizes are illustrative, but follow the following rationale. The size of average annual losses, the most recurrent return periods, and the GoF's own disaster expenditure. The size of instruments created by Fiji-like economies. However, it is important to note that if only modeled losses are considered, the instruments would tend to be larger in size. However, international experience shows that the most critical aspect to consider in developing economies is to create the instruments. These instruments can be refined in features and increased in size once created.

Table 7 below indicates the sequence of payoffs, first, starting with the annual allocation and then the reserve fund with the contingent credit providing coverage, and then over the budget allocation and reserve fund. Finally, parametric insurance coverage pays over the first three instruments.

It is worth highlighting that these coverage sizes in US $m are indicative, but consider the type of risk, government size of spending , and potential affordability for the GoF.

Table 7. Coverage in US $million by instrument and sector

Type of Instrument	Instrument	Infrastructure & Social	Water & Sanitation
Risk Retention	Reserve Fund	1.0	1.0
	Budget Allocation	1.0	1.0
	Contingent Credit	50.0	4.0
Risk Transfer	Parametric Insurance	10.0	5.0

Source: Author's estimates

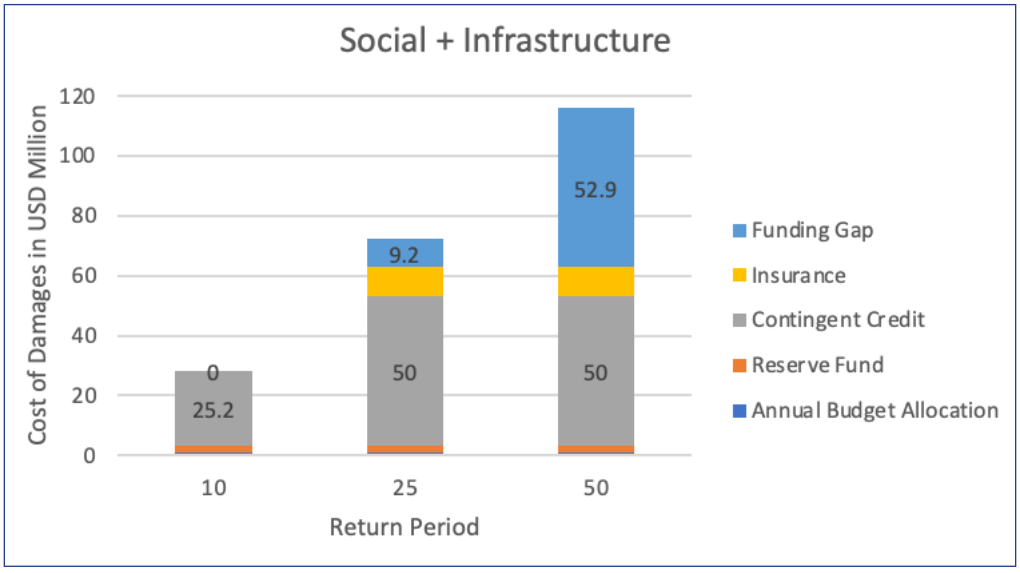
Ex-ante instrument post-implementation performance

Firstly, to assess ex-ante instruments once implemented, the analysis first considers the cost of damages estimated by return of period type (i.e., for 10, 25, and 50 years of return of period). For each return of period type (see Figure 13), the instruments provide financing (e.g., 10-year return of period damages are financed through the annual allocation, the reserve fund, and available contingent credit coverage).

Secondly, 25-year return of period damages or high frequency risk are financed with the annual allocation, the reserve fund, and full contingent credit coverage as well as insurance coverage. If the event reports this level of damage, the remaining financing gap is reduced from US $72m to US $9.2 million: the difference financed with instruments structured strategically for this level of damage.

Finally, for the third level of damages for a 50-year return of period, the above-mentioned ex-ante financing instrument works sequentially in the same order: reducing the original financing gap from US $115.9m to US $52.9m.

Figure 13. Ex-ante risk financing instruments reducing fiscal exposure to TC damages (in US $m) by return of period type for social and infrastructure sectors



Source: Author's estimate using PCRAFI data

Therefore, the instruments explained above represent a hypothetical example of the role an ex-ante risk financing strategy can play to provide the following benefits:

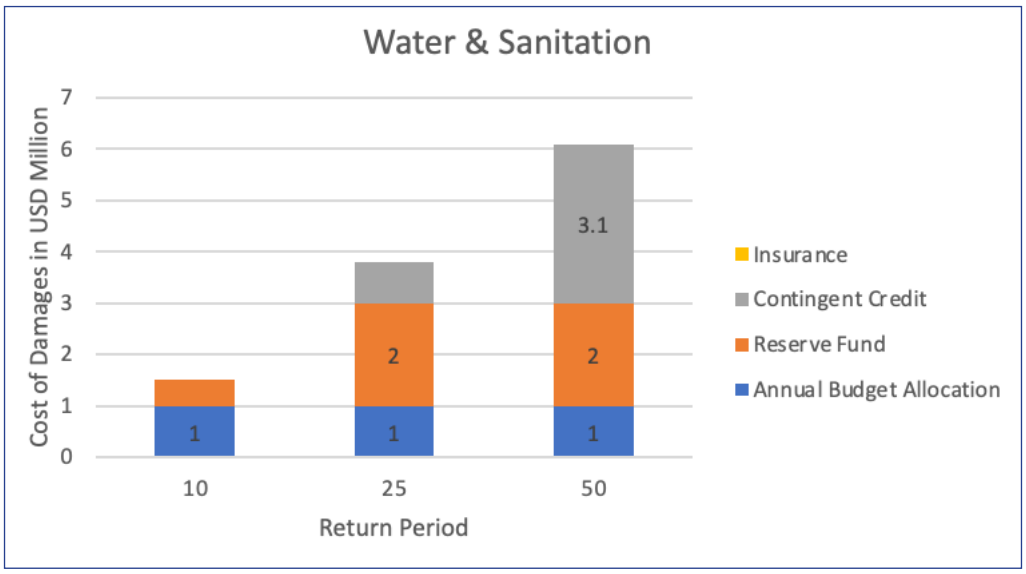
- First, ex-ante financing instruments provide governments with a predictable and reliable source of funding in the event of a disaster: helping to ensure necessary resources are available and possibly reducing the need for governments to turn to more expensive and less predictable sources of funding (such as borrowing from international financial markets).
- Second, ex-ante financing instruments can help reduce the overall cost of disaster risk management by transferring a portion of the financial burden associated with disaster response and recovery.
- Finally, ex-ante financing instruments can assist disaster management policy implementation with respect to a fiscal resilience policy: encouraging investment in risk reduction and mitigation measures and the development of comprehensive disaster risk management strategies.

Ex-ante instrument performance: water and sanitation case study

Given the size of the damages, water and sanitation sectors present an interesting case study for disaster risk financing: evaluating instrument performance through a clearer lens. Each type of TC event represents various levels of damage—as shown in **Figures 9 and 10**—for 10, 25, and 50-year return of time periods. Taking into account coverage by instrument type, diverse TC events are covered by ex-ante financing instruments.

In **Figure 14** below, we see the instruments are fully capable of financing damages for highly recurrent events (ranging from 10 to 25 years). In this regard, contingent debt begins to play a significant role in financing the gap from 25-year events while helping to fund around half of the financing required for 50-year events.

Figure 14. Ex-ante risk financing instruments reducing fiscal exposure to TC damages (in US $m) by return of period type for the water and sanitation sector.



Source: Author's estimate using PCRAFI data

In this section, a hypothetical example illustrates how to close the financing gap caused by TC using an ex-ante financing strategy as well as how financing agreements are made before disasters occur: minimizing uncertainty.

6.1. Exploring alternatives to structure insurance against water and sanitation sector disasters

This section explores the impact of various sovereign parametric insurance schemes targeting the water sector: building up over the instruments assessed in the previous section (annual budget allocation, reserve fund, and contingent credit), covering damages for high and medium frequency (10, 25, and 50-year return of periods).

The goal of this section is to add three types of parametric insurance (A, B, and C). Each insurance scheme triggers payments at different levels, with scheme A at 100 years, B at 250 years, and C at 500 years within the return of period. These levels of low frequency correspond to catastrophe events (e.g., TC Winston).

For parametric insurance schemes A, B, and C, this assessment assumed insured amounts or coverage of US $2.0m, US $3.6m, and US $4.0m, respectively. The indicative premium estimated for each layer insured is US $0.26 m (A), US $0.22 m (B), and US $ 0.09 m (C), and consequently the total coverage could be close to US $ 0.58 m for a total coverage of about US $9.8 m.

The table 8 breaking down the sample of ex ante risk financing strategy for the GoF, the GoF could assess to include all three layers of risk as part of a single insurance policy or each one individually in order to analyze independently each layer, with this analysis providing the ability to view the cost of insurance for each layer studied, and then the link of upper layer of risk (i.e., different levels of triggers) and the insurance premium.

Table 8. Coverage in US $million by instrument for water & sanitation sectors against TC

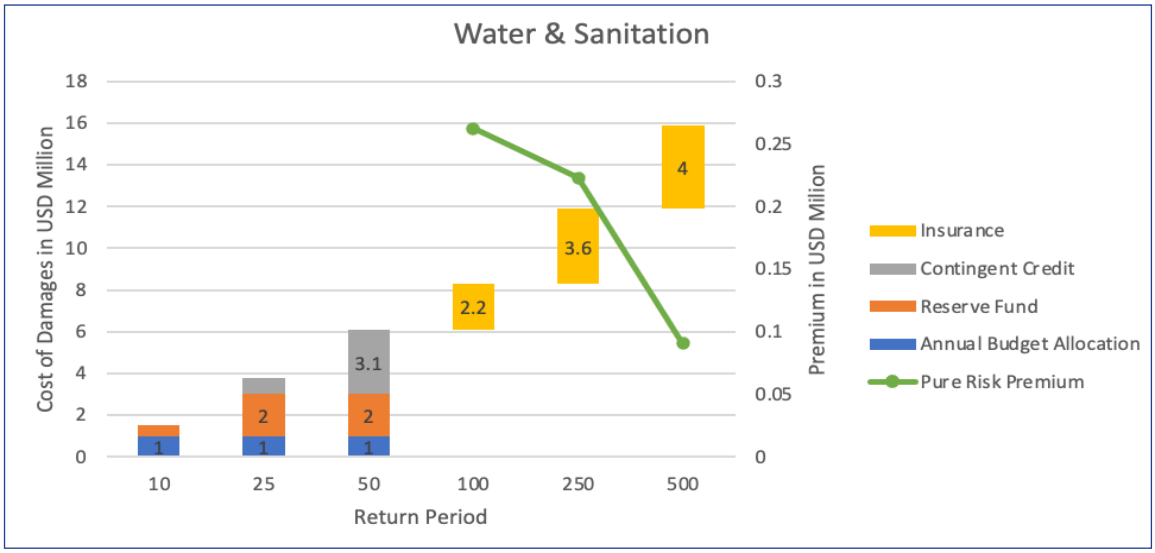
Type of Instrument	Instrument	Coverage (US$ m)	Premium (US $ m)
Risk Retention	Annual Budget Allocation	1.0	-
	Reserve Fund	1.0	-
	Contingent Credit	4.0	-
Risk Transfer	Parametric Insurance A (attachment @100 years)	2.0	0.26
	Parametric Insurance B (attachment @250 years)	3.6	0.22
	Parametric Insurance C (attachment @500 years)	4.0	0.09

Source: Author's estimates

According to the results of this analysis, Figure 15 displays the same period returns assessed (10, 25, and 50 years) on the left. Three types of parametric schemes in the chart (right side) are based on trigger levels. For the purposes of this water and sanitation sector analysis, the lower layers are covered by the annual budget allocation, reserve fund, and contingent credit while the higher layers (in yellow) are covered by insurance schemes. Primary axes (left side) represent the cost of damages in US $million, whereas secondary axes (right side) indicate the risk premium in US $million; secondary axe are only used as a reference for insurance schemes.

A pure premium risk is a proxy for the cost of insurance that excludes administrative expenses and other fees; this falls for higher layers and vice versa.

Figure 15. Ex-ante risk financing instruments reducing fiscal exposure to TC damages (in US $m) by return of period type for the water and sanitation sector.



Source: Author's estimates

This analysis shows that all damage costs are covered via ex-ante; thus, in the event of a disaster, the GoF could mitigate the uncertainty of funding and possess a resilient public finance strategy: strengthening its approach to disaster risk management.

7. Analysis Limitations

The analysis presented—based on the probabilistic analysis developed thanks to data obtained from PCRAFI—is consistent with international practices for probabilistic damage estimation. Corresponding conclusions with respect to existing data and the time window analyzed are thus sufficiently robust to explain future scenarios based on such data and timeframes.

However, the database of assets underlying the PCRAFI analysis differs from the assets affected by Tropical Cyclone Winston in 2016. This may be subject to discussion, particularly for low-severity events; however, as this is an extremely severe and low-frequency event, international experience shows that in this type of case, the degree of damage to exposed assets is such that it can converge to similar values.

In annex, we presented a methodology and framework for disaster risk management. Preferably, an estimation of exceedance probabilistic curve should be developed as a result of applying the methodology presented here. However, because such studies are beyond the scope of this methodology, PCRAFI-derived exceedance curves were used.

Historical information available for Fiji is substantially limited; however, we achieved our objective of providing the GoF with a broad view of ex-ante disaster risk financing instruments to define a funding gap while also presenting a range of likely damages and corresponding finance strategies. The water sector was analyzed, as requested per the Terms of Reference for this consultancy, alongside the consolidated public sector as well. Indicative probable damage was provided and an analysis conducted by varying activation triggers for various parametric insurance coverage types.

8. DRF Strategy Recommendations for the GoF

This report recommends strengthening current analysis and developing a database of public assets and relevant private assets, such as housing, through which PCRIC can gain access to reliable hazard modeling. Considering this inventory of assets and hazard modeling, the GoF can estimate the exceedance probability curve and can then strengthen current results by updating the same.

In this sense, it is considered that this report is a valuable input to the development of such study. PCRIC has absorbed studies leading to PCRAFI reports, and using this as a starting point, several improvements can be made to these reports with GoF participation in analysis procedures.

It is not the intention of this report to promote a particular instrument or group of instruments. However, considering the risk of TC in Fiji, the GoF could greatly benefit from implementing an ex-ante funding strategy given current circumstances that rely on retention.

Finally, analysis exercises presented in this report provide a broad view of the impact of TC events on Fiji's public finances while showing how ex-ante financing instruments can play a key role in financing damages.

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Annex 1. Risk reduction and disaster risk financing: An analytical framework

The methodology for financial management of disaster risks and risk reduction, which has three components that are applied sequentially, is presented below. The first is related to risk analysis and considers identifying the assets exposed to risk, analyzing their characteristics in the face of hazards, and determining the potential losses that may occur in the face of a broad menu of catastrophic events' severities.

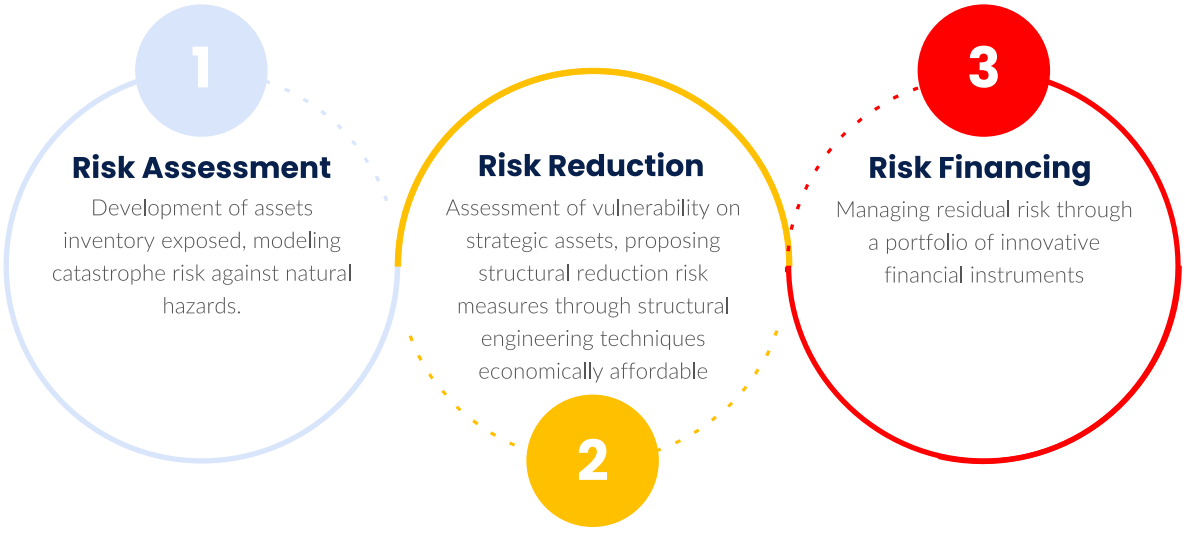
The second component of the methodology considers risk reduction in which, from the initial risk analysis, structural risk reduction measures can be defined in the assets studied to build resilience. These measures are selected in terms of their viability and efficiency from a structural engineering perspective, and the country's budgetary restrictions are also considered.

Finally, the third component addresses how to use financial instruments for residual risk management, for which the distribution of probable losses is known, given the implementation of risk reduction measures. Based on the new risk scenario, the risk is managed through financial instruments that allow for financing of the probable losses in a cost-efficient manner.

The role of financial instruments is to enable the rapid mobilization of resources in the event of a disaster and to provide protection for the Public Finance. Stakeholder can combine various risk retention and risk transfer financial instruments to meet the costs of emergency response and post-disaster recovery.

Consider including: This disaster risk management framework brings together necessary actions for building resilience, including: risk identification; risk reduction; preparedness; financial protection; and planning for disaster recovery. This framework is based on the fundamental principle of empowering governments and communities to understand their risks and make informed choices about how best to address them.

Figure 16. Methodology for risk reduction and financial risk management



Source: Author's elaboration.

Component 1: Risk analysis

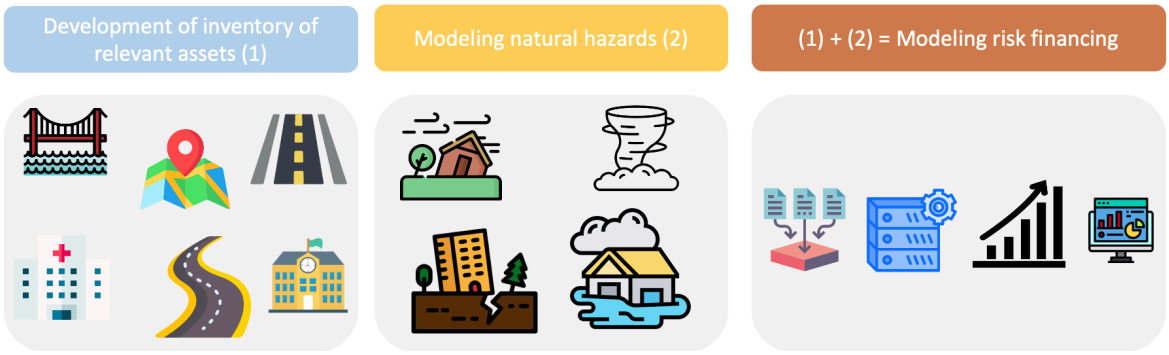
International practices for catastrophic risk modeling were used, which suggest breaking down the analysis into three independents but closely interconnected modules.

Figure 17 indicates the three main modules that the risk analysis models consider:

a. Infrastructure Identification,
b. Natural Hazard Modelling, and
c. Risk Financing Modelling.

The third module is based on 1 and 2 modules to assess the suitability of financial instruments according to the natural hazard occurrence and the probable losses given the vulnerability of each relevant assets type. In other words, considering the 1 and 2 modules outcomes, in terms of assets inventory and the impact of natural hazards, the probabilistic losses, in terms of exceedance probability, are the base of the risk financing modeling.

Figure 17. Main modules of a catastrophic risk analysis



Source: Author's elaboration.

The first module develops a detailed analysis of the exposed assets, for which a database is constructed that describes these assets, including the type contents of the assets assesed. Considering their geographic location and their physical characteristics. Figure 18 describes the sequence of activities to be carried out within this module. First, the variables that describe the information inherent to the assets are defined (for example, the location and physical characteristics, among other variables). Subsequently, a detailed analysis of these variables is performed, in order to assess the quality and level of data availability found. Once the information is collected, it is classified and analyzed. Finally, depending on the type of asset, a specific methodology is defined for those missing data variables and that by their nature are required for subsequent modules. For this purpose, a missing data treatment methodology was developed.

Figure 18. Development of inventory of relevant assets

Source: Author's elaboration.

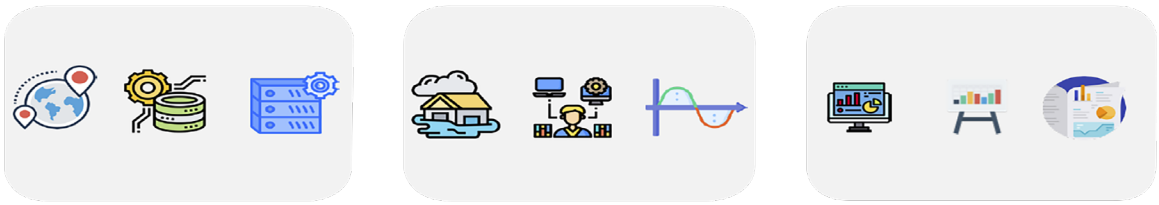
Natural hazard modelling (see Figure 19) is usually divided into three components. The first is the selection of data that best describes the natural hazard, usually using information from both local and international agencies.

Subsequently, the collected data are modeled in terms of analytical framework that describe the behavior of a particular phenomenon.

Finally, once the phenomenon has been modeled, using probabilistic tools, its behavior is simulated in a few tens to hundreds of thousands of scenarios, which allows us to build a catalog of events and assign them a probability.

This modeling simulate potential future are likely to occur, in several sizes, severities and locations to be affected, as well as the frequency in a given location.

Figure 19. Modeling natural hazards



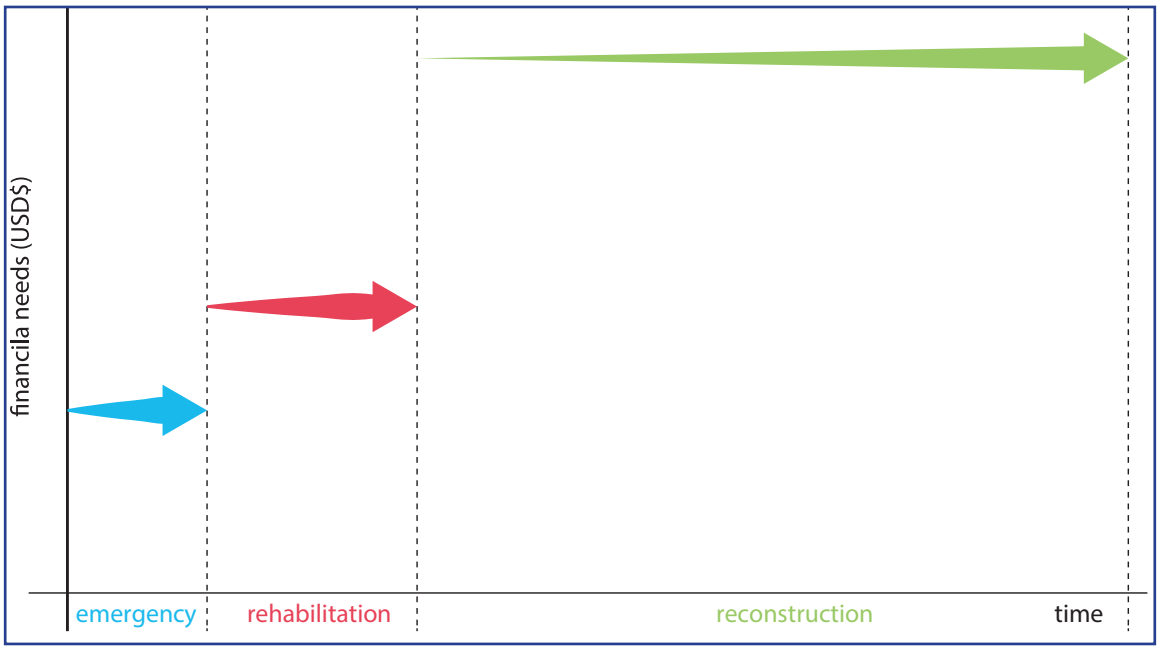
Source: Author's elaboration.

Component 2: Risk reduction as the spearhead of risk management

A first approach to understanding the dynamics of disaster risk financing and risk reduction is to consider two dimensions: time and the need for resources to act in the post-disaster phase (see Figure 20).

Regarding the timing of the need for resources, for example, post-disaster recovery programs can take months and sometimes involve years of planning before they can be implemented. The appropriate instruments must consider that not all resources are required immediately after the disaster has occurred. In this sense, resources are usually required for reconstruction over longer periods of time and needed beyond the emergency relief phase.

Figure 20. Main phases of post-disaster funding needs



Source: Author elaboration with elements taken from Ghesquiere y Mahul (2010)

Risk management methodologies have a defining impact on the selection of what and how much of an instrument to use. To the extent that disaster risk lays ground for instrument selection, it will help define the magnitude of the instrument to be used.

For example, in Figure 21, two parts are shown. On the left side is the exceedance curve of a hypothetical country. This curve shows us, on the horizontal axis, the probability of excess for a particular hazard. For each probability, there is a probabilistic value of losses. On the vertical axis (see Figure 21 left side), the zero starts from the right side and tends to infinity towards the right side. On the other hand, the vertical axis starts from zero to infinity in the direction from bottom to top.

Note that on the left side of Figure 21, the curve described is ascending and asymptotic to zero, i.e., as the values of the vertical axis (probability of exceedance), the probabilistic losses tend to infinity and are capped by the exposed assets value.

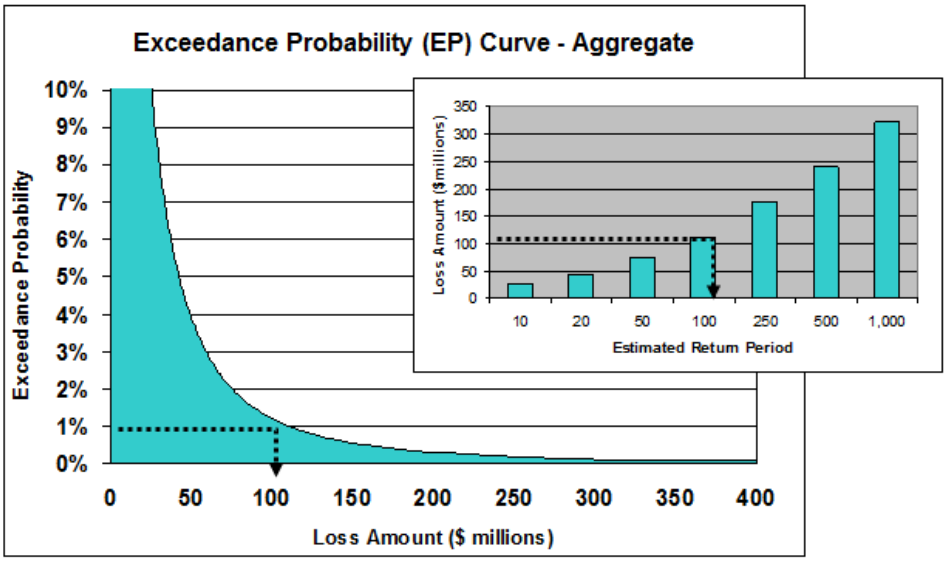
The question to be asked is whether there is any combination of instruments or only one instrument that is suitable for probabilistic losses (implemented cost effective methodologies). To answer this, it is necessary to know the specific structure of the exceedance probability curve and the parameters that define each financing instrument to be analyzed.

Figure 21, on the left-hand side, shows an exceedance probability (EP) curve, which is the likelihood that a loss of any given size or greater will occur in a given year. In other words, An EP curve marked to show a 1% probability of having losses of US 100 million or greater each year.

Another method of expressing EP probability is the Return Period, which describes the expected likelihood of a loss of a given size occurring within a given timescale. As an example, a 50-year return period states that, on average, an event/scenario will repeat itself once every 50 years when repeated samples are taken.

Then, Figure 21, on the right-hand side, shows the same information of EP Curve (left-hand side), but in terms of the return of period. To switch between these two metrics, follow these metrics: Loss Return Period = 1/(Exceedance Probability) and then, Exceedance Probability = 1/(Loss Return Period).

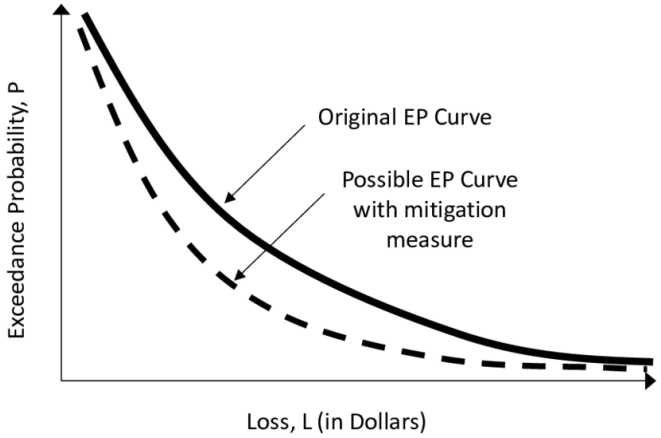
Figure 21. Exceedance probabilistic curve and post-disaster financial needs



Source: AIR Worldwide (Verisk)

Figure 22 considers the investment in risk reduction. The dotted line, below the solid line, shows the fact that risk reduction has a structural effect on the analytical understanding of risk, that is, investing in such a project or projects decreases the risk. Therefore, for the same probability of exceedance, the probabilistic loss decreases. The magnitude of this decrease will depend on the amount of investment and in particular on the structural engineering factors that will be carried out as a risk reduction measure.

Figure 22. Investment risk reduction effect in risk financing strategy



Source: Czajkowski, Jeffrey & Russo, Elisabetta & Brandenburg, Aaron & Groshong, Lisa & Young, Michael & Nielsen, Matt & Cope, Anne & Giammanco, Ian. (2020). Application of Wildfire Mitigation to Insured Property Exposure. 10.13140/RG.2.2.13898.39366.

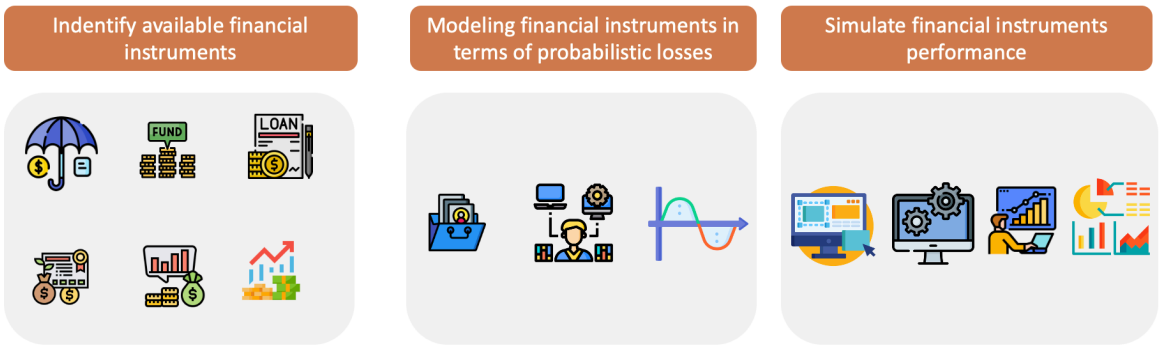
Figure 22 condenses not only the risk and financing gap reduction due to mitigation measures, which has structural effects on the description of risk in the long term.

Therefore, in terms of a risk financing strategy, the ex-ante risk financing instruments should reflect these, i.e., risk mitigation and the dispersion of financing at each stage of the disaster in accordance with the risk described by the exceedance probability curve.

Component 3: Risk financing

Finally, the third module is based on the interaction of modules 1 and 2, which generates loss scenarios, typically by generating exceedance probability curves. These curves are the starting point for the financial analysis. The first element is the identification of the instruments available in the country, to later model the behavior of the instrument for the generated exceedance probability curve. In the last stage, by means of statistical analysis of simulation, the behavior of the instruments are studied in terms of economic efficiency, that is to say, for what type of losses (low recurrence and high severity, to high recurrence and low severity) the instrument has a better yield.

Figure 23. Modeling risk financing



Source: Author's elaboration.

Once the distribution of probable disaster losses is known, the next step is the financial management of residual risk through financial instruments for disaster risk management that allow the financing of such losses in a timely and cost-effective manner. The following sections present the characteristics of financial instruments for risk management that the government can use.

Instruments for financing risk retention: from lower and highest frequency events

Risk retention instrument refers to type of risk financing instrument, that cover or provide financing for retain or assume certain layers of risk. Risk financing could be retained (financially assumed by the government by itself) or transferred (from the government to another party entity). Risk retention financing instruments make it possible to manage disaster losses using government's own resources, assume a first part of the loss in exchange for a reduction in the cost of risk transfer, and are generally used when transferring risk.

- → It is not economically efficient for low severity events that generate minor losses but have a high probability of occurrence.
- → For some low-frequency events, i.e., low probability of occurrence, but high severity, generate large losses, risk retention could be not enough to finance it.

Depending on the type of risk, it must be determined whether a risk retention instrument for risk management is efficient.

An advantage of risk retention instruments is the flexibility in deciding how and when they would have to be disbursed. However, in order to use them, the restrictions in the applicable regulatory framework for setting up reserves should be reviewed[24], as well as the minimum average balance that they should have in a year to face the average losses that could occur, and that they do not represent idle resources. Finally, these instruments require the definition of clear and transparent rules for their financing and use.

The instruments for financing risk retention are divided into two types, depending on when they are implemented:

- → Ex-post, after a disaster, which does not require prior planning, e.g., budget reallocations and sovereign issuance debt.
- → Ex-ante, prior to an event, planning should be done in advance and proactively, e.g., disaster funds and contingent lines of credit[25].

The following subsections describe the characteristics of the main instruments for financing risk retention (ex-ante and ex-post).

Budget reallocations

Budget reallocations provide resources in a short period of time, making it the first instrument that is commonly available to meet needs in the event of high-frequency disasters; However, they depend on the availability of resources at the time of the disaster, internal decisions, and the time required to execute the administrative procedures to make the resources available.

Budget reallocation seen as an ex-ante financial instrument is not economically efficient, due to the opportunity cost of modifying the plans of the programmed budget exercise by taking money from projects to which resources had originally been allocated and that will no longer generate the investment returns or the expected social benefit. Therefore, budgetary resources that are allocated ex-ante to an event through budgetary planning of potential losses allow for a reduction in the use of instruments such as budget reallocations.

24 Cardona, O. D., 2009, *Financial Management of Disaster Risk - Retention and Transfer Financial Instruments for the Andean Community*.
25 Clarke, D. J. and Dercon, S., 2016, *Dull Disasters: How Planning Ahead Will Make a Difference*, Oxford University Press.

Budget reallocations could also be used as an option after a disaster, considering that it is one of the most onerous ex-post financial instruments. It reduces the resources allocated to priority projects that contribute to the development of the economy.

Fiscal rules, institutional frameworks, and guidelines that allow for a timely response, as well as internal approval processes that allow for the transparent flow of resources, must be defined in order to make budget reallocations for disaster response.

Sovereign issuance debt

Frequently, sovereign debt is utilized to finance disaster-related damages. Governments impacted by disasters issue debt on global markets or binational debt; however, depending on the type of disaster and its severity, the post-disaster macroeconomic conditions exacerbate the conditions under which they issue debt, making financing through this source frequently scarce and costly.

Damage to the sovereign debt risk profile is the primary cause for the scarcity and difficulty of this sort of funding. In other instances, the disaster undermines credit quality by degrading the economy's infrastructure, production and consumption capacities. When the damage is structural and the likelihood of a recovery is doubtful, risk rating agencies lower the sovereign rating of a country's debt, which decreases sources of financing and increases the cost of financing via this source.

Disaster funds

Disaster funds generally accumulate their own resources, in case they are not used during the year, to meet emergency response needs in the event of a disaster caused by frequent, low-severity events. Once the holding fund is sufficiently capitalized, its resources may be used for recovery and reconstruction activities.

The constitution and administration of retention funds involves costs, since the fees of the public or private institution that administers the fund's resources must be covered, as well as the time required to define the rules for the efficient and transparent use of the resources. International experience in financial risk managing has identified the following actions for setting up a retention fund:

A. Analyze the regulatory framework to identify that the creation and management of the retention fund is permitted, i.e., the fund must comply with applicable regulations.

B. To carry out a legal act, where they are detailed:
    a. Sources of funding;
    b. Legal form, i.e., through a bank account or trust;
    c. Type of account where the resources will be deposited. This could be a commercial bank, central bank, or development bank;
    d. Corporate governance;
    e. Objectives of the fund.

C. Development and publication of manuals and/or rules of operation that detail the framework of action of the fund for disaster response and encourage transparency in decision-making and the use of resources:
    a. Trigger mechanism to make resources available;
    b. Procurement of goods and services regulations;
    c. Financial management, accounting records, and audits.

In addition to its own resources, the holding fund could receive contributions from donors and sovereign debt facilities.

Contingent credit lines

Contingent credit lines are used to finance losses with a low probability of occurrence, to limit the loss, and when it is necessary or impossible to transfer the excess risk to other instruments.

One of its main advantages is that the resources can be used to cover different types of losses. However, it is not cost-effective, since the availability and cost of resources are not favorable due to the economic conditions caused by a disaster, which increase the uncertainty of the contractor's financial situation. In addition, multilateral institutions that grant lines of credit may request a guarantee from the national government.

Contingent lines of credit are particularly contracted with multilateral organizations that provide immediate liquidity in the event of a disaster and can be used for financing:

- → Average losses;
- → Emergency needs due to disasters when there is no financial instrument for risk transfer;
- → Losses that exceed the coverage of insurance, reinsurance, or other financial instruments, such as bridge financing, since the resources are freely available.

These lines of credit are commonly granted to the national government through the Ministry of Finance by multilateral institutions, such as the World Bank, the Asian Development Bank (ADB), and the Japan International Cooperation Agency (JICA), among others. The agreement between the contractor and the multilateral must define the indexes, triggers, or circumstances for the availability of resources.

Table 9 shows the main characteristics and conditions for contracting contingent lines of credit for disaster relief offered by the multilateral institutions mentioned above.

Table 9. Characteristics and contracting conditions of contingent credit for disaster response, offered by multilateral institutions

Multilateral Institution	**World Bank**	**Asian Development Bank (ADB)**	**Japan International Cooperation Agency (JICA)**
Name	**Catastrophe Deferred Drawdown (CAT-DDO)**	**Precautionary Financing Option (PFO) under its Countercyclical Support Facility (CSF) or (CSF-PFO)**	**Stand-by Emergency Credit for Urgent Recovery (SECURE)**
Approval Criteria	» Appropriate macroeconomic policy framework; » Disaster risk management programme.	» Existence of an adequate macroeconomic policy framework and debt sustainability, including an IMF assessment letter. » Satisfactory completion of a set of substantive legal, institutional, and policy reforms to disaster risk management (captured in a policy matrix, based on prior actions). » A DPL outlining the government's commitment to development expenditure program to enhance resilience to natural hazards.	» Macroeconomic and public financial management » Plan for implementing JICA's technical cooperation for disaster prevention.
Limit	US $ 500 million or 0.25% of GDP, whichever is less.	» Each DMC can mobilize an amount equal to 0.50% of GDP, up to a maximum of $500 million if financed by regular OCR or a maximum of $250 million if financed by COL/ADF. Small DMCs whose 0.50% of GDP is less than $20 million may avail of up to $20 million, subject to their available resources.	¥10 billion (US $92 million) or 0.25% of GDP, whichever is less.

Trigger Mechanism	» Predetermined trigger, such as the declaration of the country's state of emergency.	» Disbursement is available only if pre-specified condition(s) linked to a disaster caused by natural hazard—typically the DMC's declaration of a state of emergency, or its equivalent—have been met.	» Formal request from the country.
Validity (available)[26]	» For three years.	» Up to the full allocated amount is available for disbursement at any time within 3 years of signing the legal agreement(s).	» For three years.
Conditions of Execution	» Flexibility of the country to decide when and how much to disburse. » Country-specific regulations for the exercise of spending. » Disbursement within 48 hours of request, and for various types of disasters.	» There is a policy matrix which include a set of substantive legal, institutional, and policy reforms to disaster risk management aimed at enhancing the DMC's resilience to natural hazards. ADB should demonstrate its value addition in supporting the reforms.	» Regulatory framework for the procurement of services or goods applied by JICA. » Disbursement within 15 business days of request.
Operational Requirements	» Satisfactory DRM program at the time of disbursement.	» The policy matrix should include a detailed PPPF, itemizing future reforms as well as ADB policy and technical support priorities.	» Adjust the operation of the credit to JICA's cooperation.
Cost of Financing	» Fixed price: projected by the WB, and if applicable, plus a market risk premium. » Variable prices: 6-month LIBOR + / - BM financing margin.	» 6-month LIBOR +/ - ADB's financing margin for CSF resources specifically	» Fixed for all types of SECURE credit, with a rate of 0.01%.
Renewal Availability	» Once, for a maximum of six years in total.	» The initial availability period of the CDF for regular OCR, COL, and ADF is 3 years. Regular OCR-financed CDF can be renewed up to four times for a maximum of 15 years, while COL and ADF-financed CDF can be renewed once for a maximum of 6 years. Each renewal is for a period of up to 3 years.	» Up to a maximum of 15 years with extension procedures every 3 years.
Payment Period	35 years	15 years	40 years
Grace Period	3 years	NA	10 years
Renewal Cost	0.25%	0.25%	0.00%
Initial commission	0.50%	0.25%	0.50%
Standby fee	0.00%	NA	0.00%
Commitment Committee	0.00%	0.15%	0.00%

Source: Author's elaboration with information from the World Bank (WB), the Asian Development Bank (ADB) and the Japan International Cooperation Agency (JICA).

26 From the start of the contract with the multilateral institution.

Donors and international assistance

Resources from donations and international assistance are usually provided in the case of catastrophic events that are not recurrent and where the number of losses is uncertain. Such resources are therefore mainly used for immediate response actions, such as humanitarian assistance.

Donations for disaster relief are a source of resources of low costs for the governments affected, since many donors have humanitarian programs to support relief activities, among other actions. However, some of the limitations of this mechanism are that:

- → Resources are limited, representing a portion of the total need for emergency response and recovery, and rarely support reconstruction programs;
- → Donations may be motivated by the visibility of the disaster in the media, so attendance and recurrence cannot be predicted;
- → Internal and international arrangements must be made to schedule and receive resources, which can be a complex and time-consuming process involving uncertainty;
- → The allocation of resources is not very flexible, as they are generally earmarked for previously identified expenditures.

As a summary of the section, table 10 presents the main characteristics of the instruments for financing risk retention that were described in this section.

Table 10. Characteristics of risk retention financing instruments

Instruments	Budget reallocation	Disaster Relief Holding Funds	Contingent lines of credit: - of Multilaterals	Donations and international assistance
Amount	Medium	Limited	High, maximum of US $500 million	Limited
Flexibility in the amount	» Agreed, according to need	» Defined annually	» Agreed, according to need	» Agreed, according to need
Financial cost	» Opportunity cost of resources.	» Account or Trust Administration » Opportunity cost of resources.	Institutional interest rates + commissions	» Opportunity cost of resources.
Reference to calculate the cost	» Social Discount Rate and Benchmark Rate of Return	» Social Discount Rate and Benchmark Rate of Return	» LIBOR plus Rate and Fee Adjustments	» - Social Discount Rate and Reference Rate of Return.
Flexibility in the use of resources	» According to the needs	» Distribution of resources according to needs	It is defined when the agreement is made, they can be: » Free destination, » With predetermined destinations.	In accordance with the donor's objectives and mission.
Disbursement time	» Days to weeks	» Days to weeks	» Weeks	» Weeks to months
Logistics	» Negotiations with government and legislative body » Fulfillment of the requirements and procedures.	» Design and implementation of the fund.	» Negotiations with the institution and government and comply with the requirements and procedures.	» Approach donors and comply with the requirements and procedures.

Source: Author's elaboration

Instruments for financing risk transfer

Instruments for financing the transfer of risk make it possible to eliminate the contracting parties' uncertainty about the materialization of the risk by transferring it to a financial institution. Traditional insurance is the most common instrument used to transfer disaster risks from the insured to the insurer[27]. However, there are currently several alternatives, such as parametric insurance and catastrophe bonds.

Insurance

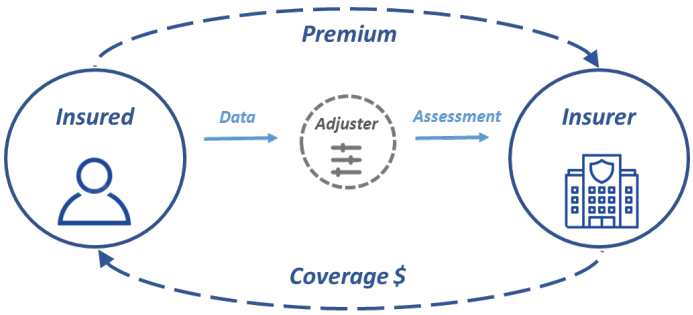
It is a contract in which the insurer is obliged to compensate the contracting party, in exchange for the payment of a premium, in the event of a loss covered by said contract and which is agreed by both parties[28].

Traditional Insurance for Governments

The insurer, through a contract, assumes the risk of a disaster and undertakes to indemnify the insured for the losses caused by the disaster in exchange for the payment of a premium. Traditional insurance for governments (or insured) contracts may include the figure of the deductible, which is an amount or percentage of the loss payable by the insured and which sets the amount above which the insurer will be liable for losses in excess of that amount or percentage. Additionally, a maximum amount of coverage to be paid by the insurer is established. Losses exceeding this amount will not be covered.

In order to make the claim of a traditional insurance coverage, a loss adjustment process must be carried out, in which an adjuster verifies and quantifies the magnitude of the insured's losses, so that the insurer, based on this information, makes the indemnity to the insured.

Figure 24. Traditional Insurance Operation



Source: Author's elaboration

Parametric insurance

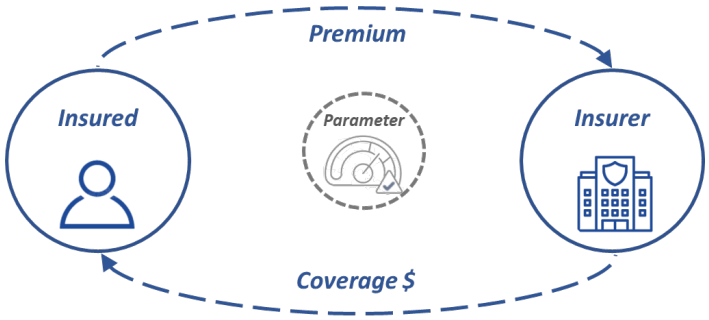
Parametric insurance is a contract whereby the insurer undertakes to compensate the contracting party when the previously agreed parameters or triggers of an event—generally quantitative, such as the intensity of the event or the amount of the loss—are met. This insurance is measured and/or calculated by a third party using a predetermined methodology of variables independent of the insured and the insurer.

Parametric insurance is based on the probability of occurrence of an event and not the loss it could cause, so no adjustments are made to these. Instead, once compliance with the parameter is corroborated, the insurer must compensate the insured in an almost expeditious manner, in accordance with the provisions of the contract. The indemnity may be staggered, associated with the value of the parameter -.

27 Clarke, D. J. and Dercon, S., 2016, *Dull Disasters: How Planning Ahead Will Make a Difference*, Oxford University Press.
28 Cardona, O. D., 2009, *Financial Management of Disaster Risk - Retention and Transfer Financial Instruments for the Andean Community*.

While for traditional insurance schemes some catastrophic risk are not usually considered insurable, through parametric ones can be covered, and international experience shows that they are used for catastrophic events, such as tropical cyclones, earthquakes, and extreme rainfall, in order to limit the financial impact of the losses they could cause.

Figure 25. Parametric insurance Operation



Source: Author's elaboration

Through an insurance or reinsurance contract, or by issuing a catastrophic bond, parametric insurance coverage is granted. The difference between these mechanisms is the entity with whom the contract is made—considering its risk retention capacity—which could be an insurance company, a reinsurer, or the capital market.

Capital market: catastrophe bonds

The capital market is an alternative for financing and transferring disaster risks, where financial mechanisms have emerged that allow risk to be assumed. Although it does not replace insurance and reinsurance markets, it complements them by transferring part of the risk.

When Insurance markets (traditional and parametric) experiment a high pricing season, catastrophe bonds could be an affordable alternative.

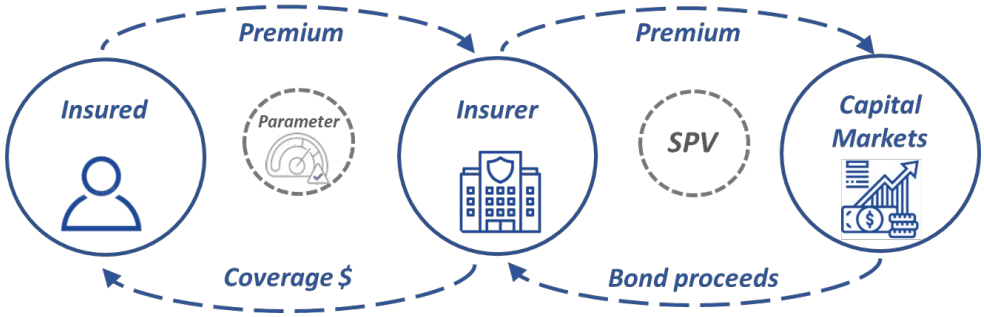
The catastrophe bond is a fixed income financial asset in which the investor buys a security for a value that will be repaid at the end of a period, and during which they receive cash flows based on the interest granted by the bond.

For the issuance of catastrophe bond securities, the issuer and the investor use a special purpose vehicle (SPV) as an intermediary, which is created for that purpose, through one or more collateral assets of the issuance, the insurance premiums of the policyholders. The SPV is a separate legal entity that enters into an insurance contract with an insurance company to issue the catastrophe bond securities in exchange for payment from investors who purchase the security. The company that transfers the risk of the bond receives a premium, which is used by the SPV to pay investors coupons.

In this instrument, a trigger must be established, such that when the circumstances are met under which all or part of the principal and/or coupons (interest on the principal) must be used, indemnification is made to finance a disaster. This compensation may be based on actual losses, according to the sum insured agreed with the insurer issuing the bonds, or through payments based on indexes that cannot be influenced by the insured and that are related to the coverage of the disaster risk that the bond is covering.

Figure 26 shows the operation of the catastrophe bond, from the interaction of the insured with the insurer, and of the latter with the capital market through the SPV.

Figure 26. Operation of the catastrophic bond



Source: Author's elaboration.

Finally, as a summary of this section, Table 11 presents the main characteristics of the risk transfer financing instruments discussed above.

Table 11. Characteristics of risk transfer financing instruments

Instruments		Advantages	Limitation	Cost of anchoring	Flexibility in the use of resources	Disbursement time	Logistics	Financial Cost
Insurance	Traditional	» Agreed sum insured » Clarity of coverage	» Ensure appropriate costs	» Risk premiums	» Free destination	» Tardiness	» Established processes (e.g., transparency) » Inspection and adjustment periods	» Pure Risk Premium + Commissions
	Parametric	» Agreed sum insured » Clarity of coverage	» Ensure appropriate costs	» Risk premiums » Basis risk*	» Free destination	» Expedited	» Established processes (e.g., transparency) » Corroboration of the detonator	» Pure Risk Premium + Commissions
Capital markets	Catastrophic bonus	» Agreed sum insured » Clarity of coverage	» Ensure appropriate costs	» Risk premiums » Basis risk	» Free destination	» Expedited	» Established processes (e.g., transparency) » Corroboration of the detonator	» Pure Risk Premium + Commissions

Note: Basis risk in insurance refers to the possibility that someone has purchased insurance, but the money they receive in a claim does not equal the full cost of that particular claim event.

Source: Author's elaboration

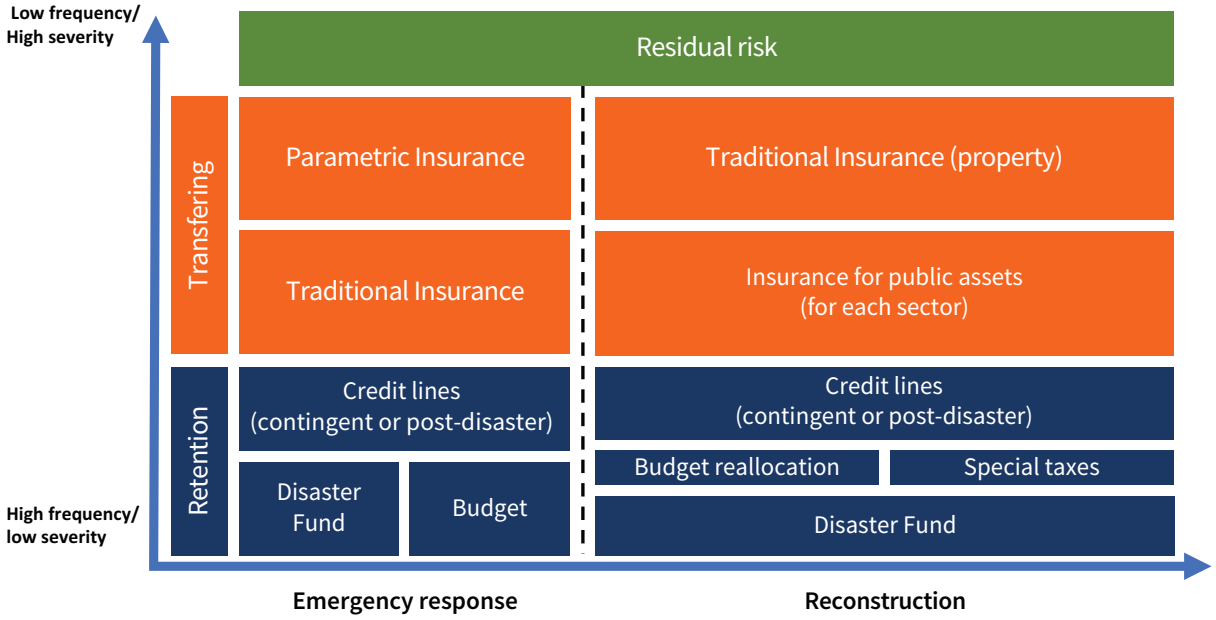
Component 4: Risk layering approach

The methodological paradigm for risk management based on risk layering, which is the practice of combining different types of financial instruments (risk retention and risk transferring) to manage and finance the financial impacts of disasters. The goal of risk layering is to create a diverse and resilient portfolio of risk transfer mechanisms that can provide coverage against different types of disaster events, while minimizing the potential for coverage gaps or overlaps.

In the field of disaster risk financing, risk layering typically involves combining traditional insurance mechanisms (such as property and casualty insurance), alternative risk transfer mechanisms (such as catastrophe bonds, parametric insurance, and risk pooling arrangements) with risk retention instruments (budget allocation, budget reallocation, contingent debt and ex post debt). By layering these different instruments, governments, can better manage their financial risks, reduce their exposure to catastrophic losses, and improve their ability to respond to disasters.

The concept of risk layering showed in figure 27 illustrates the strategic interactions of the risk financing instruments previously mentioned. Which settings are tailor made following the government's risk tolerance, funding needs, and budget, the strategy may be modified to meet its specific needs. The figure presents all possible settings for the risk financing instruments.

Figure 27. Risk layering methodology for risk financing



Source: Author's elaboration with data from World Bank (2021)


Rerevaka na Kalou ka doka na Tui