

TONGA

Disaster Risk Financing Strategy

2021 - 2025

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Acknowledgements

The Ministry of Finance (MoF) prepared this document in close collaboration with the Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications - National Emergency Management Office (NEMO); Ministry of Internal Affairs; Prime Minister's Office - National Planning Office; and National Reserve Bank of Tonga. The Ministry of Finance is grateful for technical assistance from the World Bank and Asian Development Bank. World Bank technical assistance was provided under the Pacific Catastrophe Risk Assessment and Financing Initiative, which is financed by the governments of Canada, Germany, Japan, United Kingdom, and the United States. Ministry of Finance also acknowledges the coordination and technical support provided by the Senior Specialist working at NEMO in a program funded by the Australian Department of Foreign Affairs and Trade. Their generous support is gratefully acknowledged.

Abbreviations

ADB	Asian Development Bank
ASP	Adaptive social protection
Cat DDO	Catastrophe-deferred drawdown option
DRFS	Disaster risk financing strategy
DRM	Disaster risk management
DRR	Disaster risk reduction
EQ	Earthquake/Tsunami
GDP	Gross domestic product
HMAF	His Majesty's Armed Forces
JNAP2	Joint National Action Plan 2 on Climate Change and Disaster Risk Management
MAFFF	Ministry of Agriculture, Food, Forests and Fisheries
MEIDECC	Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications
MIA	Ministry of Internal Affairs
MoF	Ministry of Finance
MoI	Ministry of Infrastructure
MPE	Ministry of Public Enterprises
NEF	National Emergency Fund
NEMC	National Emergency Management Committee
PacRIS	Pacific Risk Information System
NEMO	National Emergency Office
PCAFRI	Pacific Catastrophe Risk Assessment and Financing Initiative
PCRIC	Pacific Catastrophe Risk Insurance Company
PMO	Prime Minister's Office
TC	Tropical Cyclone

1. Introduction

Tonga is a Polynesian Pacific Island country with a population of 104,000. The Tongan archipelago comprises 169 islands, of which 36 are inhabited. Because of its location and small size, Tonga and its population are highly vulnerable to external shocks, including from natural disasters and epidemics, and to climate change and its long-term effects, such as sea-level rise and increasing intensity of tropical storms. Tonga's vulnerability was clearly demonstrated in 2020, when the COVID-19 pandemic and Tropical Cyclone Harold severely affected its economy.

Proactive public health measures to contain COVID-19—a declaration of a state of emergency in March 2020, international border closures, strict social-distancing measures, and domestic travel restrictions—combined with a global recession severely affected Tonga's tourism-dependent economy and government finances. A reduction in economic activity decreased fiscal revenues at a time when additional public expenditure was required for the health sector, households, and businesses and to stimulate the economy.

While Tonga was facing the COVID-19-induced crisis, a severe (category 4 when it hit Tonga) tropical cyclone hit in April 2020, leading to significant damages and losses. The winds and an accompanying storm surge and simultaneous king tide¹ caused widespread flooding, substantially damaging public infrastructure, housing, private infrastructure, and agriculture.²

As a result of the dual shocks in 2020, fiscal year 2020 gross domestic product (GDP) (ending June 2020) contracted by 2.5 percent, which is expected to be followed by a further contraction of 3.5 percent in fiscal year 2021 (IMF Asia and Pacific Dept 2021). This double blow affected the nation while it was recovering from Tropical Cyclone Gita in 2018, the largest natural disaster in Tonga since 1982, which caused damages and losses of 38 percent of GDP and affected more than 80 percent of the population. This cascade of shocks vividly illustrates the risks facing Tonga and the resulting challenges for the country's economic and fiscal policy makers.

Realizing the risk Tonga is facing, the government has prioritized a need for “A more inclusive, sustainable and effective land administration and environment management, with resilience to climate change and risk” under the Tonga Strategic Development Framework 2015-2025 (Ministry of Finance and National Planning 2015).

The Emergency Management Act (2007) guides Tonga's overall management of disaster risk, and the National Emergency Fund Act (2008) and participation in such initiatives as the Pacific Catastrophe Risk Assessment and Financing Initiative (PCRAFI) are targeted efforts to strengthen preparedness and minimize the financial effect of disasters.

Building on the existing legal and policy framework for disaster and disaster-related financial risk management, this disaster risk finance strategy (DRFS) brings together various ongoing and planned efforts from different sectors to quantify, reduce, and mitigate disaster-related financial risk. Developed by the Ministry of Finance (MoF), it provides a framework for coordination between key stakeholders when implementing concrete activities with a common objective: to strengthen the financial resilience of the Tongan government, households, and business to disasters.

¹ 1.3 meters above normal high tide levels.

² It is estimated that the disaster affected 28,000 people (27 percent of the population) and caused damages and losses of at least 12 percent of GDP.

2. Disaster Risk Profile

Tonga is one of the most at-risk countries in the world from several hazards, mainly tropical cyclones, seismic activity causing earthquakes and tsunamis, coastal floods, and volcanic activity. According to the Emergency Events Database,³ 25 disasters caused US\$240 million in damages and losses between 1946 and 2019, of which tropical cyclones accounted for 70 percent of events and 95 percent of losses.⁴ Tonga and its population, livelihood, and economic activities are highly exposed and vulnerable to such events, ranking second on the 2020 World Risk Index (United Nations University Institute for Environment and Human Security. 2020). Community and infrastructure are concentrated in low-lying coastal areas, including Nukualofa, Tonga’s capital and center of economic activity (Kingdom of Tonga 2012). The economy is largely based on the service and agriculture sectors, which are highly susceptible to disasters and climate change. Agriculture accounted for 1.2 percentage points of 2019 GDP growth (Kingdom of Tonga 2020a), and the two sectors combined accounted for 70 percent of employment in 2018 (World Bank Group. 2021). The tourism sector accounts for more than 20 percent of total employment in Tonga (Pacific Tourism Organisation 2018) yet is particularly vulnerable to shocks, including from the ongoing COVID-19 pandemic.

Tropical cyclones have hit Tonga frequently, causing loss of lives and livelihoods, limiting economic development, and harming public finances. Tonga is located south of the equator in an area prone to frequent tropical cyclones with damaging wind, rain, and storm surge during the wet season—November to April. Since 1960, Tonga has averaged one cyclone per year, of which six have severely affected the population, infrastructure, economy, and public finances. For example, Tropical Cyclone Gita in 2018 affected 80 percent of the population, with damages and economic losses of approximately US\$164 million, equivalent to 38 percent of GDP. The most affected sectors were housing, agriculture, and commerce and industry. These effects reduced GDP growth from a predicted 3.4 percent to 0.3 percent in 2018. More recently, on April 9, 2020, Tropical Cyclone Harold hit Tonga at a category 4 intensity, with sustained winds greater than 150 km/h. A preliminary assessment suggests that the cyclone created financial need of US\$24 million to cover the initial phase of the response and expected damages and losses of US\$124 million (equivalent to 23 percent of GDP) (Kingdom of Tonga 2018a; 2020b). Tropical Cyclone Harold hit during the COVID-19 pandemic, illustrating the problem of compound risk (materialization and mutual reinforcement of different risks simultaneously).

Although earthquakes and tsunamis have occurred less frequently, they can have devastating effects. Tonga is located along the Pacific “Ring of Fire” and near the Tongan Trench, an area with frequent seismic activity capable of generating large earthquakes and tsunamis. Before 2009, the last two significant earthquakes recorded were in 1977 and 2006, both of a magnitude of 7+, and damaging buildings and water and electricity supplies. In recent history, 20 tsunamis have affected many islands in Tonga. In 2009, a magnitude 8.1 earthquake generated a tsunami that destroyed half of the houses on Niautoputapu island (Kingdom of Tonga 2009). Even when these events have occurred less frequently, the community and infrastructure in low-lying coastal areas are highly exposed.

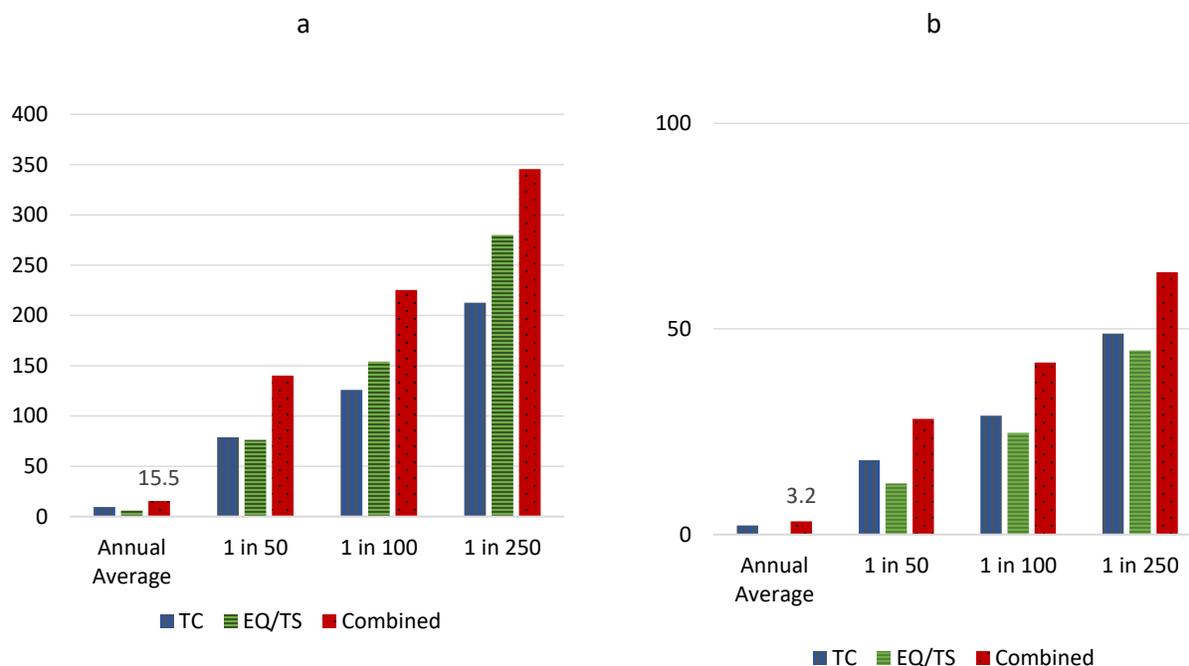
A risk assessment showed that Tonga can expect to experience average annual damages caused by earthquakes and tsunamis and tropical cyclones of US\$15.5 million. The earthquake and tsunami and

³ <https://www.emdat.be/>

⁴ Does not contain damage figures for Tropical Cyclone Gita; hence the total amount is potentially significantly underestimated.

tropical cyclone risk assessments for Tonga conducted under PCRAFI were derived from an estimation of direct damages to buildings, infrastructure assets, and significant crops from simulated potential future events. Direct damages includes the replacement value of the assets but not content losses, business interruption losses, or losses to the primary sector beyond agriculture. Estimated annual damage for different scenarios is displayed in figure 1a. Based on these estimates, earthquakes and tsunamis pose the greatest threat. Although smaller events might cause limited, manageable damage, large but less-frequent events might cause more-severe damage than tropical cyclones. Average annual damage is estimated to be US\$6 million from earthquakes and tsunamis and US\$15.5 million from all threats combined. Considering all risks mentioned, there is a 2 percent probability every year that direct damages will exceed US\$140 million and a 1 percent probability that it will exceed US\$225 million (World Bank 2011).

Figure 1. Annual Expected (a) Damages and (b) Emergency Costs from Tropical Cyclones (TC) and Earthquakes and Tsunamis (EQ/TS) Under Different Return Periods (US\$ million)



Source: Risk assessment conducted under World Bank Pacific Catastrophe Risk Assessment and Financing Initiative.
 Note: Return period is estimated time between losses of at least a specific size occurring; for example, a 1-in-100-year return period refers to losses that occur on average once every 100 years.

Average annual emergency costs are expected to be US\$3.2 million for all considered disasters. The emergency losses were estimated as a percentage of direct damages. Such costs were modeled to provide an estimate of financial need to cover emergency activities such as debris removal, setting up shelters, and providing relief to affected populations. Annual estimated emergency costs for different scenarios are displayed in figure 1b. For example, average annual emergency needs from all perils combined are expected to be approximately US\$3.2 million (World Bank 2011).

These figures could increase because climate change is expected to exacerbate disaster risk in Tonga. Tonga’s Meteorological Service, with support from the Pacific Climate Change Science Program, has

projected less-frequent but more-intense cyclones, rising sea levels causing more flooding and coastal erosion, and more-extreme temperatures with more severe floods and drought (Kingdom of Tonga 2014).

Compound Risks

When multiple risks interact, the potential collective effect can be greater than the sum of the parts. In 2020, Tonga faced the simultaneous and magnifying effect of the COVID-19 pandemic as well as Tropical Cyclone Harold (April 2020). Although Tonga has prevented infections from COVID-19, with no cases or deaths to April 2021, the effect of closed borders, a national lockdown, and international macroeconomic challenges continues to affect the national economy. Should additional natural disasters occur during the pandemic, the financial and economic vulnerability that the pandemic-induced global recession has caused may magnify the effect and increase the cost and complexity of domestic and international emergency response and reconstruction. Likewise, a disaster could lead to the import and spread of COVID-19 among the sheltering population. Despite increasing fiscal pressure, this risk highlights the importance of prearranged finance and establishment of shock-responsive systems for cost-effective response and speedy recovery.

A social protection system developed to respond to shocks (strategic priority 5 below) could be critical in supporting the government when dual shocks are faced. The dual shocks of the cyclone and COVID-19 have affected the social sector greatly, including individuals and households, especially those living below the poverty line. Tropical Cyclone Harold hit the tourism sector, which accounts for 25 percent of GDP, 38 percent of exports, and 21 percent of employment and faces the effect of protracted COVID-19 border closures, hard (Department of Foreign Affairs and Trade 2020). The International Development Agency has provided a grant package of US\$30 million to support the recovery and build resilience to dual shocks. The package prioritizes social welfare support (to elderly, disabled, and unemployed people and small businesses). Ongoing emphasis on the effects of gender through social protection programs will be required. Further details can be found in the Supporting Recovery After Dual Shocks Development Policy Operation document (World Bank 2020). The Tongan government also distributed food rations for poor families identified as food insecure because they were living below the nationally indicated poverty line.

Given the lack of historical experience, there is a high level of uncertainty regarding the progression of COVID-19. Health emergencies such as the pandemic are rare (with only three viral disease outbreaks recorded in the past 100 years) but have an extreme effect. Therefore, the strategic priorities discussed in this document focus on the costs of natural disasters that occur frequently in Tonga and for which there are statistical models to quantify the likelihood and potential effect of such events, although the financial instruments (apart from catastrophe insurance) and systems proposed are also apt to be used for responses to health emergencies. For example, contingent financing from the Asian Development Bank (ADB) and the World Bank can be drawn down for any declared disasters, including pandemics. Ultimately, the disaster risk finance principles laid out in section 4 apply equally to climate and geophysical events and health emergencies.

3. Legal and Institutional Framework

Building resilience to disasters and climate change is critical for development in Tonga; National Outcome F under the Tonga Strategic Development Framework 2015–2025 (Ministry of Finance and National Planning 2015) aims for “A more inclusive, sustainable and effective land administration and environment management, with resilience to climate change and risk” and has laid out the framework for resilient development in Tonga. Setting the overarching framework for the long-term development of Tonga, this document identifies “Improved resilience to extreme natural events and impact of climate change” under pillar 5, organizational outcome 5.4. The framework for climate change and disaster risk management (DRM) includes the National Determined Contribution, the Climate Change Policy, the Joint National Action Plan on Climate Change Adaptation and Disaster Risk Management, and the Emergency Management Act. According to the 2020 Tonga Climate Change Policy Assessment (IMF 2020), Tonga has made progress on its preparedness for natural disasters and climate change but would benefit from a comprehensive DRFS.

The primary legal document guiding DRM in Tonga is the Emergency Management Act 2007 (No. 14 of 2007), which establishes the National Emergency Management Office (NEMO) and emergency management committees at the national, district, and village levels. It also mandates elaboration of national, district, and village emergency management plans. The National Emergency Management Committee is responsible for coordinating effective emergency management and response in communities before, during, and after events. It also empowers the Prime Minister to declare a state of emergency. NEMO is revising the act and broadening its scope to take a more comprehensive approach. The new act will consolidate and align disaster resilience planning, emergency preparedness, response, and recovery efforts.

Several bodies have been established to support DRM in Tonga. The Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change, and Communications (MEIDECC) is responsible for coordinating and promoting climate resilience and DRM. It works closely with the Ministry of Lands, Survey and Natural Resources. The key institutions within the DRM architecture include the following.

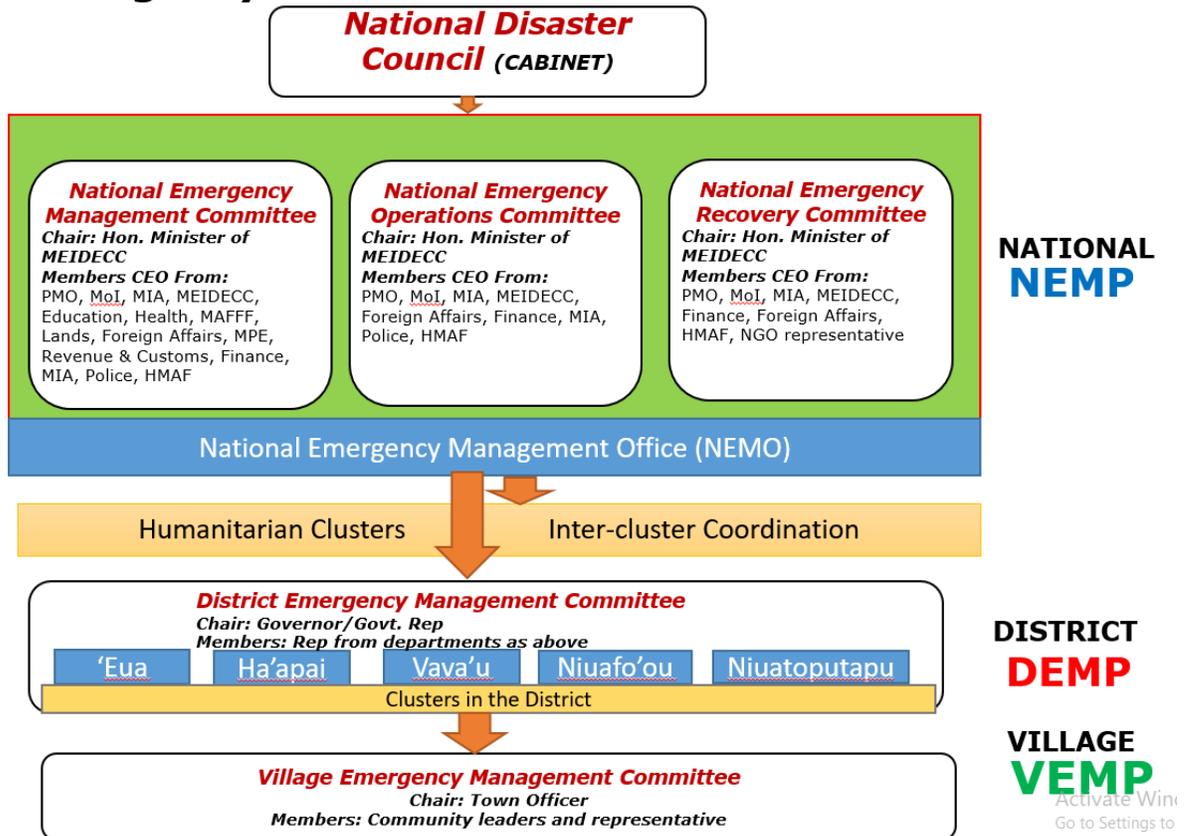
- NEMO, which is attached to MEIDECC, is the secretariat for the National Emergency Management Committee, the National Emergency Operation Committee, and the National Emergency Recovery Committee, and was established under the act, is responsible for coordinating all disaster risk reduction (DRR), disaster preparedness, and emergency management activities in Tonga.
- The Tonga Meteorological Service, attached to MEIDECC, provides weather and climate services and is the national authority for issuing meteorological and geophysical hazard warnings.
- The Natural Resources Division, of the Ministry of Lands, Survey, and Natural Resources, is responsible for earthquake monitoring, mapping, vulnerability assessments, and other related activities and shares responsibility for hydrological and geophysical warning services with the Tonga Meteorological Service.
- Since the Tongan cabinet established and endorsed the Cluster mechanism in 2014, it has played an active and integral part in all emergency response coordination. An inter-cluster coordination committee chaired by the chief executive officer of MEIDECC reports to the National Emergency Management Committee.

Figure 2 shows the structure of emergency management in Tonga as defined in the Emergency Management Act. NEMO supports and advises three national committees: National Emergency Management Committee, responsible for policy and preparedness; National Emergency Operation Committee, for delivery of emergency response; and National Emergency Recovery Committee, for coordination of relief and recovery. The district- and village-level committees develop and implement effective emergency management at their respective levels.

In addition, 10 national clusters led by sectoral ministries coordinate preparedness and response. Each cluster takes the lead in responding to the needs of its sector. Nongovernmental agencies and the private sector join the response through different clusters of which they are members.

Figure 2. Disaster Management Structure in Tonga

Emergency Governance STRUCTURE



Source: National Emergency Management Office in Tonga

The MoF manages the financial aspects of response and recovery. The MoF is part of the National Emergency Management Committee, National Emergency Operation Committee, and National Emergency Recovery Committee, its primary function being management of the financial aspects of relief and recovery. It is also the lead agency for the Economic and Social Recovery Cluster. Its role includes helping coordinate recovery and reconstruction and maintaining records of expenditures and donor contributions. The MoF administers the National Emergency Fund (NEF).

The Public Financial Management Act (2002) provides the overall financial governance framework for the government of Tonga. It mandates that the MoF manage public finances and establishes a

contingency fund, which is presented annually to the Legislative Assembly during the budget process and has an allocation of a maximum of 5 percent of the total budget. The Procurement Regulations (2015) allow use of the limited bidding method (direct sourcing) for procurement of goods and services in emergencies.

The National Emergency Fund Act (2008) provides the primary mechanism for financing emergency response and recovery in Tonga. The NEF can be used exclusively to provide resources for timely, efficient relief and reconstruction in any emergency, including natural and human-made hazards, health emergencies, and outbreaks. Financial sources include an annual budget allocation of at least T\$5 million, interest, and donations.

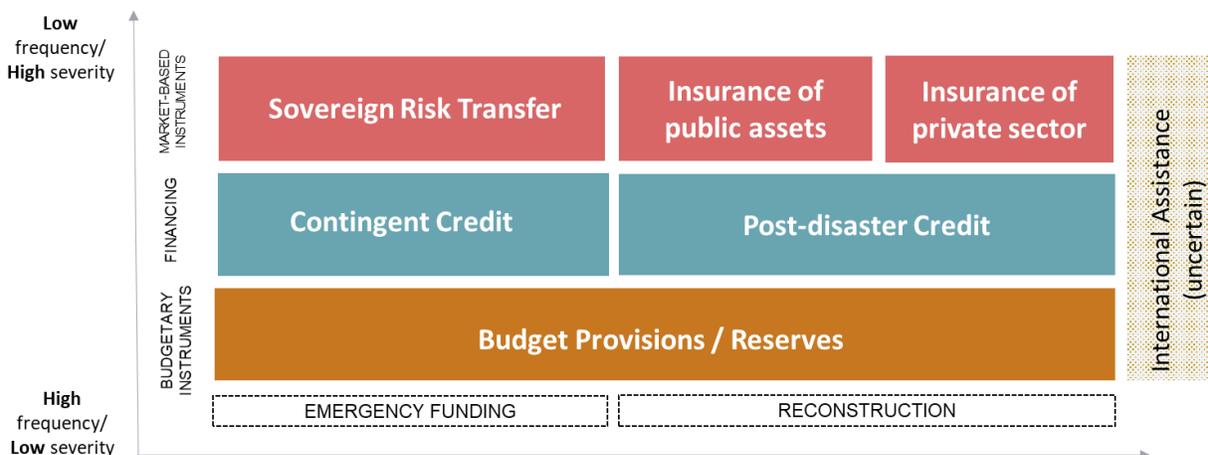
4. Strategic Framework

Fundamental Principles of Disaster Risk Financing

The objective of this DRFS is to provide strategic guidance and direction for the government of Tonga and its institutions to reduce the economic and fiscal effect of disasters by combining instruments that address various identified risks. The literature suggests that a combination of financial instruments for disaster response is cost-effective (Clarke et al. 2016). Having rapid liquidity to meet surge demand for emergency assistance can deliver significant gains because of cost efficiencies generated by early response. Also, if channeled to the poorest people, it can prevent households from adopting negative coping strategies with adverse long-term consequences. The goal of a DRFS is to identify a cost-effective combination of financial instruments to invest for DRR and preparedness and to increase the capacity to respond quickly and effectively. Ultimately, a DRFS should enhance the sustainability of public finances for DRM. A DRFS is integral to a comprehensive, proactive approach to disaster resilience, which also includes investments in DRR and preparedness (e.g., resilient infrastructure and multihazard early warning systems), adequate DRM policies and institutions, and adaptive social protection (ASP).

Risk layering refers to the combination of instruments to ensure cost-effective financing for emergency response and long-term recovery. Figure 3 provides a general overview of financial tools for disaster response for different risk layers and response phases. With risk layering, different types of instruments cover events of different magnitude. The reason for this approach is that different instruments are not equally cost-effective in covering events of different magnitude. For recurrent events (relatively small events), a disaster reserve fund can typically provide quick liquidity to finance preparedness and emergency response most cost-effectively. For medium-sized events, contingent credits and grants can complement reserves if needed, and post-disaster credit can finance long-term reconstruction. For more extreme but rare shocks, risk transfer instruments can provide additional protection to the government and private sector (business, households, farmers) most cost-effectively. The government puts some of the instruments mentioned in place before a disaster (ex-ante instruments), whereas others are mobilized after a disaster (ex post instruments).

Figure 3. Financial Instruments for Disaster Response: A Framework



Source: Adapted from Mahul et al. 2014.

In addition to using different instruments for different layers of risk, understanding the timing of needs is important when prearranging disaster response finance. Not all resources are needed at the same time. Relatively small amounts of money are needed for emergency response, whereas long-term recovery and reconstruction typically require large sums. Considering this will influence the optimal choice of instruments. Further details regarding risk layering, including a framework specific to instruments available to Tonga, can be found in appendix A.

Strategic Priorities

To help the government achieve its national outcome (Outcome F) as defined in the Tonga Strategic Development Framework, outcome F and contribution to pillar 5 (Ministry of Finance and National Planning, 2015), the DRFS has defined six strategic priorities to measure and reduce the economic and financial costs associated with disasters in Tonga:

1. Identify and quantify disaster-related economic and financial risks, including those exacerbated by climate changes
2. Review the portfolio of risk financing instruments annually to ensure they meet government objectives cost-effectively
3. Assess options to transfer risk to the private sector and strengthen domestic insurance markets
4. Strengthen disaster-related public financial management
5. Develop ASP
6. Develop national DRM policy frameworks and plans and invest in national DRR priorities to mitigate and minimize the effect of future disaster shocks, including those exacerbated by climate change

Priority 1. Identify and quantify disaster-related economic loss and damages and financial risks, including those exacerbated by climate change

a) The government will work with partners to improve hazard information and exposure data and to quantify financial risks from disasters.

Exposure data: PCRAFI established the Pacific Risk Information System, a comprehensive collection of information on hazard, exposure, and probabilistic risk assessment for 15 Pacific islands, including Tonga. It contains detailed information on buildings (residential, commercial, industrial), major infrastructure (e.g., roads, bridges, airports, ports, utility assets), major crops, and population (World Bank 2015). There are current efforts to strengthen and update the 10-year-old exposure mapping. The government will work with the Storm Prediction Center to collect necessary data and will work to establish its own public asset database, drawing on Pacific Risk Information System data and other data according to government needs.

Risk assessment: The government will use the results of ongoing risk assessment to improve its overall risk analysis, including from:

- i. Development of drought and excess rainfall models under PCRAFI
- ii. A probabilistic assessment of the hydro-metrological and geophysical hazards and risks in Tongatapu in cooperation with the ADB. This risk assessment calculates economic and fiscal risks related to buildings and the water, transport, and energy sectors while also aggregating asset losses at the village or town level for comparison across the island. It builds on PCRAFI

data while closely examining flooding potential from a range of inundation hazards with and without the effects of climate change.

- iii. An ongoing World Bank–supported probabilistic risk assessment of all schools and health facilities in Tonga. The focus of this assessment is on seismic, cyclone, and flood hazards. Results will include vulnerability and fragility functions for common building types, cost–benefit analyses, risk-informed asset registries, and a framework for investment prioritization.

The Government will also identify options, technical support, and funding for a national disaster risk assessment.

Disaster database: The government will regularly update and standardize its integrated disaster loss and damage assessment system and prepare a historical database of disaster losses (see also priority 4, activity b).

b) The government will discuss the potential fiscal implications of the results of disaster risk assessments in its budget statements. In addition to assessing catastrophe risk, the government will work with partners to assess the effect of disasters on key fiscal variables. This will be considered in the risk section of the government’s budget statements.

c) The government will strengthen the evidence base to identify effective, value-for-money DRR interventions. Information on risks and their potential consequences in terms of losses and damages is a critical basis for identifying, designing, and implementing DRR interventions. Without such information, the interventions and the investment can be ineffective and provide poor value for money, which would result in preventable losses and damages and waste scarce resources. Valuable information includes in-depth knowledge of existing disaster risks and details of housing and public assets, including their structural typologies, condition, vulnerabilities, and exposure to natural hazards.

The government will take the following steps to strengthen the evidence base for investing in DRR:

- i. Develop a multihazard climate and disaster risk assessment for Tongatapu to inform upstream, urban, and individual infrastructure investment planning to reduce exposure and vulnerability and increase resilience.
- ii. Conduct a national multihazard disaster risk and community vulnerability assessment for Tonga.
- iii. Building on the Fixed Asset Management Policy Framework (2019), prepare and keep updated a registry of public fixed assets (starting with education facilities and expanding to other critical assets (e.g., hospitals, telecommunications) in the longer term), ensure they are maintained, and plan for their replacement or repair after a disaster.⁵ Conduct training for line ministries to implement operational procedures, templates, and checklists.
- iv. Develop a comprehensive baseline for the condition of public facilities and infrastructure (education, health, transportation) across Tonga to assess their existing conditions, vulnerability, exposure to natural hazards, and structural types, which will inform possible

⁵ The Fixed Asset Management Policy Framework (2019) for management of the public fixed-asset registry outlines the reporting framework and responsibilities for determining asset strategy; asset performance evaluation; registration and reporting; and acquisition, management, and disposal of assets.

- options for intervention strategies and investment plans (including the National Infrastructure Investment Plan and sectoral plans) that reduce exposure and vulnerability.
- v. Develop a baseline assessment of housing stock conditions across Tonga to help the Housing Sector Resilience Office set priorities, encourage household investment, mobilize climate adaptation funds, conduct interventions to increase the resilience of the housing stock, and monitor results.
 - vi. Develop a road sector vulnerability assessment and climate-resilient road strategy for the island groups of 'Eua, Vava'u, Ha'apai, and Tongatapu to assess vulnerability to climate change and severe weather events (e.g., sea-level rise, extreme rainfall, landslide, storm surge). The vulnerability assessment and climate-resilient road strategy will also identify measures to enhance resilience and prioritize investments to balance vulnerability reduction against cost implication.
 - vii. Develop a systematic approach to record all disaster damage and losses at the national level and update the disaster database annually.
 - viii. Establish a central repository for all assessments and information on risks, public assets and facilities, the housing stock, and any other relevant topic for easy access by government units, local organizations, the private sector, development partners, and the general public.

d) The government will assess the potential effect of disasters on the banking sector and financial system and, through the National Reserve Bank of Tonga, will assess the potential effect of disasters on Tonga's banking sector and financial system.

e) The government will develop and establish a system to record and update disaster losses annually (disaster loss database), collect data for historical disaster loss as available, generate a report of disaster loss, develop and establish a system (e.g., Desinventar, United Nations Office for Disaster Risk Reduction/Sendai) to record disaster damage, and produce annual reports.

Priority 2. Review the portfolio of risk financing instruments annually to ensure they meet government objectives cost-effectively

The government of Tonga relies on a mix of prearranged instruments and post disaster funding sources to finance disaster response and recovery.

Ex ante instruments include budget reserves, contingent grants, and sovereign insurance:

Contingency fund. The Public Finance Management Act 2002 sets a contingency fund with a maximum of 5 percent of the annual budget to cover unforeseen expenditures beyond disasters. The Legislative Assembly agrees upon the level of the contingency budget annually. In the fiscal year 2020 budget, the assigned amount was T\$5 million (~US\$2 million). The minister may release funds as necessary while ensuring that they remain within the limit.

The NEF. In 2008, Tonga established the NEF with an annual appropriation of up to T\$5 million (~US\$2 million). In the last 10 years, the fund was fully exhausted only in fiscal year 2011; payments totaled T\$9 million, which included payments to support overseas Tongans in the Christchurch Earthquake, Japan Earthquake, and Queensland Floods and for the sinking of the Princess Ashika Ferry and Tropical Cyclone Wilma. The second-largest year of payments was T\$4 million in fiscal year 2020, which included payments for Tropical Cyclones Sarai, Tino, and Harold and for COVID-19 relief. The fund's mandate is to provide efficient relief and reconstruction in any emergency (Kingdom of Tonga 2008).

Contingent financing. Tonga has access to the ADB’s Policy-Based Contingent Disaster Financing Instrument, with a maximum payout of US\$10 million. The government of Tonga is in discussions with the World Bank on development policy financing with a catastrophe-deferred drawdown option. Both instruments provide contingency grants that may be withdrawn after the agreed-upon trigger in an emergency, allowing for rapid liquidity. There are also several World Bank–funded projects that include a contingent emergency response component, which can be used to provide funding in the aftermath of a disaster.

Sovereign insurance. Tonga has purchased parametric insurance coverage for earthquake, tsunami, and tropical cyclone risk from the Pacific Catastrophe Risk Insurance Company (PCRIC). PCRIC’s coverage focuses on emergency losses, which are estimated using a modeled representation of the event based on hazard parameters and calculation of total physical damages. Based on actual coverage, the maximum possible payout is US\$6.9 million per year for Tonga. In the past, payouts were received within 10 days after Tropical Cyclone Ian (US\$1.3 million) and Tropical Cyclone Gita (US\$3.5 million), according to the agreed-upon payout timeframe; after Tropical Cyclone Harold (US\$4.5 million), the payout took longer to because of problems with PCRIC’s correspondent bank.

Tonga has used the following ex post funding sources in the past.

Budget reallocations and capital budget realignments. Under the Public Finance Management Act (2002), budget program funds may be reallocated within a ministry with the approval of the MoF. Capital budget realignments also allow for a redirection of public funds.

Supplementary budgets can be passed after natural disasters to increase resources available for disaster response.

Post disaster international assistance. Development partners, international organizations, local nongovernmental organizations, businesses, and individuals can contribute in the form of cash grants and aid in kind. For example, after Tropical Cyclone Gita, development partners provided T\$32.6 million to support short-term needs and approximately US\$35 million for medium-term recovery.⁶

To optimize the use of these instruments and inform potential adoption of new instruments, the government will:

a) Set risk finance objectives (determine for what type of event and to cover what type of cost (emergency, recovery, reconstruction) prearranged finance will be put in place).

b) Conduct a financial gap analysis and update it annually. This analysis will compare available funding after events of different sizes with required needs. It provides the basis for an informed discussion about adoption of additional potential disaster risk finance instruments. The first such analysis is presented in section 5 (Funding Gap Analysis). It will be reviewed and, if necessary, updated annually.

c) Assess the relative cost-efficiency of different instruments to ensure the best value for money based on identified financial gaps for different events and policy priorities. The government will review annually all the risk finance instruments it has in place to ensure that the portfolio of instruments remains relevant and meets government needs in the most cost-effective way possible.

⁶ Supporters include the World Bank, ADB, European Union, other international and regional partners, and neighboring countries (Kingdom of Tonga 2018a).

d) Reform existing instruments or develop or adopt new instruments based on annual review of existing instruments. During preparation of this DRFS, the government identified instruments that it will reform or assess:

- i. *Reform the NEF, including its governance framework, rules for determining allocation of resources to the fund, its maximum size, and eligible expenditures.* The government will reassess the size of the NEF and develop clear operating rules to ensure that resources can be disbursed quickly after disasters while maintaining cost-effectiveness and transparency. The NEF will be resourced through an annual budget allocation, the size of which will be determined during the implementation phase of this DRFS, following the framework laid out in appendix B. Any amount not used in a given year will be rolled over to the next year, until a predetermined ceiling is reached. The ceiling amount will also be determined during implementation of the DRFS. Likewise, the NEF regulations will clarify how any amounts above the ceiling can be used. The governance framework for the NEF, as well as clear rules regarding how to access the fund's resources and what activities the fund can finance, will also be determined during DRFS implementation. To ensure transparency and accountability, the government will develop processes for regular, independent review of the fund, including (but not limited to) annual audit and reporting of the fund.
- ii. *Engage with PCRIC to assess the suitability of new sovereign disaster insurance products (in particular for coverage against excess rainfall and drought risk) to meet its needs.*

Priority 3. Assess options to transfer risk to the private sector and strengthen domestic insurance markets

The insurance market in Tonga is small, and catastrophe insurance coverage is rare at the household level. As of 2015, total non-life insurance premiums were T\$7.6 million (US\$4.3 million)—approximately T\$75.2 (US\$42) per capita, which at the time was lower than in other Pacific island countries. Three non-life insurers operate in the Tongan market: National Pacific Insurance (Tonga) Limited is a subsidiary of National Pacific Insurance (Samoa), Dominion Insurance (Tonga) Limited is a subsidiary of Dominion Insurance Limited (Fiji), and Federal Pacific Insurance Company Limited is a branch of a Samoan company (World Bank 2015).

Insurance for catastrophic effects of earthquakes and cyclones is available in the market and is offered as part of standard property coverage or as an extension. In 2015, property insurance rates for cyclones (0.25 percent) and earthquakes (0.15 percent) were average for Pacific island countries (World Bank 2015), but overall demand for household insurance is low and even more so for catastrophe insurance. According to the 2017 Financial Services Demand Survey, only 10 percent of the population had insurance, with the main stated reason being lack of need (66 percent) (Kingdom of Tonga 2017). A 2018 household survey conducted in the aftermath of Tropical Cyclone Gita confirmed that coverage with cyclone insurance is low. The survey covered 75 percent of households, of which only 11 percent had cyclone insurance. The survey showed that better-off households were more likely to be insured, with 23 percent of the highest quintile of households and 4 percent of the lowest quintile having coverage (Kingdom of Tonga 2018b). One reason for low catastrophe insurance rates of private properties is that most houses in Tonga are not financed through mortgages, so bank requirements for insurance of mortgage-financed houses have no effect.

The government does not systematically insure public assets. There is no insurance program in place for government property or infrastructure assets in Tonga.

Considering that low levels of risk transfer to the private sector, the government will:

a) Assess the feasibility of catastrophe insurance for public assets and state-owned enterprises.

International experience shows that public asset insurance can be a cost-effective way to transfer risk of extreme disasters to the private sector and ultimately out of the country, but development of such schemes requires adequate private sector capacity, as well as government capacity to manage it. Small scale and private and public sector capacity constraints could limit the usefulness of public asset insurance in Tonga, although this needs to be adequately assessed. Thus, the government will conduct a feasibility study to have a basis for making an informed decision as to whether to pursue public asset insurance.

b) Review experiences with property insurance in the Pacific, with a view to potentially piloting property catastrophe insurance schemes in Tonga.

Uninsured households are a contingent liability for the government, insofar as it sees itself obliged (for legal, moral, or political reasons) to provide relief and reconstruction support to households with properties damaged in disasters. Property catastrophe insurance is a way to reduce this contingent liability, because private insurers would (at least partially) assume the risk in exchange for payment of a premium. Widespread adoption of property insurance schemes is rare in developing countries, and there are none in Pacific island countries, although several are being developed and are ready to be introduced. The government will review such schemes and assess the feasibility of implementing a property catastrophe insurance scheme for Tonga.

Priority 4. Strengthen disaster-related public financial management

Priority 4 aims to strengthen public financial management systems and practices for efficient, transparent emergency response and recovery. After a disaster, efficient, transparent processes to deploy available financial resources quickly (see priority 2) are required to achieve intended objectives with the greatest value for money.

Contingency and response planning, budgeting, and reporting for emergencies

a) The government will strengthen contingency planning and preparedness for effective disaster response, starting with the most critical risks. The government's recently developed and approved generic cluster terms of reference and standard operating procedures for disaster preparedness and response identify contingency planning as a core function of the clusters. Each of the cluster agencies should identify priority activities and their respective needs in terms of beneficiaries, support channels, and resources (e.g., staffing and emergency goods, services, projects) for a variety of possible disaster scenarios. Contingency planning will help with mapping and coordinating available domestic and external assistance from multiple partner organizations.

It will be crucial to develop contingency planning approaches, embedded within the broader disaster preparedness strategies, tailored to available capacity and resources of clusters and their agencies. The cluster system was established only a few years ago, and although initial experiences, starting with the response to Tropical Cyclone Gita, have been positive, this effort is still in its infancy. Cluster standard operating procedures require appointment of a cluster coordinator and a budget allocation for cluster preparedness activities, but resources are generally scarce. Building upon established practices, such as the comprehensive corporate planning process and the advanced business continuity management

system of Tonga Power Limited, could be a way to achieve an adequate level of contingency planning without overstressing available resources. To advance this work, the government will:

- i. Map existing practices and capacity to inform suitable contingency planning approaches as part of disaster preparedness across government ministries and departments.
- ii. Support basic contingency planning as part of disaster preparedness for the most critical risks at the cluster and agency level, including through development partner technical assistance.
- iii. Strengthen preparedness and response capacity by addressing identified gaps and needs.

b) The government will continue to improve the post disaster needs assessment approach and disaster-specific response and recovery planning through the cluster system. A post disaster needs assessment estimates damages and losses and identifies the needs of the affected population. It is the first step toward developing a holistic recovery program that promotes equity and inclusion. The comprehensive review and lessons of emergency preparedness and response after Tropical Cyclone Gita identified several weaknesses and duplication in existing practices. To address these challenges, the government will:

- i. Improve coordination within and between clusters in the lead-up to and direct aftermath of a disaster.
- ii. Implement a standardized multisectoral needs assessment to be universally adopted and protocols for preservation, storage, and access to assessment data for purposes of response and later analysis
- iii. Regularly update the available integrated disaster loss and damage assessment system and database

c) The government will harmonize reporting and auditing of post disaster spending. The urgency of needs and chaotic nature of disaster situations increase the risks of waste and misappropriation of resources. Comprehensive reporting and auditing are therefore important to increase the transparency and accountability of post disaster spending. Although the MoF prepares disaster-specific financial summaries that provide an overview of funding received and the main expenditure items, a detailed, comprehensive report containing financial and nonfinancial performance of disaster funding across the whole government is not prepared. Furthermore, government-audited public accounts are generally delayed and only include opening and closing balances for trust money accounts, including the NEF and disaster-specific funds (e.g., Tropical Cyclone Gita fund). Separate audited financial reports for the NEF are not available. To increase transparency and accountability of post disaster spending, the government will:

- i. Review current post disaster expenditure coding, monitoring, and reporting practices.
- ii. Develop guidance and a template for financial and narrative reporting for disaster spending.
- iii. Issue harmonized reports and accounts of expenditures after disasters

Strengthen implementation of emergency procurement and post disaster grant making

d) The government will review and improve procurement of goods, services, and projects required for emergency response and early recovery. Procurement planning for emergency situations, as part of contingency planning, is the basis for improving emergency procurement. Based on that, the government intends to pursue a two-pronged strategy: After disasters, the government requires a range of products and services, some of which are the same after most events. NEMO maintains stores of certain emergency-related goods (e.g., tarpaulins, sanitary kits) throughout the country, but procuring such goods

and services after an event takes time and may cost more (because of increased demand) than if prices are agreed upon before an event. To avoid this, the government will:

- i. Assess the introduction of emergency framework agreements based on an identified list of goods and services that are frequently needed for emergency response and early recovery.
- ii. Include specific terms and specifications for emergency goods, services, and projects when regular (nonemergency) contracting of suppliers and service providers provides an opportunity to do so.

e) The government will introduce harmonized rules on post disaster grant making. Grants are an important avenue to provide post disaster relief and recovery support. Tonga has used grant making for a multitude of beneficiaries: individual citizens and households (including through transfers using the social safety net), town officers, schools, farmers and fishermen, and public enterprises (e.g., for Tonga Power Limited and Tonga Water Board). Post disaster grants have been awarded on an ad hoc basis rather than following a standardized process. Similarly, effects have not been assessed systematically, making it difficult to ensure accountability. In particular, the government will:

- i. Develop clear grant-making criteria and standard agreements and design and establish efficient, auditable disbursement channels for post disaster grants.
- ii. Prepare guidelines and training for government staff and beneficiaries on eligible expenditures, model agreements, and accountability requirements.
- iii. Audit post disaster grant programs

Priority 5. Develop ASP

International experience has shown that poor people are particularly vulnerable to shocks, for multiple reasons. Factors that limit a household's ability to adapt and respond to shocks, such as having limited to no savings, access to finance, or access to formal insurance, can combine and contribute to this excess vulnerability and inability to manage the effects of shocks. In addition to being vulnerable, poor people are also more exposed to the risk of natural disasters, given that they tend to live in the most at-risk areas and houses. To protect their short-term well-being and consumption after a shock, they often adopt negative coping strategies, such as selling assets at fire-sale prices or de-prioritizing investment in human capital, which limits growth over the long term and can exacerbate existing inequalities. Poor people are especially prone to shocks, but vulnerable groups such as informal workers and near-poor people face similar difficulties trying to manage such effect, becoming at risk of poverty.⁷

Adapting and building resilience is critical for poor and vulnerable households. Global evidence suggests that well-designed ASP systems can increase the resilience of vulnerable households while enabling a quick response to shocks.⁸

⁷ An estimated 26 million people globally fall into poverty every year because of natural disasters, particularly floods and drought (Hallegatte et al. 2017). Economic crisis also has deleterious effects on poor and vulnerable people. It has been estimated that, for each percentage point decline in GDP growth resulting from an economic downturn, an additional 20 million people fall into poverty (Otker-Robe and Podpiera 2013).

⁸ "Adaptive social protection helps to build the resilience of households that are vulnerable to shocks through direct investments that support their capacity to prepare for, cope with, and adapt to shocks: protecting their wellbeing and ensuring that they do not fall into poverty or become trapped in poverty as a result of the impacts" (Bowen et al. 2020)

The government has successfully used its social protection system to respond to recent shocks. After Tropical Cyclone Gita hit the country in 2018, the government channeled nearly T\$1 million through the Social Welfare Scheme for the Elderly and the Disability Benefits Scheme—the government’s two core social protection programs (Doyle 2018). Similarly, after the dual shocks of COVID-19 and Tropical Cyclone Harold in 2020, an additional one-time payment was provided to Social Welfare Scheme for the Elderly and Disability Benefits Scheme beneficiaries and to secondary school conditional cash transfer program beneficiaries of the Skills and Employment for Tongans project. Cash was disbursed quickly to those recipients, because the programs were already operational, allowing households to use cash to address their immediate post disaster needs.

Despite successful implementation of disaster responses through Tonga’s social protection system, challenges remain. Top-up benefits were provided only to beneficiaries of existing programs, whereas other vulnerable families could not obtain assistance. In addition, the management information system of the Ministry of Internal Affairs does not cover all poor households, because the conditional cash transfer program is focused on poor households with secondary school-aged children. Transfers after a natural disaster were provided in an ad hoc manner, without an ASP strategy or procedures to implement ASP programs.

To increase the resilience of poor and vulnerable people in the face of shocks, the government will develop an ASP strategy, which will set program rules for when ASP programs will be implemented (conditions for trigger); determine program eligibility, benefit amounts, and duration; and plan the costs of ASP programs. Ideally, a national social protection policy would underpin an ASP strategy to provide a strong framework for ASP interventions. With an ASP strategy in place, the government will increase ownership of response, promote transparency of programs, and plan options for financing the cost of ASP programs with appropriate financial instruments.

As part of the ASP strategy, the government will:

a) Establish an institutional coordination mechanism within the government, with the participation of key humanitarian agencies and donor partners. Implementation of ASP programs will include coordination among several ministries, such as the Ministry of Internal Affairs (MIA), MoF, National Retirement Benefits Fund, Ministry of Infrastructure, MEIDECC, and National Emergency Management Office, and coordination with humanitarian agencies and donor partners that channel assistance during disaster response. For smooth implementation of programs managed by different agencies, the government may create a technical working group to prepare an ASP strategy and a national social protection policy and clarify the roles and responsibilities of each agency.

b) Study options for ASP programs and cost them. The study will provide indicative costs of expanding the safety net (e.g., top-ups to existing beneficiaries and support to new beneficiaries) for different types and levels of hazard (e.g., for more frequent shocks: 1-in-3-year return period events, large events such as Tropical Cyclones Ian, Gita, and Harold) with several options for cash grant amounts. The contingent liability for the government associated with the preferred option can then be managed using a combination of financial instruments as part of a broader DRFS.

c) Design standard operating procedures for ASP programs. The government will revise current standard operating procedures for various social protection programs, namely the Social Welfare Scheme for the Elderly, the Disability Benefits Scheme, and conditional cash transfer for Skills and Employment for Tongans beneficiaries. The revised standard operating procedures will enable the government to

introduce ASP programs smoothly during and after a disaster. Standard operating procedures will clarify the rules for each program's expansion, such as triggers, eligibility, grant amounts, enrollment and verification processes, cash delivery mechanisms, grievance redress mechanisms, communication tools, and monitoring and evaluation approaches.

d) Enhance existing management information system for ASP programs, supporting development of a social registry for poor and vulnerable people. The Ministry of Internal Affairs management information system maintains a comprehensive poverty registry of households meeting the minimum eligibility criteria for inclusion in the conditional cash transfer program in support of secondary school attendance (poor households with secondary school-aged children). The government will leverage this registry, based on the design of the ASP programs, to enable registration of other categories of poor households, not only those with secondary school-aged children. A social registry for poor and vulnerable people would enable rapid support of those who are in need but are not currently beneficiaries of the Skills and Employment for Tongans program in the event of a natural disaster. The government will also ensure interoperability of the management information system with other databases, such as the civil registry and national identification, that can be used to cross-check and verify information. The government will consider how to link the management information system with hazard information, such as early warning systems and hazard maps, to promote timely, informed decisions for ASP programs.

Priority 6. Develop national DRM policy framework and plan and invest in national DRR priorities to mitigate and minimize the effect of future economic disaster shocks, including those exacerbated by climate change

The magnitude of disaster risk depends on the actions taken to avoid (prevention) or limit (mitigation and preparedness) damage from hazards. Investments in DRR reduce the cost of disasters by minimizing potential casualties, direct costs of damage to infrastructure and assets, and disruption to basic services and livelihoods. For example, cyclones and earthquakes often affect the housing sector the most because of structural design vulnerabilities and inadequate construction practices. The estimated cost of the housing recovery program was more than T\$21.5 million after Tropical Cyclone Gita and more than T\$9 million after Tropical Cyclone Harold (Kingdom of Tonga 2020c). In addition, Tropical Cyclone Gita damaged approximately 75 percent of schools in Tongatapu, causing damage and losses to the education sector of approximately T\$22 million (Kingdom of Tonga 2018b)). Damage to roads and ports disrupts critical post disaster emergency management and access to livelihoods. As these examples indicate, return on investment in building the resilience of the housing stock and critical infrastructure is potentially very high.

The Joint National Action Plan 2 on Climate Change and Disaster Risk Management (JNAP2) identifies three strategic actions that will contribute to financial resilience through effective DRR: strengthen the evidence base for identifying effective, value-for-money DRR interventions; continue efforts to design and prioritize DRR activities based on available information and include them in government plans; and identify and access resources to fund national DRR priorities and systematically monitor their implementation. In view of the government's fiscal constraints, prioritization of DRR actions is required, using the evidence base mentioned in the JNAP2 and consultation with stakeholders to decide which risks are economically and socially acceptable and which require mitigation through investments in risk reduction.

The Emergency Management Act (2007) mandates that the government of Tonga develop emergency management plans at the national, island or district, and village levels to form the basis for all emergency and DRM interventions at the national and local levels. Appropriate resource allocation and implementation of these plans at all levels determine the effectiveness of all DRM efforts in Tonga.

a) Develop a national DRM policy framework and plan to set up DRR priorities for Tonga to strengthen the evidence base for identifying effective, value-for-money DRR interventions. The government will develop a DRM regulation and policy framework and national, district or island, and village DRM plans.

b) The government will continue efforts to design and prioritize DRR activities based on available risk information (see priority 1, activity c) and include them in their plans. The government, led by the National Planning division in the Prime Minister’s office, together with the Department of Climate Change and NEMO in MEIDECC and the Resilience Development and Financing Division in MoF, has started to mainstream the JNAP2 into government plans. Following the endorsement of the new DRM Bill, NEMO will develop a National Disaster Risk Management Plan which replaces the current National Emergency Management Plan. The government will develop Disaster Risk Management Mainstreaming guideline and/or tool kit to help ministries and departments to identify and include disaster risk management activities into the respective corporate plan. A risk screening toolkit has been developed to identify and assess disaster and climate change risks to and from activities and projects as part of the government’s One Process toolkit for Corporate Planning and Budgeting. The government is also updating its National Infrastructure Investment Plan, and there are multiple sector plans that incorporate some disaster risk information.

Although many development partner-supported projects conduct detailed risk and safeguard assessments, further work is required to identify information from various climate and disaster risk assessments, the public asset registry, facility and housing stock baselines, and any other relevant data and make it publicly available. This will support the effort to prioritize evidence-based DRR activities in national and sector plans, ministries’ corporate plans, and projects that currently do not go through a thorough screening process.

The government will take the following steps to incorporate risk information and prioritize DRR investments in its plans.

- i. *Reflect available and any newly generated information, including from the multihazard climate and disaster risk assessment in Tongatapu, the public asset registry, and facility and housing stock baselines, in:*
 - a. the National Infrastructure Investment Plan, updated with costed, prioritized, sequenced whole-of-government investment projects that build in disaster and climate resilience.
 - b. a climate- and disaster-resilient urban development strategy and investment plan for Nuku’alofa to enable continued development of the city in a manner resilient to natural hazards.
 - c. other national and sector investment plans that establish financing gaps for identified priority investments.
- ii. *Continue efforts to mainstream JNAP2 into national, sector, and ministry corporate plans. As part of this, increase the capital and human resource capacity of NEMO to play an active*

- leadership role and support individual ministries in the mainstreaming process, including through development partner technical assistance.⁹
- iii. In line with JNAP2, *revisit and complement existing guidance and templates for incorporating risk information and prioritizing DRR activities in government plans and in all development partner-funded projects*. The goal is to build a robust system that systematically uses available risk information and supports strategic inclusion of DRR activities in government plans.
 - iv. Develop a comprehensive DRM plan (after promulgation of a new DRM bill, to replace the existing national emergency management plan).
 - v. In line with the Fixed Asset Management Policy Framework, *strengthen asset management to improve lifecycle management and increase the resilience of public infrastructure to natural disasters*, including by ensuring that assets are maintained and their replacement and repair after a disaster is planned.

c) The government will identify and access resources to fund national DRR priorities as defined in national, district, and village DRM plans and systematically monitor their implementation. The main tool for coordinating and allocating funding for prioritized DRR activities is the national budget. Budget resources comprise the government's domestic funds and budget support, both largely used to fund the recurrent budget, and project funding from development partners and through selected (concessional) loans under the development budget. Given the importance of the budget, strengthening its link to national and sector plans and to ministries' corporate plans that increasingly contain prioritized DRR activities is critical to gradually increasing resources for DRR.

Important and growing funding sources for climate resilience and DRR projects, including the Green Climate Fund, the Adaptation Fund, and the Global Environment Facility, complemented by other multi- and bilateral funds with a focus on climate change and DRR at the global and regional levels, are available through the international climate finance architecture. At the national level, Tonga has established the Climate Change Trust Fund to support community-level projects that can include DRR elements.

When looking to access additional funding, particularly from sources outside the budget, it is critical to find suitable arrangements that combine evidence-based project selection, efficient implementation, and accountable financial management. This is particularly important in a country like Tonga, where the units responsible for mobilizing additional funding often consist of small teams. In this context, smart use of available resources is crucial, increasing the importance of close coordination and collaboration of government teams specialized in technical and financial matters and with development and implementing partners. Having a strategic approach to resourcing priorities, factoring in their scale and complexity (e.g., funding small-scale activities through the recurrent budget and large or more complex sets of activities through dedicated projects), can help advance effective, value-for-money DRR.

d) The government will track implementation progress and financing because this is an important aspect of deriving dependable information for management decision-making and resource allocation. Identifying suitable tracking approaches tailored to available resources (including technical expertise and staff time) across public sector entities in Tonga is important. On the financing side, this work can build upon the Pacific Climate Change Finance Assessment Framework and the Climate Public Expenditure and Institutional Review methodologies applied in the Climate Financing and Risk Governance Assessment for

⁹ Technical assistance to support this work is available from the ADB Pacific Disaster Resilience Program, the United Nations Development Programme, and the World Bank, in addition to sector-specific project support.

Tonga in 2016, as well as other countries' experiences. Often, this can be done through simple spreadsheets; using the integrated financial management information system and its future upgrades could be helpful whenever its functionality is suited to the tracking and automated reporting of resources for DRR.

The government will take the following steps to resource DRR priorities and monitor their implementation:

- i. Support greater involvement of the new Resilience Development and Financing Division of the MoF, NEMO, and the Department of Climate Change in the annual budget process, including in budget consultations
- ii. After endorsement of the new DRM bill (planned to be presented to the parliament in fiscal year 2021), develop comprehensive DRM plans at the national, island, and village levels
- iii. Continue project preparation and dialogue with development partners to secure donor and climate fund financing (grants) for priorities identified in national and sector investment plans
- iv. Develop a strategic approach to accessing international climate financing, with suitable application, implementation, and oversight arrangements based on available specialized expertise and in close collaboration with development and implementing partners
- v. Track and report on (including through budget documentation and as part of progress reports of various government plans) implementation progress and financing of DRR activities at the project level and comprehensively, through new integrated financial management information system functionality where appropriate, to inform management decision-making and future resource allocation

Institutional Arrangement for Implementing DRFS

The MoF prepared the DRF strategy in close consultation with NEMO, and a Steering Committee that the MoF Chief Executive Officer chairs will oversee its implementation. A working group comprising members of the ministries and agencies responsible for implementing specific tasks under the identified priorities will implement it. Progress on tasks and toward meeting milestones will be reported on in quarterly meetings of a steering committee that the MoF will chair. The tasks and associated milestones are outlined in an implementation plan that will be updated after every meeting of the working group. Thus, the DRFS implementation plan is a living document. Appendix C presents the current version.

5. Disaster Funding Assessment

This section provides a framework for setting objectives with regard to funding disaster-related damages and losses and presents a funding gap analysis based on currently available DRF instruments and risk models on tropical cyclones and earthquakes. Setting clear funding objectives is a crucial first step for the government so that strategies regarding risk finance instruments can be decided upon. There are different ways to consider how instruments can be structured to cover losses in the event of disasters. Assessing the funding gap is one way to do this (see section Funding Gap Analysis). As stated in section 4, under priority 2, the funding gap analysis will be updated on a recurring basis to determine the adequacy of the combination of risk finance instruments.

Setting Loss Funding Objectives

A critical part of determining a suitable risk-layering strategy is to set clear government objectives and priorities. The level of prearranged funding and the composition of instruments depends largely on two factors:

- 1) What the prearranged financing will be used for (e.g., for emergency costs or to cover the cost of damages, the latter being much larger)
- 2) The size of the event(s) that the government would want to have full funding for through prearranged instruments

Another way of describing the second factor is at what frequency the government would have to resort to ex post instruments such as borrowing after a disaster. Defining and agreeing on objectives can help determine policy and financial decision making on, for example, allocations to the NEF, sovereign insurance, and other risk finance instruments.

Different strategies may be most effective depending on the objectives and risk tolerance of the government. To move toward an optimal strategy, the government must first specify and agree on these objectives. One simple way to quantify this is shown in table 1, which shows the size of emergency costs and damages for various return periods for tropical cyclones and earthquakes. For example, if the government wanted to be fully funded using prearranged financing for a 1-in-10-year level of damages, it would require US\$36.6 million of prearranged financing.

Table 1. Return Period and Loss Matrix

	Return Period for Cyclone and Earthquake Loss (US\$ million)				
Type of Loss	1 in 2 year	1 in 5 year	1 in 10 year	1 in 30 year	1 in 100 year
Emergency costs	0.5	3.6	7.8	19.0	41.8
Damages	2.3	17.0	36.6	90.7	225.3

Source: PCRAFI catastrophe model

Clear objectives will help determine an optimal strategy. Table 1 is starting point for determining which instruments at what size are required by understanding what is to be financed. Appendix D provides more

discussion and examples of possible objectives based on factors such as risk tolerance and available funding. Objectives can change, so the mix of risk finance instruments will be reviewed annually.

Funding Gap Analysis

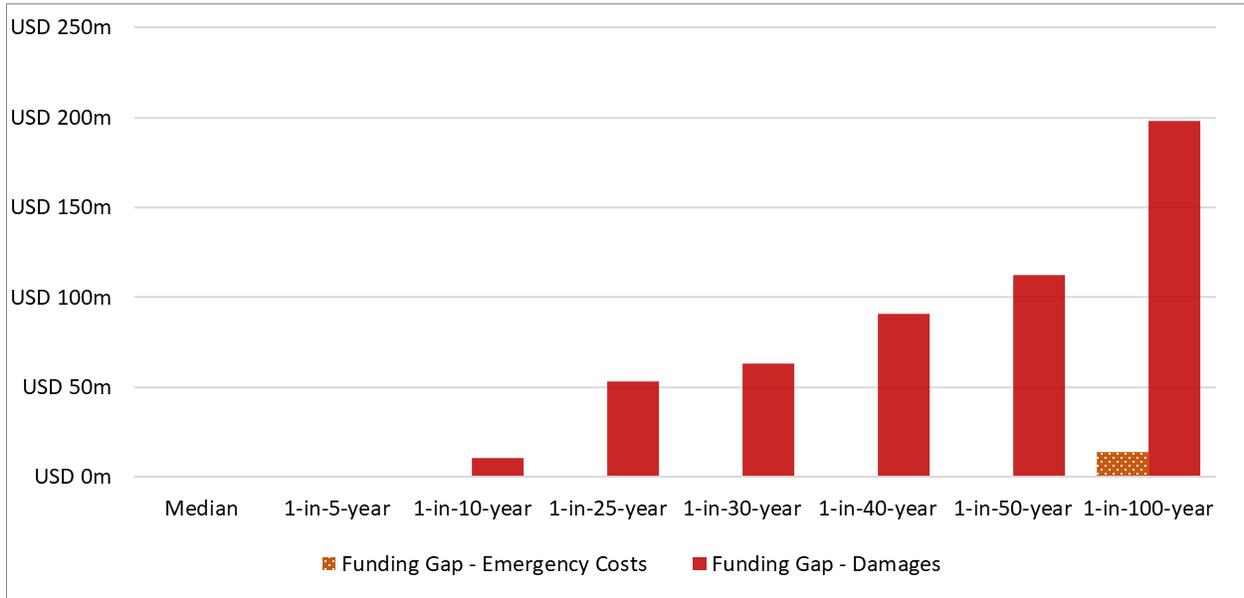
A funding gap analysis compares available resources from risk finance instruments with potential needs for disaster response for different event magnitudes. To do this, one possible strategy has been selected (the base strategy). This strategy is based on instruments that the government has already adopted or are under consideration, with the NEF assumed to receive an annual allocation of 1 percent of GDP, as proposed in the International Monetary Fund/World Bank Technical Assistance Report—Climate Change Policy Assessment (IMF and World Bank. 2020). This strategy uses a range of financial instruments to finance losses of varying magnitudes. This strategy will be considered as an option as the government reviews its current mix of risk finance instruments during implementation of the DRFS.

The assumptions for the base strategy are as follows:

- **Contingency fund of US\$2 million.** This is to be used for unforeseen events other than disasters, although in the event of a severe catastrophe, it is reasonable to assume that it would be used to cover emergency costs, so it has been included in the analysis for severe events.
- **NEF of US\$4 million.** This has been set to 1 percent of GDP, as recommend in the Climate Change Policy Assessment report. Such funds are useful to cover low risk layers—relatively frequent but low-impact events—although there are opportunity costs associated with holding monies in this fund, insofar as other projects cannot be financed with the money set aside. For simplicity, the analysis below considers the NEF to be US\$4 million, when in practice, if an annual injection of NEF is set to be US\$4 million and the unspent fund accumulates year after year, the balance of this fund would be at least US\$4 million at the beginning of every year.
- **Contingent grant with the ADB with a maximum payout of US\$10 million.** Draw-down of these funds requires declaration of a national disaster. It is expected that this will be used for high-severity, low-frequency events whose costs would exhaust the resources of the NEF.
- **Catastrophe-deferred drawdown option with the World Bank with a maximum payout of US\$8 million.** This instrument, currently under discussion between the government and the World Bank, would complement the ADB contingent grant to respond to high-severity, low-frequency events.
- **Parametric insurance purchased from PCRIC, maximum payout of US\$6.9 million split between a tropical cyclone event and an earthquake or tsunami event.** This insurance provides payouts after earthquakes or tropical cyclones that exceed a prespecified intensity (measured by modeling the financial loss to Tonga based on known windspeeds or seismic activity). This insurance is designed to cover large per-event losses, those expected to be exceeded less than once in every 10 years. The cover that PCRIC provides includes reinstatement of cover, which provides the government extra protection should a second severe event occur within 1 year. Insurance coverage has been structured such that a maximum payout is expected for a 1-in-30-year tropical cyclone or earthquake event. Parametric insurance is presented in further details in Appendix F.

Figure 4 shows the funding gaps for the base strategy at different return periods or emergency costs and for total damages.

Figure 4. Funding Gap for Emergency Costs and Damages from Tropical Cyclones, Earthquakes, and Tsunamis at Different Return Periods (US\$ million)

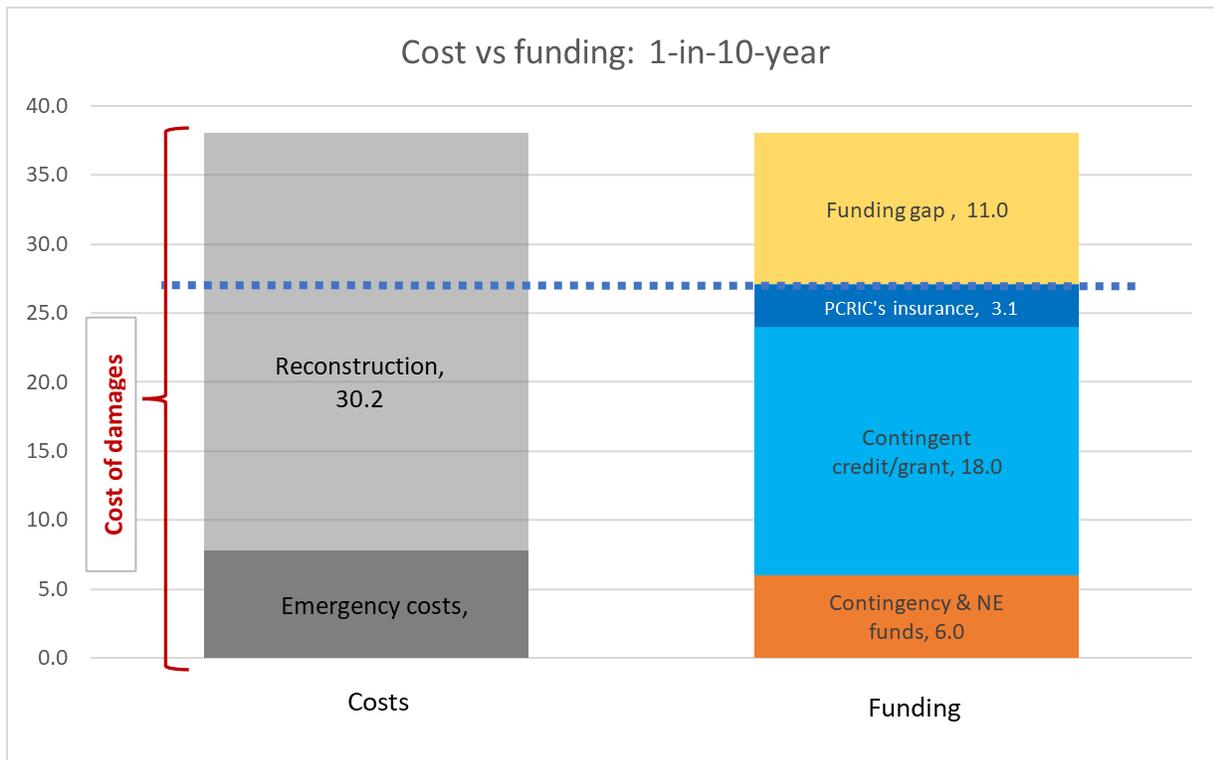


Source: World Bank staff calculations based on PCRAFI catastrophe model

Based on the instruments for the base strategy, the government is expected to have prearranged funding for expected emergency costs sufficient up to the worst year expected in 50 years or for damages up to the worst year in 6 years from combined tropical cyclones and earthquakes.

Understanding the funding gap for different return periods for emergency costs and damages helps the government determine priorities. The risk layering should be set by considering to what return period (threshold) and for what type of loss the government would want to be fully funded based on prearranged instruments before relying on ex post instruments and risking being unable to meet costs after an event. Figure 5 is an example of the 1-in-10-year scenario and indicates that emergency costs are fully funded using prearranged finance, but when considering the full cost of damages (US\$38 million), at this return period, there is an US\$11 million funding gap. The blue dotted line represents the point to which there is no funding gap.

Figure 5. Cost versus Funding for the 1-in-10-Year Return Period



Source: World Bank staff calculations based on PCRAFI catastrophe model

Figures 4 and 5 consider losses only from tropical cyclones and earthquakes because these are the major hazards for Tonga, but other risks could materialize at the same time as a tropical cyclone or earthquake, which would exacerbate their effect. In this case, funding gaps would be larger than shown unless the amount of prearranged finance were increased (e.g., through a greater allocation to the NEF than assumed in the calculations underlying figures 4 and 5).

Contingent grant funding from the ADB and World Bank totaling US\$18 million may not be available indefinitely and could change at some point. Should the level of contingent grant funding decrease, it would be crucial that the amount available through other risk finance instruments be revised to maintain funding for the same risk level. Adjusting the allocation to the NEF would become particularly important under such a scenario.

The most cost-effective strategy and mix of instruments depends on the use that the prearranged finance is intended for. The analysis outlined in appendix A provides information on how this is done and what the effect could be. The government will reassess the layering each year based on availability, risk, and objectives. Current expected shortfalls at different return periods can be adjusted in line with the government's evolving risk appetite.

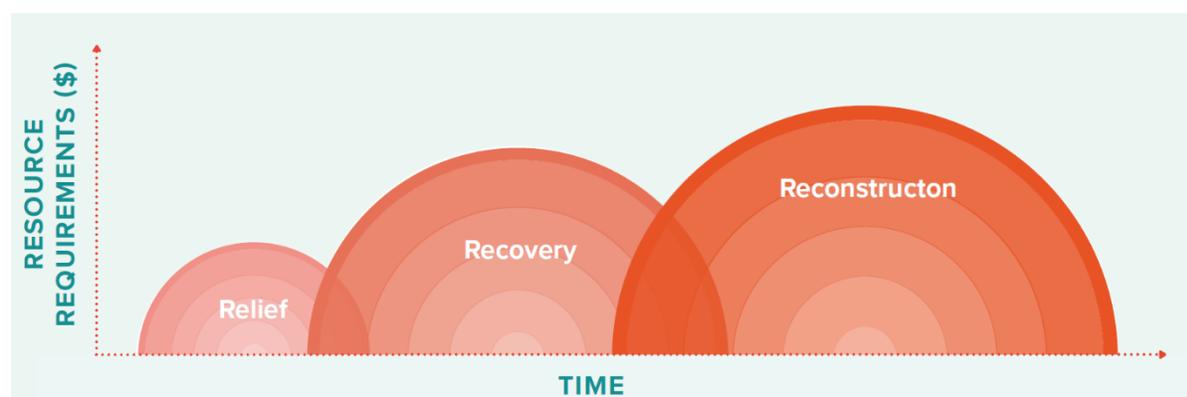
Appendix A: Disaster Funding Assessment Framework

Maximizing the Benefit of Quickly Disbursing Disaster Risk Financing

Responding quickly to a disaster can substantially reduce its ultimate economic and human cost. Quick liquidity is one of the core benefits of ex ante financial planning for disasters, but not all financing is needed immediately. The cost of quickly available finance varies depending on availability and use, in part because of the cost of putting in place and holding prearranged finance that is not used.

Emergency costs, those required to cover emergency activities in the aftermath of a disaster, are most effectively backed using efficient, quickly disbursing funds. Meanwhile, some other costs of damages, such as large, nonessential reconstruction, are not as sensitive to immediate availability of financing, so costs could be effectively addressed through future borrowing or budgets. Figure A.1 illustrates the relative level of resources required for various response stages in the aftermath of a disaster. Figure 1 (in section 2) estimates losses for Tonga considering all damages (which includes a range of costs, including short, medium, and long term) versus just emergency costs.

Figure A.1. Resources Required in Aftermath of a Disaster



Experience from Tropical Cyclone Gita (February 2018) demonstrates that not all funds for recovery and reconstruction are needed immediately. US\$11 million was used to finance the most urgent recovery needs in the first 3 months after the disaster. This was financed from the National Emergency Fund (NEF), insurance payouts, and donor contributions (Kingdom of Tonga, 2018c). Of total recovery and reconstruction costs after Tropical Cyclone Gita (table A.1), 21 percent was needed in the first few months, to June 2018. The amount and timing of recovery needs will depend on the specific disaster, but this example demonstrates that not all needs must be met immediately after a disaster.

Table A.1. Summary of Recovery and Reconstruction Costs for Tropical Cyclone Gita (US\$ million)

Cyclone Gita	Immediate (To Jun18)	Short term (FY18/19)	FY19/20- 20/21	Total Needs
Total Needs	33	44	82	160
Public Needs				102

*DISASTER RECOVERY FRAMEWORK FOR TROPICALCYCLONE GITA: World Bank Oct 2018

Financial Analysis Using a Risk-Layering Framework

This appendix assesses how the government could structure disaster risk financing instruments to respond to disasters in Tonga. The analysis builds on the disaster risk profile discussed in section 2 and complements the strategic priorities discussed in section 4 within a financing framework.

The financial strategies analyzed are based on existing instruments available to Tonga (described under priority 2), adjusted for the Climate Change Policy Assessment suggestion to increase the allocation to the NEF. The exercise considers the risks facing Tonga and applies economic and financial analysis to develop a strategy based on available financing and financial instruments.

Because the value of different approaches to financing risk depends on the timing and use of funds, it is critical to set objectives and clarify uses of financing before finalizing a layering of financial instruments. The analysis outlined in this appendix considers two simplified alternatives based on losses modeled as part of the Pacific Catastrophe Risk Assessment and Financing Initiative: financing all damages from earthquakes and tropical cyclones or funding only emergency losses. The financial layering should be revised and refined as the DRFS develops, and more is known about the activities to be financed and the associated need.

Three strategies for funding emergency costs and three strategies for funding all damages are compared.

Costs of Strategies

One way to compare various strategies is to compare associated costs.¹⁰ The base strategy is one of many possible strategies for the government. The cost of a strategy considers the cost that the government incurs (e.g., drawing down from a fund when required), as well as the cost of not being able to use this money for other purposes. For example, by reallocating the budget after a disaster, this money could not be used for other public investments. The assumptions underlying cost calculations can be found in table A.2. The indicative strategies below are sensitive to these assumptions.

Financing Used for Emergency Costs

The strategies below are possible strategies that the GoT could consider and provide an initial basis to compare the costs of different strategies.

¹⁰ The cost associated with a different strategy depends on the economic assumptions made. These assumptions are deemed reasonable, but ultimately, they are based on the best judgement of the analyst and, if changed, would result in different opportunity cost results. These economic assumptions can be found in appendix E.

Table A.2. Strategies for Funding Emergency Costs

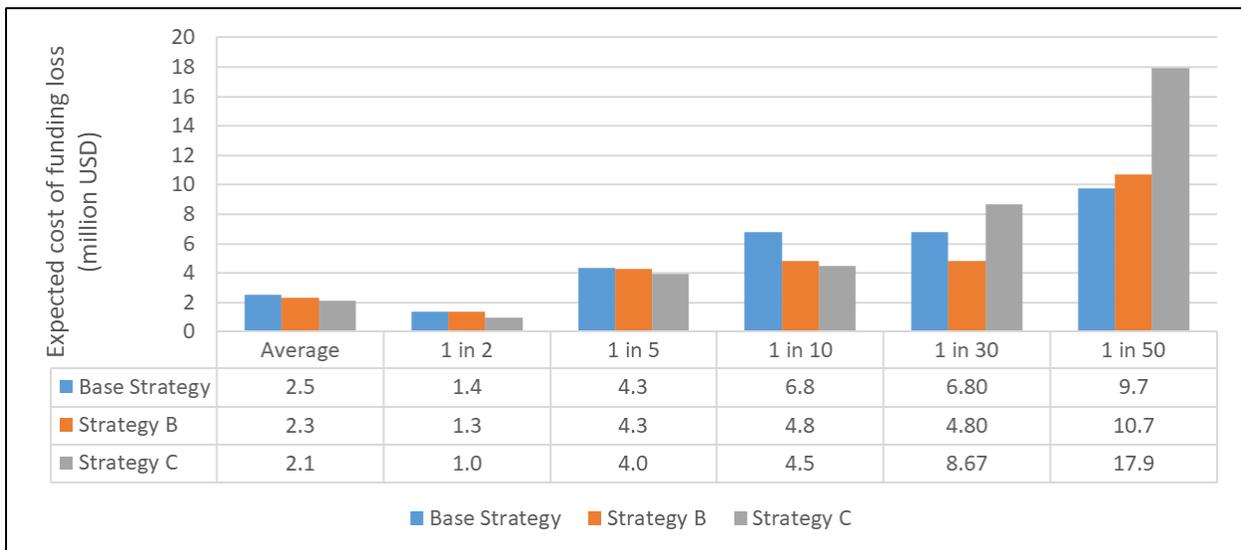
Emergency costs	Instruments			
	Reserve Fund	Contingent Financing	Insurance	Budget Reallocation
Base	Contingency Fund: US\$2 million NEF: US\$4 million	ADB Contingent Grant: US\$10 million WB Cat DDO: US\$8 million	Per Peril Insurance to cover RP 10 - RP 30 events TC: Max payout of US\$5.5 million EQ: Max payout of US\$1.4 million	None
Strategy B	Contingency Fund: US\$2 million NEF: US\$2 million	ADB Contingent Grant: US\$10 million WB Cat DDO: US\$8 million	Per Peril Insurance to cover RP 10 - RP 30 events TC: Max payout of US\$5.5 million EQ: Max payout of US\$1.4 million	US\$2 million
Strategy C	Contingency Fund: US\$2 million NEF: US\$2 million	ADB Contingent Grant: US\$10 million WB Cat DDO: Not available	Per Peril Insurance to cover RP 10 - RP 30 events TC: Max payout of US\$5.5 million EQ: Max payout of US\$1.4 million	US\$2 million

Note: Blue text indicates differences from base strategy.

Source: World Bank staff calculations

As shown in table the table below, the base strategy is sufficient to provide quick-disbursing finance up to the worst year expected out of 50, but if a catastrophe-deferred drawdown option (Cat DDO) is unavailable, this amount would reduce substantially, shown in strategy C.

Figure A.2. Costs to Government of Three Strategies for Emergency Costs



Source: World Bank staff calculations

If funding is to be used for emergency costs, strategy B (NEF set at US\$2 million) is generally the most cost-effective strategy, primarily because of the level of funding available from the Asian Development Bank and World Bank Cat DDO, such that there is no funding gap when the NEF is set at US\$2 million (instead of US\$4 million) up to a 1-in-45-year scenario. This illustrates that there is a cost to setting aside funds in the NEF if they are not used.

If the level of contingent financing is reduced (strategy C if there is no Cat DDO), having a smaller NEF results in slow, expensive budget reallocations and ex post borrowing, which makes strategy C least cost-effective, by a large margin, at higher return periods. Under that scenario, alternative instruments (sizes) could be considered, for example, larger NEF, additional insurance, or other contingent instruments. In the 1-in-30-year scenario, strategy C is substantially less cost-effective than the base strategy. The level

of cost-inefficiency for strategy C is greater for more-severe return periods, indicating that, when contingent grants are not available, the emergency fund is crucial in ensuring adequacy of financing.

Financing Used for Damages

If the objective is for prearranged finance to cover the cost of damages, the base strategy is sufficient up to the 1-in-7-year scenario. Given the additional costs to be financed, it would be cost-effective to increase insurance coverage as shown in strategy C because this would reduce the residual costs falling to slower, less-certain ex post financing. The tables below show the cost between the three strategies when pre-arranged financing is used to fund damages.

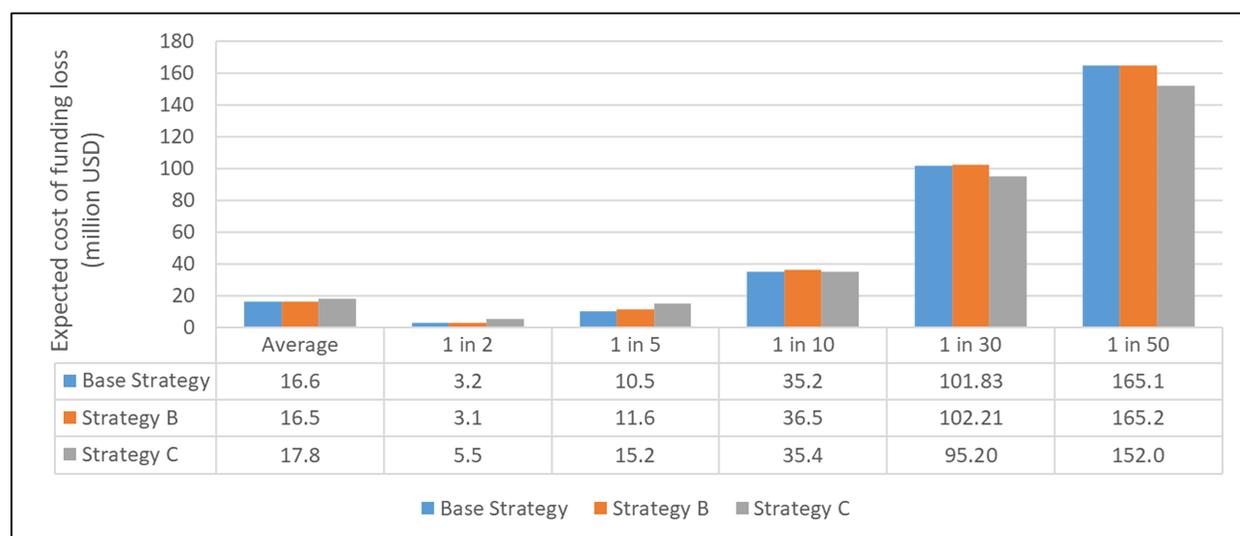
Table A.3. Strategies for Funding Ground-Up Damages

Damages	Instruments			
	Reserve Fund	Contingent Financing	Insurance	Budget Reallocation
Base	Contingency Fund: US\$2 million NEF: US\$4 million	ADB Contingent Grant: US\$10 million WB Cat DDO: US\$8 million	Per Peril Insurance to cover RP 10 - RP 30 events TC: Max payout of US\$5.5 million EQ: Max payout of US\$1.4 million	None
Strategy B	Contingency Fund: US\$2 million NEF: US\$2 million	ADB Contingent Grant: US\$10 million WB Cat DDO: US\$8 million	Per Peril Insurance to cover RP 10 - RP 30 events TC: Max payout of US\$5.5 million EQ: Max payout of US\$1.4 million	US\$2 million
Strategy C	Contingency Fund: US\$2 million NEF: US\$2 million	ADB Contingent Grant: US\$10 million WB Cat DDO: US\$8 million	Additional \$2m put towards insurance, i.e. coverage and premium increased by 350%	US\$2 million

Note: Blue text indicates differences from base strategy.

Source: World Bank staff calculations

Figure A.4. Costs to Government of Three Strategies for Damages



Source: World Bank staff calculations based on PCRAFI catastrophe model

The base strategy is the most cost-effective up to a 1-in-10-year scenario to finance total damages. For larger losses, strategy C is more cost-effective because payouts from insurance can cover higher costs, although this comes at a cost for lower return periods during which insurance is less cost-effective because of the upfront premium paid with no corresponding pay-out.

Summary

The effectiveness of financial layering strategies depends on the losses and activities to be financed.

The analysis demonstrates that the existing and planned financial instruments are effective and efficient to finance emergency losses from earthquakes and tropical cyclones, but should other natural disasters occur or a Cat DDO or other instruments not be available, an increase to the NEF may increase effectiveness.

There may be losses associated with natural disasters (including those identified in section 4) that go beyond those categorized as emergency costs and increase demands on financing. The analysis considering all modeled damages illustrates that, with greater needs, additional financing may be required, such as through additional insurance.

The government's financial strategy should therefore be periodically refined in light of updating objectives, financing, and risk.

Appendix B: Evolution of the Size of the National Emergency Fund Under Different Scenarios

This appendix presents scenarios for the evolution of the size of the National Emergency Fund (NEF) by varying the annual injection into the NEF and the ceiling of the NEF

As part of priority 2, activity d, the government will look to determine how the amounts above the ceiling will be spent. In the below analysis, it is assumed that funds above the ceiling will be spent on resilience activities.

The analysis¹¹ assumes that the NEF finances emergency costs, which appears most congruous with current practice because the NEF has been exhausted only once in the last 10 years. If the NEF were to finance damages, it is expected, based on modeling, that it would be fully exhausted every other year.

The following scenarios demonstrate how different annual injection and fund ceilings affect the probability of exhausting the fund in a future year (estimated at year 3, at which point the fund will have had more time to accumulate, depending on the occurrence of disasters).

Scenario 1: US\$4 Million Injection per Year

Scenario 1 considers a US\$4 million injection per year, in line with the Climate Change Policy Assessment’s recommendation of an annual injection of 1 percent of GDP. Table B.1 shows the probability of NEF exhaustion in year 3 without and with a ceiling. For various ceiling levels, the average accumulated amount above the ceiling is also shown.

Table B.1. National Emergency Fund (NEF) Scenario with US\$4 Million Annual Injection

	Ceiling			
	\$5m	\$6m	\$7m	\$8m
Probability of NEF Exhaustion (in yr 3)				
No ceiling	7%	7%	7%	7%
With ceiling	15%	11%	10%	9%
Cumulative avg amount (US\$m - at end of Yr 3)	4.4	3.5	2.6	1.8

Source: World Bank staff calculations

Scenario 2: US\$2 Million Injection per Year

A lower injection amount of US\$2 million per year is considered in scenario 2 (table B.2).

¹¹ The event set used for the modeling (which represents the range of possible tropical cyclones or earthquakes that may or may not happen in any year) is for 1 year only. To examine changes in the size of the NEF and the amount accumulated above the ceiling, this event set has been resampled for subsequent years.

Table B.2. National Emergency Fund (NEF) Scenario with US\$2 Million Annual Injection

	Ceiling			
	\$5m	\$6m	\$7m	\$8m
Probability of NEF Exhaustion				
No ceiling	15%	15%	14.6%	14.6%
With ceiling	19%	16%	14.9%	14.6%
Cumulative avg amount (US\$m - at end of Yr 3)	1.3	0.6	0.2	0.0

Source: World Bank staff calculations

The probability of NEF exhaustion is lower with a larger annual injection. Furthermore, the average amount accumulated above the ceiling is 70 percent lower when the annual injection is US\$2 million instead of US\$4 million (assuming a US\$5 million ceiling). The annual injection should be set at a rate that is sustainable from a budgetary perspective and provides an adequate level of comfort (probability) to the government that sufficient funds will be available for any given future disaster.

Appendix C: Implementation Plan

Only the first 20 months of the implementation plan are displayed below due to limited space and given that the plan will be adapted over time. However, the DRFS will be implemented until the end of 2025. For the full implementation plan, please refer to the Excel file which is part of this DRFS.

P2: Review the portfolio of risk financing instruments annually to ensure they meet government objectives cost-effectively

Action/Sub-action	Responsible Agency	Contact/ Role	Funding	TA support	Start Date	End Date	2021						2022									
							May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
a) Set loss funding objectives																						
Government to decide on objectives for funding instruments	MoF	RDFD PA	PCRAFI	Y,WB	Jan-21	Jun-21																
b) Conduct a financial gap analysis and update it on a yearly basis.																						
Review and update original analysis contained in the DRF Strategy	MoF	RDFD PA	PCRAFI	Y,WB	Jan-21	Jun-21																
Review and update original analysis contained in the DRF Strategy	MoF	RDFD PA	PCRAFI	Y,WB	Jan-22	Jun-22																
c) Assess the relative cost-efficiency of different instruments to ensure best value for money, based on identified financial gaps for different events and policy priorities. Review all the risk finance instruments in place to ensure that the portfolio of instruments remains relevant and meets Government needs in the most cost-effective way possible.																						
Annually review all the risk finance instruments to ensure relevance and they continue to meet government objectives	MoF	RDFD PA	PCRAFI	Y,WB	Jan-21	Jun-21																
Annually review all the risk finance instruments to ensure relevance and they continue to meet government objectives	MoF	RDFD PA	PCRAFI	Y,WB	Jan-22	Jun-22																
d) Reform existing instruments or develop/adopt new instruments, based on the annual review of existing instruments.																						
Review and reform the NEF, including its governance framework, rules for determining the allocation of resources to the fund, its maximum size, and eligible expenditures	MoF/ JW	DCEO Treasury	PCRAFI	Y, ADB, WB	Jan-21	Jun-21																
Issue new NEF regulations, review and sign off for cabinet	MoF/ JW	DCEO Treasury	PCRAFI	Y, ADB	Jul-21	Dec-21																
Drafting of NEF bill	MoF/ JW	DCEO Treasury	PCRAFI	Y, ADB	Jul-21	Dec-21																
Engage with PCRIC to assess the suitability of new sovereign disaster insurance products (excess rainfall & drought)	MoF	DCEO Treasury	PCRAFI	Y,WB	Jul-21	Dec-21																
Allocate budget to NEF in accordance with new NEF regulations	MoF	DCEO Treasury	PCRAFI	Y, ADB	Jan-22	Jun-22																
NEF audits and annual report are published	MoF	DCEO Treasury	PCRAFI	Y, ADB	Jul-22	Dec-22																

P6: Develop national DRM policy frameworks and plans and invest in national DRR priorities to mitigate and minimize the effect of future disaster shocks, including those exacerbated by climate change

Action/Sub-action	Responsible Agency	Contact/ Role	Funding	TA support	Start Date	End Date	2021												2022											
							May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
a) Develop National Disaster Risk Management Policy Framework and Plan to set up DRR priorities for Tonga, to strengthen the evidence base for identifying effective, value-for-money DRR interventions.																														
Develop Tonga Disaster Risk Management Regulation	NDRMO	DCEO NDRMO	TBC	Y	Jul-21	Jun-22																								
Develop Tonga Disaster Risk Management Policy Framework	NDRMO	DCEO NDRMO	TBC	Y	Jul-22	Dec-22																								
Review the National Disaster Risk Management Plan, District/Islands Disaster Risk Management Plan and Village Disaster Risk Management Plan	NDRMO	DCEO NDRMO	TBC	Y	Jan-23	Dec-23																								
b) Continue efforts to design, prioritize and implement DRR activities based on available risk information (see Strategic Priority 1, item d) and include them in their plans.																														
Mainstreaming Risk and Resilience as defined by the NDRM and JNAP 2 into national, sector and ministries' corporate plans	PMO, MEI/DECC, MOF	D/CEO National Planning			Jan-21	Dec-25																								
Revisit and complement existing guidance and templates for incorporating risk information and prioritizing DRR activities in Government plans	PMO, MEI/DECC, MOF	D/CEO National Planning			Jan-22	Dec-22																								
Reflect available and any newly generated information, including from the multi-hazard climate and disaster risk assessment in Tongatapu, the public asset registry, and facility and housing stock baselines in: • NIIP • a Climate and Disaster Resilient Urban Development Strategy and Investment Plan for Nuku'alofa • other national and sector investment plans that establish the financing gaps for the identified priority investments.	PMO, MEI/DECC	D/CEO National Planning		Y	Jan-21	Dec-25																								
Strengthen asset management to improve the life cycle management and resilience of public infrastructure to natural disasters	MoF	DCEO RDFD			Jul-21	Dec-23																								
c) Identify and access resources to fund national DRR priorities as guided by National, District and Village Disaster Risk Management Plan and systematically monitor their implementation																														
Identify funding sources for DRR which are appropriate, outside of the budget	MoF	DCEO RDFD		Y	Jun-21	Jun-22																								
d) Track implementation progress and financing to use in management decision-making and resource allocation																														
Support greater involvement of the new Resilience Development and Financing Division of the Ministry of Finance, NEMO and the Department of Climate Change in the annual budget process, including in budget consultations.	MoF	D/CEO RDFD			Jan-22	Dec-25																								
Following the endorsement of new Disaster Risk Management bill (planned to be presented to the parliament this FY), develop comprehensive disaster risk management plan at all levels national, Island and village level	NEMO	D/CEO NDRMO			Jan-22	Dec-25																								
Continue project preparation and dialogue with development partners to secure donor and climate fund financing (grants) for the identified priorities in national and sector investment plans.	MoF	D/CEO RDFD/RDF D PA			Jan-22	Dec-25																								
Develop a strategic approach to access international climate financing, with suitable application, implementation and oversight arrangements based on available specialized expertise and in close collaboration with development and implementing partners.	MoF	D/CEO RDFD/RDF D PA		Y	Jan-22	Dec-25																								
Track and report (including through budget documentation and as part of progress reports of the various Government plans) on implementation progress and financing of DRR activities at the project level and comprehensively, through new IFMIS functionality where appropriate, to inform management decision-making and future resource allocation.	MoF	RDFD PA		Y	Jan-22	Dec-25																								

Appendix D: Examples of Disaster Risk Financing Strategy Objectives

Table D.1 provides examples of possible disaster risk financing strategy objectives that could be adopted. The specific objective developed and agreed upon will determine which risk-layering strategy would be most effective for the government.

Table D.1 Examples of Disaster Risk Financing Strategy Objectives

Example Objective	Description
Minimize opportunity cost of selected strategy for 1 in every x years	<ul style="list-style-type: none"> • It is assumed that the government has a finite amount of funds available whether these funds are ring-fenced as emergency funds or used to buy insurance. • There are costs that come with not using these funds elsewhere, for example investing the money in other projects. • By considering the alternate ways these funds could be used, the opportunity cost of a particular strategy is estimated. • Considering the opportunity cost after a certain severity of loss (e.g., 1 in every x years) provides a framework to maximize cost-efficiency allowing for government’s risk appetite.
Minimize opportunity cost at the median level	<ul style="list-style-type: none"> • This is like the first objective but assesses the cost in a median year. A median occurrence is one that is expected be exceeded in half of years. • Examining the median occurrence focuses the strategy on disasters that occur more frequently.
Eliminate expected funding gap for years with losses below predefined loss threshold	<ul style="list-style-type: none"> • A funding gap can translate into high human and economic costs because it means that the government would not be able to respond adequately to a disaster until late, after receiving ad hoc international support. • Assessing the funding gap at return periods, the government can choose a strategy whereby losses are funded with prearranged financing up to a specified return period (specified annual losses). Losses greater than this would require that the government seek assistance from international donors.

Appendix E: Methodology, Assumptions, and Limitations of Disaster Funding Assessment Framework

Methodology

The methodology used to assess the cost of alternative financial instruments to meet the costs of disasters is set out in *Evaluating Sovereign Disaster Risk Finance Strategies: A Framework* (Clarke, Daniel; Mahul, Olivier; Poulter, Richard; Teh, Tse Ling. 2016). Adjustments were made to allow for more sophisticated consideration of contingent grants, because the costs are materially different from those of contingent loans.

Cost of Contingent Grant

The contingent grant opportunity cost is calculated allowing for three key components:

- 1) **Crowding out of other projects that could be financed instead of the contingent grant:** This has been calculated as the social rate of return (discounted to current terms) on the amount crowded out for the next year. Although it is assumed that an International Development Agency envelope is generally programmed every 3 years, it is also assumed that the second- and third-year costs are incurred in those years, respectively.
- 2) **Cost of drawing down the grant in year 1:** If the grant were fully drawn down in year 1, it would not be possible for the government to access this grant funding for years 2 and 3. In such a case, any losses in years 2 or 3 would be funded using other, more expensive instruments. In these cases, there would be an opportunity cost for drawing this grant funding down early. Assumptions have been made to simplify the modeling for multiple years:
 - a. Same structure of instruments for years 1, 2, and 3 (in terms of size of instrument and order of instruments used)
 - b. Same simulated set of losses for years 1, 2, and 3
 - c. Years assumed to be independent
 - d. Projection not stochastic and may be subject to sampling error
- 3) **Arrangement fee:** The set-up fee for arranging and administering the contingency fund was assumed to be 1 percent of the contingency funding amount.

Economic and Financial Assumptions

Table E.1. Assumptions for Cost Calculations

Assumption	Value
Marginal interest rate on sovereign debt	3%
Discount factor	3%
Investment return on unspent reserves	1%
Interest rate on contingent credit	1.15%
Arrangement fee for contingent credit	1%
Social rate of return on projects not funded due to reallocation of budgets	10%
Marginal interest rate on ex post borrowing	4%
Repayment term of ex post borrowing	6 years
Annual effective increase in cost financing through ex-post borrowing	40%

Delay period in financing through ex post borrowing	9 months
Insurance pricing multiple	1.4
Asian Development Bank crowding out factor	0.33
World Bank crowding out factor	0.5
Number of years until alternative project can be funded (assumed to be in next International Development Agency program)	3
Insurance premium (grant funded)	US\$580,000

Sensitivities Regarding Social Rate of Return on the Cost of Strategies

There is a large difference between the assumed social rate of return (10 percent) and the rate on sovereign borrowing (3 percent), so a sensitivity analysis was conducted regarding the assumed social rate of return, assuming it is closer to the assumed rate of borrowing for the government. The methodology for calculating the cost of various strategies relies on the assumptions selected for Tonga. A 10 percent social rate of return was assumed for Tonga, and a 3 percent interest rate on sovereign borrowing was selected (proxied on government coupons issued in 2020). These assumptions are deemed reasonable, but it is nonetheless important to understand the effect they have on the analysis and the conclusions. Two sensitivities regarding these assumptions and the resulting cost were considered.

- Alternative social rates of return of 6 percent and 3 percent were considered for post budget reallocation and contingency grant cost calculations: *base social rate of return assumption of 10 percent.*
- Reserve fund cost calculations were assumed to be funded from budget reallocation (instead of commercial borrowing) at rates of 6 percent and 10 percent: *base sovereign rate of borrowing assumption of 3 percent.*

For the sensitivities mentioned above, the cost comparison conclusions between strategies (base, strategy B, strategy C) are unchanged from what is detailed above.

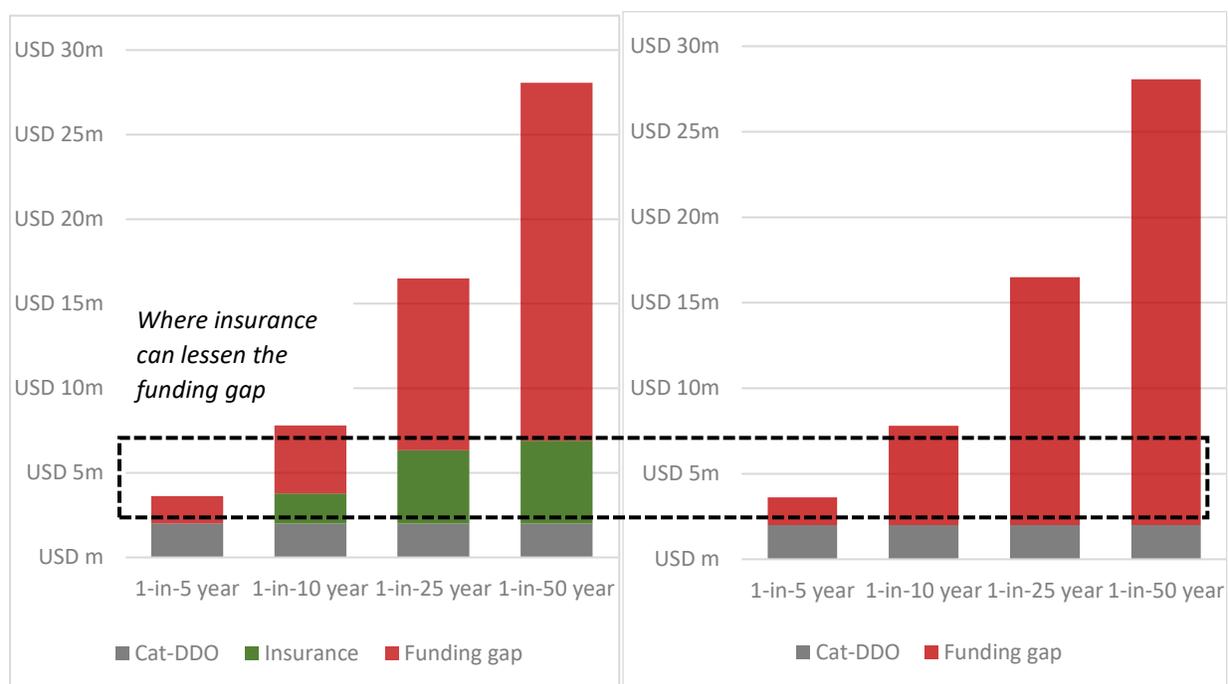
Appendix F: Role of Parametric Insurance and Associated Risks

Funding Options and Role of Insurance

A critical factor in assessing risk-layering options is the coverage provided by alternative instruments, particularly when comparing insurance with other instruments. When considering average annual losses, or only less-adverse scenarios, insurance can look more expensive than contingent credit, for example, which can be very cost-effective for certain events, but after the most severe events, insurance benefits from its leveraged nature, meaning that it can provide greater coverage than the annual cost (the premium). This is illustrated in a simple example in which two instruments are considered: parametric insurance purchased from Pacific Catastrophe Risk Insurance Company (PCRIC) and a catastrophe-deferred drawdown option (Cat DDO) of US\$2 million from the World Bank.

Figure F.1 shows that, although the financial resources available to the government after a 1-in-5-year scenario are the same whether insurance is purchased or not, insurance provides more coverage as return periods (severity of annual losses) increase and thus lessens the funding gap in those instances.

Figure F.1. Funding Gap Example for Using and Not Using Insurance: Losses from Tropical Cyclones, Earthquakes, and Tsunamis with Different Return Periods



Source: World Bank staff calculations based on PCRAFI catastrophe model

Note: Cat DDO, catastrophe-deferred drawdown option.

The Cat DDO provides up to US\$2 million regardless of the size of the loss because this is the maximum payout possible assumed in this illustrative example. For a 1-in-5-year loss (US\$3.2 million), the government would receive US\$2 million from the Cat DDO as a grant and nothing from PCRIC, because the insurance is not triggered at this level. In worse years, say under a 1-in-25-year scenario with a loss of US\$16.5 million, the Cat DDO payout remains US\$2 million, which would have left a funding gap of US\$14.5 million if insurance had not been purchased. With insurance, based on the current PCRIC policy in place, the government would receive a payout of US\$4.3 million, resulting in a smaller funding shortfall

of US\$10.2 million. The benefit of insurance is most obvious for adverse years when larger losses are experienced. Insurance policies can be structured to suit the objectives of the government. Broadly, insurance should be purchased for high-severity, low(er)-frequency types of events and in line with the government's risk appetite.

Many sources, including the International Monetary Fund, believe that countries like Tonga will experience increasing costs from climate change irrespective of global action to reduce greenhouse gas emissions. Tropical cyclones are expected to be more intense, with more damage from wind and storm surges (IMF 2020). For this reason, considering losses in these less-frequent years and the funding required in these cases is helpful for Tonga's overall risk management strategy.

Basis Risk

There will be a level of basis risk—the risk that the insurance coverage purchased is inadequate to cover the risks the insured may have to face—when purchasing insurance. Several factors can drive this mismatch of coverage to payout, the most common being the coverage or terms of the insurance. Insurance that the government purchases through PCRIC covers tropical cyclone, earthquake, and tsunami risks. These are the main natural catastrophes identified as part of Tonga's risk profile, although other risks that could adversely affect Tonga, for example, a pandemic or excess rainfall.

The contingent credit that the World Bank and the Asian Development Bank offer is a way to mitigate basis risk.

Unmodeled Risk

The data underlying the outputs above are only for tropical cyclones, earthquakes, and tsunamis. Tonga experiences other natural catastrophes that do not (yet) have robust statistical models, such as excess rainfall.¹² These risks, although deemed to be smaller than the modeled risks, pose an additional layer of risk (and cost to the government) that has not been factored into the financial analysis presented in the main text of this strategy document.

¹² The Pacific Catastrophe Risk Assessment and Financing Initiative Technical Assistance Program is modeling excess rainfall risk for Tonga.

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