

Advancing Disaster Risk Finance in **Belize**

SOCIAL, URBAN, RURAL AND RESILIENCE GLOBAL PRACTICE
LATIN AMERICAN AND THE CARIBBEAN UNIT

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Abbreviations and Acronyms

AAL	Average Annual Loss
BCRIP	Belize Climate Resilient Infrastructure Project
BOP	Balance of Payments
CARTAC	Caribbean Regional Technical Assistance Centre
Cat DDO	Catastrophe Deferred Drawdown Option
CCRIF SPC	Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company
CDB	Caribbean Development Bank
CDRP	Country Disaster Risk Profile
CERC	Contingency Emergency Response Component
CoA	Chart of Accounts
DANA	Damage and Needs Assessment
DFID	Department for International Development
DRF	Disaster Risk Finance
DRM	Disaster Risk Management
DRFTA	Disaster Risk Finance Technical Assistance
DRR	Disaster Risk Reduction
ECLAC	Economic Commission for Latin America and the Caribbean
EDF	Emergency Disaster Fund
EP	Exceedance Probability
EU	European Union
FPMU	Fiscal Policy Management Unit
FSRA	Financial Services Regulatory Authority
GDP	Gross Domestic Product
GoB	Government of Belize
HHI	Herfindahl-Hirschman Index
IADB	Inter-American Development Bank
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
LAC	Latin America and Caribbean
LPP	Livelihood Protection Policy
MoF	Ministry of Finance
MNRA	Ministry of Natural Resources and Agriculture
NEMO	National Emergency Management Organization
ORINCO	Organization of Insurance Companies in Belize
PEFA	Public Expenditure and Financial Accountability
PFM	Public Financial Management
PML	Probable Maximum Loss
PPP	Public-Private Partnership
SIDS	Small Island Developing States
USAID	U.S. Agency for International Development
USD	United States Dollar
WINCROP	Windward Islands Crop Insurance Ltd

Glossary

Contingent liabilities: Are obligations that may or may not come due, depending on whether particular events occur. The probability of their occurrence may be exogenous to government policies (for example, if they are related to natural disasters) or endogenous (for example, if government programs create moral hazard).

Explicit contingent liabilities: Are specific obligations, created by law or contract, that governments must settle.

Implicit contingent liabilities: Represent moral obligations or burdens that, although not legally binding, are likely to be borne by governments because of public expectations or political pressures.

Damage: Total or partial destruction of physical assets existing in the affected area.

Note: Damage occurs during and immediately after the disaster and is measured in replacement value of assets (based on, e.g., percentage of housing damaged, kilometers of roads).

Disaster risk financing (DRF) strategies against disaster: Strategies to protect governments, businesses, and households from the economic burden of disasters.

Note: Disaster Risk Financing strategies can include programs to increase the financial capacity of a state to respond to a disaster impact or an emergency, while protecting the fiscal balance. They can also promote the deepening of insurance markets at a sovereign and household level and social protection strategies for the poorest.

E.g., the Livelihood Protection Policy (LPP) in Jamaica insures low-income individuals from wind and excess rain and the Government of Grenada disburses National Insurance Scheme (NIS) funds in response to post-disaster short-term unemployment.

Exceedance probability: Probability that a given loss from an event will be equaled or exceeded.

Economic loss: Total economic impact that consists of direct economic loss and indirect economic loss.

Direct economic loss: The monetary value of disaster damages.

E.g., Hurricane Dean caused damages in Belize in 2007, with direct economic losses that amounted to USD 48 million (BZ\$ 96 million) in assets and stocks.

Indirect economic loss: Monetary value of the consequence of direct economic loss and/or human and environmental impacts. Indirect economic loss includes micro-economic impacts (e.g., revenue declines from business interruption), meso-economic impacts (e.g., revenue declines from supply chain impact or temporary unemployment), and macro-economic impacts (e.g., price increases, increases in government debt). Indirect economic losses can occur inside or outside of the hazard area and often with a time lag.

E.g., the indirect losses caused by Hurricane Dean in 2007 in Belize amounted to USD 42 million (BZ\$ 84 million). Adding the direct economic losses of USD 48 million (BZ\$ 96 million), Hurricane Dean accounted for USD 90 million (BZ\$ 180 million) in economic losses.

Fiscal risk: The possibility of deviations in fiscal variables from what was expected at the time of a budget or other forecast. Fiscal risks include macro-economic shocks and contingent liabilities.

E.g., Belize has high fiscal risks to disasters: Losses modeled by the Caribbean Catastrophe Risk Insurance Facility (CCRIF) for tropical cyclone events show that a 1-in-100-year event could result in an economic loss of at least USD 565 million (BZ\$ 1.130 billion).

Mean return period/rate of occurrence: Estimate of the likelihood of the loss of a particular event to occur, such as a particular amount of loss from a hurricane or earthquake. It is also the inverse of the rate of occurrence of a loss. If the loss associated with a given hurricane wind speed has a 0.01 annual rate of occurrence, the return period is equal to $1 \div 0.01 = 100$ years. This does not imply that the loss from a wind speed will be exceeded exactly once every 100 years, rather that the average time between exceedances is 100 years.

Risk reduction: Measures taken in advance of a disaster aimed at decreasing or eliminating its impact on society and environment.

Parametric insurance: Payout is made based on the occurrence of an event, not the magnitude of the resulting loss. As such, trigger mechanisms must be devised to determine whether such an event has occurred and if payment under a parametric insurance contract is required. Triggers may be based on:

A pure parametric nature: Trigger is based solely on weather recordings like wind speed or rainfall amount (e.g., LPP is a policy launched in Jamaica, Saint Lucia, and Grenada that insures low-income individuals from wind and excess rain).

A parametric index or model: Trigger is based on a formula, index, or model as a proxy for the actual event (e.g., in the case of CCRIF, payouts are proportional to the estimated impact of an event on each country's budget. The estimated impact is derived from a probabilistic catastrophe risk model developed specifically for the Facility).

Executive Summary

The objective of this report is to make recommendations for the Government of Belize (GoB) for the formulation of a country-specific comprehensive disaster risk finance (DRF) strategy, based on the assessment of the legislative, financial management, fiscal, and insurance market environment in Belize. This report is envisioned to be used as a planning tool for the potential development of a comprehensive DRF strategy that would equip the Ministry of Finance (MoF) with information and instruments to manage contingent liabilities posed by disasters.

On average, in the long term, the GoB would need to cover losses of approximately USD 29.5 million (BZ\$ 59.0 million) annually—1.69 percent of Belize’s gross domestic product (GDP)—to address its contingent liabilities related to hurricanes and floods¹ (Table 1). This amount is also equivalent to 4.7 percent of total government expenditure in 2015.² Hurricane damage to public and private building infrastructure alone will amount to USD 17.9 million (BZ\$ 35.8 million) on average each year in the long run (1.02 percent of GDP). For any given year, Belize has about a 1 percent chance of losses from hydrometeorological events exceeding USD 1,858 million (BZ\$ 3,716 million) for the economy as a whole. In addition to long-term impacts on economic and social development in Belize, disasters also increase Belize’s sovereign debt, as more loans are borrowed to finance unplanned post-disaster expenditures.

Table 1: Modeled Loss Metrics for Key Return Periods (all figures in USD million)

Return Period (Years)	Probabilistic Modeling of Building Losses (Hurricanes)	Actuarial Analysis of Historic Events (Floods and Hurricanes)		
	Total Direct Damage	Total Direct and Indirect Impact	Total Direct Damages	Total Government Contingent Liability
Average Annual Loss (AAL)	17	123	88	30
10	13	182	124	42
50	281	1,190	883	306
100	488	1,857	1,379	477
250	791	2,736	2,035	703

Source: Authors’ analysis.

Belize can adjust its approach to disaster financing to be more timely and cost-effective and to minimize opportunity costs. As it stands, the GoB is forced to reallocate funds from essential development activities to crisis response. The Financial Secretary in the Budget Department of the MoF will run an above-the-line account to cover immediate emergency costs following a natural disaster. The department typically observes that these funds would be offset from the reallocation of national funds, as well as donor funds. Financing for long-term reconstruction takes the form of International assistance and loans secured on an ad hoc basis after disaster strikes, further limiting fiscal space and exacerbating the country’s public debt problems.

Existing instruments for DRF are not optimized to address Belize’s disaster risk profile, prone to recurrent, frequent floods and occasional major hurricanes and tropical storms. A preliminary analysis of the National Budget indicates that there is no existing natural disaster fund or contingency budget mechanism that may address the low layers of risk. Such a fund, with a fast-disbursement mechanism, could be further capitalized and regulated as a vehicle for the rapid financing of public post-disaster reconstruction operations. A Contingency Emergency Response Component (CERC) of USD 1 million (BZ\$ 2 million) as part of the Belize Climate Resilient Infrastructure Project (BCRIP) is one source of immediate liquidity after a disaster.³ Belize has been a member of the Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company (CCRIF SPC) since 2007, with policies for hurricane, excess rainfall, and earthquake events, but chose not to renew its policies in the 2017/18 coverage period. Parametric catastrophe insurance

¹ Authors analysis, based on probabilistic modeling and historic losses, explained in Chapter 3.

² International Monetary Fund (IMF). 2017. World Economic Outlook.

³ The CERC is available to Belize until the end of the BCRIP, and is triggered by a request from the government.

like CCRIF SPC is well suited for coverage of severe events, but Belize is lacking access to financing for low- and medium-severity events, most effectively provided through reserve funds and flexible ex ante contingent financing arrangements.

This report presents recommendations for a cost-effective natural DRF strategy in Belize, drawing heavily on international experience, country-specific information, and similar conditions in highly indebted small island developing states (SIDS). These complementary recommendations for a national DRF strategy are based on a preliminary fiscal risk analysis and a review of the current financial management of natural disasters in Belize. The report benefits from the international experience of the World Bank and the approach outlined in its operational disaster risk financing and insurance framework,⁴ which has assisted several countries in the design and implementation of sovereign catastrophe risk financing strategies (for instance, Colombia, Fiji, Grenada, Indonesia, Jamaica, Mexico, Pakistan, the Philippines, Saint Lucia, Samoa, Solomon Islands, Sri Lanka, Tonga, Vanuatu, and Vietnam). This report tailors the approach to the institutional, social, and economic characteristics of Belize.

The following chapters outline combinations of new, existing, and refurbished risk retention and risk transfer instruments that could help the GoB increase its immediate financial response capacity against natural disasters and better protect its fiscal balance. The DRF tools and approaches that Belize has accessed in the past are listed below (Table 2). Some are the result of ex ante planning, and some materialize after a disaster (ex post).

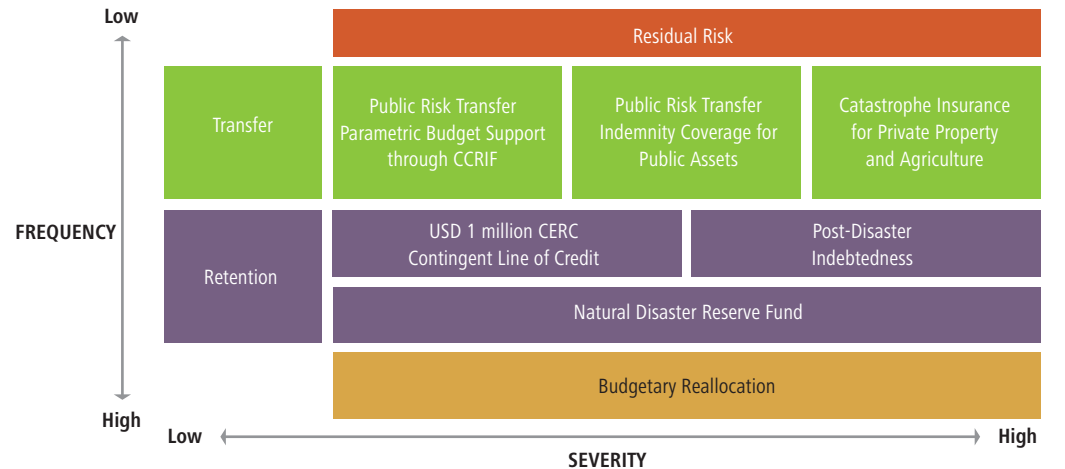
Table 2: Current and Past Disaster Risk Finance Instruments

Ex Ante	Retention	World Bank Contingent Emergency Response Component Reallocation of Funds	
	Transfer	Direct Contingent Liabilities	CCRIF SPC
		Implicit Contingent Liabilities	Private Property Insurance
Ex Post	Retention	Special Reconstruction Fund	International Loans and Assistance

Source: Authors.

Building on the risk layering approach promoted by the World Bank for events of varying frequency and severity, based on existing instruments identified in the diagnostic analysis, the following options for a DRF strategy are proposed in Figure 1 and more-detailed recommendations are listed in Table 3.

Figure 1: Illustrative Strategy for Proposed DRF Options



Source: Authors' analysis.

⁴ Financial Protection against Natural Disasters: From Products to Comprehensive Strategies, An Operational Framework for Disaster Risk Financing and Insurance. 2014. World Bank Group,

Table 3: Proposed Recommendations for DRF in Belize

Time Frame	Instrument and Strategy Recommendations for DRF
Sovereign Protection	
Short Term	1. Streamline and institutionalize a damage and loss data collection and reporting system across ministries for all severities of events.
	2. Reinforce the role of budgetary planning for disaster-related contingent liabilities at the ministry level.
	3. Streamline reporting of disaster response expenditures by including explicit programs within the Chart of Accounts (CoA) to distinguish expenditure for disaster response and to further categorize them into affected sectors, e.g., housing, agriculture, tourism. Expenditures should also be categorized by event, e.g., Hurricane Lenny or December 2015 flood.
	4. Establish or re-establish the enforcement of laws that allow for a fast disbursement mechanism for the financing of post-disaster expenses.
Short/Medium Term	5. Develop an inventory of public assets at the national level.
Short Term	6. Formalize and implement a DRF strategy that includes a budgetary process for financing disaster response.
	a. Prepare a manual for post-disaster financing to accurately capture the actors, the systems, the various sources of financing, and the process to disburse funds.
Medium Term	7. Establish a contingency fund or reserves for public contingent liabilities associated with events with a 5-year return period, accumulated over time.
Short Term	8. Engage external development partners in establishing a contingent line of credit to finance public contingent liabilities associated with events of a 10-year return period
Medium Term	9. Establish a robust catastrophe risk insurance program for public assets and parastatals.
	10. Enhance management of contingent liability related to social protection, e.g., establish policy for post-disaster cash transfers.
Private Insurance Market	
Medium Term	11. Enhance availability, penetration, and affordability of private and residential catastrophe insurance. Evaluate potential for public-private partnerships (PPPs) for housing subsidies and explore potential micro-insurance mechanisms.
	12. Enhance data sharing on agricultural insurance and develop more-robust and -affordable products for smallholder farmers.

Source: Authors' analysis.

The above recommendations would allow the GoB to finance its contingent liabilities from a flood or hurricane event with a 20-year return period with its own funds without reallocation or further indebtedness, other than drawing down on a contingent financing mechanism (based on fiscal analysis discussed in Chapter 3). The combination of reserves, emergency financing from a contingent line of credit, parametric insurance, and indemnity insurance offers a cost-effective strategy. Reserves and/or annual budget allocations are efficient to finance recurrent low-severity events like localized floods, storms, or landslides. Lines of contingent credit such as the World Bank Catastrophe Deferred Drawdown Option (Cat DDO), the Inter-American Development Bank (IDB) Contingent Credit Facility for Natural Disaster Emergencies or the International Monetary Fund (IMF) Rapid Credit Facility (RCF) are more cost-effective than risk transfer solutions for the intermediate layers of risk like tropical storms and low-intensity hurricanes. Catastrophe risk transfer solutions like parametric insurance have proven to be cost-efficient against high-risk layers like major hurricanes and earthquakes.

The GoB could support the establishment of a disaster risk insurance program for key public assets in partnership with the private insurance industry. Most of the public assets, including critical assets such as hospitals and schools, are not currently insured against natural disasters. This program would aim to offer technical assistance to public entities in the design of their catastrophe insurance coverage of public assets. Standardized terms and conditions for the property insurance policies would be developed, which would assist public managers in identifying their risk exposure and their insurance needs. The program could also build a national insurance portfolio of public assets that could then be placed on the private (re)insurance market. A national property catastrophe insurance program for public assets would create economies of scale and diversification benefits and thus lower reinsurance premiums.

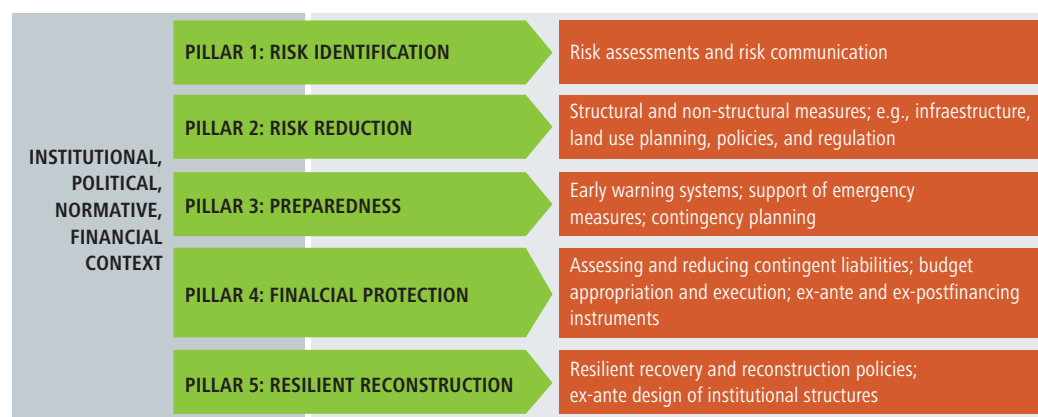
Chapter 1

Chapter 1. Introduction

Brief Presentation of the Theoretical Framework of Disaster Risk Finance

Financial management of disaster risk is an element of Priority 3 of the Sendai Framework 2015–2030⁵ and is part of the Strategic Framework for Comprehensive Risk Management of Disasters developed by the World Bank.⁶ This report defines the five pillars of a disaster risk management (DRM) strategy (see Figure 2). It assumes that while a country cannot escape the risk of natural hazards, it can significantly and efficiently reduce its vulnerability and its exposure to risks. Thus, to reverse the current trend of increasing impacts from natural disasters, it is necessary to integrate risk management into development plans and into public and private investment, both locally and nationally.

Figure 2: Strategic Pillars of DRM Developed by the World Bank



Source: World Bank and GFDRR, Sendai Report.

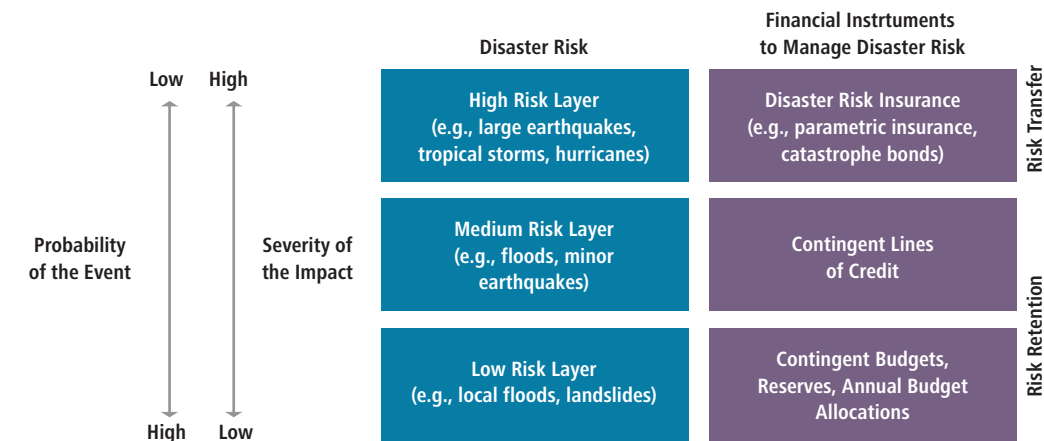
It is important to note that the Disaster Risk Finance Technical Assistance (DRFTA) Project on which this report is based focuses solely on the financial protection pillar. However, it does not lessen the need to strengthen the other dimensions of integrated risk management, including the preparedness component that is crucial for Belize. The DRFTA Project is part of the broader partnership with the GoB on DRM and climate change adaptation. Belize is currently implementing the World Bank-funded Climate Resilient Infrastructure Project (P127338), which aims to reduce physical and fiscal vulnerability to disasters and the impacts of climate change through a combination of infrastructure works and technical assistance activities that increase capacity to identify and manage climate and disaster risk.

The primary objective of a DRF strategy is to reduce the economic and fiscal impact caused by disasters, based on the concept of cost-effectiveness, that is to say, to develop instruments differentiated according to the different types of risks identified (Figure 3). To this end, a DRF strategy combines instruments for the retention and transfer of risk and administrative and legal mechanisms to increase the capacity to respond effectively and reduce the associated financial burden and, ultimately, to ensure the sustainability of public finances. From a macro-economic point of view, the various instruments forming the strategy play the role of automatic stabilizers and help manage budgetary volatility caused by disasters. Within these tools are the ex ante instruments put in place by the GoB prior to the disaster and the ex post measures operationalized after a disaster.

⁵ The Sendai Framework for Disaster Risk Reduction 2015–2030 was adopted by 187 states and international actors in March 2015 and establishes a roadmap and priorities for disaster risk reduction (DRR).

⁶ This report details the disaster management framework developed by the World Bank. It is available online at: <https://www.gfdr.org/sites/default/files/publication/sendai-report.pdf>.

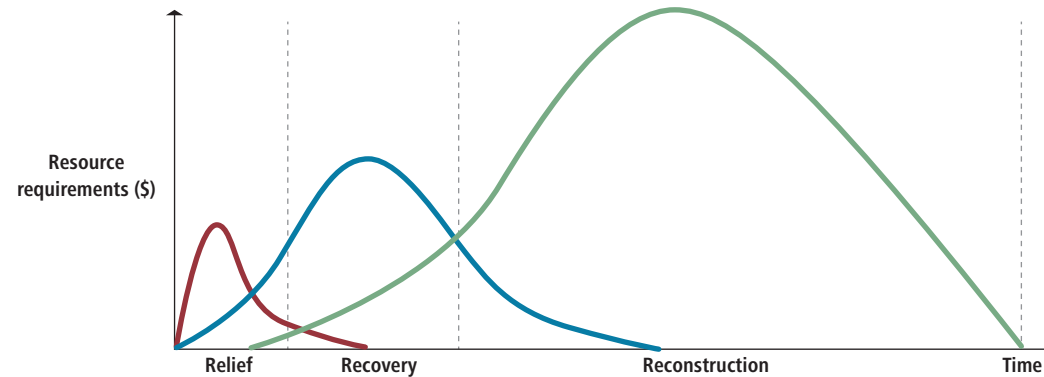
Figure 3: Most Cost-Effective Financial Instruments for Different Types of Risk



Source: World Bank.⁷

A temporal dimension is the second key factor to be taken into account in forming a cost-effective DRF strategy. Indeed, a government might not use all of the funds needed for recovery in the days following a disaster (Figure 4). Immediate resources are necessary to carry out emergency operations. Ensuring that these resources are available and that operations can be carried out quickly is crucial to stabilize the human, social, or even economic impact of a disaster. However, it is only after a few months, sometimes even a few years, that the financial needs will be maximized to address reconstruction works.

Figure 4: Temporal Dimension of Post-Disaster Finance Needs



Source: World Bank.⁸

The third factor concerns the legal and administrative aspects. Funds and financing mechanisms must be put in place and payments must be made at the required times. This step is vital for the financial strategy to effectively meet the GoB's needs. In many cases, efforts to secure funds quickly after a disaster are hampered by the multiple administrative steps required for the responsible institution to appropriate resources and execute operations. In other cases, oversight of the use of public resources is suspended and the lack of transparency often results in losses when resources are already low. Similarly, some governments take out parametric insurance before realizing after a disaster that the payments would be treated as non-tax revenues and would therefore be transferred to the treasury, thus generating delays in the execution of emergency and recovery operations. Although often overlooked, this legal and administrative dimension needs to be addressed with particular attention so that the risk financing strategy is effective.

To address these three key factors, the analysis captured in this report employs a country-specific operational framework informed by the experience of the World Bank in similar countries. ⁹ To specifically address the needs of the GoB related to natural disasters, this approach focuses on three activities: quantifying the contingent liabilities of the GoB to estimate the fiscal risk of natural disasters, reviewing the current public financial management of natural disasters in Belize and the legal environment for addressing shocks on public finances, and evaluating the domestic non-life insurance industry for its capacity to build a strong financial sector for public and private risk transfer

⁷ Ghesquiere, F. and Mahul, O. 2010. Financial Protection of the State Against Natural Disasters: A Primer. Washington, DC: World Bank.

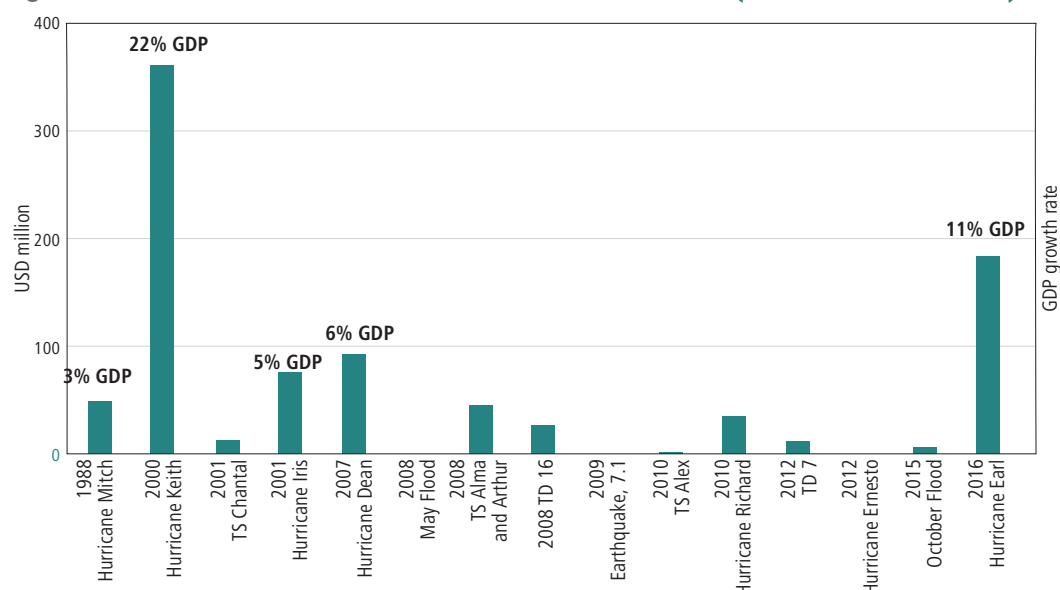
⁸ Ibid.

⁹ Financial Protection against Natural Disasters: From Products to Comprehensive Strategies, An Operational Framework for Disaster Risk Financing and Insurance. 2014

Brief Introduction on the Case for a DRF Strategy in Belize

Over the past 15 years, Belize has experienced several major hurricanes that have had serious impacts on agriculture,¹⁰ tourism, and infrastructure—all of which contribute significantly to Belize's economy. Given the size of Belize, natural disasters have varying impacts depending on the area of landfall.¹¹ Impacts from Hurricane Keith (20-year return period event)¹² were felt along the coast, totaling USD 100 million (BZ\$ 200 million) in damages to tourist facilities and lost revenue. Hurricane Iris (5-year return period event)¹³ caused USD 50 million (BZ\$ 100 million) in losses and damages to the export-earning banana industry,¹⁴ and Hurricane Dean (6-year return period event)¹⁵ affected papaya production in the north with more than USD 37 million (BZ\$ 74 million) in losses and damages.¹⁶ Tropical Depression 16 affected subsistence farmers who lived within the River Valley, creating a situation of food insecurity for rural populations.¹⁷ In addition to long-term impacts on economic and social development, disasters also increase Belize's sovereign debt, as more loans are borrowed to finance unplanned post-disaster expenditures.

Figure 5: Losses from Natural Disasters in Belize since 1995 (USD million, real 2015)



Source: Authors, based on Desinventar, the Caribbean Disaster Emergency Management Agency, and the World Bank.

Belize is highly exposed to natural disasters of varying intensity and severity. Several types of disasters, such as hurricanes, tropical storms, earthquakes, droughts, floods, and landslides, frequently occur. Between 2000 and 2016, nine named storms made landfall in Belize, causing significant physical and financial damages. In addition, tropical depressions and low pressure systems have been experienced, such as the Tropical Depression 16 in 2008, with intense rainfalls causing flooding. Moreover, Belize's proximity to active systems in Mexico and Guatemala also renders the country susceptible to rare occurrences of earthquakes, particularly in the southern part of the country. The Intergovernmental Panel on Climate Change (IPCC) has high confidence that the effects of climate change will intensify.¹⁸ Impacts from natural disasters will therefore most likely become even larger, coupled with growth in populations and economies. Belize can expect extreme weather events to become more frequent and more intense, resulting in greater financial losses. On the revenue side, smaller economies like Belize's often have lower than expected revenue generation, partly due to tax policies that might not be optimal for small economies. However, there also seems to be a regional factor at play, as Latin America and Caribbean

¹⁰ The DRFTA Project acknowledges the concerns by the MoF on the vulnerability of the agricultural sector, but notes that it may not be included in the analysis due to challenges with quantification.

¹¹ Guha-Sapir, D.; Below, R.; and Hoyois, P. 2016. EM-DAT: Emergency Events Database. Université Catholique de Louvain. Available at: www.emdat.be.

¹² Based on DRFTA Project modeled actuarial return period corresponding to reported damages of Hurricane Keith.

¹³ Caribbean Disaster Emergency Response Agency. 2000. Hurricane Keith Situation Report No. 3.

¹⁴ Based on DRFTA Project modeled actuarial return period corresponding to reported damages of Hurricane Iris.

¹⁵ Caribbean Disaster Emergency Management Agency. 2001. Report from National Emergency Management Organization Damage Assessment Sub-Committee.

¹⁶ Based on DRFTA Project modeled actuarial return period corresponding to reported damages of Hurricane Dean.

¹⁷ NEMO Damage Assessment and Needs Analysis Preliminary Report Version 3 Hurricane Dean. 2007.

¹⁸ Mimura, N. et al. 2007. Small Islands – Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry et al. (eds.), Cambridge: Cambridge University Press.

(LAC) countries in general exhibit low government revenue generation. These revenue factors, combined with the increased cost of natural disasters, result in high levels of public debt in LAC small economies.¹⁹

Figure 6: Hurricane Dean Losses by Sector

- USD 89.51 million in loss and damages
- 53% of losses were to assets and stocks
- Affected 65% of agricultural GDP and 7% of total GDP
- 1.2% loss in 2007 GDP growth rate

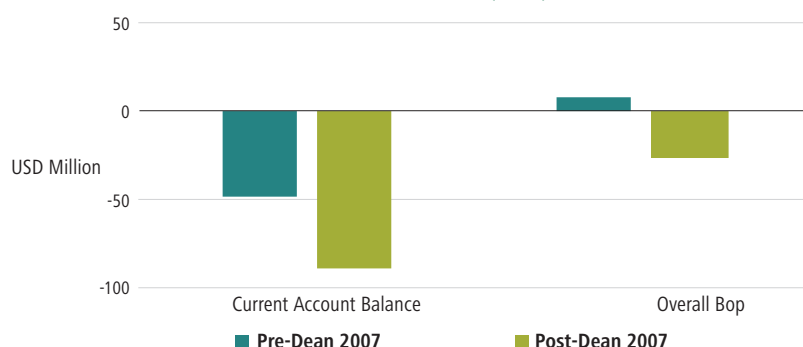
Sectoral Loss and Damage

- Education & Health 1%
- Water, Electricity & Telecom 1%
- Environment 4%
- Transportation Infrastructure 5%
- Tourism 5%
- Housing 19%



Source: Economic Commission for Latin American and the Caribbean (ECLAC).

Figure 7: Belize 2007 Balance of Payments (BoP)



Source: International Monetary Fund (IMF).

According to Belize's 2014 Article IV Consultation, a surge in contingent liabilities is a main risk to its macro-economic outlook.²⁰ After Hurricanes Keith and Iris in 2000 and 2001, Belize's debt-to-GDP ratio peaked at over 101 percent, gradually declined, and then again peaked at 85 percent in 2008 after Hurricane Dean resulted in a sharp deterioration in the balance of payments²¹ (Figure 7). Bilateral and multilateral aid flows, at only USD 80 million (BZ\$ 160 million) since 1990 are not sufficient to finance recovery and reconstruction efforts.²²

The quantification of fiscal risks linked to natural disasters is the first step in devising a cost-effective DRF strategy. Belize's Country Disaster Risk Profile (CDRP) developed by the World Bank presents country- and department-level earthquake and hurricane risk profiles by estimating the potential economic losses to public and private building infrastructure.²³ According to the CDRP, hurricanes cause an average annual loss (AAL) of USD 17.9 million (BZ\$ 35.8 million) and earthquakes cause USD 1.4 million (BZ\$ 2.8 million) in direct losses, or 1.02 percent and 0.08 percent of GDP, respectively. Moreover, there is a 0.4 percent chance each year of direct losses exceeding USD 791 million (BZ\$ 1,582 million) due to hurricanes and USD 63 million (BZ\$ 126 million) due to earthquakes. Single-family, wood stud-wall frame with plywood/gypsum board sheathing walls and concrete block unreinforced masonry with lime or cement mortar

¹⁹ Lederman, Daniel and Lesniak, Justin T. 2017. Open and Nimble: Finding Stable Growth in Small Economies, Summary. Washington, DC: World Bank. Available at: <https://openknowledge.worldbank.org/handle/10986/26304> License: CC BY 3.0 IGO.

²⁰ Belize: 2014 Article IV Consultation and Request for an Extended Credit Facility Arrangement – Staff Report.

²¹ IMF World Economic Outlook Database. 2015.

²² AidData Beta. 2015. Open Data for International Development

²³ For the purposes of this report, the "quantification of fiscal risks" has been applied through several methodologies, each focusing on explicit and implicit contingent liabilities. However, it must be noted that implicit contingent liabilities are inherently difficult to distinguish and solely quantify. The CDRP is a methodology (explained in Chapter 3) that quantifies a portion of direct economic loss of the building stock, then further extrapolates from this amount which costs are borne by the GoB, or rather, the GoB's contingent liabilities in building stock. The actuarial analysis of historical disasters in Belize, also discussed in Chapter 3, models the public sector-specific losses from future events by using country knowledge of public investments in each productive, transportation, and social sector affected by the disaster. These estimates capture primarily the GoB's contingent liabilities, including a portion of the GoB's implicit contingent liability by, for example, applying the knowledge that historically the GoB has made ad hoc financial responses to the housing sector.

are the buildings that incur the largest losses on average due to hurricanes, together accounting for approximately 19 percent of AAL.

This report further validates these estimates and takes the first steps in quantifying the GoB's explicit contingent liabilities using data from historical events, with a focus on explicit contingent liabilities.²⁴ A portion of implicit liabilities is included in the quantification, given available data. The exercise considered 12 natural disasters between 2000 and 2014, including events that were less severe than the major disasters referenced above. Total losses and damages for all events considered was USD 679 million (BZ\$ 1,358 million) and, on average, USD 45.5 million (BZ\$ 91.0 million) per annum.

This report contains the main findings and recommendations of this technical assistance, including how to use risk assessments like AAL in a fiscal protection strategy. This report contains five chapters. After this introductory chapter. Chapter 2 presents an overview of the budgetary framework for disaster response and the legislation and policies that support it, before evaluating its effectiveness and cost-efficiency. Chapter 3 provides a preliminary financial disaster risk assessment for Belize, focusing particularly on the fiscal impact of natural disasters. Chapter 4 presents an overview of the private catastrophe insurance market, and Chapter 5 reviews the recommendations for future financing of natural disaster recovery and reconstruction expenditures. The report is complemented by technical annexes that provide information on further analyses and results.

²⁴ A consultant with the World Bank DRFTA Project interacted with the MoF and NEMO for data collection in May–June 2016.

Chapter 2

Chapter 2. Public Financial Management of Disaster Risk

This chapter provides an analysis of the systems in place for financing responses to natural disasters, with a goal of identifying the existing gaps that are critical to reducing the effects of natural hazards on Belize. The analysis examines the GoB's legal obligation to address the financial needs for disaster management and seeks to define the GoB's contingent liabilities related to natural disasters. Natural disasters have regularly affected Belize during the period under review. Between 2000 and 2016, nine named storms made landfall in Belize and caused physical and financial damages. In addition to those named storms, tropical depressions and low pressure systems have also caused intense rainfall, leading to widespread flooding.

Table 4: Named Storms Affecting Belize between 2000 and 2016

Name	Year	Category	Magnitude	Economic Losses (USD million)	Public Funds Allocated (USD million)	Public Funds Spent (USD million)
Keith	2000	Category 4	135 mph	270.67	51.00	1.29
Chantal	2001	Tropical Storm	70 mph	10.18	0.74	—
Iris	2001	Category 4	145 mph	61.23	1.67	0.60
Dean	2007	Category 5	165 mph	85.20	1.10	0.24
—	2008	Flood	—	0.20	—	—
Arthur	2008	Tropical Storm	40 mph	42.00	0.55	0.52
TD 16	2008	Tropical Depression	—	28.00	0.16	—
—	2009	Earthquake	7.1 Richter	0.03	—	—
Alex	2010	Tropical Storm	40 mph	1.25	—	—
Richard	2010	Category 1	90 mph	35.20	4.44	3.47
TD 7	2012	Tropical Depression	—	12.50	—	—
Ernesto	2012	Hurricane	—	0.03	—	—
—	2015	Flood	—	6.50	0.31	—
Earl	2016	Category 1	80 mph	184.00	—	3.54
Total				736.99	59.97	9.66

Source: Post-Disaster Needs Assessments, NEMO, and Estimates of Expenditure and Revenue.

The direct and indirect losses from natural disasters in Belize between 2000 and 2016 is **US\$ 737 million (BZ\$ 1,474 million)**,²⁵ not including loss of revenue from capital assets. This cost averages annually to USD 46 million (BZ\$ 92 million), and almost half of the total losses, USD 319 million (BZ\$ 638 million), comes from hurricanes or storms that are of the intensity of Category 1 or less. This signifies that at least half of the losses are likely a result of flooding and storm surge. Additionally, the GoB has allocated a total of USD 60 million (BZ\$ 120 million) for disaster relief, response, and reconstruction during the same period, based on a timeline of up to 3 years after each disaster. Through tracking subsequent estimates of expenditure, only USD 9.66 million (BZ\$ 19.32 million) of those allocated funds have been recorded as spent. While certainly more funds have been mobilized for disaster response, the inability to track these expenditures is a detriment to strategic planning and disaster risk monitoring.

In some cases, the lack of immediate access to reconstruction funds has reduced productivity and added to the national debt, as additional expenditures in the short term are acquired by government to meet reconstruction needs. In 2008, the Kendall Bridge, an important passageway on the Southern Highway, was washed away by Tropical Storm Arthur. Funding for a new bridge was obtained through a loan from

²⁵ This figure also includes preliminary damage estimates from Hurricane Earl.

the Caribbean Development Bank. During the waiting period the GoB built a temporary wooden bridge. However, the temporary bridge was low and prone to flooding, occasionally resulting in repair work and road closures. As a result, the movement of goods and services was often compromised during the 4 years that it took the GoB and its contractors to construct, install, and reopen the new Kendall Bridge.

Agriculture is the sector most disrupted by hurricanes and tropical storms, with more than USD 232 million (BZ\$ 464 million) in damages over the observed period. Flooding has resulted in major damages to the rice, sugar cane, citrus, and papaya industries. Tourism and housing are the second and third most affected sectors, respectively, and the recovery of lost assets for extended periods leaves firms and individuals homeless and without an income and creates gaps in service provision, which slows economic growth. A 2015 Statistical Institute of Belize report shows that tourism and agriculture are the two most productive sectors and remain the main sources of income and employment, with tourism employing more than 28 percent of the labor force, while agriculture employs 10 percent. Tourism contributes more than 21 percent of the country's GDP and agriculture contributes 13 percent of GDP. Over the years, disruptions in both sectors have therefore have been aligned with significant drops in Belize's GDP growth.

Figure 8: Historical Annual Loss from Natural Disasters in Belize and Percent Change in GDP



Source: World Bank Data Bank and authors' analysis.

A key risk to Belize's economic growth is the fiscal shock from disasters. Fiscal space is limited in Belize, with a current gross national debt-to-GDP ratio of 76 percent,²⁶ and the public debt trajectory is vulnerable to various shocks. Belize's economy is estimated to have grown by only 0.7 percent in 2013, mainly because of a continued decline in oil production and weak agricultural output, especially sugar cane and citrus. Over the medium term, real GDP growth is expected to hover around 2.5 percent a year; however, there are risks of an economic downturn as additional external vulnerabilities could arise from a protracted period of weak growth in advanced economies or complications with PetroCaribe financing.²⁷ The authorities have, however, been proactive in developing programs to mitigate the potential impact of these risks.²⁸

An analysis of the National Budget indicates that there is no existing natural disaster fund or contingency budget that may address the low layers of risk. When a disaster occurs, NEMO, which is responsible for emergency response, assesses the damage and submits an application for an allocation of funds to the MoF. The BCRIP has allocated USD 1 million (BZ\$ 2 million) as a contingent component to respond to eligible natural disasters²⁹ in Belize. If triggered, all uncommitted funds may be reallocated to this CERC. Designed as a mechanism to support the GoB's rapid response to an emergency, this component would enable the project to finance emergency recovery activities and reconstruction subprojects under an agreed CERC Operations Manual.

²⁶ IMF World Economic Outlook Database. 2015.

²⁷ Petrocaribe is an oil alliance of many Caribbean states with Venezuela to purchase oil on conditions of preferential payment.

²⁸ IMF. 2014. Statement at the Conclusion of the IMF Article IV Consultation Mission to Belize, Press Release No.14/212.

²⁹ A crisis or emergency eligible for financing is, according to the BCRIP, an event that has caused, or is likely to imminently cause, a major adverse economic and/or social impact to the Borrower, associated with a natural or man-made crisis or disaster.

The Legal and Policy Framework

Despite the GoB's efforts to introduce relevant legislation and policy measures, Belize's DRM policy framework is fragmented and its institutional capacity is low, as indicated by the poor implementation of national strategies across ministries. Public sector agency organization and legislative frameworks mainly support the emergency management cycle, and they suffer disparities in addressing comprehensive risk management, including promoting climate change adaptation. For example, key challenges to the implementation of the National Hazard Mitigation Policy (which has never been officially adopted) are: it lacks a focus on institutionalizing ex ante risk identification, prevention, and mitigation; it lacks knowledge about the importance of hazard mitigation across ministries; and the regulatory, administrative, and institutional framework for hazard mitigation needs to be strengthened. Finally, it lacks the capacity to upgrade or develop information systems to support and facilitate multisectoral decision making in the implementation of hazard mitigation programs.

Belize has introduced several pieces of legislation and policy measures to mitigate disaster risk and to enhance disaster preparedness. The country's legislators recognize the need for a formal system to declare emergencies and to make provision for response to disasters. The legal process for both these procedures are found within the Disaster Preparedness and Response Act, for the purpose of mass mobilization of resources, and in the Financial Orders and the Finance and Audit (Reform) Act in the case of allocating financial resources.

The Disaster Preparedness and Response Act

Chapter 145 of the Laws of Belize, the Disaster Preparedness and Response Act (2000, revised in 2003), is the primary legislation governing DRM in Belize. This law provides the legal authority that sets in motion the official response to natural disasters and covers the use of government resources. Section 5 of the act authorizes NEMO to autonomously utilize the service of all public officers. The act therefore immediately provides NEMO with the human resources to achieve the required response. "Every public officer shall co-operate with the National Coordinator in the discharge of any responsibilities assigned to that officer under the National Disaster Preparedness Response Plan and in the implementation of the procedures under that plan for the Ministry or Department of Government in which that public officer serves."

While the law is very specific regarding the procedures that set the response process into action and the persons who are involved in the execution of the response, the act only vaguely speaks to allocation of financial resources. The act makes no mention of the financial processing of disaster response requirements. It is therefore necessary to revisit the legislation to provide clarity on the responsibilities of the MoF as they relate to financing the response to disasters.

The Finance and Audit (Reform) Act

The 2005 Finance and Audit (Reform) Act makes provision for the regulation of revenue, expenditures, and contracts. Section 5 of the act gives the Minister of Finance the authority to appropriate supplementary resources, "if the Minister is satisfied that there has arisen an urgent and unforeseen need for expenditure." These funds are charged to the consolidated revenue fund in extraordinary circumstances, including, but not limited to, the aftermath of natural disasters.

The MoF can create a special warrant whenever there is an extraordinary circumstance. Each special warrant specifies the program and activities that are allowed to be addressed from the expenditure estimates; therefore, authorized warrants for disaster management will be specifically stated. The minister has 90 days after creating the warrant or warrants to present a supplementary appropriation bill to the national assembly to enact the proposed expenditure. This approach is the current mechanism used to finance disaster response-related activities.

Unfortunately, those expenditures are not explicitly recorded as disaster related; rather, they are recorded within the existing expenditure distributions of the line ministries to whom the resources are allocated. As a result, tracing disaster response expenditures in the recurring budget is difficult. To achieve a reliable system for reasonably determining the contingent liability of the government, there must be a more robust system of compiling, storing, and retrieving the necessary information for decision making at the top management level of NEMO and by the executive body of the government. The simplest way of achieving this is by including explicit segments within the structure of expenditure recording.

Recording of Disaster Expenditure

The management of historic data at NEMO and the management of disaster-related financial data at the MoF are in need of procedural standardization to increase accessibility. To conduct future budget planning, it is important to keep detailed records so that expenditure history is accurately maintained. This applies to disaster management in particular at NEMO, but it also applies to the various departments and ministries where the NEMO committees operate. The lack of proper accounting records and event files makes it challenging to properly assess the fiscal shocks caused by disasters.

The government utilizes several modules of the SmartStream Financial suite to manage fund allocation, purchase goods and services, and process expenditure payments. SmartStream is used by governments across the Caribbean, and it has proven to be very a reliable package for budget management and budget execution. The GoB uses other budget management tools, such as COGNOS and Commonwealth Secretariat Debt Management System for budget preparation and reporting and for loan tracking, respectively.

Table 5 shows a sample of loan accounts that are used for disaster expenditure in the current system.

Table 5: Sample of Account Description

Btl Sof	Item	Account Description
615001	77002	TRINIDAD & TOBAGO HURRICANE LOAN
616009	77002	CDB 12/SFR-OR-BZ(SFR) DISASTER MGMT.
616010	77002	CDB 12/SFR-OR-BZ (OCR) DISASTER MGMT.
616011	77002	CDB 12/SFR-OR-BZ (OCR) DISASTER MGMT.
616014	77002	CDB 49/SFR-BZ Hurricane Keith Immediate Response
616019	77002	CDB 50/SFR-BZE Hurricane Iris Immediate Response
617003	77002	EIB BZE INT. AIRPORT REHAB
619008	77002	IDB 1275/OC-BL EMER. RECONSTRUC. FACILITY

The MoF Treasury and Budget Departments and the Central Information Technology Office are in a process of revising the existing Chart of Accounts (CoA), with the assistance of the Caribbean Regional Technical Assistance Centre (CARTAC). While the existing CoA is limited to five dimensions, the revised structure will be far more accommodating as it will have nine dimensions in each accounting distribution. The new dimensions will allow for each expenditure program within NEMO to be properly defined and for the financial records to be clearly traceable. The revision will also correct the common practice in the allocation of capital expenditure of using two dimensions within the CoA (item and source of funds) alone without reference to the remaining dimensions that are necessary to clearly identify the expenditure unit and program under which the account is being utilized. Both scenarios partially achieve what would be necessary to thoroughly capture the required details for proper accounting for disaster management expenditure and funding source. However, they do not individually account for funding nor expenditure source. If they were combined, they do not classify the expenditure into the relevant categories that would provide a complete review and disposal of each transaction.

The recommendations for the revised CoA should provide for a detailed review of post-disaster spending. The best practice would be to classify the programs so that they distinguish between expenditures on relief, on recovery, and on reconstruction, and further categorize them into the affected sectors—Housing, Agriculture, Tourism—and from which cost center the response came. It would also be important to reflect the location of expenditure while identifying the program under which the expenditure is classified.

The Budgetary Response Framework

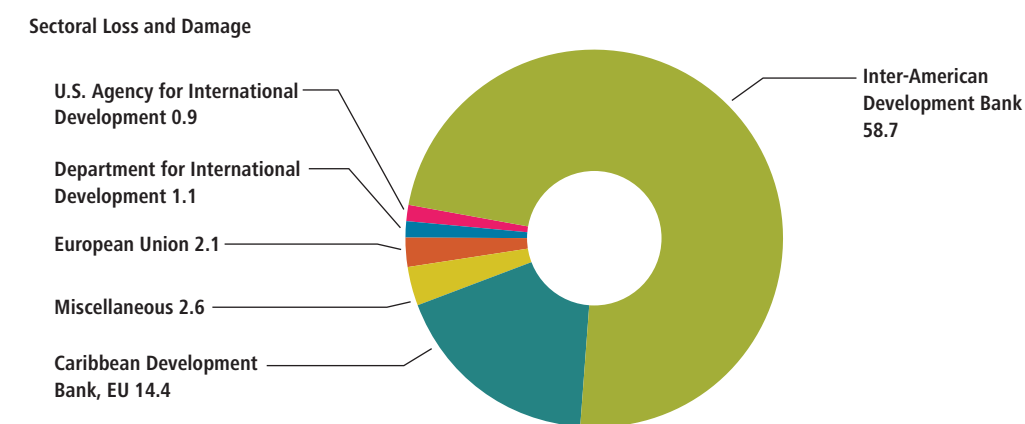
Belize has a well-defined Emergency Response Plan. The Ministry of Natural Resources and Agriculture (MNRA) conducts the initial assessments and produces a Damage and Needs Assessment (DANA) report that prioritizes disaster response needs. This DANA report is also utilized by the MoF to monitor insurance claims. Within the first 24 hours, the MNRA DANA team flies over Belize and prepares the first Situation Report. In the next 10–21 days (for Category 1 and 2 events) or 21–60 days (for Category 5 events), the DANA team compiles the detailed assessment by sectors. The Ministry of National Economic Recovery may mobilize a task force after a disaster, if necessary. NEMO has verbal and binding contracts with the

private sector for its participation in emergency response, particularly around evacuation procedures, as all of the major transport vehicles are private.

The Financial Secretary in the Budget Department of the MoF will run an above-the-line account to cover immediate emergency costs following a natural disaster. The department observes that, prior to 2015, these funds would be offset from the reallocation of national funds, as well as from donor funds. All expenses have to be verified by NEMO that they were used for legitimate emergency response activities. The MoF should be able to track these funds through the SmartStream accounting system. NEMO has suggested that a system to track emergency funding be put into place and that each ministry have an emergency response budget.³⁰ The MoF has noted the need to establish a position for a Chief Risk Officer within the ministry and a need to allocate resources within the recurrent and capital budget of ministries involved in disaster response. Examples of these resources include allocations for security forces for responding to security challenges after a disaster and for the Ministry of Works, which provides immediate response to damaged infrastructure.

The long-term recovery process is generally financed through bilateral loans that are sought through the MoF. However, bilateral and multilateral aid flows were not sufficient to support Belize in disaster recovery and reconstruction efforts. Belize received only USD 80 million (BZ\$ 160 million) in aid, loans, and grants combined, to support DRM and emergency response since 1990.³¹ Low levels of private insurance and lack of diversification of risk caused significant contingent liabilities for the government of a small country such as Belize, and the GoB issued external debt to finance recovery and reconstruction costs. Total debt peaked at over 100 percent of GDP in 2003³² following hurricanes Keith (2000) and Iris (2001).

Figure 9: Disaster-Related Grants and Loans to Belize since 1994 (USD millions)



Legend: DFID = Department for International Development, USAID = U.S. Agency for International Development, CDB = Caribbean Development Bank, EU = European Union, IADB = Inter-American Development Bank. "Miscellaneous" includes Canada, Ireland, Japan, Luxembourg, Netherlands, Norway, Spain, Switzerland, and the United Nations Development Programme.

Source: GFDRR Disaster Aid Tracking Database.

On an annual basis, there are some allocations made for disaster management within the recurrent budget of line ministries, but they are related to disaster preparedness. These allocations are requested by the ministries themselves and are generally cosmetic in nature with the intention of procuring basic supplies and equipment to secure buildings and equipment should the need arise. They do not address the wider spectrum of expenditures that are affiliated with the unit involvement in disaster management, which would include the participation of public servants in some core disaster management functions, such as shelter management, search and rescue, and damage assessment. The allocations also do not consider the deployment of assets from each ministry. There is some evidence of post-disaster cash transfers. For example, in the private sector, after Hurricane Richard, money was transferred to communities to assist with the retrofitting and rehabilitation of homes. Some cash transfer mechanisms include credit unions and microfinance.

³⁰ DRFTA Project. Conversation with Col. De Four, Acting Director, NEMO. June 2013.

³¹ AidData. 2017. Open Data for International Development. Available at: <http://aiddata.org>

³² IMF World Economic Outlook Database. 2015.

Table 6: Belize's Annual Recurrent and Capital Expenditures on Disaster Management or Response (USD)*

	Line item	2012/13 Actual	2013/14 Actual	2014/15 Actual	2015/16 Actual	2016/17 Estimates
Recurrent	Caribbean Disaster Emergency Management Agency	52,000	52,000	Not found	Not found	Not found
	NEMO	631,000	648,000	941,757	1,094,937	1,491,551
	Integrated Disaster Management Plan	33,883	68,763	0	0	0
	CCRIF	375,000	250,000	250,000	250,000	Not found
	Emergency Management	–	–	–	100,611	1,942,462
Capital	Hurricane Preparedness	23,485	125,150	154,500	200,000	404,038
	Hurricane Assistance – Districts	–	–	–	–	3,028,932
	Hurricane assistance – Belize City	-	-	-	-	525,357

* Approved Estimates of Revenue and Expenditure for Fiscal Year 2013/14, as approved by the House of Representatives on March 22, 2013; Approved Estimates of Revenue and Expenditure for Fiscal 2015/2016, as approved by the House of Representatives in March 2015; Approved Estimates of Revenue and Expenditure for Fiscal 2014/2015, as approved by the House of Representatives in March 2014.
Source: Belize Estimates of Expenditure.

The Department of NEMO³³ is responsible for addressing the preparation and immediate response to natural disasters affecting Belize. The Department of NEMO does not have authority for the financing or deployment of assets for disaster management, unless authority is given by the NEMO committee chaired by the prime minister. That authority belongs to NEMO, which is responsible for coordinating and communicating with the respective Emergency Management Committees and all the public and private agencies. The NEMO committees include a wide cross-section of ministries and departments, all of whom have various responsibilities. The committees are required to meet at least twice before the hurricane or rainy season and meet every month between July and September to focus on actions that will increase operational readiness of the committees.

While the duties of each committee are clear and outlined in sufficient detail (see Annex 1), ensuring that these duties are carried out should consider and plan for the required expenses. The MoF's Budget Department oversees the sourcing and distribution of funds used to address natural disasters. The process used is essentially set within the guidelines of the budget execution process for goods and services that require a supplementary budget. The departments and ministries are not seen to overtly consider NEMO responsibilities based on the committees that they serve. The allowance of supplementary allocation has in the past been fairly reliable in getting necessary resources for immediate response and to assist in providing basic relief for affected persons and communities, but it causes a strain on the financial resources. The availability of a contingency fund can serve to reduce the strain on the annual financial budget.

The vulnerability of Belize to natural hazards and the experience that the country has had over the past years should warrant a more direct concern from the executive body of government. Discussion surrounding disaster management is unavoidable, as the occurrences have become increasingly frequent over the past years. The existence of a functioning and well-managed NEMO confirms the importance of mitigation and reaction financing for emergencies and is indeed a tremendous step in the right direction, but, given the observed frequency and likelihood of occurrences, financial planning should feature an immediate-reaction financial allocation of funds as a part of budget execution.

The budget cycle is outlined below and the points of consideration of emergency management are highlighted:

- 1. Planning** – Setting of strategic priorities by the Cabinet
- 2. Proposal of Estimates** – A bottom-up approach for functional line ministries and assembly of the budget by the Budget Management Department (the Department of NEMO also submits an operational budget).
- 3. Approval of Parliament** – Presentation by the prime minister and approval by the legislative arm.

³³ The Department of NEMO and NEMO are two different entities.

4. **Budget Execution** – Carrying out of activities (disaster management for ministries and departments besides NEMO would usually be addressed during execution).
5. **Final Accounting** – Reporting on the financial performance and results (done by the Office of the Accountant General).
6. **Auditing of the Accounts** – Done annually by the Accountant General (a measurement of the proposed budget is compared to achieved results).
7. **Fiscal Targets** – Agreement on the fiscal targets are assessed prior to starting the planning process.

The PEFA assessment released in 2014³⁴ noted that the GoB has undertaken steps to strengthen public financial management (PFM) since 2008. In particular, the PEFA report notes that the following elements have been strengthened: budget preparation and in-year budget performance reporting; the controls over budget execution, which enable in-year predictability in budget execution and reduce the chances of payments arrears; debt recording and reporting; and the transparency of donor operations. All locally funded capital projects adhere to national procedures, and donor funds are executed using donor guidelines.

However, there are still outstanding issues that need to be addressed to reduce the current bottleneck in allocating and spending post-disaster relief and reconstruction funds. The PEFA assessment notes that resource allocation and monitoring systems are in place, but formal resource use monitoring reports are not yet prepared. Although financial monitoring has strengthened, the GoB is not yet preparing consolidated fiscal risk reports. The MoF has reached the planning stage of the internal audit function through discussions with the CARTAC. Insufficient understanding of and compliance with internal control rules is still an issue, and they are therefore not enforced. All of which makes it challenging to determine proper execution of post-disaster budgetary funds. Additionally, procurement guidelines do not specifically address post-disaster procurement.

³⁴ The PEFA Program aims to assess the conditions of the country's public expenditure, procurement, and financial accountability systems and to develop a practical sequence for reform and capacity-building actions. Available at: www.pefa.org.

Chapter 3

Chapter 3. Fiscal Disaster Risk Assessment

The quantification of fiscal risks linked to natural disasters, including the government contingent liabilities, is the first step in devising cost-effective DRF strategies. Ideally, such an assessment requires a merge between historical loss data analysis and modeled losses derived from natural catastrophe risk models. This chapter presents the results of an initial disaster risk profile that was developed for the GoB.³⁵ The objective of this assessment is to inform the GoB of the levels of risk the country faces and to facilitate discussions on how it can become more resilient to both current and future risk based on resulting key baseline data.

An initial assessment of the GoB's contingent liability to disasters indicates that it faces a major financing challenge arising from natural catastrophes. Hydrometeorological events—storms, hurricanes, and floods—are a major driver of risk, with an AAL of USD 122.7 million (BZ\$ 245.4 million), including both direct and indirect losses, equivalent to 7.0 percent of national GDP. However, simulations show that a major hurricane event with a return period of 100 years could cause losses in excess of USD 1,857.7 million (BZ\$ 3,715.4 million), which equates to around 106.0 percent of national GDP.³⁶

Assessing short-term post-disaster spending needs is essential. While there are various financial instruments that can be mobilized for the post-disaster reconstruction phase, including additional credit and tax increases, financial instruments that ensure access to immediate liquidity after a disaster are more challenging to access. To devise a robust, cost-effective DRF strategy, it is critical to assess the possible short-term public spending needs that create additional fiscal risk for the government. (See Annex 4, which presents the derivation of a potential cost-benefit analysis of a DRF strategy to meet the short-term losses.)

Probabilistic Disaster Risk Profile

The CDRP, developed by the World Bank in 2015, presents country- and department-level probabilistic disaster risk profiles to provide risk assessments and estimates of potential damage to buildings caused by hurricanes³⁷ and earthquakes.³⁸ Traditionally, sophisticated global building inventory exposure models for use in natural hazard risk assessment are held within the private sector, usually the reinsurance industry and catastrophe risk modeling agencies. However, these models, databases, and methods are proprietary and not freely or openly available to the public sector. They also concentrate on building stock and do not explicitly address the fiscal exposure of a government, which is important for the public sector to quantify its sovereign disaster risk.

A critical component of a CDRP is the development of a consistent and robust exposure model to complement existing hazard and vulnerability models. Exposure is an integral part of any risk assessment model, capturing the attributes of all exposed elements grouped by classes of vulnerability to different hazards, and analyzed in terms of value, location, and relative importance.

The CDRP captures the spatial and construction attributes of the total building stock in Belize, such as geographical location, urban/rural classification, type of occupancy, building typology (e.g., wood, concrete, masonry), and replacement value. The total modeled replacement value of the building stock in Belize was estimated at USD 4.62 billion (BZ\$ 9.24 billion) (updated to 2015 values). When the final combined asset replacement and infrastructure density are integrated with existing hazard and vulnerability models, the main results are separate loss exceedance probability (EP) curves with respect to perils, which represents the likelihood that a specific economic loss will be exceeded. This was done for both earthquakes and hurricanes using building exposure. (See Annex 4 for more details.)

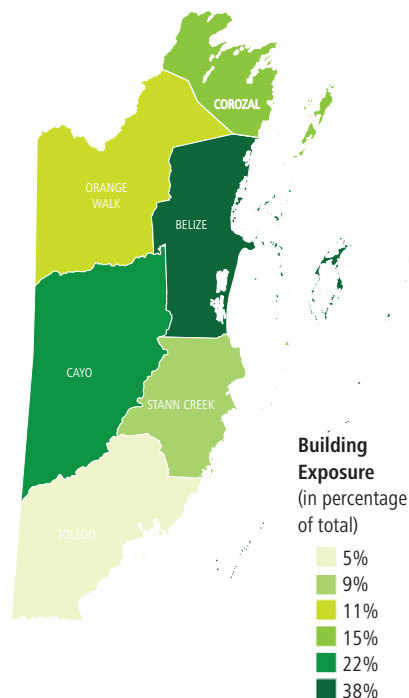
³⁵ Any modeled results provide the expression of a view on possible loss experience, and they should not be taken as predictive of specific future losses or annual experience.

³⁶ USD and GDP are in 2015 values.

³⁷ The losses associated with hurricanes account for wind damage only, not damage from flooding or storm surge.

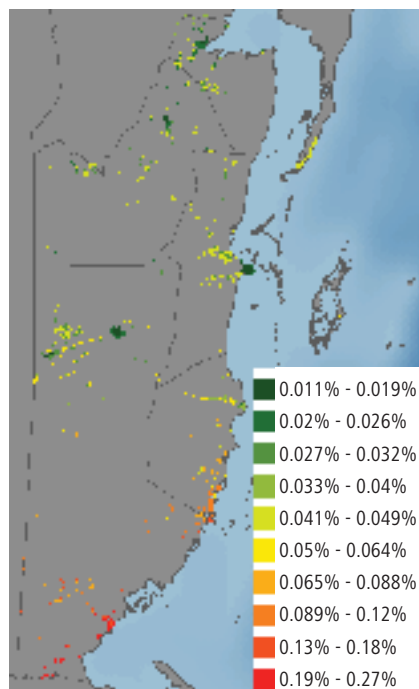
³⁸ The development of the CDRP corresponds to increased impacts of natural hazards in recent years and increasing demand from the public sector for openly available disaster risk profiles. These profiles are intended to outline a holistic view of financial risk due to natural hazards, assisting governments in long-term planning and preparedness.

Figure 10: Building Exposure Aggregated by District



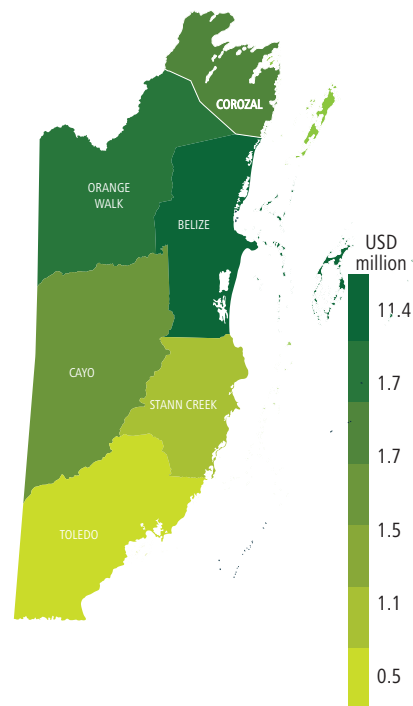
Source: World Bank CDRP.

Figure 11: Disaggregation of the AAL due to Earthquake (as % of the total exposure value)



Source: World Bank CDRP.

Figure 12: Disaggregation of the AAL due to Hurricanes by District



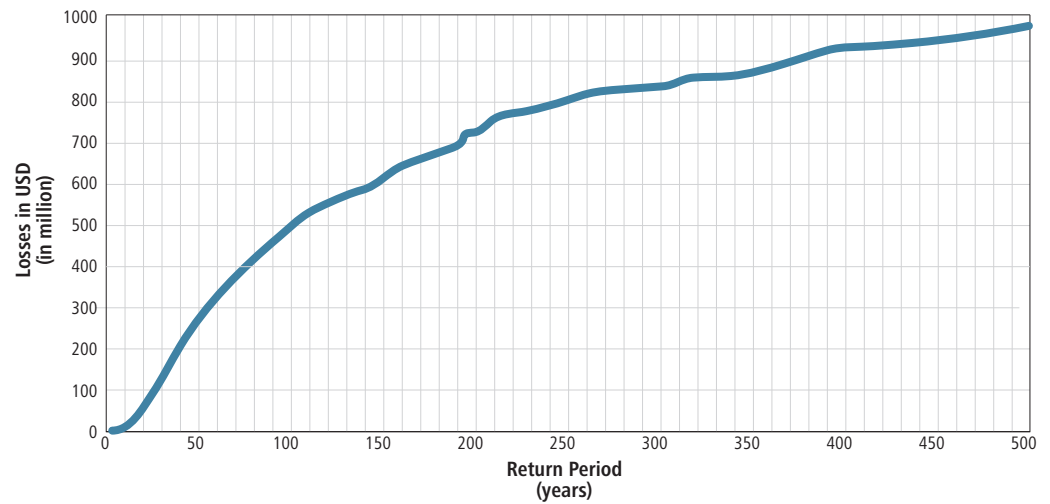
Source: World Bank CDRP.

Combining the exposure model with hazard and vulnerability models indicates that the national AAL to the building stock due to earthquake risks is approximately USD 1.4 million (BZ\$ 2.8 million), which equates to 0.08 percent of the national GDP. Additionally, once every 250 years, these losses are expected to exceed USD 63.3 million (BZ\$ 126.6 million), i.e., 3.6 percent of the national GDP.

Regarding hurricane risk, which is the most prominent hazard in Belize, the national AAL to the building stock is approximately USD 17.9 million (BZ\$ 35.8 million), or 1.02 percent of the national GDP. Additionally, with a return period of 250 years, these losses are expected to exceed USD 791 million (BZ\$ 1,582 million), i.e., 45.1 percent of the national GDP. The loss EP curve shows the potential hurricane losses for key return periods (Figure 13). Aggregated results at a district level underscore that the district of Belize accounts for 63.7 percent of the AAL. Moreover single-family, wood stud-wall frame buildings with plywood/gypsum board sheathing and concrete block, unreinforced masonry with lime or cement mortar are buildings incurring the largest loss in the long term, each accounting for approximately 19 percent of AAL. (See Annex 4 for more-detailed results.)

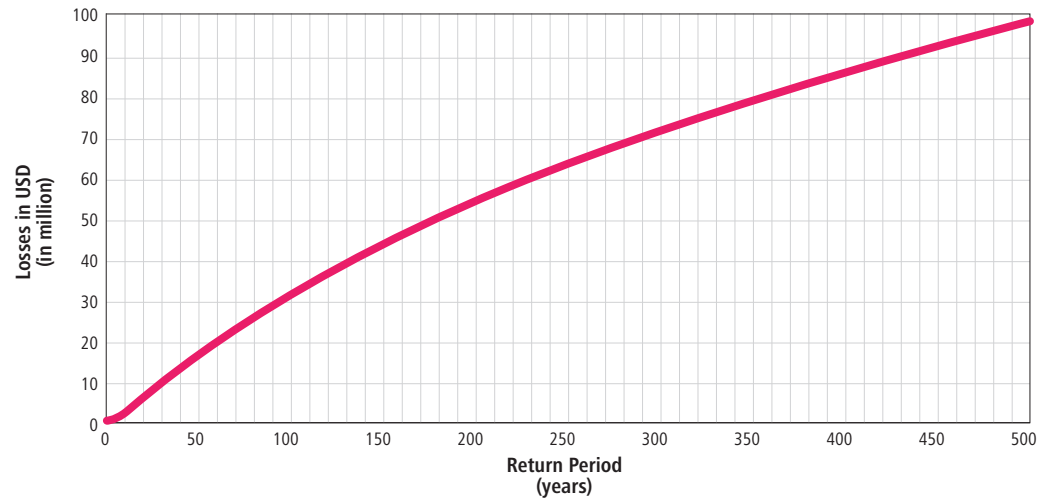
Figure 14 shows the EP curve for potential earthquake losses for key return periods. Aggregated results at a district level underscore that the Toledo and Belize districts account for 28.4 percent and 20.2 percent of the AAL, respectively. Moreover, multifamily, unreinforced concrete block masonry buildings with lime or mortar built on stilts are buildings most vulnerable to earthquakes: In the long term, annually, 0.45 percent of the total value of the building stock in Belize is affected by earthquake loss. (See Annex 4 for more-detailed results.)

Figure 13: EP Curve for Losses in Building Stock due to Hurricanes



Source: World Bank CDRP.

Figure 14: EP Curve for Losses in Building Stock due to Earthquakes



Source: World Bank CDRP.

Table 7: Potential Earthquake and Hurricane Losses for Key Return Periods

Return Period (Years)	Earthquake Losses (USD million)	As % of Total Building Exposed Value	Hurricane Losses (USD million)	As % of Total Building Exposed Value
AAL:	1.4	0.031%	17.9	0.387%
Probable Maximum Loss (PML):				
10	1.3	0.029%	12.9	0.279%
50	15.4	0.332%	280.8	6.076%
100	30.7	0.664%	487.8	10.555%
250	63.3	1.369%	791.2	17.120%
500	98.1	2.122%	969.8	20.985%

Analysis of Historical Disasters in Belize

The probabilistic risk modeling approach is more comprehensive when combined with historical losses.

This study compiled a historical database of natural disasters affecting Belize in the last two decades, from 1996 to 2016. Due to data availability, and because hydrometeorological events (floods, tropical storms, hurricanes, etc.) constitute the major risk in Belize, actuarial analysis on the historical losses was conducted for hydrometeorological events and did not include earthquakes. This analysis was intended to adjust the results of the estimated CDRP hurricane risk profile for recurrent losses, e.g., low return periods, and to extrapolate the risks on Belize's building stock to determine the entirety of public sector losses faced by the GoB. (See Annex 2 for the methodology and key assumptions.)

The annual public fiscal disaster losses from hydrometeorological events are approximately USD 29.5 million (BZ\$ 59.0 million), or 1.68 percent of the GDP. Once every 100 years, these losses are expected to exceed USD 477.1 million (BZ\$ 954.2 million), 27.22 percent of the national GDP, i.e., there is a 1 percent probability in any year that losses from a particular event exceed USD 477.1 million (BZ\$ 954.2 million). Figure 15 shows the indicative loss EP curve for the estimated total economic losses, direct economic losses, and total government contingent liabilities.

Figure 15: Estimated National Floods and Wind-Related Events Risk Profile – Indicative EP Curve

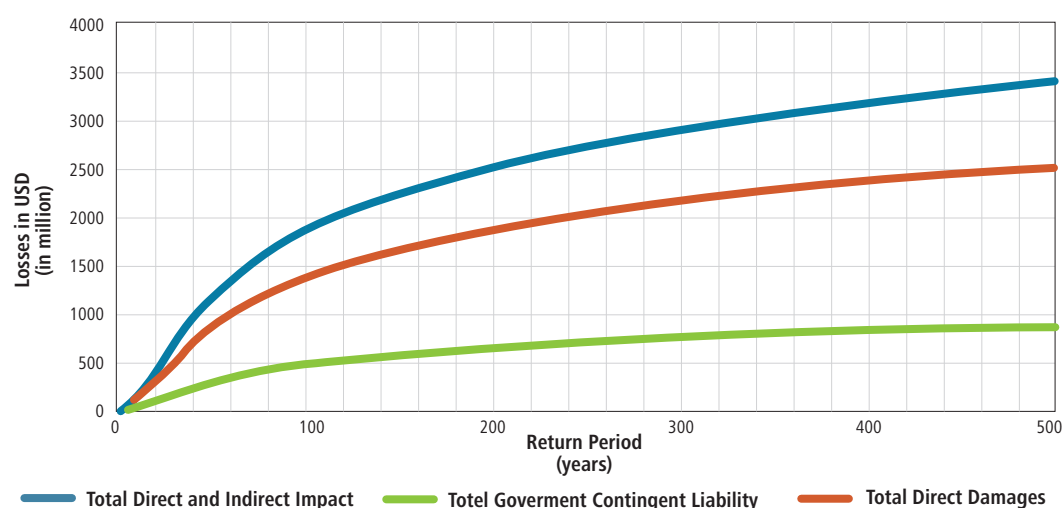


Table 8: Potential Hurricane and Flood Losses for Key Return Periods

Return Period (Years)	Total Direct and Indirect Impact (USD millions)	Total Direct Damages (USD million)	Total Government Contingent Liability (USD million)
AAL:	123	88	30
10	182	124	42
50	1,190	883	306
100	1,857	1,379	477
250	2,736	2,035	703

In summary, this fiscal disaster risk assessment provides the GoB with an order-of-magnitude estimate of its possible public spending needs for post-disaster operations. Due to the lack of historical earthquake events, it was not possible to perform an actuarial of the possible fiscal costs of this type of natural catastrophe. The results of this assessment are used as an input to a series of options that the GoB may wish to consider in the development of a national DRF strategy. (See Chapter 5.)

CCRIF SPC products, as well as a contingent credit line, such as a World Bank Cat DDO, IDB Contingent Credit Facility for Natural Disaster Emergencies or the IMF RCF are financial instruments with a common

particularity: They provide fast disbursements of liquidities in the aftermath of a disaster. The CCRIF SPC trigger is parametric; assuming that the calculated index value is high enough to trigger a payout, the payout is to be made within 14 business days³⁹ after the index calculation.⁴⁰ The trigger of a contingent line of credit can be soft: for example, funds might become available for disbursement after the declaration of a state of emergency due to a natural disaster.. To go further, a baseline to develop disaster risk financing when immediate liquidities are needed can be conducted by combining these two types of instruments, with contingent reserves alongside.

A dilemma commonly found in finance when optimizing portfolios is the tradeoff between minimizing the yearly average government spending under the terms of a given strategy and the uncertainty of that strategy. A mix of risk retention and risk transfer instruments is recommended to devise an optimal multi-year DRF strategy, the optimality depending on the level of risk aversion of decision makers. Ex ante risk retention instruments have a higher global impact on reducing the average overall cost, and ex ante risk transfer instruments have a higher global impact on the uncertainty or variance of this cost. In addition, there is a need to define longer-term objectives for sovereign instruments, such as capitalized reserves in a fund, and to strategize the multi-year uses of others instruments in order to integrate these aspirations to efficiently devise such a tailored strategy in the long run.⁴¹

39 Business days are defined as days on which banks in the Cayman Islands are open for regular business.

40 More specifically, CCRIF SPC has the discretion to delay payment by not more than 90 days following receipt of the insured's claim.

41 For more details, see collaboration.worldbank.org/groups/cdrp.

Chapter 4. Review of Catastrophe Risk Insurance Market in Belize⁴²

Exposure and livelihoods in Belize are largely located in coastal areas, which are generally flat, as well as in the Cayes along the Belize Barrier Reef. Belize City, is situated at the mouth of the Haulover Creek, making it highly prone to hydrometeorological hazards. Insurance is an efficient ex ante risk financing instrument that can be used to transfer a part of the financial risk out of the hands of the government and private companies. This chapter aims to present an overview of the current insurance and reinsurance market in Belize, with a focus on private and public catastrophe insurance, providing insights on its capacity to play a key role in Belize's DRF strategy. Specifically:

8. Low non-life insurance penetration rates in Belize mean that the private sector is underinsured. This increases the indirect contingent liability of the GoB because it is often perceived as the insurer of last resort.
9. The GoB can more cost-effectively mitigate natural disaster risk by insurance of public assets and consolidating coverage into larger policies that reduce rates.
10. Current soft market conditions (as of September 2017) mean that premiums are lower, coverage is broader, and underwriting is easier.
11. Interest in a local insurance pool (but not necessarily a regional one) to insure public assets and the willingness to develop an inventory of public assets have been highlighted during discussions between the Belizean insurance key players and the government.

Market Overview

The Belize insurance market has stagnated in the last few years. Gross written premiums have stagnated around USD 60 million to USD 65 million (BZ\$ 120 million to BZ\$ 130 million) within the last 5 years. Over last 5 years, the growth rate in non-life premiums has not been able to match the rate of inflation. Hence, despite an average growth rate of approximately 1.5 percent, the real value of the non-life insurance industry's premium is facing stagnation. Property insurance premiums have also stagnated or even contracted recently, as have motor business insurance premiums. Anecdotal evidence suggests this is the effect of increased competition and subsequent rate reductions.

The non-life insurance market in Belize offers a range of conventional as well as non-conventional insurance products. In 2015, Fire & Property (55 percent of the premium) remained a key area of business for the non-life insurers in terms of gross written premium. Table 9 summarizes the mix of business in non-life insurance, written by gross premium, according to the key classes of business in Belize. In general, rated Caribbean insurers appear to be navigating through these very challenging times and remain well capitalized due to conservative capital management strategies.

Table 9: Gross Premium Distribution by Line of Business in Non-Life Insurance (%)

	Year			
	2012	2013	2014	2015
Gross Written Premium (USD million)	39.3	38.5	40.0	40.2
Fire & Property	52.9%	54.0%	56.0%	55.2%
Motor	29.5%	29.6%	28.0%	28.3%

* Sources: Office of Supervisor of Insurance and Private Pensions: Annual Revenue Accounts 2012–2015; Axco Company Reports.

⁴² This high-level industry review was intended to inform recommendations to the Government of Belize and lay the groundwork for future public/private collaboration. An in-depth analysis of private sector catastrophe risk insurance was beyond the scope of and the focus of the study, though the report addresses sovereign catastrophe risk insurance through the CCRIF SPC in detail.

	Year			
	2012	2013	2014	2015
Liability	9.4%	8.8%	9.0%	9.4%
Surety, Bonds, and Credit	1.0%	1.3%	1.5%	1.7%
Marine, Aviation, and Transport	7.1%	6.2%	5.5%	5.0%

* Sources: Office of Supervisor of Insurance and Private Pensions: Annual Revenue Accounts 2012–2015; Axco Company Reports.

The insurance market in Belize remains underdeveloped due to a lack of awareness and understanding of the different products and a lack of new products within the insurance market. In 2015, non-life insurance penetration (total gross written premium as a percentage of GDP) was only 2.5 percent, below that of many SIDS in LAC.

Table 10: Country-Specific Non-Life Insurance Penetration

Country	Non-Life Insurance Penetration % (2014)	Non-Life Insurance Penetration per Capita (USD 2014)
Antigua and Barbuda	4.21	566
The Bahamas	4.15	931
Barbados	5.30	811
Belize	2.49	121
Dominica	2.95	223
Grenada	3.93	310
Guatemala	0.83	33
Jamaica	2.25	111
Saint Lucia	3.16	235
Trinidad and Tobago	1.12	240

Source: Axco.

The non-life insurance density (or gross written premium per capita) decreased by roughly 4 percent between 2012 and 2015 to USD 111.89 (BZ\$ 223.78). As previously stated, the low penetration rate and the decreasing density could be attributed to low awareness of the benefits of the insurance. On the other hand, the low penetration coupled with the growing Belizean economy suggests a potential opportunity for the insurance market.

Meanwhile, although there is, to some extent, interest from the private sector tapping into micro-insurance, such as the Livelihoods Protection Policy (LPP) and Windward Islands Crop Insurance Ltd (WINCROP) currently being implemented in several other Caribbean countries, concerns remain on its sustainability, given that there is no micro-insurance regulation in place in Belize at the moment.⁴³

Box 1. The Herfindahl-Hirschman Index

The HHI has been used for many decades to measure market concentration for purposes of anti-trust enforcement. The HHI of a market is calculated by summing the squares of the percentage market shares held by the various firms that participate in the given industry. For example, an industry consisting of two firms with market shares of 70% and 30%, respectively, has an HHI of $70^2 + 30^2 = 5,800$.

A market is considered “unconcentrated” if the HHI is at or below 1,500, while those valued between 1,500 and 2,500 are considered “moderately concentrated” and those 2,500 or above are “highly concentrated.” A merger potentially raises “significant competitive concerns” if it produces an increase in the HHI of more than 100 points in a moderately concentrated market or between 100 and 200 points in a highly concentrated market. A merger is presumed “likely to enhance market power” if it produces an increase in the HHI of more than 200 points in a highly concentrated market.



43 DRFTA Project. Conversation with representatives of local insurance companies. 2015.

Key Market Players

There are currently nine insurance companies operating in Belize, of which four concentrate on non-life insurance (RF&G Life Insurance, Insurance Corporation of Belize, Massy United Insurance Ltd, and Guardian General Insurance Ltd.) and three on life insurance (RF&G Life Insurance, Sagicor Life, and Scotia Insurance Caribbean), and two are composite insurers (Atlantic Insurance Company Ltd and Home Protector Insurance).

The Belize insurance market is still heavily concentrated with a few key participants. RF&G Life Insurance has the majority of the total market with a limited number of competitors. The Herfindahl-Hirschman Index (HHI) for Belize is 3,972. (See Box 1 for more details and implications for Belize regarding the HHI.)

Regarding the property business, RF&G is the market leader, with approximately 60 percent of the market share, followed by Atlantic, which may have an additional 15–20 percent, followed by Insurance Corporation of Belize and Massy United, with even smaller market share percentages. Lloyd's market in the United Kingdom is licensed to accept direct non-life insurance business and also operates as a reinsurer.

Private Reinsurance

The majority of the catastrophe exposure is transferred using traditional reinsurance techniques with a blend of proportional and non-proportional reinsurance for catastrophic exposures. There are no local reinsurance companies in Belize. Leading international reinsurers play an important role in providing reinsurance capacity for the market. The principal overseas property and accident treaty reinsurers include Everest Re, Munich Re, Swiss Re, QBE, SCOR, and Lloyd's syndicates.

The non-life insurance market depends heavily on reinsurance to protect against natural perils, which is dominated by windstorm coverage. There has been little change in catastrophe reinsurance costs for Belize in recent years. The impact of Category 1 Hurricane Earl, which hit Belize on January 1, 2016, on renewal rates for 2017 is as yet unknown. However, such an event is not expected to generate significant losses to the industry. The next most recent hurricane event was Hurricane Richard in 2010, which struck Belize as a Category 1 hurricane in October 2010. No market figures were published, but claims are not expected to have exceeded USD 10 million (BZ\$ 20 million), from perhaps 1,000 claims. This would not represent a loss equivalent to even 1 year's income for reinsurers. Certainly, it did not cause any notable hardening of terms on either proportional or non-proportional treaties. According to market reports, 2010 was most likely a break-even year for reinsurers.

The hazard that has affected treaty reinsurers the most in Belize is the hurricane hazard, notably from Greta in 1978, when the total insured loss is said to have equaled 7 years of non-life income. There have been no major (Category 4 or 5) losses yet this century in Belize. As a result, pricing has stagnated and even decreased, which would attest to the soft market conditions for property insurance in Belize. In addition, catastrophe excess of loss pricing is going down and companies can purchase additional limits for the same premium and negotiate better terms at the same rates.

Regulatory Capital, Statutory Deposit, and Solvency Requirements

The MoF does not provide underwriting guidelines, but it does review insurance companies' guidelines, by conducting both desktop reviews and on-site inspections. The Organization of Insurance Companies in Belize (ORINCO) has been active since 2007. Along with the relatively new Insurance Institute, ORINCO performs educational outreach and advertising, particularly during hurricane season.

There is no policyholder protection fund, but under Section 24 of the Insurance Act, 2004 statutory deposits are required, calculated at 15 percent of an insurer's retained premiums with a minimum of USD 50,000 (BZ\$ 100,000) for domestic companies and USD 150,000 (BZ\$ 300,000) for foreign insurers. Section 69 of the act stipulates that, as an insurer winds up its operations, the supervisor shall transfer these funds to its liquidator, who must apply them first to discharging any liabilities to policyholders. Belize plans to adopt the risk-based capital approach that requires an insurance company with higher risk to hold a larger amount of capital. As the regulations in Belize are stricter than in other countries in the region, switching to a risk-based capital approach may be challenging.

Non-life insurance solvency requirements mandate that a company's assets to exceed its liabilities by either a minimum monetary amount or 20 percent of net premium income in the previous financial year, whichever is greater. Composite insurers are also needed to meet life insurance solvency requirements.

In addition, under Section 11 of the Insurance Act, 2004 minimum paid-up capital is USD 500,000 (BZ\$ 1 million) for local companies and USD 1.5 million (BZ\$ 3.0 million) for foreign companies transacting long-term or general business.

There is no requirement to maintain claims equalization reserves, though at least one local non-life insurer does so on a discretionary basis. Reserves (including claims reserves) are established net of reinsurance.

Natural Catastrophe Insurance and Losses

According to a survey of participants in the Belizean insurance market conducted as part of this report, the largest recent significant insured loss was in 2000 with Hurricane Keith.

Table 11: Recent Insured Losses in Belize

Event (Year)	Location	Insured Loss (USD million)	Economic Loss (USD million)	Insured Market Penetration (Insured/Economic)
Hurricane Earl (2016)	Belize City	12.5	110.0	11.4%
Hurricane Richard (2010)	Country-wide	10.0	35.5	28.2%
Hurricane Dean (2007)	Corozal	5.0	95.0	5.3%
Hurricane Iris (2001)	Placencia	7.5	20.0	37.5%
Hurricane Keith (2000)	San Pedro	30.0	50.0	60.0%

Sources: Industry statistics, rating agencies, regulatory bodies, Axco reports.

Hurricanes Iris and Keith resulted in more property and infrastructure damage than Hurricane Dean and Tropical Depression 16, which mainly affected the agricultural sector.

Personal line property insurance is usually bought when it is mandated as part of a mortgage. Underinsurance to natural disasters can represent a contingent liability on the side of the government. Consequently, it could be beneficial for the GoB to consider legislation mandating insurance for properties valued above certain thresholds. Moreover, operators of hurricane-resistant home improvement programs could receive reductions in premium costs to incentivize risk mitigation measures.

Catastrophe Private Insurance Market

The current insurance penetration and density of non-life insurance products that relate to catastrophe risk are very low in Belize. The majority of the residential property stock is not currently insured against natural disasters. One might assume that, due to the low penetration levels compared to the Caribbean as a whole, Belize is significantly underinsured compared to its exposures. This suggests significant growth opportunities for the insurance market.

To evaluate the adequacy of Belize's non-life insurance coverage, the following analysis uses a process of adjustment (Table 12). The initial measures of non-life insurance penetration are adjusted by the expected losses resulting from natural catastrophes and the income level of the country. The insurance penetration shows the level of written non-life insurance premiums in each year compared to the GDP in the same year. It indicates that, based on the historical and probabilistic loss database used in Chapter 3, the Belize market is "moderately insured."⁴⁴ For countries like Norway, which face relatively low levels of expected loss while having high levels of GDP per capita, a Tier 2 classification may not be cause for concern. For countries like Belize, with relatively high levels of expected loss and historically large differences between insured and total losses, this classification is more of an issue. Given its higher risk status, one would expect Belize to aim to become better insured compared to other middle-income countries.

⁴⁴ Countries above the average placed in the Tier 1 (better insured) category, with benchmarked insurance coverage between 1.36 percent and 10 percent. Those below the average are placed in the Tier 2 (moderately insured) category, with benchmarked insurance coverage between 0.00 percent and 1.36 percent. Countries below 0.00 percent benchmarked insurance coverage are underinsured. This method of classification takes into account not only how well insured a country is above the minimum, but also how it compares to other countries.

Table 12: Risk-Adjusted Insurance Adequacy for Belize, 2016

Non-life insurance penetration	2.60%
LESS expected annual loss (% of GDP)*	1.10%
Expected loss adjusted penetration	1.50%
LESS benchmark requirement (for upper middle income**)	1.60%
Benchmarked insurance coverage	(0.10%)
Insurance adequacy (% of GDP in USD millions)	(1,750)

Source: Lloyd's Global Underinsurance Report, CEBR Methodology, October 2012.

* According to the estimated AAL to the building stock presented in Chapter 3.

** World Bank country income classification.

Currently, there is no insurance product in Belize specifically focused on natural catastrophes. The only natural catastrophe insurance coverage that is currently available from the insurance market is an extension to the fire policy, subject to additional premiums. Hurricane and earthquake insurance attracts the natural catastrophe deductibles of 5 percent or more of sum insured per location on the Cayes, 3 percent on businesses within 1 mile of the sea, and 2 percent on all other risks. In recent years, these deductibles have been somewhat eroded by competitive factors, with some companies said to offer 2 percent for every risk regardless of location or occupation.

Since vendor catastrophe models for Belize are limited,⁴⁵ pricing tends to be conservative. All insurers maintain windstorm accumulation records, but there is no consistent approach to zoning. Probable maximum loss (PML) underwriting is not used, although most insurance experts think that levels of cover purchased range from approximately 10 percent to more than 20 percent of country-wide aggregates. Insurers are familiar with the parts of the country that are exposed to hurricanes, which are principally the coastal areas and the offshore Cayes. Larger risks are usually surveyed to determine the adequacy of construction and any protections, such as windstorm shutters.

There are currently gaps in coverage for certain properties, such as in coastal areas in the Cayes. To develop a more robust catastrophe insurance market, the insurance sector would need to slowly transition from purchasing proportional reinsurance to excess of loss protection. Furthermore, residential and commercial properties should be insured to actual value.

Catastrophe Public Insurance

Until June 2017, Belize was one of the 16 members of CCRIF SPC, which, since its foundation in 2007, has given member governments cover against losses caused by earthquakes, hurricanes, and excess rainfall perils. CCRIF SPC is the first multi-country catastrophe insurance (not-for-profit) pool; it works on a parametric basis, backed by both traditional and capital markets through catastrophe swaps.

Unlike traditional insurance settlements that require an assessment of individual losses on the ground, parametric insurance relies on a payout disbursement contingent on the intensity of an event (e.g., wind speed, ground acceleration). In the case of CCRIF SPC, payouts are proportional to the estimated impact of an event on each country's budget. The estimated impact is derived from a probabilistic catastrophe risk model developed specifically for the facility.

In 2015, the GoB paid an annual premium of approximately USD 650,000 (BZ\$ 1.3 million) to CCRIF SPC from own-source funds. CCRIF SPC made a payout of USD 261,073 (BZ\$ 322,146) to the GoB as a result of heavy rains from Hurricane Earl during August 4–5, 2016. Rainfall from the hurricane caused widespread flood damage to homes and businesses, interrupted water and electricity services, and brought losses to the tourism and agriculture industries. Payouts from CCRIF SPC coverage can help finance response for relief in the aftermath of a disaster from the government side, when immediate liquidities are needed.

⁴⁵ Currently, there is only a windstorm and earthquake model available from EQECAT Inc.

Chapter 5

Chapter 5.

Recommendations for a National Disaster Risk Financing Strategy in Belize

A comprehensive national DRF strategy for Belize should be designed to improve the capacity of the GoB to access immediate financial resources in the event of a national disaster, be flexible to allow for a proportional response based on the magnitude of the loss, while minimizing reallocations from existing programs and maintaining the fiscal balance. Twelve recommendations for a comprehensive DRF strategy in Belize are presented in Table 13, followed by discussion of each of the recommendations. These recommendations follow the operational framework of first quantifying and assessing risk, or the contingent liability of the GoB; preparing the environment for financial solutions to operate efficiently; and then arranging the solutions

Recommendations

Table 13: Proposed Recommendations for Disaster Risk Finance in Belize

Time Frame	Instrument and Strategy recommendations for DRF
Sovereign Protection	
Short Term	1. Streamline and institutionalize a damage and loss data collection and reporting system across ministries for all severities of events.
	2. Reinforce the role of budgetary planning for disaster-related contingent liabilities at the ministry level.
	3. Streamline reporting of disaster response expenditures by including explicit programs within the Chart of Accounts (CoA) to distinguish expenditure for disaster response and to further categorize them into affected sectors, e.g., housing, agriculture, tourism. Expenditures should also be categorized by event, e.g., Hurricane Lenny or December 2015 flood.
	4. Establish or re-establish the enforcement of laws that allow for a fast disbursement mechanism for the financing of post-disaster expenses.
Short/Medium Term	5. Develop an inventory of public assets at the national level.
Short Term	6. Formalize and implement a DRF strategy that includes a budgetary process for financing disaster response.
	a. Establish a contingency fund or reserves for public contingent liabilities associated with events with a 5-year return period, accumulated over time.
Medium Term	7. Engage external development partners in establishing contingent financing arrangements to finance public contingent liabilities associated with events of a 10-year return period.
Short Term	8. Engage external development partners in establishing contingent line of credit to finance public contingent liabilities associated with events of a 10-year return period.
Medium Term	9. Establish a robust catastrophe risk insurance program for public assets and parastatals.
	10. Enhance management of contingent liability related to social protection, e.g., establish policy for post-disaster cash transfers.
Private Insurance Market	
Medium Term	11. Enhance availability, penetration, and affordability of private and residential catastrophe insurance. Evaluate potential for public-private partnerships (PPPs) for housing subsidies and explore potential micro-insurance mechanisms.
	12. Enhance data sharing on agricultural insurance and develop more-robust and -affordable products for smallholder farmers.

Discussion

Sovereign Protection

1 Streamline and institutionalize a damage and loss data collection and reporting system across ministries for all severities of events.

Historical damage and loss data are crucial for accurate disaster risk analysis. Historical data are important components of disaster risk assessment and actuarial analysis, and thus plays a significant role in the development of DRM strategies and financing instruments.

In the past, Belize has used the Economic Commission for Latin American and the Caribbean (ECLAC) methodology to collect and report information related to the damage and losses sustained by different sectors for low-frequency, high-intensity events via post-disaster and needs assessment reports. However, information on damage and loss from high-frequency, low-intensity events is not reported in detail across ministries. In addition, information on expenditures related to disasters is very sparse.

A new database in line with the standard damage and loss assessment methodology across ministries is recommended, along with guidelines on how and when to enter information. This would allow line agencies at national and subnational levels, as well as local authorities, to report damage and losses easily. It would also enable the MoF and other line ministries to access critical information for recovery planning and appeal to donors. Although this initiative could be launched in the short term, a comprehensive database might take time to be fully completed.

2 Reinforce the role of budgetary planning for disaster-related contingent liabilities at the ministry level.

Aside from the unavoidable expenditure on infrastructure such as roads, there are often appeals for government assistance for private citizens in rebuilding homes, replacing assets, or providing a temporary cash assistance. The extent to which government is involved in providing recovery assistance to individuals must be properly recorded in order to achieve a reliable system for reasonably determining the contingent liability. There must be a more robust system of compiling, storing, and retrieving the necessary information for financial decision making at NEMO and at the MoF Budget Department; availability of software that will apply to NEMO's function; and identification of a system that inherently records and categorizes the particular data that will make the appropriate office a one-stop place for information on the management of disaster occurrences, response, relief, and recovery.

The unbudgeted use of resources to respond to natural disasters inevitably reduces the funding available for planned development goals. In many cases, the departments that deploy resources for response to natural disasters do not request a reimbursement of the amounts used from their recurrent budget. Departments should be encouraged to make submissions to determine the true cost of the response to each event. The allocation of project numbers, as in the recommendations for the new CoA, can assist in tagging the expenditures on the use of human and other resources that are not presently determined by the departments in times of disaster response.

From the historic information provided, there is a very high probability of occurrence of natural hazards in Belize, particularly frequent flooding in the country's low-lying areas. A more direct approach for inclusion of DRF within the budget cycle would reduce the unbudgeted amounts used for disaster response. Flooding is the primary cause of damage in the agriculture sector, which is the most significantly affected economic sector. The losses become significantly more likely to occur during the rainy season each year.

3 Streamline reporting of disaster response expenditures by including explicit programs within the Chart of Accounts (CoA) to distinguish expenditure for disaster response and to further categorize them into affected sectors, e.g., housing, agriculture, tourism. Expenditures should also be categorized by event, e.g., Hurricane Lenny or December 2015 flood.

The additional line item that has been added to the recurrent section of the CoA by the MoF Budget Department is a minimal step and does not address the wider issues that are the results of financial risks from natural disasters. The movement to the new CoA will enable the Budget Department to make a more meaningful adjustment to account for responding to disasters. The CoA will be better able to account for disaster risk reduction (DRR) expenditures with the new accounting structure, which will include clear segments for identifying key information, such as source of funds, cost center, program, and location. There can also be a clear definition of stages of disaster management and sectoral information to identify economic sectors in which the disaster-related expenditure is being incurred. The recommended segments should therefore be able to identify the following:

- **Ministry:** The specific ministry that is responsible for the department through which the expenditure is taking place.
- **Cost Center:** Separation should be made between the ministry and the cost center, as experience shows that, from time to time, departments are shuffled among ministries for various reasons.
- **Program:** The program can show the stages of disaster management that are addressed. Programs should therefore be created for specific stages, such as disaster relief, response, and reconstruction. Also, consideration can be given to creating programs for disaster mitigation, preparedness, etc.
- **Location:** The location can make reference to the exact location of the related expenditure.
- **Economic Sector:** The economic sector is important to show real economic impact of each disaster event. Economic accounts can be created for agriculture, tourism, housing, etc.
- **Project:** In line with the description offered by the CoA manual, the project can reflect segments used for those activities that are separately funded in the budget or funded from external sources to meet a specific purpose. Projects will have specified life spans as determined by the MoF.
- **Source of Funds:** Sources of funds will be used to identify the receipt of funds and the inflow source, whether they are internal or external.

4 Establish or re-establish the enforcement of laws that allow for a fast disbursement mechanism for the financing of post-disaster expenses.

Present legislation should be amended to reflect the allocation of financial resources to the response effort. It would be prudent for the GoB to have a disaster response fund in the CAP2 allocation of the budget. This fund should be sourced among the primary allocations for capital expenses and it should become available at the start of the hurricane season. While the appropriation from supplementary budgets provides a mechanism for making funds available for DRF, the continued use of financial resources for unbudgeted purposes severely affects budget execution and the achievement of short-, medium-, and long-term strategic goals.

5 Develop an inventory of public assets at the national level.

This recommendation complements ongoing efforts in the BCRIP with a component aimed at strengthening the capacity of relevant technical line ministries and the Ministry of Works and Transportation to mainstream climate and disaster resilience considerations into core physical and investment planning and asset maintenance. Along with the uniform loss and damage reporting system (Recommendation 1), an asset management plan and inventorying system could potentially be implemented through coordination with NEMO and other stakeholders but reside with the MoF. Rehabilitation and retrofitting existing government buildings could reduce government costs by decreasing reconstruction and maintenance costs, building resiliency in a pool of government assets, and decreasing insurance costs for public assets. An inventory of public assets is also the first step in accounting for the GoB's contingent liabilities in budgetary planning.

A geo-referenced inventory of public assets at risk and their attributes (e.g., exact location, construction type, number of stories) is also a key component in building an exposure database, which is integrated with hazard and vulnerability models to establish a fiscal disaster risk profile.⁴⁶ Generally, the more accurate the inventory is, the more accurate the fiscal risk assessment. Data to construct the inventory can be collected from various sources, such as government agencies, universities, research centers, international organizations, and statistics institutions. As the exposure database identifies what assets need to be protected, the unit within the MoF responsible for purchasing insurance could be best suited to maintain the database. To better understand the collected information, the GoB may choose to standardize and house the information on an open-source web-based platform and make it accessible to all stakeholders.

6 Formalize and implement a DRF strategy that includes a budgetary process for financing disaster response. Prepare a manual for post-disaster financing to accurately capture the actors, the systems, the various sources of financing, and the process to disburse funds.

This study recommends the development of an ex ante plan for managing the fiscal impacts of natural disasters, considering the potential contribution of budget reallocations, debt financing, contingency reserves, insurance, and capital market instruments, and taking into account financial capacity and desired risk retention and transfer levels, as well as the cost, timing, and availability of the various financing options.

⁴⁶ World Bank. 2011. "Quantify Contingent Liabilities Associated with Natural Disasters." Available at: <http://documents.worldbank.org/curated/en/672271467997574054/pdf/97977-BRI-Box391499B-PUBLIC-Short-Note-1-Risk-Assessment-04Nov2013.pdf>.

The plan or appropriate portions of the plan should be publicly disclosed, where permissible, with the aim of building confidence in the GoB's capacity to manage the financial impacts of disasters.

The MoF should develop a post-disaster manual, with specific procedures for the GoB, in collaboration with all the key agencies, including NEMO, with a view to shortening the time it takes to approve expenditures for disaster financing. This manual should ensure that the different systems and applications being used fully represent the budget preparation and execution process for disaster financing.

7 Establish a contingency fund or reserves for public contingent liabilities associated with events with a 5-year return period, accumulated over time.

This estimate is based on the estimated AAL for public contingent liabilities as described in Chapter 3. These funds should be accessible for immediate post-disaster relief. The chosen amount does not have to be met with a one-time immediate capitalization; it can be accumulated over time incrementally with a medium-term goal of reaching the target.

8 Engage external development partners in establishing contingent line of credit to finance public contingent liabilities associated with events of a 10-year return period.

International development partners should be engaged to develop more-flexible instruments to address not only reconstruction but also relief and recovery. The GoB requires a menu of options to address DRF, and there is a need to develop a contingent line of credit that facilitates rapid disbursement of funds for medium- to high-intensity natural disasters after the reserve fund has been depleted. To that effect, a contingent credit line instrument, such as the World Bank Cat DDO or the IMF RCF, which is complementary to CCRIF SPC, can be customized in terms of triggers and the cost-effectiveness to optimize coverage of varying impacts of natural disasters.

While taking on contingent financing does increase public debt, there is an argument for increasing spending in times of a temporary economic shock like a natural disaster. Basic economic theory notes that a country should adjust to a negative permanent shock and cut spending, but if the shock is temporary, it can be financed and paid back later. In practice, however, policy makers face the extraordinarily difficult task of needing to assess permanency of a shock in real time.

9 Establish a robust catastrophe risk insurance program for public assets and parastatals.

The GoB could support the establishment of a disaster risk insurance program for key public assets in partnership with the private insurance industry. Most of the public assets, including critical assets such as hospitals and schools, are not currently insured against natural disasters. This program could aim to offer technical assistance to the public entities in the design of their catastrophe insurance coverage of public assets. Standardized terms and conditions for the property insurance policies could be developed, which would assist public managers in identifying their risk exposure and their insurance needs. The program could also build a national insurance portfolio of public assets that could then be placed on the private (re)insurance market. A national property catastrophe insurance program for public assets would create economies of scale and diversification benefits and thus lower reinsurance premiums.

10 Enhance management of contingent liability related to social protection, e.g., establish policy for post-disaster cash transfers.

Flexible social protection systems that are triggered by natural disasters and linked to national systems have the potential to reduce the administrative and financial burden of governments when responding to disasters. Post-disaster cash transfer mechanisms can be administratively and logistically cumbersome. Identifying affected people is time-consuming, particularly in the aftermath of a disaster, and funds can take too long to reach those with immediate needs. Scalable programs with built-in risk mitigation and risk financing mechanisms can respond quickly to beneficiary needs within existing systems. These programs provide immediate assistance to poor people, protecting development gains by preventing people from selling productive assets and falling back into poverty. Ex ante social protection financing mechanisms also promote shared prosperity through better targeting of and focusing on underlying factors affecting inequality, such as gender. To this end, the best-designed programs use census and survey data, as well as geospatial platforms, to locate vulnerable people.

Disaster-linked social protection programs can also build the capacity of governments to provide timely and focused assistance to affected vulnerable populations in the aftermath of a disaster while protecting their long-term fiscal balance through risk financing instruments. This can be achieved by making full use of financial instruments that allow for a more efficient management of disaster-related liabilities. To

Box 2. Countercyclical Argument for Increasing Spending after a Temporary Shock

“By definition, a prudent policymaker will tend to put more weight on a positive shock being temporary and a negative shock being permanent. As a result, the prudent policymaker may, on average, save too much in good times and dis-save (or borrow) too little in bad times. This ‘excessive’ saving could be viewed as the cost of self-insurance, and hence a price that needs to be paid for living in shock-prone or more volatile external environments. Interestingly enough, in bad times a prudent policymaker may mimic, to some extent at least, a procyclical policymaker. But, if anything, this should be viewed as an additional argument to seek the blessings of countercyclical fiscal policies since market-based insurance (which would clearly be the first-best scenario) should be more readily available to countries with higher credit ratings.”

Vegh, Carlos; Lederman, Daniel; Bennett, Federico R. 2017. *Leaning Against the Wind: Fiscal Policy in Latin America and the Caribbean in a Historical Perspective*. LAC Semiannual Report; April 2017. World Bank, Washington, DC. © World Bank. <https://openknowledge.worldbank.org/handle/10986/26364>
License: CC BY 3.0 IGO.

ensure the effectiveness of such programs, quantifying the costs and benefits of disaster-linked social protection schemes and their impact on budget is also key. Building in natural disaster responsiveness to a social safety net program means designing it to “scale up” after a disaster, to either reach more beneficiaries in the same or different area than the program may reach normally or provide additional payouts to households during or after the crisis, or both. Successful scalable social protection systems include a flexible delivery system, predictable financing for contingent liabilities, robust information systems, and ex ante coordination mechanisms and capacity investments.⁴⁷

Private Insurance Market

11 Enhance availability, penetration, and affordability of private and residential catastrophe insurance. Evaluate potential for public-private partnerships (PPPs) for housing subsidies and explore potential micro-insurance mechanisms.

It is important that the government and the insurance industry tackle together the issues of expanding penetration of property insurance against natural disasters and making insurance accessible to vulnerable populations. Acting alone, the insurance industry may focus on short-term profitability and shield itself from hard-to-address risks in vulnerable populations. On the other hand, if the public sector worked alone, products might not be as efficient and protection could be costly. A government also faces the risk of implementing policies that compete with or reduce the incentives to purchase insurance. A PPP can reduce and manage ex ante risks, adapt to the needs of different sectors of society, and lead to sound policy making and DRF decisions.⁴⁸

Figure 16: Advantages of PPPs to Governments and the Insurance Industry

Advantage for governments

- Microinsurance can bring a client-centred approach to product development. Beneficiaries of public programmes can experience reduced payout times and improved benefits. The private sector may be able to deliver benefits more effectively and efficiently.
- Data on different risks can be developed over the long term to be able to price and transfer risk in a more efficient way, while contributing to greater public transparency.
- PPPs can create better budget management, as insurance premiums can help to bring certainty around contingent events that have a severe impact on public finances.
- Insurance mechanisms can help to align incentives within the government to set up the policies that can reduce the exposure to risk of particular groups.

Advantages for the insurance industry

- Access to programme with scale can help reduce operational and premium costs. Scale can help to improve value for final beneficiaries.
- Collaboration with the government provides opportunities for improved data collection, which can lead to better pricing and beneficial competition.
- Insurance PPPs can increase the capacity of the industry to deal with bigger volumes of clients and premiums, while fostering national financial risk-transfer mechanisms.
- Joint work with government can help to change the exposure to risk of the population, making insurance protection sustainable for both insurers and reinsurers.

Source: “Making public-private partnerships work in insurance.” International Labor Office Geneva: ILO, 2015 (Paper no. 40).

47 World Bank. 2015. *R2D2: Responding to Disasters Together*. Washington, DC: World Bank.

48 Ramm, G. 2011. “Public-private partnerships in microinsurance.” Discussion Paper No. 001. Luxembourg: Microinsurance Network.

12 Enhance data sharing on agricultural insurance and develop more-robust and -affordable products for small-holder farmers.

The agriculture and fisheries sector contributes about 14 percent to Belize's GDP and agricultural workers make up about 16 percent of the labor force.⁴⁹ Lack of crop insurance in Belize is a major factor for consideration because farmers face an annual risk of intense floods in the low-lying areas.

One of the main pillars in the plan (Horizon 2030) behind the GoB's growth and development strategy is increasing agricultural production to build economic resilience-generating resources for long-term development. In addition to an increased public investment in technology and irrigation, the GoB plans to develop agricultural insurance options to cover crop losses and to involve cooperatives and credit unions to develop a support structure for smallholder farmers.

Another area to consider for possible governmental support is the improvement of the technical capacity to overcome some of the limitations in the provision of insurance. Even though weather data and weather risk maps are available, local insurers may require additional technical capacity in contract design and monitoring and access to reinsurance markets.⁵⁰ Further analysis can be undertaken to explore successes and challenges in agricultural PPPs.

Table 14: Examples of Agricultural Insurance PPPs

	Agriculture Catastrophe Insurance (Peru)	Component of Assistance against Natural Disasters (Mexico)
Risk	Agricultural catastrophe Drought, excess humidity, frost, low temperatures, floods, avalanches, hail, fire, wind, high temperatures, and pests Undefined crops	Catastrophe Meteorological risks (drought, cols, hail, snow, torrential rain, low temperatures, flooding, tornadoes, and cyclones) and geological events (earthquakes, volcanic eruptions, tsunamis, and landslides) Crops and livestock
Ministry/ government entity	Ministry of Agriculture	Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food
Levels of government	Central and state	Central and state
Target audience	Farmers, such as peasant communities, native communities, small- and medium-scale farmers	Vulnerable smallholder farmers defined as producers with up to 20 hectares of annual crops, up to 10 hectares of fruit crops, or up to 60 animal units
Year of launch	2009	2003
Premium payment	Central Government – 100%	For the ex ante insurance component, central government 80%–90%, state 10%–20%, which has changed over time
Enrollment	Local agricultural agencies	State agricultural agencies
Outreach	Insured area up to 490,000 ha, average number of beneficiaries per year, 56,000	As of 2013, 12 million ha and 10 million animal units (75% and 70% of the estimated target population, respectively)

Source: "Making public-private partnerships work in insurance." International Labor Office Geneva: ILO, 2015 (Paper no. 40).

⁴⁹ World Bank Data Bank. 2015

⁵⁰ Ibid.

Annex 1. NEMO Committees

NEMO COMMITTEE		COMMITTEE RESPONSIBILITIES
1	NATIONAL EDUCATION, INFORMATION, COMMUNICATIONS AND WARNING COMMITTEE CHAIR – Cabinet Secretary	<ol style="list-style-type: none"> 1. To use all available media, government and other sources and means to educate the public about what actions they need to take (including using an emergency family plan) in face of potential disasters in order to mitigate the impact from disasters. 2. To disseminate accurate and updated information on Hazard threats such as Hurricane, Flood, Earthquake etc., to the public in an efficient manner. 3. To assist other National Operational Committees with their communication needs for the proper execution of their activities. 4. To establish usable internal and external telecommunications network within the Emergency Agencies. 5. To ensure that Emergency Alert and Warning Systems are operational and effective throughout Belize. 6. To obtain and collate information on impending disasters and to share such information with all national and district Chairpersons in NEMO. 7. To disseminate all relevant NEMO decisions to the public.
2	SEARCH AND RESCUE AND SECURITY COMMITTEE CHAIRPERSON – CEO MINISTRY OF DEFENSE	<ol style="list-style-type: none"> 1. To develop and keep updated the national and districts Search and Rescue plan. 2. To identify and coordinate priorities and allocate the resources (helicopters, boats, vehicles, equipment, personnel etc.) necessary for Search and Rescue and recovery operations as required countrywide. 3. Assist in the coordination of SAR training. Ensure that Search and Rescue Teams are trained and available in all districts. 4. To collect and collate all reports of missing persons and make submissions to the Chairman of NEMO thru the NEOC as required 5. To direct all private and government Search and Rescue efforts. Be prepared to activate for localized SAR that has national implications. 6. To assist the Education, Information, Communication and Warning Committee with information regarding the availability of radios and technical communication persons as required to meet the needs of the EIWC. 7. To address security issues related to disaster response and recovery operations.
3	TRANSPORT AND EVACUATION COMMITTEE CHAIRPERSON: CHIEF TRANSPORT OFFICER	<ol style="list-style-type: none"> 1. To develop and keep updated a plan that can address transportation and evacuation needs for at risk communities to effect a well-coordinated and safe evacuation. 2. To ensure the revision and update of the National and District Transport and Evacuation Committee Plan. 3. To identify priorities and allocate resources necessary for the conduct of transportation and evacuation in particular fuel needs for evacuation (buses and boats). 4. Stand ready to commandeer any serviceable vehicle or heavy equipment where cooperation is lacking during an emergency. 5. Co-chair: Coordinate Government vehicles for NEMO committees for the execution of their emergency duties.
4	HOUSING AND SHELTER COMMITTEE CHAIRPERSON: CEO MIN OF HOUSING	<ol style="list-style-type: none"> 1. To identify safe and suitable public and private buildings that be used as shelters and for those to be placed on the National Shelters' List for use in times of emergency and disasters; including registering and repairing of all buildings used as Shelter. 2. To ensure, in coordination with other committees that public buildings and facilities to be used as shelters are properly secured and have the right equipment before, during and after an event. 3. To maintain an updated National Shelters List including the managers and wardens for respective shelters; 4. To ensure, by liaising with NMCPHC and NRS MC that adequate material, medical supplies, food, etc., are available during an emergency for each Shelter in coordination with other relevant committees and stakeholders; 5. To provide shelter for the homeless following an event and to address the basic needs of the physically challenged persons. Note. Belize is a signatory to the related conventions. 6. To liaise with school administrators before the occurrence of an emergency where schools are used to ensure cooperation to facilitate access, use and return of the schools to the administrators; 7. Develop and coordinate reconstitution and reconstruction of affected communities with the relevant ministries in particular with the National Economic Recovery Committee.

NEMO COMMITTEE		COMMITTEE RESPONSIBILITIES
5	HUMAN RESOURCE MANAGEMENT COMMITTEE CHAIRPERSON: CEO MIN OF PUBLIC SERVICE	<ol style="list-style-type: none"> 1. To allocate personnel as required by other National Operational Committees to serve as: First Responders, Shelter Wardens, Shelter Managers, DANA Teams, SAR personnel, Relief Aid Worker, Drivers, Helpers etc., during an emergency 2. To maintain a database of qualified public servants who may serve in specific emergency posts during an emergency; 3. To ensure all Public Officers are aware of their roles and understand what is their personal responsibility and obligation in fulfilling their roles during an emergency. 4. To conduct planning meetings involving closely related committees, NEMO HQ staff, district staff and partners. 5. To support Public Officers with the relevant gears and tools required to perform their emergency duties including the request for incentives and advances of allowances.
6	DAMAGE AND NEEDS ASSESSMENT COMMITTEE CHAIRPERSON: CEO MIN OF NATURAL RESOURCES	<ol style="list-style-type: none"> 1. To coordinate rapid and detail assessments that will facilitate the timely production of (1) the First Report known as the Initial Report, which must be completed within 24 hours and the Final Report due within 21 days respectively dependent of the extent of damage. These timelines are stringent for Hurricanes and Floods. 2. To establish the National Damage Assessment Collection and Collation Centre in the NEMO Headquarters. 3. To coordinate, attend and conduct DANA training at the national and district levels in order to develop DANA Teams capable of collecting and reporting DANA information. 4. To establish in partnership with NEMO, the relevant GOs and NGOs for the upkeep of the National DANA Database; 5. To standardize, review, upgrade and distribute the DANA Collection and Collation Forms.
7	FOREIGN ASSISTANCE COMMITTEE CHAIRPERSON: CEO MIN OF FOREIGN AFFAIRS	<ol style="list-style-type: none"> 1. To update all Foreign Missions and Governments on any disaster from which Belize may require external assistance and act as the national legal authority to coordinate all foreign assistance to Belize. 2. To make short, medium and long term requests for assistance from foreign governments, agencies and organizations based on predetermine standard post disaster needs avoiding duplication of pledges and donations 3. To answer queries from abroad on the whereabouts of Belizean relatives and foreigners. 4. Assist and facilitate the requirements for national recovery through NEMO with the relevant ministries based on programs for reconstitution and reconstruction of affected communities in accordance with the National Economic Recovery Plan
8	ECONOMIC AND RECOVERY COMMITTEE CHAIRPERSON: FINANCIAL SECRETARY	<ol style="list-style-type: none"> 1. To identify the priorities and allocate resources, through ministries' projects and programs, from IFIs necessary to jump start the immediate recovery of vital economic areas and livelihoods following an emergency. 2. To assist the Human Resource Management Committee with incentives and advances for public officers as indicated by the HRMC utilizing advice for the legal advisor and Ministry of Finance as required. 3. To support the relevant committees with their work programs for reconstitution and reconstruction of affected communities in accordance with a National Recovery Plan. 4. To meet at least twice before the Hurricane/Flood/Rainy Season and meet every month between July, August and September to focus on actions that will increase operational readiness of the committee.
9	MITIGATION, ACCESS AND INFRASTRUCTURE WORKS COMMITTEE CHAIRPERSON: CEO MINISTRY OF WORKS	<ol style="list-style-type: none"> 1. To enhance, from a disaster mitigation vantage point, sustainable physical infrastructure changes and multi-hazard resistant development; 2. Enforce, with the relevant authority and stakeholders, proper structural mitigation methods and building standards for residential, government and commercial buildings, roads, sea and airports including purpose built shelters to reduce disaster losses. 3. To participate and guide the implementation of Land Use Management programs in harmony with the Land Utilization Authority as a means of averting disasters. Develop effective regulations to reduce disaster for community extensions anywhere in Belize. 4. Coordinate the inspection of all public and private buildings that can be used as a shelter and repair them as prioritized by the Cabinet of Belize and the Ministry of National Emergency Management. 5. Open and maintain routes affected by the disaster to ensure free movement along all major road networks post disaster with support from the relevant committees. 6. Develop and coordinate with the relevant ministries through the Recovery committee programs for reconstitution and reconstruction of affected communities in accordance with the National Economic Recovery Plan. 7. Identify, coordinate and implement reconstruction priorities for a joint Recovery/ Infrastructure Works – Task Force following a disaster

NEMO COMMITTEE		COMMITTEE RESPONSIBILITIES
10	ENVIRONMENTAL AND SOLID WASTE COMMITTEE	<ol style="list-style-type: none"> 1. To develop strategies to protect the environment in order to safeguard communities' livelihoods after before during and after disasters; 2. To make recommendations and implement the recovery of the ecology and habitats to their natural state after a disaster; 3. To assess and evaluate the impact of all disasters on the environment; 4. To develop and coordinate with the relevant ministries through the Economic Recovery Committee work programs for reconstitution and reconstruction of affected communities' environment in accordance with the National Economic Recovery Plan; 5. To make recommendations and supervise the implementation of a plan to deal with and manage debris accumulated due to the disaster; 6. To meet at least twice before the Hurricane/Flood/Rainy Season and meet every month between July, August and September to focus on actions that will increase operational readiness of the committee;
11	MEDICAL CARE AND PUBLIC HEALTH COMMITTEE CHAIRPERSON: CEO MIN OF HEALTH	<ol style="list-style-type: none"> 1. To ensure that an adequate supply of emergency medical supplies are available. 2. To have in place a plan for the effective distribution of medical supplies wherever they may become necessary. 3. To check all manifests for medical supplies pledged and those coming into the country 4. To make provisions for the establishment of emergency hospital units at designated areas. 5. To ensure that adequate resources are available for the transportation of those in need of immediate medical attention. 6. To identify an effective method for dispatching medical teams to accident or disaster sites. 7. To make adequate provisions for the disposal of the dead. 8. To develop a program that would prevent the outbreak of diseases that are related to disaster conditions. 9. To develop and coordinate with the relevant ministries through the Recovery committee work programs for reconstitution and reconstruction of affected communities in accordance with the National Economic Recovery Plan 10. To avert medical emergencies from becoming medical disasters
12	RESTORATION AND UTILITIES COMMITTEE CHAIRPERSON: DIRECTOR OF ENERGY, MIN OF PUBLIC UTILITIES	<ol style="list-style-type: none"> 1. To design a plan of action, that will allow each utility company to respond to water, telecommunications, fuel and electricity disaster problems and needs in a coordinated manner recognizing their interdependency. 2. To ensure that utilities are restored and maintained within the shortest possible timeframe after the 'All Clear'. Keep the public abreast of all developments. 3. To ensure longer term protection/mitigation measures are forecasted and implemented by the Utilities companies to reduce impact of hazards on Utility infrastructure in Belize. 4. To ensure all public utilities systems function after the event. 5. To identify all sources of natural and commercial portable water, fuel, light and telephone sources required before and after a disaster. 6. To establish mechanisms to increase and access all sources of water, fuel, light and telephone water with the Relief Supplies Committee at the national, district and community level 7. To develop and enforce regulations, with all public and private sector entities, to protect water sources and sustainable access. 8. To establish the regular and emergency need requirements for water, fuel, light and telephone consumption. 9. Develop and coordinate with the relevant ministries through the Economic Recovery committee's work program for reconstitution and reconstruction of affected communities in accordance with their National Recovery Plan 10. To educate, in collaboration with the Education, Communication and Warning Committee, the public on all aspects of water usage, sustainable preservation and precautionary actions as suggested by utility companies advisory.
13	ENVIRONMENT AND SOLID WASTE MANAGEMENT COMMITTEE CHAIRPERSON: CEO MIN OF ENVIRONMENT AND SUSTAINABLE DEVELOPMENT	<ol style="list-style-type: none"> 1. To develop strategies to protect the environment in order to safeguard communities' livelihoods after before during and after disasters; 2. To make recommendations and implement the recovery of the ecology and habitats to their natural state after a disaster; 3. To assess and evaluate the impact of all disasters on the environment; 4. To develop and coordinate with the relevant ministries through the Economic Recovery Committee work programs for reconstitution and reconstruction of affected communities' environment in accordance with the National Economic Recovery Plan; 5. To make recommendations and supervise the implementation of a plan to deal with and manage debris accumulated due to the disaster; 6. To meet at least twice before the Hurricane/Flood/Rainy Season and meet every month between July, August and September to focus on actions that will increase operational readiness of the committee.

Annex 2. Methodology and Key Assumptions for Risk Modeling and Actuarial Analysis

Box A2-1. Probabilistic Catastrophe Risk Modeling

Fiscal disaster risk assessments for governments can be developed using inputs from probabilistic catastrophe risk models. Catastrophe modeling techniques were originally developed by the international (re)insurance industry to assess the risk on portfolios of underwritten assets (e.g., buildings) and are increasingly being used by governments to analyze their exposure to adverse natural events. Typically, catastrophe risk models comprise the following components:

Exposure Module: This is a geoReferenced database of assets at risk, capturing important attributes such as geographical location, type of occupancy (e.g., residential, commercial, industrial, agricultural) and construction (e.g., wood, steel, masonry), age and number of stories.

Hazard Module: This module contains a catalog of thousands of potential natural catastrophe events that could occur in a region, each one defined by a specific frequency and severity of occurrence. Analyses are performed on the historical occurrence of catastrophic events to capture the extent of possible events, based on expert opinions.

Vulnerability Module: This is a series of relationships which relate the damage to an asset to the level of intensity of a peril (e.g., ground shaking for earthquakes, wind speed for tropical cyclones). The relationships will vary by peril and by the characteristics of each asset; for example, a small wooden house and a tall concrete building will respond in different ways to a ground shaking caused by an earthquake and as such, they will be damaged in different ways and to different extents. On a larger scale, for instance when analyzing an entire neighborhood or city, proxies may be used to capture the overall vulnerability of an area.

Loss Module: This module combines the information in the other three components in order to calculate the overall losses expected for selected perils impacting a portfolio of assets of interest. Typically, there are two kinds of risk metrics produced: average annual losses (AALs) and probable maximum losses (PMLs). The AAL is the expected loss, on average, every year for the risks being analyzed; while the PMLs describe the largest losses that might be expected to occur for a give return period (within a given time period), such as a 1DinD50 year loss or a 1DinD250 year loss.

Risk metrics produced by probabilistic catastrophe risk models can be used to complement historical analyses and are particularly useful to policy makers in assessing the probability of losses and the maximum loss that could be generated by major events (e.g., an earthquake affecting a major city or a cyclone affecting a major port).

Box A2-2. Loss Risk Estimation Data, Methodology, and Key Assumptions

The technical results derive from an actuarial analysis of past floods and wind-related events in Belize. This analysis is based on empirical analysis of past losses and not on a probabilistic catastrophe model.

Although basic cross-validation of the data were completed, any material errors in the underlying data could affect the results of this technical analysis.

Methodology

The methodology followed these steps:

- Historical losses were compiled into a single table by event. Whenever the data was available, sectorial losses were recorded.
- Based on, proxies to extract direct losses to the building stock, direct losses and public losses out of the total losses were determined by sector and more globally by event.
- Losses were then updated to 2015 USD values.
- Theoretical and statistical analysis validated the use of the Extreme Value Theory and Generalized Pareto Distributions are fitted for each of the 4 categories of evaluated historical losses: direct losses to the building stock, direct losses, public losses and total economic losses.
- Focusing on the fitted direct losses to the building stocks, distributions of losses from the actuarial analysis and from the catastrophe risk model coincide for low-frequent losses. A mix of the distributions is operated: (i) actuarial analysis complemented results from the catastrophe model for the most frequent losses within the tail distribution; and, (ii) another statistical distribution for the rest of the tail was fitted based on the catastrophe risk model's results.
- Results for the low-frequent losses of the tail distribution of direct losses to the building stock were extrapolated to the 3 other categories to complement the results previously derived for more frequent losses within the tail distribution.

Assumptions

The analysis uses the following key assumptions:

- There are no material errors or omissions in the data underlying the disaster damage report.
- The developed proxies to estimate the portions of direct losses to the building stocks, direct losses and public losses are based on historical sectorial losses information drawn from Damage and Loss Assessment reports and an inventory of public assets are reasonable approximations.
- The use of the CPI index to update the historical losses to 2015 USD value is legitimate.
- The use of the Extreme Value Theory is legitimate and the fitted statistical distributions are reasonable approximations of the loss impact of natural disasters.
- Results derived from the catastrophe risk model for the high return periods can be extrapolated to other categories of losses arisen from disasters; each category of loss follows the same distribution for the high return periods.

Source: World Bank DRFTA Project.

Annex 3. Operational Disaster Risk Financing and Insurance Framework

Table A-1: Actions Taken by Governments for Financial Protection

Actions	Actions by Governments for Financial Protection of the State	Actions by Government for Financial Protection of Society		
	Beneficiaries			
	Government – National & Local (Sovereign DRFI)	Homeowners and SMEs (Property Cat Risk Insurance)	Farmers and Herders (Agricultural Insurance)	Low income population (Social Protection)
Assess Risks	Collect and manage risk and loss data Quantify potential disaster related losses from fiscal and budget perspective Assess potential post-disaster (short term and long term) funding gaps	Collect and manage risk and loss data Quantify potential disaster related losses from property damage Identify proportion of losses incurred by public and private stakeholders Assess capacity of domestic insurance markets		Collect and manage disaster risk and loss/impact data Quantify potential disaster related losses on low-income population Quantify fiscal impact of potential disaster related losses through social protection programs
Arrange Financial Solutions	Develop Financial decision making tools Develop national strategy for financial protection Secure immediate liquidity for budget support following disasters: risk layering including reserves, contingent credit, and catastrophe risk transfer Secure longer term reconstruction financing, e.g., insurance program for public assets	Promote domestic demand for insurance Financial incentives through premium subsidies and/ or tax breaks Compulsory vs voluntary schemes Awareness/education of consumers on insurance products Develop domestic supply of insurance Assess legal and regulatory environment to allow private sector to develop/test private insurance solutions while protecting consumers Risk data collection, management and sharing Product development (indemnity and index based) Insurance pools		Secure contingent funding for social protection programs against disasters Complement/enhance social protection programs with insurance principles and market-based products including use of transparent for payouts
Deliver Funds to Beneficiaries	Establish national disaster fund Establish transparent, timely and effective post disaster loss reporting mechanisms Establish post disaster budget execution mechanisms to transfer funds from national to subnational level and from MoF to line ministries	Develop risk market infrastructure to support delivery channels Underwriting and claims settlement process Delivery channels through insurance agents Alternative delivery channels: Banks, micro-finance Intermediaries, input providers, NGOs, etc.		Improve beneficiary targeting and assessing eligibility for post-disaster payouts
Linkages to DRM	Reduce Underlying Drivers of Risk			

Table A-2: World Bank DRFI Program Operational Framework – Illustrative Examples of Financial Protection

Beneficiaries	Government – National and Subnational (Sovereign DRFI)	Homeowners and SMEs (Property Catastrophe Risk Insurance)	Agricultural Producers and Herders (Agricultural Insurance)	Low Income Population (Social Protection)
Assess Risks	<p>The Government of Colombia included the assessment of contingent liabilities from disasters in the government's fiscal risk management strategy.</p> <p>In Mexico, R&FONDEN a probabilistic catastrophe risk modeling tool, creates probabilistic simulations of potential material and human losses from disasters.</p> <p>Morocco has developed a probabilistic catastrophe risk modeling tool to assist the government in prioritizing their risk mitigation investments.</p> <p>The Philippines is developing a catastrophe risk model to evaluate options for risk transfers and insurance to reduce the fiscal burden of disasters.</p> <p>The Pacific Risk Information System, under the Pacific Catastrophe Risk Assessment and Financing Initiative, includes a database of over 3.5 million georeferenced buildings and infrastructure in 15 Pacific Island Countries. It was used to develop the Pacific catastrophe risk insurance pilot.</p>	<p>In Chinese Taipei, the Residential Earthquake Insurance Fund (TREIF) has developed an earthquake risk model to strengthen the independence and professionalism of its earthquake risk assessments.</p> <p>The preparation of the Southeast Europe and Caucasus Regional Catastrophe Risk Insurance Facility includes extensive multi-hazard country risk assessments for climate and geological hazards.</p>	<p>India has developed detailed agricultural risk assessment tools to help policymakers to better understand the economic consequences of drought, quantify such impacts, and investigate the impacts of risk coping strategies, at both the farm and state levels.</p> <p>In Mongolia, livestock census/surveys are used to inform the government about the economic and fiscal impact of adverse weather events, and in the design and pricing of index based livestock insurance policies.</p>	<p>India has developed detailed agricultural risk assessment tools to help policy makers to better understand the economic consequences of drought, quantify such impacts, and investigate the impacts of risk coping strategies, at both the farm and state levels.</p>
Arrange Financial Solutions	<p>Contingent lines of credit provide developing countries with funds immediately following disasters. Products are offered by the World Bank, IDB and JICA.</p> <p>The first multi-country risk pool, the Caribbean Catastrophe Risk Insurance Facility, established in 2007, offers 16 small island states countries over USD150 million in hurricane and earthquake coverage.</p> <p>In 2006, Mexico transferred USD450 million of earthquake risk to financial markets by combining the world's first government catastrophe (cat) bond (Cat MEX – USD160 million) and parametric reinsurance (USD290 million).</p> <p>In Colombia, the government uses standardized terms and conditions informed by international best practices to purchase catastrophe insurance for its public buildings.</p>	<p>The Turkish Catastrophe Insurance Pool (TCIP), a public private partnership with the domestic insurance industry, provides compulsory, affordable earthquake insurance to homeowners, increasing catastrophe insurance coverage from less than 3 percent to over 40 percent of residential buildings in urban areas.</p> <p>The Japanese public-private earthquake insurance program for homeowners relies on the Japan Earthquake Reinsurance Company (JERC), an earthquake reinsurance pool backed by the Government.</p>	<p>The IndexDBased Livestock Insurance Pilot in Mongolia protects the livelihoods of 11,000 herders or 22 percent in piloted provinces in 2012.</p> <p>India's weather based crop insurance has been in place since 2007 for 11 growing seasons, with 11.6 million farmers and \$370 million covered in the most recent season. While the national crop insurance program since 2010 offers more than 1.1 million farmers a total of \$67 million coverage in yield crop insurance.</p> <p>In Morocco, the government and the agricultural mutual insurance company have established a crop insurance program for cereals which currently covers 700,000 ha and will soon be extended to fruit trees.</p>	<p>The Productive Safety Net Programme (PSNP) in Ethiopia is aimed at enabling the rural poor facing chronic food insecurity to resist shocks, create assets and become food self-sufficient.</p> <p>In 2011, reinsurance company MiCRO (Microinsurance Catastrophe Risk Organization) was established to provide insurance coverage to women-owned microenterprises in Haiti.</p> <p>Insurance products of the Center for Agriculture and Rural Development Mutual Benefit Association (CARD MBA) in the Philippines are mandatory for members of a network of institutions including CARD NGO and CARD Bank, providing scale and preventing adverse selection.</p>
Deliver Funds to Beneficiaries	<p>The Government of Mexico established a post-disaster loss reporting mechanism managed by FONDEN. Affected states can therefore access timely payments from the Natural Disaster Fund (FONDEN), reducing time-consuming coordination problems.</p> <p>In the Cook Islands, the establishment of the Disaster Emergency Trust Fund has served to reduce delays in emergency response.</p>	<p>As a public private partnership the Turkish Catastrophe Insurance Pool relies on the domestic insurance market for the distribution and claims settlement.</p>	<p>Distribution in the Moroccan multi-peril crop insurance program takes place either by linkage to loans made by Crédit Agricole or by direct marketing of MAMDA, the sole provider of agriculture insurance in the country, structured as a mutual.</p> <p>The national crop insurance program in India uses GPS enabled mobile phones and video recording technology to enhance crop cutting experiments, improving the accuracy of claims assessments while reducing fraudulent claims. Claims settlement takes place through direct payment to bank accounts.</p>	<p>HARITA was launched in Ethiopia in 2007 as a pilot program to address the needs of small-scale farmers through drought insurance, credit, and risk reduction, allowing farmers to pay for insurance through labor, an idea based on "food-for-work" programs.</p> <p>MiCRO's coverage in Haiti is bundled with loans from Fonkoze, the country's largest microfinance institution.</p>

Annex 4. Belize Country Disaster Risk Profile

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BELIZE Hurricanes and Earthquakes RISK PROFILE

What is a country disaster risk profile?

An estimation of the potential economic losses to property caused by adverse natural hazards.

Country Disaster Risk Profile

Applications

- ▷ Inform disaster risk financing
- ▷ Develop key baseline data
- ▷ Evaluate impact of disasters
- ▷ Promote and inform risk reduction

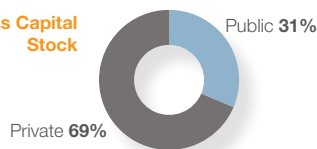
Country At-A-Glance

GDP US\$ 1.7 billion | Population 352,000 | Total Building Exposure US\$ (Replacement Value) 4.6 billion

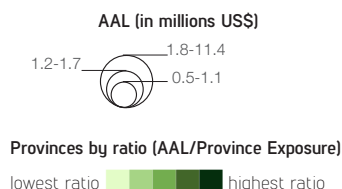
Population



Gross Capital Stock

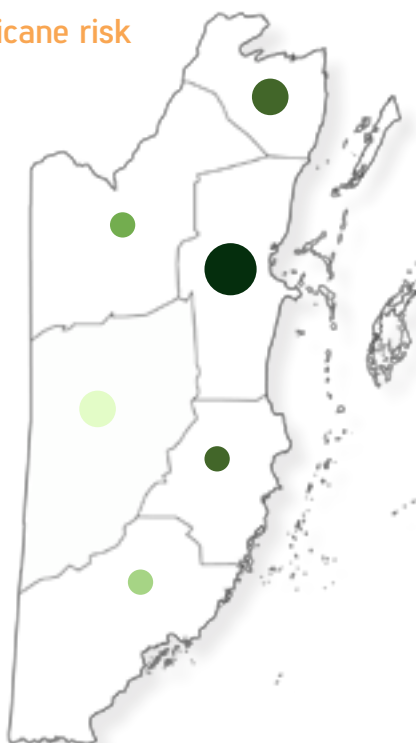


Two representations of hurricane risk



Absolute Risk: The larger the circle, the higher the Annual Average Losses that the province could potentially incur over the long term.

Relative Risk: The darker the color, the higher the ratio of AAL/Province Exposure. The darkest color represents the province of Corozal which has a higher proportion of vulnerable structures due to construction types and/or potentially higher hurricane intensity.



Snapshot

▷ The **hurricane risk** in Belize is **more significant** than the **earthquake risk**.

▷ Annual Average Loss (AAL) from **hurricanes** is **US\$ 17.9M (1.05% of GDP)** and from **earthquakes** is **US\$ 1.4M (0.08% of GDP)**.

▷ The Probable Maximum Loss for **hurricanes** (250 year return period) is **US\$ 791M (46.6% of GDP)** and for **earthquakes** (250 year return period) is **US\$ 63M (3.7% of GDP)**.

▷ Single-family, wood stud-wall frame buildings with plywood/gypsum board sheathing and concrete block, unreinforced masonry with lime or cement mortar are buildings incurring the largest loss in the long term, **each accounting for approximately 19% of the AAL**.

COUNTRYDISASTER RISK PROFILES

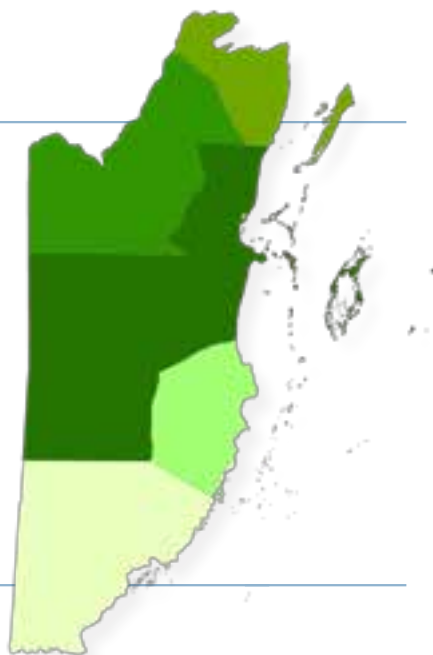
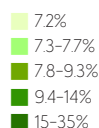
BELIZE

What is at risk?

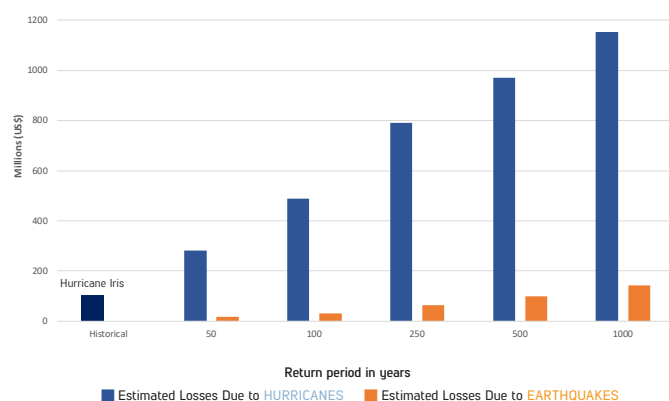
Economic assets such as residential and non-residential buildings are at risk. These assets that are exposed to natural disasters are referred to as a country's **Building Exposure**.

The map provides the value of residential and non-residential buildings in each province at risk from hurricanes and earthquakes.

Building Exposure
(in percentage of total)



What are the potential losses in Belize?

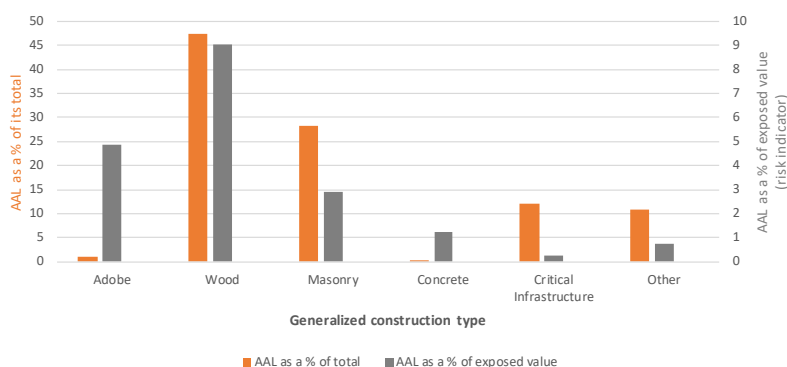


The chart shows the estimated potential future losses in Belize that could be caused by hurricanes and earthquakes for a given return period.

In 2001, Hurricane Iris struck Belize. If this historical event were to happen in 2015, it would cause a loss of US\$ 105M, amounting to 6% of GDP.

How can hurricane risk be reduced?

Masonry structures are the most prevalent building types in Belize, accounting for over 30% of the total building stock. Wood structures, however, are the riskiest construction types.



To learn more, visit: collaboration.worldbank.org/groups/cdrp or email cdp@worldbank.org



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