



Advancing Disaster Risk Finance in Grenada

SOCIAL, URBAN, RURAL AND RESILIENCE GLOBAL PRACTICE
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Abbreviations and Acronyms

AAL	Average Annual Loss
AGIC	Association of Grenada Insurance Companies
CARICOM	Caribbean Community
Cat DDO	Catastrophe Deferred Drawdown Option
CCRIF SPC	Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company
CDEMA	Caribbean Disaster Emergency Management Agency
CDRP	Country Disaster Risk Profile
DaLA	Damage and Loss Assessment
DRF	Disaster Risk Finance
DRFTA	Disaster Risk Finance Technical Assistance
DRM	Disaster Risk Management
ECCU	Eastern Caribbean Currency Union
ECF	Extended Credit Facility
GARFIN	Grenada Authority for the Regulation of Financial Institutions
GDP	Gross Domestic Product
GoG	Government of Grenada
GWP	Gross Written Premium
IDA	International Development Association
IPCC	Intergovernmental Panel on Climate Change
LAC	Latin America and Caribbean
LPP	Livelihood Protection Policy
MoF	Ministry of Finance, Planning, Economic Development, Trade, Energy and Cooperatives
NaDMA	National Disaster Management Agency
NaDMAC	National Disaster Management Council
NEAC	National Emergency Advisory Council
NERO	National Emergency Relief Organization
NGO	Nongovernmental Organization
NIS	National Insurance Scheme
NRL	National Reconstruction Levy
NTF	National Transformation Fund
OECS	Organization of Eastern Caribbean States
PFM	Public Finance Management
PML	Probable Maximum Loss
PPP	Public-Private Partnership
RDVRP	Regional Disaster Vulnerability Reduction Project
SEED	Support of Education, Empowerment, and Development
SIDS	Small Island Developing States
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 an affected area.

Note: Damage occurs during and immediately after a 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: Strategies to protect governments, businesses, and households from the economic burden of disasters.

Note: DRF 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 Emily caused damages in Grenada in 2005, with direct losses that amounted to USD 45 million (EC\$ 122 million).

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 Emily in 2005 in Grenada amount to USD 7 million (EC\$ 19 million). Adding the direct economic losses of USD 45 million (EC\$ 122 million), Hurricane Emily accounted for USD 52 million (EC\$ 140 million) in economic loss.

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., Grenada has high fiscal risks to disasters: Losses modeled by the Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company (CCRIF SPC) for tropical cyclone events show that a 1-in-100-year event could result in an economic loss of at least USD 343 million (EC\$ 926 million).

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 than 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., the Livelihood Protection Policy 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 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).

Executive Summary

The objective of this report is to make recommendations for the Government of Grenada (GoG) 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 Grenada. 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, Planning, Economic Development, Trade, Energy and Cooperatives (MoF) with information and instruments to manage contingent liabilities posed by natural disasters.

On average, in the long term, the GoG would need to cover losses of approximately USD 3.5 million (EC\$ 9.5 million) annually –0.3 percent of Grenada’s gross domestic product (GDP)– to address its contingent liabilities related to hydrometeorological events.¹ This amount is equivalent to 1.3 percent of the GoG’s total expenditure for 2015.² Hurricane damage to public and private building infrastructure alone will amount to USD 10 million (EC\$ 27 million) on average each year in the long run, or 1.1 percent of GDP. For any given year, Grenada has about a 1 percent chance of losses from hurricanes exceeding USD 246 million (EC\$ 664 million) for the economy as a whole. In addition to long-term impacts on economic and social development in Grenada, disasters also increase Grenada’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)	10.6	20	12	3.5
10	14.8	34	17	6
50	111.0	249	133	46
100	233.6	386	246	64
250	384.8	567	396	89

Source: Authors’ analysis.

Grenada can adjust its approach to disaster financing to be more timely and cost-effective and to minimize opportunity costs. Funds for short-term disaster relief and some recovery expenditures are currently re-allocated from existing recurrent or capital expenditures and accounted for in a supplementary budget. The GoG is forced to reallocate funds from essential development activities to crisis response. 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 sovereign debt problems.

Existing instruments for DRF are not optimized to address Grenada’s disaster risk profile, prone to high- and low-frequency natural hazards. A contingency fund is mandated by the constitution with a prescribed annual non-cash allocation of 2 percent of revenues, but the contingency fund has a broad mandate beyond natural disasters. Grenada’s National Transformation Fund (NTF), built from the receipts of the Citizenship by Investment Program, can also be tapped for post-disaster reconstruction. Grenada has also been a member of the Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company (CCRIF SPC, formerly CCRIF) since 2007, paying an annual USD 1.42 million (EC\$ 3.8 million) premium for a parametric windstorm, excess rainfall, and earthquake insurance policy.

This report presents recommendations for a cost-effective natural DRF strategy in Grenada, drawing heavily on international experience, country-specific information, and similar conditions in highly indebted

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

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

small island developing states (SIDS). These complementary resources for a national DRF strategy are based on a preliminary fiscal risk analysis and a review of the current budget management of natural disasters in Grenada. The report benefits from the international experience of the World Bank and the approach outlined in its operational disaster risk financing and insurance framework,³ which has assisted several countries (Belize, Colombia, Fiji, Indonesia, Jamaica, Mexico, Pakistan, the Philippines, Saint Lucia, Samoa, Solomon Islands, Sri Lanka, Tonga, Vanuatu, and Vietnam) in the design and implementation of sovereign catastrophe risk financing strategies. This report tailors the approach to the institutional, social, and economic characteristics of Grenada

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

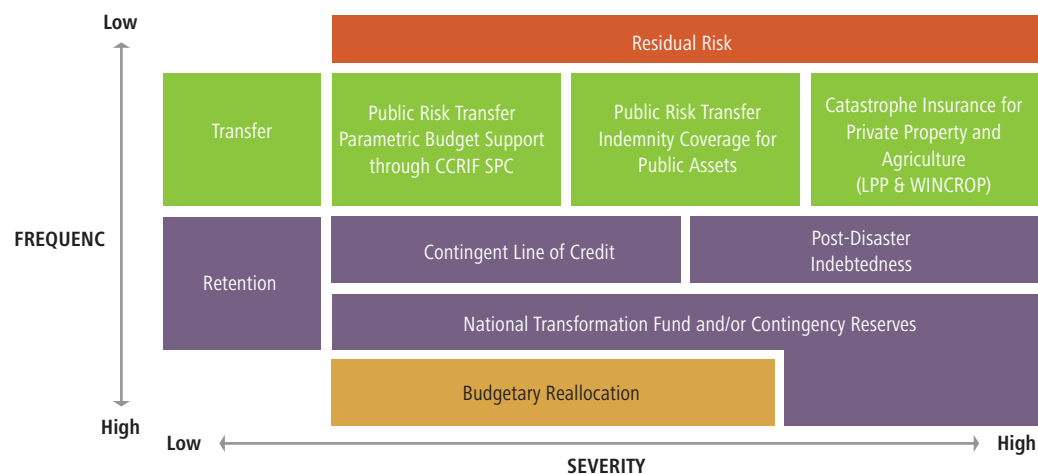
Table 2: Current and Past Disaster Risk Finance Instruments

Ex Ante	Retention	National Transformation Fund
		Contingency Reserves
	Transfer	CCRIF Property Insurance NIS
		Livelihood Protection Policy (LPP) Windward Islands Crop Insurance Ltd (WINCROP) Property Insurance
Ex Post	Retention	International Loans and Assistance
		National Fund for Reconstruction and Development
		National Reconstruction Levy Fuel Price Increase
		Budget Reallocation

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 (Figure 1) and more-detailed recommendations are listed in Table 3.

Figure 1: Illustrative Strategy for Proposed DRF Options



LPP = Livelihood Protection Policy; WINCROP = Windward Islands Crop Insurance Ltd;
Source: Authors' analysis.

³ 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: Strategy Recommendations for DRF in Grenada

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. Develop an inventory of public assets in Grenada – potential link to cadaster.
	3. Create the legal institutional environment for DRF as the key to strategy sustainability.
	a. Review the Public Financial Management Act and consider inclusion of earmarking funds specifically for disasters.
	b. Establish or re-establish a mechanism for the rapid disbursement of financing of post-disaster expenses.
	c. Review the legal definition of contingent liabilities.
	d. Integrate explicit contingent liabilities in budgetary planning process.
	e. Review Public Sector Investment Program and Smartstream for their ability to track post-disaster expenditures.
	4. Codify or approve a DRF strategy.
	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.
	5. Increase contingency reserves earmarked only for natural disasters through the NTF for publiccontingent liabilities associated with events with a 10-year return period.
	a. Establish safeguards to ensure appropriate fund management.
	b. Conduct an audit of the selected mechanism to ensure that all funds for short-term disaster financing have been transferred.
	6. Establish a contingent line of credit, to finance public contingent liabilities associated with events of a 15-year return period.
Medium Term	7. Establish a robust catastrophe risk insurance program for public assets.
	8. Enhance management of contingent liability related to social protection.
Long Term	9. Explore diaspora bond and catastrophe bond markets.
Private Insurance Market	
Medium Term	10. Enhance availability, penetration, and affordability of private and residential catastrophe insurance (potential public-private partnerships [PPPs]).
	11. Enhance data sharing on agricultural insurance and develop more-robust and -affordable products for smallholder farmers.

The above recommendations would allow the GoG to finance its contingent liabilities from a hydrometeorological event with a 30-year return period with CCRIF SPC and 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 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) 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.

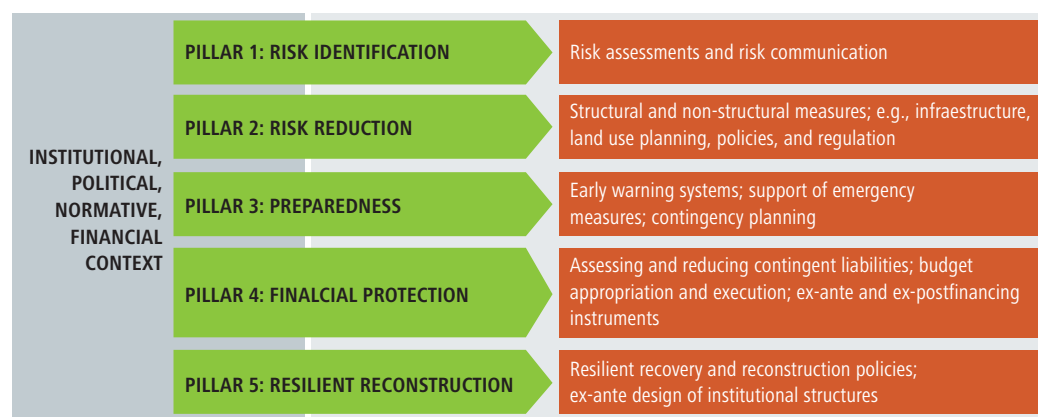
The GoG could support the establishment of a disaster risk insurance program for key public assets in partnership with the private insurance industry. Most of the public assets, including critical assets such as hospitals and schools, are not currently insured against natural disasters. The first step in designing a catastrophe insurance program for public assets would involve a national inventory of public assets. Undertaking an inventory has an additional application of informing the national cadaster and property tax records. A national property catastrophe insurance program for public assets would create economies of scale and diversification benefits and thus lower reinsurance premiums.

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 2015–2030⁴ and is part of the Strategic Framework for Comprehensive Risk Management of Disasters developed by the World Bank.⁵ 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.

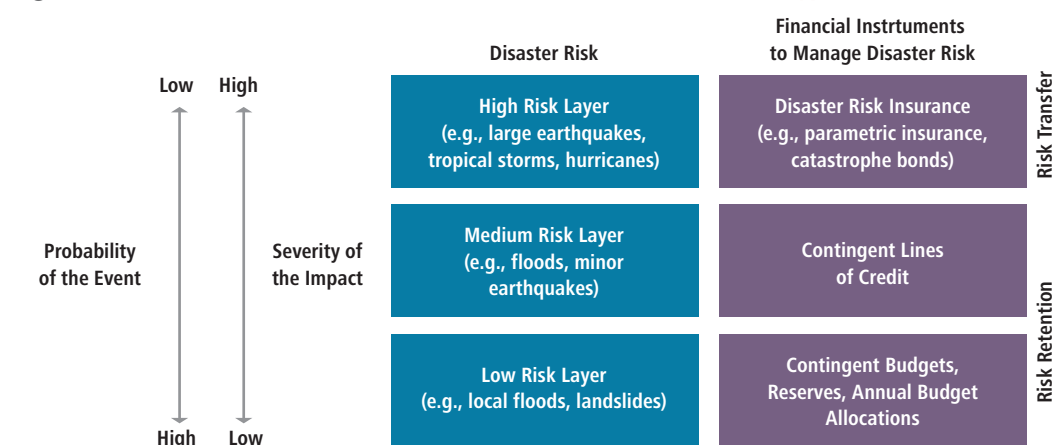
It is important to note that the Disaster Risk Finance Technical Assistance (DRFTA) Project on which this report is based focuses solely on the financial protection pillar. However, it does not lessen the need to strengthen the other dimensions of integrated risk management, including the preparedness component that is crucial for Grenada. The DRFTA Project is part of the broader partnership with the GoG on DRM and climate change adaptation. Grenada is currently implementing the World Bank-funded Regional Disaster Vulnerability Reduction Project (RDVRP – P117871), 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 GoG prior to the disaster and the *ex post* measures operationalized after a disaster.

⁴ 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.

⁵ 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>.

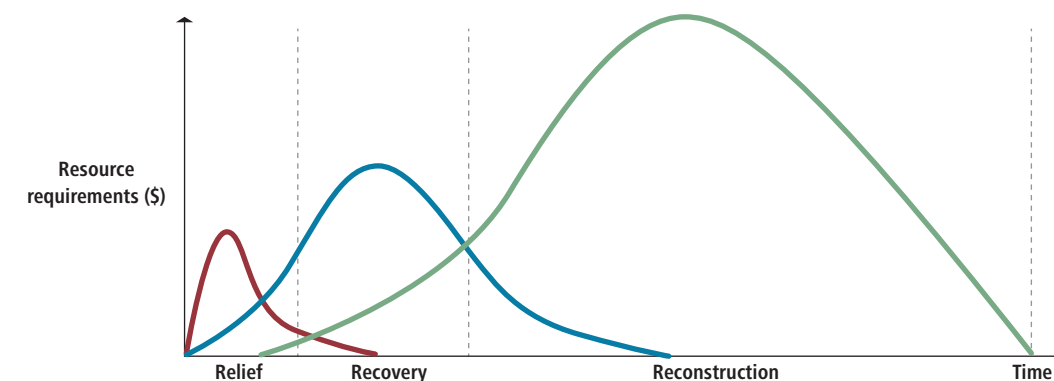
Figure 3: Most Cost-Effective Financial Instruments for Different Types of Risk



Source: World Bank.⁶

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.⁷

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 GoG'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.⁸ This approach, in order to specifically address the needs of the GoG related to natural disasters, focuses on three activities: quantifying the contingent liabilities of the GoG to estimate the fiscal risk of natural disasters, reviewing the current public financial management of natural disasters in Grenada 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.

⁶ Ghesquiere, F. and Mahul, O. 2010. Financial Protection of the State against Natural Disasters: A Primer. Washington, DC: World Bank

⁷ Ibid.

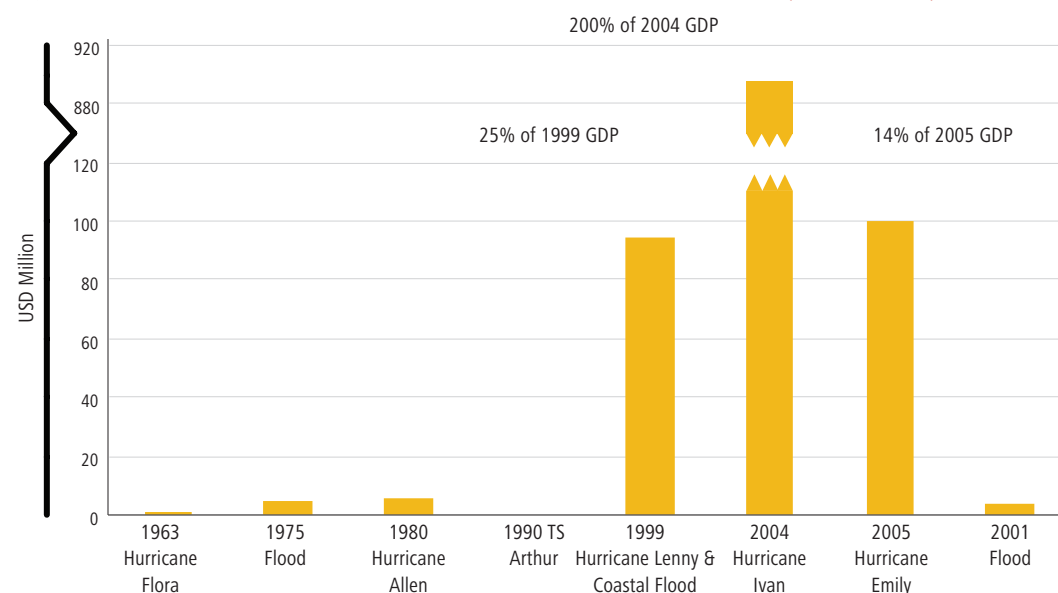
⁸ Financial Protection against Natural Disasters: From Products to Comprehensive Strategies, An Operational Framework for Disaster Risk Financing and Insurance. 2014.

Brief Introduction of the Case for a DRF Strategy in Grenada

Grenada is highly exposed to natural disasters of varying intensity and severity. Several types of disasters—hurricanes, tropical storms, earthquakes, droughts, floods, and landslides—occur frequently. Exposure and livelihoods are largely located in coastal areas due to a mountainous interior. The country's main city and capital, St. George's, with a high concentration of population and assets, is situated around a horseshoe-shaped harbor, making it highly prone to hydrometeorological hazards. Consequently, a single flood or wind-related event can provoke tremendous losses to the building stock and to the economy. In the last 40 years, four hurricanes have made landfall in Grenada causing significant physical and financial damages. In addition, rainfall has caused periods of intense flooding in several parts of the country. Grenada is also located near the Lesser Antilles subduction zone, making the country prone to earthquakes.

The Intergovernmental Panel on Climate Change (IPCC) has high confidence that the effects of climate change will intensify.⁹ Impacts from natural disasters will therefore most likely become even larger, coupled with growth in populations and economies. Grenada can expect extreme weather events to become more frequent and more intense and result in greater financial losses. On the revenue side, smaller island economies like Grenada'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 (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.¹⁰

Figure 5: Losses from Natural Disasters in Grenada since 1963 (USD million)



Source: Authors, based on EM-DAT, Desinventar, Caribbean Development Bank.

In a country where tourism-related foreign investment inflows comprise 40 percent of GDP, a disruption in the hospitality industry infrastructure caused by damages from natural disasters could reduce growth and widen the current account deficit. After Hurricane Ivan in 2004, 70 percent of Grenada's hotel infrastructure was rendered inoperable and the debt-to-GDP ratio increased from 80 percent to 94 percent. In 2014, it peaked at 117 percent. Bilateral and multilateral aid flows, at USD 154 million since 1990 (EC\$ 416 million), are not sufficient to finance recovery and reconstruction efforts.¹¹ In addition to the long-standing problems of low growth and high unemployment, in the last 15 years, Grenada has faced its largest natural disaster and the most prolonged recession since independence. A cost-effective DRF strategy helps governments mobilize immediate post-disaster resources, but is also an important financial protection mechanism that mitigates the long-term fiscal impact of disasters. However, a comprehensive

⁹ IPCC. 2014. Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II, and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [R.K. Pachauri and L.A. Meyer (eds.)]. Geneva: IPCC.

¹⁰ 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.

¹¹ AidData Beta. 2015. Open Data for International Development.

risk management strategy should cover many other dimensions, including programs to identify risks, reduce the impact of adverse events, and strengthen emergency services.

The quantification of fiscal risks linked to natural disasters is the first step in devising a cost-effective DRF strategy. Grenada'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.¹² According to the CDRP, hurricanes and earthquakes cause USD 10 million (EC\$ 27 million) annually on average over the long term, or 1.1 percent of GDP. Germanwatch went further to estimate an average annual loss (AAL) from all natural disasters between 1990 and 2013 at 10.8 percent of GDP, the highest relative losses in the world during this time period, largely due to Hurricane Ivan.¹³

The DRFTA Project was able to further validate these estimates and take the first steps in quantifying the GoG's explicit contingent liabilities by analyzing the financial and sector losses and modeling the occurrence of losses from future events.¹⁴ Results, discussed in Chapter 3, show that, on average, in the long term, AAL for public sector assets is around USD 3 million (EC\$ 8 million), and, for any given year, Grenada has a 1 percent chance of experiencing losses to its public assets of greater than USD 64 million (EC\$ 173 million).

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 Grenada, 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.

¹² 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 government, or rather, the government's contingent liabilities in building stock. The actuarial analysis of historical disasters in Grenada, 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 GoG's contingent liabilities, and also capture a portion of the government's implicit contingent liability through, for example, applying the knowledge that historically the government has made *ad hoc* financial responses to the housing sector.

¹³ Kreft, Sönke et al. 2014. "Global Climate Risk Index 2015." Germanwatch.

¹⁴ A consultant with the DRFTA Project worked with the MoF and NaDMA for data collection in August–September 2015.

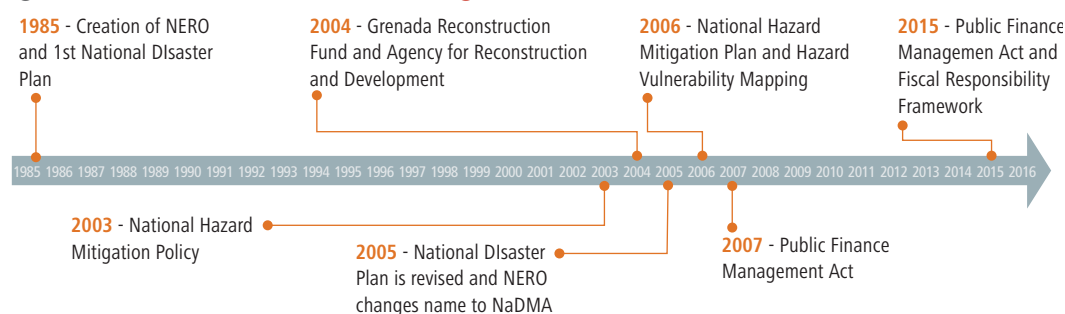
Chapter 2

Chapter 2. Public Financial Management of Disaster Risk

The Legal, Institutional, and Regulatory Framework¹⁵

In Grenada, most activities surrounding DRM are related to preparedness, response, and recovery, and focus less on risk reduction or financing. The creation of the National Emergency Relief Organization (NERO) formalized disaster management in Grenada in 1985 and produced a National Disaster Plan.

Figure 6: Timeline of Relevant DRM Legislation and Administration



Source: Authors' analysis.

The National Disaster Plan

Recovery activities after Hurricane Ivan carried with it organizational changes in Grenada that brought about important mainstreaming of DRM, but stopped short of planning for DRF. The National Disaster Plan was revised in 2005 and NERO's name was changed¹⁶ to the National Disaster Management Agency.¹⁷ This revision was driven by the National Emergency Advisory Council (NEAC). The NEAC, through this revision, also changed its name to the National Disaster Management Council (NaDMAC). NaDMAC meets at least once per month—more frequently during a disaster—and is composed of representatives from various ministries, the police, the transportation sector, public utilities, relief agencies, community organizations, churches, and the private sector.¹⁸ The plan includes clarification of the roles of government ministries that are derived from existing legislation and is currently undergoing another round of revisions with support from the Caribbean Disaster Emergency Management Agency (CDEMA) Coordinating Unit.^{19,20}

Under the National Disaster Plan, NaDMA, consisting of 11 staff with offices in the disaster operations center, is the national disaster management coordinating body. Organizational authority is provided through the Office of the Prime Minister and the Emergency Powers Act of 1987. NaDMA coordinates and oversees the operations of 17 District Disaster Management Committees during a disaster. One of the strengths of this framework is its commitment to, and active engagement and partnerships with, nongovernmental organizations (NGOs), civil society, and the private sector. However, more-strategic engagement could be made of the private sector in mobilizing financial and technical resources to support prevention and mitigation interventions.

¹⁵ The World Bank acknowledges this is not a full legal review, which was beyond the scope of this technical assistance. However, this report does address the most pertinent aspects of the Constitution, Acts, and Plans that relate to DRF, with a focus on assessing those that were cited by the GoG as the legal backing to its actions in times of disaster related to finance.

¹⁶ NERO was renamed to NaDMA to reflect expanded responsibility to comprehensive disaster management and not only emergency response. Some say the popular chant "NERO to Zero" was the catalyst for this change, as it reflected the public's negative perceptions about NERO's response to Hurricane Ivan. University of Pittsburgh. 2007.

¹⁷ Huggins, Leonard James. "Comprehensive Disaster Management and Development: The Role of Geoinformatics and Geo-Collaboration in linking Mitigation and Disaster Recovery in the Eastern Caribbean." Available at: http://d-scholarship.pitt.edu/6252/1/HugginsLJ_ETD2007.pdf.

¹⁸ Website of the Government of Grenada. 2017. Available at: <http://www.gov.gd/departments/nadma.html>.

¹⁹ NaDMAC, NaDMA. 2005. "National Disaster Plan." Version 3.1.

²⁰ Grenada national progress report on the implementation of the Hyogo Framework for Action (2011–2013)

Currently, all involved government agencies and ministries are responsible for writing their own emergency response plan, and responsibilities for government agencies are outlined as follows:

Office of the Prime Minister

- Chair NaDMAC
- Coordinate all response activities from the Emergency Operations Center
- Declare a national disaster²¹

Ministry of Finance, Planning, Economic Development, Trade, Energy and Cooperatives

- Organize post-disaster needs assessments
- Collect, collate, and maintain damage statistics
- Estimate amounts of financial and other relief and rehabilitation requirements
- Assist with coordination of assistance received by NGOs

Ministry of Legal Affairs

- Examine and update relevant sections of the Insurance Act for public liability
- Examine and revise relevant sections under the Emergency Powers Act to provide additional authority through legislation, when required by NaDMA to guarantee full delivery of relief services

Department of Customs and Excise Finance

- Provide expedited handling of documents to facilitate the inflow of relief supplies

Ministry of Foreign Affairs

- Establish contact with international organizations and agencies

The Hazard Mitigation Policy and Plan

In 2003 and 2006, the GoG articulated both a Hazard Mitigation Policy and a Hazard Mitigation Plan as part of its mandate to mainstream hazard risk reduction into national development planning. The Hazard Mitigation Policy lists the development and implementation of appropriate economic programs for hazard risk reduction as a key strategic intervention.²² The Hazard Mitigation Plan was written over 3 years, from 2003 to 2006, during which workshops and consultations were conducted with the public and private sectors to determine the scope of hazard assessment, to review outputs, and to achieve consensus mitigation actions.

Ultimately, the plan failed to carry out its main proposal of a Comprehensive DRM Act that would, among other activities, institutionalize a National Disaster Management Fund to finance disaster response and build capacity in the insurance sector to make natural hazard risk information public and to partner with the public sector in hazard mitigation measures. There still, however, exists no overarching legislation on DRF or DRM.²³

The Public Finance Management Act (2015) and Grenada's Fiscal Responsibility Framework

In June 2014, the International Monetary Fund (IMF) approved a 3-year, USD 21.7 million (EC\$ 58.6 million) Extended Credit Facility (ECF) arrangement for Grenada and concluded its 2014 Article IV Consultation, in which natural disasters were named as a main risk to the macroeconomic outlook.²⁴ The authorities identified contingency measures on both revenues and expenditures to address these risks and to bring

²¹ The constitution of Grenada grants the Governor General the authority to declare a national disaster or state of emergency on the advice of the prime minister, while the Emergency Powers Act (1987) gives the prime minister the authority to conduct emergency operations in the context of a national disaster.

²² Thomas, Dr. Linus Spencer. 2003. "Grenada National Hazard Mitigation Policy."

²³ Grenada national progress report on the implementation of the Hyogo Framework for Action (2011–2013).

²⁴ Grenada: Article IV Consultation and Request for an Extended Credit Facility Arrangement. 2014. Staff Report.

Box 1: Relevant Excerpts from the Public Finance Management Act 2015

Source: Sec 22 of Public Finance Management Act 2015

1. There shall be a Contingency Fund for purposes specified in this section.
2. Annual Appropriation shall approve amount not lower than 2 percent of locally generated revenue, as estimated in the approved budget of the next year to be paid into the Contingency Fund.
3. The Contingency Fund shall be used solely for urgent and unforeseen expenditures arising from emergency situations for which payments cannot be postponed until the passage of Supplementary Budget or next National Budget without seriously affecting public interest.
4. In accordance with sec 79 (2) of the Constitution, where any advance is made from the Contingency Fund, a Supplementary Estimate shall as soon as possible be laid before the House of Representatives and, when the Supplementary Bill has been approved by the House, a Supplementary Bill shall be introduced as soon as possible in the House for the purpose of replacing the amount so advanced.



the fiscal flows on track with program targets and contingency financing. Article 75-82 of the Grenada Constitution and the Public Finance Management Act and Audit Act both provide a legal basis for public financial management (PFM) and oversight.

In July 2015, Grenada's parliament approved a landmark fiscal responsibility framework that will transition Grenada to a rule-based fiscal framework. Grenada is the first Eastern Caribbean Currency Union (ECCU) country to put in place such legislation, and the second Caribbean Community (CARICOM) country (after Jamaica). The overall objective is to restore and maintain debt sustainability. The framework also includes an escape clause to provide sufficient flexibility to address rare events like natural disasters and public health epidemics that result in a declaration of a state of emergency, severe economic contraction of real GDP of 2 percent or more, or a financial crisis certified by the Eastern Caribbean Central Bank likely to exceed 4 percent of GDP. In the event of triggering the escape clause, the MoF must submit a recovery plan, and suspension of rules may not last more than 1 year.²⁵

The GoG is currently using a computerized accounting system, SmartStream, which does not capture project expenditures financed by the World Bank and other multilateral organizations. As presently configured, SmartStream is geared more toward single-year budgeting and not well suited to meet the challenges of the new multi-year requirements. As such, the financial management of internationally financed projects is undertaken by MOF.²⁶

The Public Finance Management Act defines contingent financial liabilities broadly as any guarantee of the payment obligations of a state-owned enterprise and includes agreements to provide protection against risk of loss. However, after a natural disaster, lines between explicit and implicit contingent liabilities can get blurred. This could be remedied by a schedule that specifies what are considered either implicit or explicit liabilities and the regulatory mechanisms to address both. Explicit contingent liabilities are a fiscal policy imperative that has implications for debt management, expenditure management, and revenue performance. Implicit contingent liabilities, if not planned for and quantified before a disaster, can have serious implications for disaster response financing.

The Contingency Fund

Grenada has allocated reserves of between USD 18,500 and USD 37,000 (EC\$ 49,950 and EC\$ 99,900) into the contingency fund as a line item in its annual budget,²⁷ except for the 2015 budget supplementary where USD 925,000 (EC\$ 2.5 million) was allocated.²⁸ This increase in reserves is a result of a concerted effort to improve fiscal responsibility in recent years and to introduce meaningful contingency appropriations within the budget.²⁹ Grenada's Public Finance Management Act codifies a contingency fund, but capitalization or management of this fund is not clearly mandated, and the fund has not historically been used for disaster-related expenses.³⁰ These limited contingency reserves would be depleted quickly at the onset of a disaster, and additional funds would be reallocated within an already tight fiscal space.

²⁵ Grenada Second Review under the ECF, IMP Country Report No. 15/193. 2015.

²⁶ World Bank. 2011. Project Appraisal Document on a Proposed Credit of SDR 6.2 Million to Grenada for Regional Disaster Vulnerability Projects. Report No. 61650-LAC.

²⁷ GoG. Estimates of Revenue and Expenditure for Years 2013, 2014, and 2015. In 2015, there was no estimated contingency provision.

²⁸ December 4, 2015 meeting with PS Timothy Antoine.

²⁹ Government of Grenada. 2014. Initial Financing Estimates.

³⁰ Grenada National progress report on the implementation of the Hyogo Framework for Action (2011–2013).

The National Transformation Fund

In August 2015, the GoG finalized regulation for the NTF, a public fund in which foreign nationals can make a donation to obtain Grenadian citizenship. The regulations enhance transparency by mandating publication of financial statements; establishing a board of directors; and requiring that, consistent with the Fiscal Responsibility Act of 2015, the first 40 percent of NTF resources must be saved for arrears repayment, debt reduction, and contingency financing for disaster relief.³¹

Grenada's 2017 budget estimates NTF receipts of approximately USD 12 million (EC\$ 32 million). The GoG reaffirms its commitment to adhering to the NTF regulations by saving "40 percent of the monthly inflows into the NTF for debt reduction and other contingency purposes, including natural disasters."³² While this allows the GoG to develop a buffer to cushion negative economic shocks, it does not earmark a specific amount for natural disasters.

The Grenada Reconstruction and Development Fund

In response to the heavy reconstruction costs of the 2004 and 2005 hurricanes, Grenada restructured its external commercial and bilateral debts in 2005, saving USD 150 million (EC\$ 405 million) in debt servicing from 2005 to 2015.³³ Grenada also passed the National Reconstruction Levy (NRL) in 2006,³⁴ through which households earning between USD 371 and USD 1,850 (EC\$ 1,001 and EC\$ 4,995) per month were taxed 3 percent of their income. Households that made between USD 1,850 and USD 3,333 (EC\$ 4,995 and EC\$ 8,999) per month paid a flat monthly rate of USD 225 and USD 350 (EC\$ 608 and EC\$ 945), respectively. This money was transferred into the Grenada Reconstruction and Development Fund managed by the Agency for Reconstruction and Development,³⁵ which started in 2004.³⁶ The IMF lauded the NRL, along with a concurrent 45 percent increase in retail fuel prices, as a key factor in fiscal stabilization.³⁷ The levy, with an estimated USD 3.7 million (EC\$ 10.0 million) annually in revenues,³⁸ was repealed in January 2009.

The National Insurance Scheme

The GoG accessed the National Insurance Scheme (NIS), a pension program, to respond to Hurricane Ivan's impact on short-term unemployment. The program's mandate was expanded to pay benefits in the form of unemployment insurance. This Temporary Unemployment Program assisted employees displaced as a result of the hurricane. The program budgeted for USD 3.7 million (EC\$ 10.0 million), but disbursed only USD 2.7 million (EC\$ 7.3 million) to claimants, indicating a stronger recovery than expected.³⁹ The NIS currently does not offer unemployment insurance as a result of a natural disaster, only as a result of injury.

The CCRIF SPC

Grenada has been a member of CCRIF SPC since 2007, with a parametric windstorm and earthquake insurance policy, and has not yet received a payout. In April 2014, excess rainfall coverage was added to Grenada's policy at no extra charge. In October 2014, Grenada experienced a rainfall event that triggered a "Covered Rainfall Event" according to CCRIF SPC's model. However, the loss calculated was below the policy's attachment point, so no payout was due. In 2013, the World Bank signed a 3 year, USD 2 million (EC\$ 5 million) agreement with Grenada to pay almost all of its annual premiums to CCRIF SPC. Grenada's 2015–2016 fiscal year is the last year that this agreement stands. Grenada is currently (2017) seeking donor assistance to purchase natural disaster insurance at an increased level of coverage to ensure that fiscal policies are not derailed by natural disaster shocks.⁴⁰ The GoG estimates that the cost of this insurance would be USD 3–5 million (EC\$ 8–14 million per year (0.4–0.6 percent of GDP)).⁴¹

31 Third review under ECF. IMF Country Report 15/333. 2015.

32 "Memorandum of Economic and Fiscal Policies by the Authorities of Grenada," included in fifth review under ECF. IMF Country Report No. 16/389. 2016.

33 "Assessment of Public Financial Management in Grenada using the PEFA PFM performance." 2010. Final Report

34 Government of Grenada 2006 Budget Speech.

35 Letter to IMF: Letter of Intent, Memorandum of Economic and Financial Policies, and Technical Memorandum of Understanding. 2014.

36 "Grenada: Use of Fund Resources: Request for Emergency Assistance: Staff Report." 2014. Press Release on the Executive Board Discussion, and Statement by the Executive Director for Grenada Issues 4-405 of IMF country report.

37 "IMF Executive Board Completes First Review under PRGF Arrangement with Grenada, Extends Arrangement, and Approves US\$4.8 Million Disbursement." 2008. Press Release No. 08/169.

38 Government of Grenada 2009 Budget Speech.

39 World Bank, Latin America and the Caribbean Hazard Risk Management Unit. 2005. Grenada: A Nation Rebuilding. An assessment of reconstruction and economic recovery one year after Hurricane Ivan.

40 Ibid.

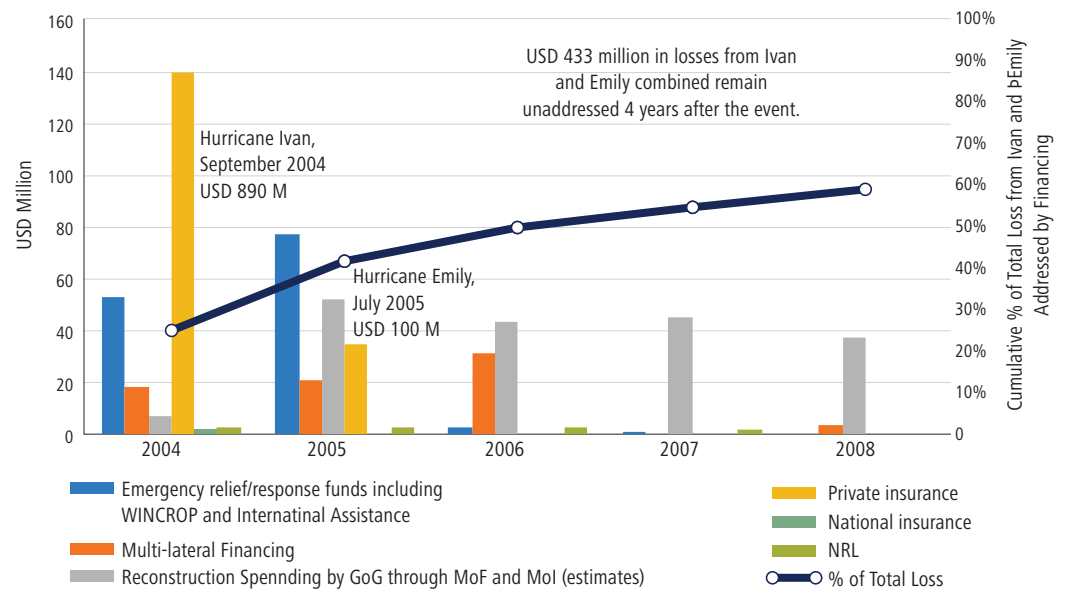
41 Ibid.

Budgetary Framework for Post-Disaster Financing

Budgetary arrangements for financing natural disasters are provided in the Annual Estimates of Revenue and Expenditure as prepared by the MoF. Small amounts are allocated to NaDMA to cover operational expenses, while capital expenditures or expenditures related to any projects in the aftermath of a disaster would be sourced through external grants or loans.

The GoG contributed approximately 5.6 percent to the total cost of the recovery effort after Hurricanes Ivan and Emily for the period 2004–2008 (Figure 7). This effort was realized mainly due to the Reconstruction and Development Fund, which was established to finance Grenada’s reconstruction and development program in the aftermath of the two hurricanes.

Figure 7: Hurricane Ivan Relief, Recovery, and Reconstruction



chapter 3

Chapter 3. Fiscal Disaster Risk Assessment

The quantification of fiscal risks linked to natural disasters, including the government's contingent liabilities, is the first step in devising a cost-effective DRF strategy. Ideally, such an assessment requires a merge between historical loss data analysis and modeled losses derived from natural catastrophe risk models. The objective of this assessment is to inform the GoG of the levels of risk it faces and to facilitate discussions on how it can become more resilient to both current and future risk based on systematic collation and analysis of key baseline data.⁴²

An initial assessment of the government's contingent liability associated with natural 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, causing an estimated total annual economic impact of USD 19.6 million (EC\$ 52.9 million), equivalent to 1.99 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 386.3 million (EC\$ 1,043.0 million) (from both direct and indirect impacts), which equals about 39.26 percent of national GDP.⁴³

Fiscal Disaster Risk Modeling

The CDRP, developed by the World Bank in 2015, presents country- and parish-level probabilistic disaster risk profiles to provide risk assessments and estimates of potential damage to buildings caused by hurricanes⁴⁴ and earthquakes.⁴⁵ Traditionally, sophisticated global building inventory exposure models for use in natural hazard risk assessments are held within the private sector, usually the reinsurance industry and catastrophe risk modeling agencies; 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 Grenada, 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 Grenada was estimated at USD 2.13 billion (EC\$ 5.75 billion) (updated to 2015 values). When the final combined asset replacement and infrastructure density is integrated with existing hazard and vulnerability models, the main result is loss exceedance probability curves, which represent the likelihood that a specific economic loss will be exceeded. This was done for both earthquakes and hurricanes using building exposure.

Fiscal Disaster Risk Profile

Combining the exposure model with hazard and vulnerability models indicates that the AAL to the building stock due to earthquake risks is approximately USD 1.75 million (EC\$ 4.73 million), or 0.18 percent of the national GDP. Additionally, there is a 0.4 percent chance in any given year that these losses are expected to exceed USD 95.7 million (EC\$ 258.4 million), or 9.72 percent of GDP. The loss exceedance curve shows the potential earthquake losses for key return periods. Aggregated results at a parish level underscore

⁴² Any modeled results provided are the expression of a view on possible loss experience, and they should not be taken as predictive of specific future losses or annual experience.

⁴³ USD, EC\$, and GDP figures are in 2015 values.

⁴⁴ The losses associated with hurricanes account for wind damage only, not damage from flooding or storm surge.

⁴⁵ 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 8: Building Exposure by Parish

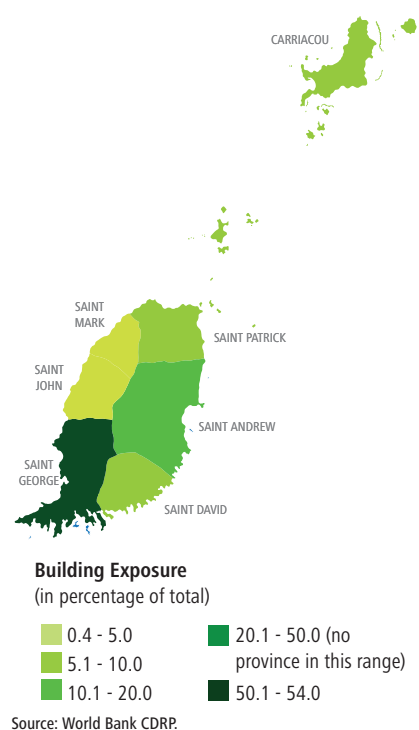


Figure 9: Earthquake AAL by km

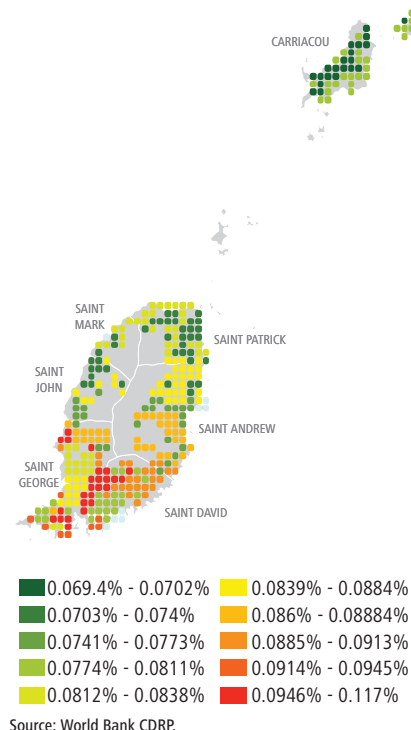
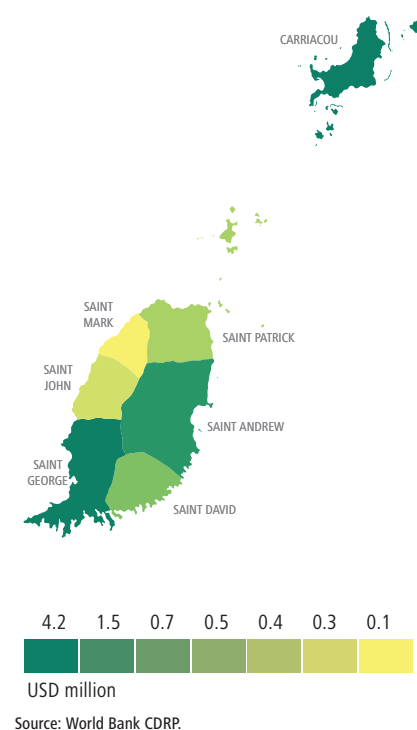


Figure 10: Hurricane AAL by Parish



that Saint George parish accounts for 58 percent of the AAL. Moreover, multifamily, unreinforced concrete block masonry with lime or mortar buildings are buildings most vulnerable to earthquakes: In the long term, annually, 0.24 percent of the total value of this building typology in Grenada is affected by earthquake loss. (See Annex 2 for more-detailed results.)

Regarding hurricane risks, the most prominent hazard in Grenada, the AAL to the building stock is approximately USD 8.19 million (EC\$ 22.1 million), or 0.83 percent of GDP. Additionally, there is a 0.4 percent chance in any given year (or 250-year return period) that these losses are expected to exceed USD 393.8 million (EC\$ 1,063.3 million), or 40.02 percent of GDP. The loss exceedance curve shows the potential hurricane losses for key return periods. The analysis also suggests that single-family, wood light unbraced post and beam frame buildings are incurring the largest losses in the long term, accounting for approximately 21 percent of AAL. (See Annex 2 for more-detailed results.)

Table 4: Earthquake Building Exposure Losses for Key Return Periods

Return Period	USD million	As % of Total Building Exposed Value
Annual Average Loss	1.75	0.082%
Probable Maximum Loss		
10-year return period	0.48	0.022%
50-year return period	17.25	0.809%
100-year return period	40.74	1.911%
250-year return period	95.73	4.490%
500-year return period	158.51	7.435%

Source: World Bank CDRP.

Analysis of Historical Disasters in Grenada

Disaster risk modeling can assist Grenada's MoF in identifying the fiscal impacts of major disasters. However, while probabilistic risk modeling techniques are efficient for low-frequency events and large losses, this approach tends not to accurately capture the most recurrent losses usually caused by small-scale

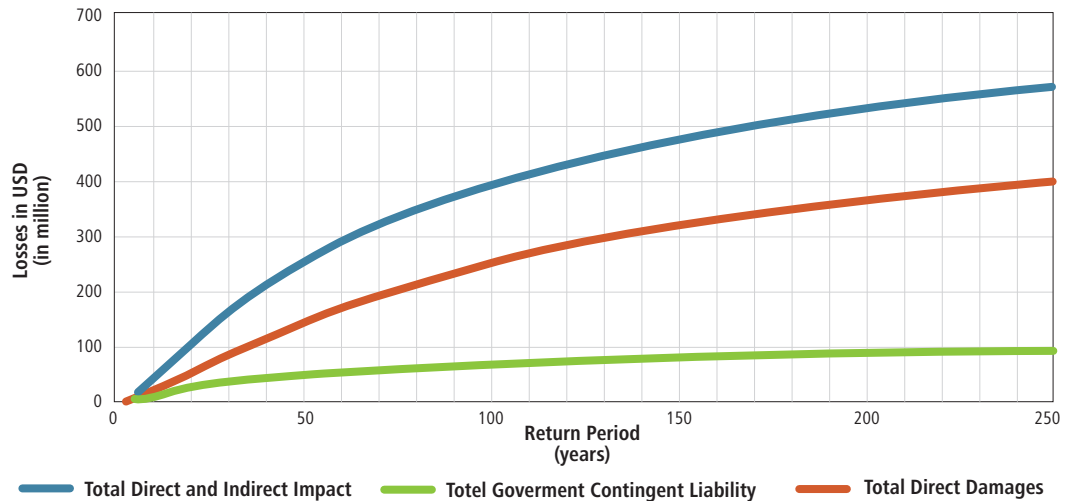
floods or tropical storms. Recurrent small-scale losses must be taken into account because their accumulation can create significant additional losses and therefore poses a non-negligible risk for the government.

Therefore, as a first step, a historical database of natural disasters affecting Grenada in the last 4 decades—from 1975 to 2015—was compiled. Due to data availability, and since hydrometeorological events (floods, hurricanes, storms, etc.) constitute the major risk in Grenada, actuarial analysis on the historical losses are conducted for all hydrometeorological events combined and did not include earthquakes. Statistical analysis was performed to meet two objectives: to adjust the results of the estimated hurricane risk profile for recurrent losses, i.e., low return periods, and to extrapolate the risks on the building stock of the country to determine the public losses that the GoG is facing.

The annual public fiscal disaster losses from hydrometeorological events are approximately USD 3.5 million (EC\$ 9.5 million), i.e., 0.35 percent of the national GDP. Additionally, there is a 1 percent probability in any given year that a loss exceeding USD 64.4 million (EC\$ 173.9 million) will occur, i.e., 6.55 percent of GDP. This means that the GoG will be facing USD 64 million (EC\$ 173 million) in realized contingent liabilities due to damages, which could take the form of relief expenditures, lost revenue, road reconstruction, public school and hospital reconstruction, or any other relief or reconstruction expenditure the government is responsible for after a disaster.

Figure 11 shows the indicative loss exceedance curve for the estimated total economic losses, direct losses and total government’s losses.

Figure 11: National Floods and Wind-Related Events Risk Profile – Indicative Exceedance Probability Curves



Source: Authors.

Table 5: Key Return Periods for Windstorm and Flood Losses

Indicative Risk Metrics	Total Direct and Indirect Impact (USD million)	Total Direct Damages (USD million)	Total Government Contingent Liability (USD million)
AAL	20	12	3.5
10-year return period (10%)	34	17	6
100-year return period (1%)	386	246	64
250-year return period (0.4%)	567	396	89

Source: Authors’ analysis.

In summary, this fiscal disaster risk assessment provides the GoG with an order-of-magnitude estimate of its possible public spending needs for post-disaster operations. Due to the lack of historical recorded losses from earthquakes, 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 GoG may wish to consider in the development of a national DRF strategy, further discussed in Chapter 5.

CCRIF SPC products, as well as a contingent line of credit, such as a World Bank Cat DDO or 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 days⁴⁶ of the index calculation.⁴⁷ 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 DRF 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 risk aversion of the decision makers. Indeed, *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 other instruments to integrate these aspirations to efficiently devise such a tailored strategy in the long run. More details can be found at collaboration.worldbank.org/groups/cdrp.

⁴⁶ Business days are defined as days on which banks in the Cayman Islands are open for regular business.

⁴⁷ More specifically, CCRIF SPC has the discretion to delay payment to not more than 90 days following receipt of the insured's claim.

Chapter 4. Review of the Catastrophe Insurance Market in Grenada⁴⁸

Catastrophe insurance is an efficient *ex-ante* risk financing instrument through which to transfer part of a country's financial risk. This chapter presents an overview of the current insurance and reinsurance market in Grenada, with a focus on private and public catastrophe insurance, providing specific insights into the government's capacity to play a key role in the country's DRF strategy. Specifically:

1. **Low non-life insurance penetration rates in Grenada mean that the private sector is underinsured.** This increases the indirect contingent liability of the GoG because it is often perceived as the insurer of last resort.
2. **The GoG can more cost effectively mitigate natural disaster risk by insuring public assets and consolidating coverage into larger policies that reduce rates.**
3. **Current soft market conditions (as of September 2017) mean that premiums are lower, coverage is broader, and underwriting is easier.**

Market Overview

Grenada's non-life insurance market is larger than those of Dominica and St. Vincent, and smaller than those of Saint Lucia and Antigua and Barbuda. In 2013, per capita spending on property insurance was USD 310 (EC\$ 837). Gross written premium (GWP) increased slightly between 2012 to 2013, while there was a modest regression in 2014 and 2015. Property premiums have actually stagnated or contracted recently, along with the automobile business, which is feeling the effects of increased competition and rate reductions. The 2009 collapses of the Colonial Life Insurance Company and the British American Insurance Company,⁴⁹ while mainly affecting the life and health insurance sectors, has fueled a lack of confidence and trust in insurance companies in the region. Insurance premium collection issues have become a current and serious concern to insurers and will likely continue.

Table 6: **Gross Written Premiums in Grenada**

	Year				5-Year Compound Annual Growth Rate
	2012	2013	2014	2015	
Gross Written Premiums* (USD million)	39.1	38.9	38.6	40.1	
Non-Life Insurance Premiums (USD million)	29.4	30.0	29.6	28.2	(1.04%)
Life Insurance Premiums (USD million)	9.7	8.9	9.0	11.9	5.38%

* Axco Country Report.

Regional property insurance rates are higher for homeowners than for commercial enterprises, although both are subject to downward pressure. Market sources indicate that the average commercial insurance rate for the overall market is 0.54 percent of the total sums insured, or USD 5.40 per USD 1,000 (EC\$ 14.58 per EC\$ 2,700) of insurance coverage. Homeowners' rates (including contents) tend to be 0.25 percent to 1.00 percent higher than commercial rates. Rates were historically USD 7.50–USD 8.50 per USD 1,000 (EC\$ 20.25–EC\$ 22.95 per EC\$ 2,700) of coverage several years ago, and USD 6.00–USD 6.50 per USD 1,000 (EC\$ 16.20–EC\$ 17.55 per EC\$ 2,700) over the last couple of years. However, in Grenada's domestic market, commercial rates between USD 6.00 and USD 7.00 per 1,000 (EC\$ 16.20 and EC\$ 18.90 per EC\$ 2,700) of insurance coverage are higher than homeowner rates.

⁴⁸ This high-level industry review was intended to inform recommendations to the Government of Grenada 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.

⁴⁹ Both of these companies are part of the CL Financial conglomerate.

Market observers comment that when mortgages end and banks no longer require insurance on mortgaged properties, many insureds lapse their policies. In recessionary times, these lapses are not replaced in the same numbers by new mortgages being contracted and so the market shrinks. The situation is compounded in the commercial sector by the closure of businesses and by fewer construction projects being undertaken.

Underinsurance remains common, even in the aftermath of Hurricane Ivan. In the current economic climate, local sources report that, even if insureds understand the average clause, they will still often underinsure purely for reasons of cost. United Kingdom-style average clauses apply to property policies on either an 85 percent basis (usually for homeowners) or a 100 percent basis and may only be deleted under exceptional circumstances.

On the other hand, Grenada has a higher insurance market penetration than the Caribbean as a whole and is arguably better insured than other jurisdictions in the Eastern Caribbean. In 2015, life and non-life insurance penetration (comprising total GWP as a percentage of GDP) was 6.1 percent, slightly above that of the Pan-Caribbean region (5.8 percent).⁵⁰ The non-life insurance penetration was 3.8 percent in 2015.⁵¹

Grenada has been a leading jurisdiction among the Organization of Eastern Caribbean States (OECS) in trying to harmonize regional insurance laws. Grenada has approximately one insurer for every 7,000 inhabitants, which, in fact, is a better ratio than other OECS jurisdictions, where there is approximately one insurer for every 3,700 inhabitants. The Grenadian insurance market is moderately concentrated, with the top 10 insurers writing more than 90 percent of the general insurance business in 2015. The insurance sector in Grenada mirrors those of many other Caribbean islands in that insurance companies comprise a proliferation of general agency operations sharing the market with a relatively small number of largely Caribbean-owned companies, although the presence of non-Caribbean insurers is very limited. The number of agencies and companies is disproportionately large for the small volume of business in the region. Furthermore, any insurer wishing to operate on more than one island must apply for a separate license.

Key Market Players

There are currently 15 general insurance companies operating in Grenada. Guardian General Insurance Ltd. is the market leader for property business, with approximately 16 percent of the market share. Massy United Insurance Ltd. and Grenadian General Insurance Company Ltd. have approximately 11 percent each as the second and third largest non-life insurance policy writers on the island. Lloyd's is licensed to accept direct non-life insurance business and also operates as a reinsurer.

Table 7: Market Share by General Insurer

Insurer	General Insurance Market Share (2014)	General Insurance Market Share (2015)
Guardian General	16.0%	15.8%
Massy United	11.5%	11.5%
Grenadian General	10.9%	11.3%
Netherlands Insurance	9.5%	9.8%
NEWIM	7.7%	8.1%
Caribbean Alliance	7.4%	7.9%
NAGICO	7.3%	7.8%
Guyana & Trinidad Mutual	6.6%	7.3%
Sun General	3.0%	4.6%
Lloyd's	7.4%	3.6%
Eastern Caribbean Insurance	1.5%	1.5%
Island Heritage	1.0%	0.6%
Gulf Insurance	0.3%	0.4%
American Home	0.1%	0.1%
Grenada Motor & General	1.4%	0.0%

Source: GARFIN Annual Insurance Market Reports – 2014 and 2015.

⁵⁰ AM Best Special Report: A Snapshot of the Caribbean Insurance Market. 2015.

⁵¹ Industry statistics, rating agencies, regulatory bodies, Axco reports.

Private Reinsurance

There are no local reinsurance companies in Grenada, and no reinsurance is transacted between companies locally. There are no specific legal requirements for reinsurers. 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. Marine reinsurance is largely placed in Lloyd's, while the London and French markets are mainly used for aviation reinsurance.

The non-life insurance market depends heavily on reinsurance to protect against natural perils, mainly windstorms. There has been little change in catastrophe reinsurance costs for Grenada in recent years, which is driven largely by the potential hurricane exposure and, to a lesser extent by the flood, by earthquake and volcanic eruption exposures. Pricing has stagnated and even decreased, which would attest to the soft market conditions for property insurance in Grenada.

Pro-rata programs with long-term track records and relationships have generally been maintained, and, while some reinsurers have exited the market due to inadequate pricing, new capacity has easily absorbed any gaps in coverage. Most reinsurers have now established event limits; downward commission adjustments have also been applied to some treaties, and reinsurers continue to seek assurances about maintaining original rates, albeit without normally applying warranties to this effect. Table 8 demonstrates the reliance on reinsurance for various insurers in the marketplace. Companies having less reliance on the reinsurance market are mostly writing automobile insurance.

Table 8: Retention Ratio by General Insurer

Insurer	Gross Premium (USD) Income (2015)	Net Premium (USD) Income (2015)	Retention Ratio
Guardian General	4,735,190	1,339,259	28.3%
Massy United	3,400,740	1,219,192	35.9%
Grenadian General	3,240,502	1,071,932	33.1%
Netherlands Insurance	2,757,557	1,532,941	55.6%
NEWIM	2,285,481	1,316,495	57.6%
Caribbean Alliance	2,203,333	963,333	43.7%
NAGICO	2,152,963	1,075,926	50.0%
Guyana & Trinidad Mutual	1,957,037	1,591,852	81.3%
Sun General	878,518	212,222	24.2%
Lloyd's	2,197,778	0	0.0%
Eastern Caribbean Insurance	336,667	408,187	(21.2%)
Island Heritage	292,592	(48,148)	16.5%
Gulf Insurance	102,592	31,111	30.3%
American Home	16,667	18,889	(13.3%)
Grenada Motor & General	418,664	0	0.0%
Total	28,238,963	11,307,383	40.0%

Source: GARFIN Annual Insurance Market Report 2014-2015.

Regulatory Capital, Statutory Deposit, and Solvency Requirements

The Insurance (Amendment) Act 2013 introduced new revenue-generating powers for the regulator Grenada Authority for the Regulation of Financial Institutions (GARFIN). Non-life insurers are required to pay a levy of 1 percent on GWP on all novation, renewals, and additional premiums from June 1, 2013, and this levy must not be shown or referred to in writing on any policy document or related material. The act is designed to generate income to fund GARFIN's day-to-day operations because annual fees paid by licensees were insufficient to meet its expenses. GARFIN performs periodic on-site examinations of insurance companies and is in the process of implementing a form of risk-based supervision.

The new Insurance Act No. 5 went into effect on March 26, 2010, by way of Statutory Rule and Order No. 6 of 2010. The legislation is based on the Eastern Caribbean Central Bank's draft Uniform Insurance Act, which has been under review for a number of years, with the intention that it would replace the existing insurance legislation in force for all countries in the OECS.

In July 2011, Grenada's parliament passed an Insurance (Amendment) Act of 2011 that broadens the definition of "local company" to include companies that are incorporated not only in Grenada, but also in the

ECCU, in keeping with the drive by the ECCU to create one single financial space in the OECS subregion. Non-life insurance solvency requirements mandate that a company's assets exceed its liabilities by either a minimum monetary amount or a percentage of net premium income, whichever is greater. The minimum paid-up capital is USD 185,185 (EC\$ 500,000) and the total capital must be higher than the minimum or 20 percent of net premium income.

Natural Catastrophe Insurance and Losses

The domestic insurance market paid out an estimated USD 175 million (EC\$ 473 million) following Hurricane Ivan, almost 30 percent of GDP,⁵² relating to approximately 5,200 reported losses, of which 75 percent were under homeowners' policies. The cost to the insurance sector in Grenada could have been significantly higher, however. Figures produced by the Association of Grenada Insurance Companies (AGIC) show that fewer than 20 percent of residential buildings were insured, the figure for contents was even lower, at less than 10 percent. Approximately 90 percent of all houses were damaged or destroyed, together with government buildings, hospitals, schools, churches, hotels, and a prison. Despite the extent of the damage, all 13 members of AGIC were able to meet their financial obligations. Grenada was again struck in July 2005, by Hurricane Emily. The total direct and indirect damage costs were estimated to be about USD 50 million (EC\$ 135 million), but insurance losses were said to be less than USD 5 million (EC\$ 14 million).

Table 9: Recent Insured Losses in Grenada

Event (Year)	Insured Loss (USD million)	Economic Loss (USD million)	Insured Market Penetration (Insured/Economic)
Hurricane Ivan (2004)	175.0	900.0	19.4%
Hurricane Emily (2005)	5.0	50.0	10.0%
Hurricane Lenny (1999)	0.0	100.0	N/A

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

Catastrophe Private Insurance Market

Market sources indicate that only 20 percent to 40 percent of homeowners are estimated to have windstorm insurance, often conditioned on borrowing money. Insurance is generally limited to mortgage holders, a minority in Grenada. Many individuals insure only the value of their loan and will cancel coverage when the loan has been repaid. Furthermore, insurance settlements are not always sufficient due to such factors as underinsurance and the rise in construction prices following hurricanes.

To evaluate the adequacy of Grenada's non-life insurance coverage, the following analysis uses a process of adjustment. The initial measures of non-life insurance penetration are adjusted by the expected losses resulting from natural catastrophes and the income levels in 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 Grenadian market is "moderately insured."⁵³ For countries such as Norway that 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 Grenada, 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 Grenada to aim to become better insured compared to other middle-income countries.

All companies maintain earthquake aggregates. However, as hurricane is the principal exposure, insurers use their probable maximum losses (PMLs) for windstorms to establish reinsurance requirements. Reinsurers have increasingly insisted on their clients using exposure modeling to control their exposures, although in the Caribbean this primarily relates to the windstorm exposure.

Property rates are not broken down into their component parts. Market sources estimate that the catastrophe element of local property rates probably represents between 50 percent and 70 percent of the overall rate, although the windstorm element would normally be the major factor. A deductible of 2 percent normally applies to earthquake, volcano, and windstorm losses on a per-insured-item basis. The percentage catastrophe deductible is usually subject to a minimum monetary amount, typically USD 926 (EC\$ 2,500).

⁵² World Bank Latin America and the Caribbean Hazard Risk Management Unit. 2005.

⁵³ 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 percent and 1.36 percent. Countries below 0 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 10: Risk-Adjusted Insurance Adequacy for Grenada, 2016*

Non-life insurance penetration	3.80%
LESS expected annual loss (% of GDP)*	(1.10%)
Expected loss adjusted penetration	2.70%
LESS benchmark requirement (for upper middle-income**)	(1.60%)
Benchmarked insurance coverage	1.10%
Insurance Adequacy (% of GDP – in USD millions)	10,824

* AAL to the building stock from the results of the risk profile presented in Chapter 3.

** World Bank country income classification.

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

Some insurers offer higher deductible options, typically 5 percent, with a modest premium discount. The amount of premium charged divided by the limit of coverage for catastrophic excess of loss protection is called the rate-on-line. The rate-on-line for non-life insurers in Grenada is 5.5 percent to 6.5 percent.

Insurance for Grenada's banana crop is handled exclusively through Windward Islands Crop Insurance Ltd (WINCROP). WINCROP started in Grenada in 2000, was suspended after Hurricanes Ivan and Emily, and was restarted in 2012. It provides statutory indemnity insurance against loss of banana holdings by windstorm and volcanic eruption.⁵⁴ There are no government contributions. WINCROP received 581 total claims from Grenada from 2000 to 2009, and paid 479 of them—totaling USD 128,295 (EC\$ 346,397). A Grenada banana farmer received one payout in 2015. This amounts to only 0.4 percent of overall WINCROP claims.⁵⁵ WINCROP is designing new products to cover nutmeg, cocoa, and other crops of high market value.

Low-income individuals in Grenada are eligible for insurance from wind and excess rain through the Livelihood Protection Policy (LPP), a weather index-based insurance policy designed by the Grenada-based Trans-Nemwil Insurance Ltd., together with Grenada Co-Operative Bank Ltd. and Grenville Co-Operative Credit Union. The LPP helps low-income individuals recover from the damage caused by strong winds and/or heavy rainfall during hurricanes and tropical storms. Targeted at all low-income individuals irrespective of occupation, the LPP provides timely cash payouts soon after a weather event. The product is available across the island through local distribution channels, including cooperative banks, credit unions, and farmer associations. The LPP was developed through the "Climate Risk Adaptation and Insurance in the Caribbean" project implemented by the Munich Climate Insurance Initiative in partnership with CCRIF SPC, MicroEnsure, and Munich Re.⁵⁶

Catastrophe Public Insurance

Grenada is one of the 16 members of CCRIF SPC, which, since its founding in June 2007, has given member governments cover against losses caused by earthquakes and hurricanes. CCRIF SPC is the first multi-country catastrophe insurance (not-for-profit) pool and 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.

⁵⁴ CARICOM. 2010. "Looking inward for agriculture insurance solutions – CCRIF sees potential for expanded role in Agriculture Risk Management." Press Release 279/2010.

⁵⁵ Caribbean Initiatives presentation by Kevin Stephenson Inter-American Institute for Cooperation on Agriculture, at the Fifth Symposium on Agricultural Risk and Insurance in Washington, DC. 2015.

⁵⁶ Munich Climate Insurance Initiative. Available at: <http://www.climate-insurance.org>.

Chapter 5

Chapter 5.

Recommendations for a National Disaster Risk Financing Strategy in Grenada

A comprehensive national DRF strategy for Grenada should be designed to improve the capacity of the government to access immediate financial resources in the event of a national disaster and be flexible to allow for a proportional response based on magnitude of loss, while minimizing reallocations from existing programs and maintaining the fiscal balance. Eleven recommendations for a comprehensive DRF strategy in Grenada are presented in Table 11, 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 government; preparing the environment for financial solutions to operate efficiently; and then arranging the solutions

Recommendations

Table 11: Strategy Recommendations for DRF in Grenada

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. Develop an inventory of public assets in Grenada – potential link to cadaster.
	3. Create the legal institutional environment for DRF as the key to strategy sustainability.
	a. Review the Public Financial Management Act and consider inclusion of earmarking funds specifically for disasters.
	b. Establish or re-establish a mechanism for the rapid disbursement of financing of post-disaster expenses.
	c. Review the legal definition of contingent liabilities.
	d. Integrate explicit contingent liabilities in budgetary planning process.
	e. Review Public Sector Investment Program and Smartstream for their ability to track post-disaster expenditures.
	4. Codify or approve a DRF strategy.
	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.
	5. Increase contingency reserves earmarked only for natural disasters through the NTF for public contingent liabilities with events with a 10-year return period.
Medium Term	a. Establish safeguards to ensure appropriate fund management.
	b. Conduct an audit of the selected mechanism to ensure that all funds for short-term disaster financing have been transferred.
Medium Term	6. Establish contingent line of credit to finance public contingent liabilities associated with events of a 15 year return period.
	7. Establish a robust catastrophe risk insurance program for public assets.
Long Term	8. Enhance management of contingent liability related to social protection.
	9. Explore diaspora bond and catastrophe bond markets.
Private Insurance Market	
Medium Term	10. Enhance availability, penetration, and affordability of private and residential catastrophe insurance (potential public-private partnerships [PPPs]).
	11. Enhance data sharing on agricultural insurance and develop more-robust and -affordable products for smallholder farmers.

Source: Authors.

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 play a significant role in the development of DRM strategies and financing instruments.

Grenada has a system of collecting and reporting information related to the damage and losses sustained by different sectors for low-frequency, high-intensity events. However, information on damage and loss from high-frequency, low-intensity events is not reported in detail across ministries.

A new database in line with the standard damage and loss assessment (DaLA) methodology across ministries is recommended, along with guidelines on how and when to enter information. Discussions with the MoF suggest that NaDMA could maintain and update the database if the appropriate funding was obtained. 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 for reconstruction and retrofitting of existing infrastructure. Such a database would also be useful in substantiating appeals to donors, for example, the Climate Investment Fund. Although this initiative could be launched in the short term, a comprehensive database might take time to be fully completed.

2 Develop an Inventory of public assets in Grenada – potential link to cadaster.

This DRFTA Project recommendation complements the Public Finance Management Act, under which there is requirement for development of an inventory of public assets. An asset management plan, which includes an inventory, is under development as part of an ongoing PFM reform program. Along with the uniform loss and damage reporting system (Recommendation 1), this system could potentially be implemented through coordination with NaDMA and other stakeholders but reside with the MoF. Both the inventory and the loss reporting system would inform an ongoing effort that prioritizes the reconstruction of buildings damaged by Hurricane Ivan. Rehabilitation and retrofitting existing currently uninhabited buildings could reduce government costs by decreasing rental payments, building resiliency in a pool of government assets, and increasing insurance coverage for public assets. An inventory of public assets is also the first step in accounting for the GoG'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.⁵⁷ Generally, the more accurate the inventory is, the more accurate the fiscal risk assessment. The inventory could also include private assets, such as houses and small and medium enterprises, to inform the national cadaster, a key component of the ongoing RDVRP. 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 GoG may choose to standardize and house the information on an open-source web-based platform and make it accessible to all stakeholders.

3 Create the legal institutional environment for DRF as the key to strategy sustainability.

The PFM assessment has raised a number of issues that require policy and/or legislative and regulatory actions to ensure that a DRF strategy can operate cost-effectively and -efficiently. Also important to the sustainability of the strategy is a disaster risk model that provides updated and accurate risk information based on hazard, exposure, and vulnerability. The options, as outlined below, address specific issues identified in the budgetary analysis and through discussions with the GoG.

⁵⁷ World Bank. 2013. "Quantify Contingent Liabilities Associated with Natural Disasters." Available at: <http://documents.worldbank.org/curated/en/67221467997574054/pdf/97977-BRI-Box3914998-PUBLIC-Short-Note-1-Risk-Assessment-04Nov2013.pdf>.

a Review the Public Financial Management Act and consider inclusion of earmarking funds specifically for disasters.

Currently, the 2 percent of revenues that the Public Financial Management Act mandates be channeled in contingency funding are not specifically earmarked for natural disaster response and may be used for other unforeseen expenses. This report recommends nominal contributions each year in the short term, with a medium-term goal of reaching at least USD 3 million (EC\$ 8 million) in reserves. A contingency fund should be capitalized continuously with at least USD 3 million- (EC\$ 8 million), which is roughly equivalent to the AAL of explicit public contingent liabilities

b Establish or re-establish a mechanism for the rapid disbursement of financing of post-disaster expenses.

Review the time it takes to get approval for warrants to be issued to ministries for disaster-related expenditures, relative to when the submissions are received by the MoF. It may be prudent to further amend proceedings to reduce the time to 1 week post-submission to minimize further losses from delayed relief and recovery funds. These amendments would eliminate or reduce the bottlenecks in receiving contingent funding for relief operations.

c Review the legal definition of contingent liabilities.

Review the existing definition of contingent liabilities and, where appropriate, make amendments to ensure that it is relevant to the central government's contingent liabilities associated with disasters.

Ensure that the appropriate accounting treatment is used for both contingent liabilities and any weather-related fund to ensure budget transparency. The accounting treatment of both contingent liabilities and the weather-related fund—specifically the International Public Sector Accounting Standards—will need to be determined before implementation to inform the law.

d Integrate explicit contingent liabilities in budgetary planning process.

A common weakness in budgetary preparation lies in quasi-fiscal expenditures, or contingent liabilities, not being taken into account. Examples of such quasi-fiscal expenditures include interest subsidies paid by the central bank on loans to public enterprises and special support operations for banks and public or private sector enterprises administered through the banking system. However, quasi-fiscal expenditures also include spending by nonfinancial public enterprises that represent the provision of public goods (e.g., schools or hospitals) or unplanned disaster response and reconstruction.⁵⁸

In general, it is difficult to estimate the cost of future disaster responses and to consolidate such data in the general government budget tables. But to gain an overall assessment of the fiscal stance, it may be necessary to assess the size of such operations through estimation of the government's physical assets and to notionally add the figures to the information on general government operations. In addition, those preparing the budget should take every opportunity to persuade policy makers to transform potential post-disaster social safety payouts, cash transfers, etc., to the extent that they can plan for such an expense, within the budget.

The government should ensure that a careful record of all such explicit contingent liabilities is maintained, while recognizing that there will always be some uncertainty on the impacts of natural disasters, as well as moral pressures on implicit contingent liabilities, and ensuring that there are sufficient resources in the contingency reserve and potential payouts from sovereign catastrophe insurance or contingent financing mechanisms to meet such expenditures. Those preparing the budget should ensure that some estimate of expenditures from both explicit and implicit contingent liabilities is allowed for in budget preparation.

e Review Public Sector Investment Program and Smartstream for their ability to track post-disaster expenditures.

4 Codify or approve a DRF strategy.

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, 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.

⁵⁸ Potter, Barry H. and Diamond, Jack. 1999. "Guidelines for Public Expenditure Management." IMF

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

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.

The MoF should develop a post-disaster manual and procedures for the government, in collaboration with all the key agencies, including NaDMA, with a view to shortening the time it takes to approve expenditure 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.

5 Increase contingency reserves earmarked only for natural disasters through the NTF for public contingent liabilities associated with events with a 10-year return period.

The contingency reserves should address low-impact, high-frequency events (events with return periods of 1–10 years). These funds must 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.

a Establish safeguards to ensure appropriate fund management.

b Conduct an audit of the selected mechanism to ensure that all funds for short-term disaster financing have been transferred.

6 Engage a contingent line of credit to finance public contingent liabilities associated with events of a 15-year return period.

Engaging international development partners to develop more-flexible instruments addresses not only reconstruction but also relief and recovery. The GoG 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 World Bank Cat DDO or IMF RCF, which is complementary to CCRIF SPC, is customizable in terms of triggers and 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 situation of needing to assess permanency of a shock in real time.

7 Establish a robust catastrophe risk insurance program for public assets.

The Government 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 the 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 structure a national insurance portfolio of public assets that could be placed on the private

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 policy maker may mimic, to some extent at least, a procyclical policy maker. 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.



(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.

8 Enhance management of contingent liability related to social protection.

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 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 ensure the effectiveness of such programs, quantifying the costs and benefits of disaster-linked social protection schemes and their impact on the budget is also key.

For example, Grenada's Support of Education, Empowerment, and Development (SEED) Program aims to reduce poverty and increase investments in human capital among the poor and vulnerable. The World Bank Grenada Safety Net Advancement Project (P123128) is strengthening the basic architecture of the SEED Program and the capacity of the Ministry of Social Development and Housing to implement it. The benefits under SEED include conditional cash transfers linked to such things as the recipients' adherence to health checkups and school attendance. Building in natural disaster responsiveness to a social net program means designing it to "scale up" after a disaster, to either reach more beneficiaries in the same or different area that the program may reach normally or to 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.⁵⁹

9 Explore diaspora bond and catastrophe bond markets.

Diaspora bonds could be of interest as another risk financing instrument. They were discussed by the previous administration, and there is potential appetite and market for such products. Grenada received USD 29.6 million (EC\$ 79.9 million) in personal remittances in 2015; they had previously peaked at USD 48.1 million (EC\$ 129.9 million) in 2004.⁶⁰ If the GoG can successfully harness remittance flows during times of disaster, through convincing the diaspora to redirect or increase remittance payments into public assistance, diaspora bonds represent a potential external instrument for borrowing. These bonds provide an alternative to costly foreign borrowing.

The success of using such bonds relies heavily on the "patriotic discount" based on variables of trust in governance and the patriotism of the diaspora.⁶¹ Israel, since 1951, and India, since 1991, have been on the forefront in raising hard-currency financing from their respective diaspora. Israeli bonds have been sold globally, with sales approaching USD 40 billion (EC\$ 108 billion). On the other hand, India has used issuances of diaspora bonds in periods of financial turmoil by, in 1991, offering "India Development Bonds" during a balance of payments crisis and, in 1998, offering "Resurgent India Bonds."

Private Insurance Market

10 Enhance availability, penetration, and affordability of private and residential catastrophe insurance (potential public-private partnerships [PPPs]).

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

⁵⁹ World Bank. 2015. R2D2: Responding to Disasters Together. Washington, DC: World Bank.

⁶⁰ World Bank DataBank. 2017.

⁶¹ Akkoyunlu, Sule and Stern, Maximilian. 2012. "Empirical Analysis of Diaspora Bonds." Research Paper 3. Graduate Institute of Geneva.

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.⁶²

AGIC is well positioned to partner with the GoG in designing a PPP for catastrophe insurance. The local insurance industry has proved, through its response to Hurricane Ivan, that it has the capacity to respond to severe events and, through interviews in the DRFTA Project, also has demonstrated a desire to work with the government to expand natural disaster protection throughout the island.

Figure 12: Advantages of PPPs to Governments and the Insurance Industry

Advantage for governments

- Microinsurance can bring a cliente-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 clientes 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: International Labor Office Geneva. 2015. "Making public-private partnerships work in insurance." Paper no. 40

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

Grenada's economic recovery after two hurricanes presents several constraints in agriculture and the export sector. For example, a reduction in the number of farmers, which is driven by an aging population and by the lack of interest from younger generations to work in the agricultural sector, is an important restriction. In spite of a government subsidy provided to reduce the higher costs of production, the labor and land-clearing costs are prohibitive. Additional constraints are explained by an increase in tree diseases, a lack of planning materials, and an uncertainty about the economic impact of future extreme weather events.⁶³

The GoG has made efforts to lessen uncertainty as a barrier to a productive smallholder agricultural sector. Grenada has allocated USD 370,000 (EC\$ 999,000) in an Emergency Relief Fund to help affected farmers in the event of losses. This fund does not replace the need for crop insurance, which the government will continue to pursue with regional and international partners. 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 to access reinsurance markets.⁶⁴ Further analysis can be undertaken to explore successes and challenges in agricultural PPPs.

⁶² Ramm, G. 2011. "Public-private partnerships in microinsurance." Discussion Paper No. 001. Luxembourg, Microinsurance Network.

⁶³ World Bank. 2012. "Agricultural Risk Management in the Caribbean: Lessons and Experiences." World Bank Latin American and Caribbean Region

⁶⁴ Ibid.

Table 12: 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 <i>ex ante</i> 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: International Labor Office Geneva. 2015. "Making public-private partnerships work in insurance." Paper no. 40.

Annex 1. Operational Disaster Risk Financing and Insurance Framework

Table A1-1: Actions Taken by Governments for Financial Protection

Actions by Governments for Financial Protection of the State		Actions by Government for Financial Protection of Society		
Actions	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	<ul style="list-style-type: none">Collect and manage risk and loss dataQuantify potential disaster related losses from fiscal and budget perspectiveAssess potential post-disaster (short term and long term) funding gaps	<ul style="list-style-type: none">Collect and manage risk and loss dataQuantify potential disaster related losses from property damageIdentify proportion of losses incurred by public and private stakeholdersAssess capacity of domestic insurance markets		<ul style="list-style-type: none">Collect and manage disaster risk and loss/impact dataQuantify potential disaster related losses on low-income populationQuantify fiscal impact of potential disaster related losses through social protection programs
Arrange Financial Solutions	<ul style="list-style-type: none">Develop Financial decision making toolsDevelop national strategy for financial protection<ul style="list-style-type: none">Secure immediate liquidity for budget support following disasters: risk layering including reserves, contingent credit, and catastrophe risk transferSecure longer term reconstruction financing, e.g., insurance program for public assets	<ul style="list-style-type: none">Promote domestic demand for insurance<ul style="list-style-type: none">Financial incentives through premium subsidies and/or tax breaksCompulsory vs voluntary schemesAwareness/education of consumers on insurance productsDevelop domestic supply of insurance<ul style="list-style-type: none">Assess legal and regulatory environment to allow private sector to develop/test private insurance solutions while protecting consumersRisk data collection, management and sharingProduct development (indemnity and index based)Insurance pools		<ul style="list-style-type: none">Secure contingent funding for social protection programs against disastersComplement/enhance social protection programs with insurance principles and market-based products including use of transparent for payouts
Deliver Funds to Beneficiaries	<ul style="list-style-type: none">Establish national disaster fundEstablish transparent, timely and effective post disaster loss reporting mechanismsEstablish post disaster budget execution mechanisms to transfer funds from national to subnational level and from MoF to line ministries	<ul style="list-style-type: none">Develop risk market infrastructure to support delivery channels<ul style="list-style-type: none">Underwriting and claims settlement processDelivery channels through insurance agentsAlternative delivery channels: Banks, micro-finance Intermediaries, input providers, NGOs, etc.		<ul style="list-style-type: none">Improve beneficiary targeting and assessing eligibility for post-disaster payouts
Linkages to DRM	Reduce Underlying Drivers of Risk			

Table A1-2: 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 PPP 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 Index-Based 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>

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)
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>	As a PPP the Turkish Catastrophe Insurance Pool relies on the domestic insurance market for the distribution and claims settlement.	<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 2. Grenada Country Disaster Risk Profile

COUNTRYDISASTER RISK PROFILES WORLD BANK GROUP

GRENADA 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.

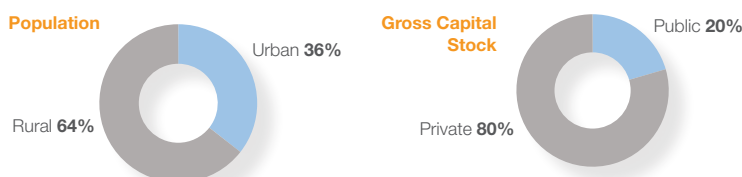
Country Disaster Risk Profile

Applications

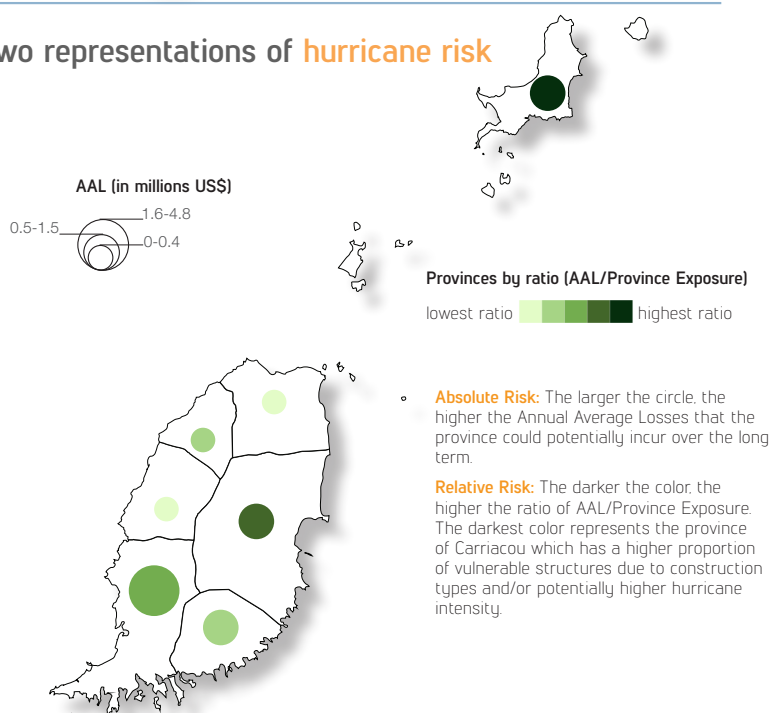
- ▶ Inform disaster risk financing
- ▶ Develop key baseline data
- ▶ Evaluate impact of disasters
- ▶ Promote and inform risk reduction

Country At-A-Glance

GDP US\$ 912 million | Population 106,000 | Total Building Exposure US\$ (Replacement Value) 2.1 billion



Two representations of hurricane risk



Snapshot

▶ The **hurricane risk** in Grenada is **more significant** than the **earthquake risk**.

▶ Annual Average Loss (AAL) from **hurricanes** is **US\$ 8.2M (0.9% of GDP)** and from **earthquakes** is **US\$ 1.8M (0.2% of GDP)**.

▶ The Probable Maximum Loss for **hurricanes** (250 year return period) is **US\$ 397M (43.6% of GDP)** and for **earthquakes** (250 year return period) is **US\$ 96M (10.5% of GDP)**.

▶ Single-family, wood light unbraced post and beam frame are the buildings most vulnerable to **hurricanes**, **accounting for approximately 20% of AAL**.

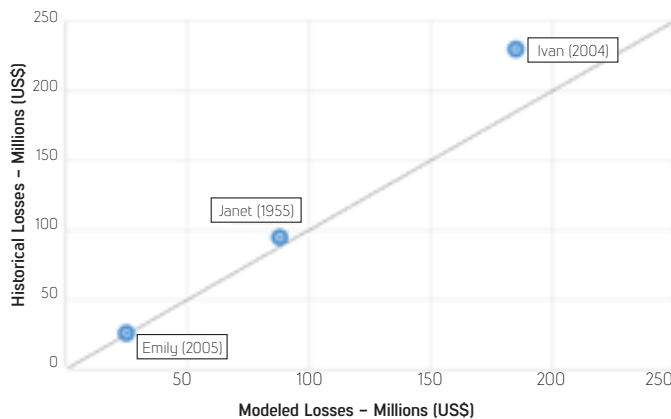
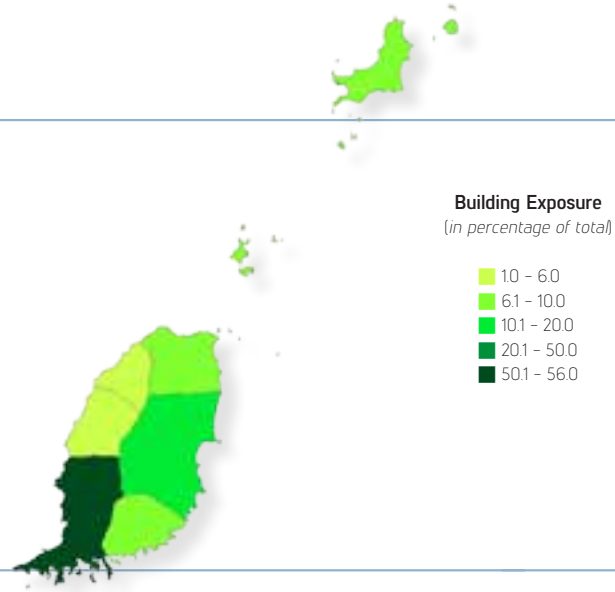
COUNTRYDISASTER RISK PROFILES

GRENADA

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.



What have been the historical losses?

Grenada has suffered significant losses from hurricanes. The direct losses have been modeled to a high degree of accuracy in the risk profile. In 2004, Hurricane Ivan struck Grenada. If this historical event were to happen in 2016, it would cause a loss of US\$ 230M, amounting to 25% of GDP.

The chart shows the direct actual and modeled losses due to historical events.

What are the potential future losses?



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

This is the first step of quantification of contingent liability. Next steps include determining its impact on budgetary appropriation, which would directly inform the development of the disaster risk financing strategy.

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

Annex 3. DRFTA Methodology of Quantifying Contingent Liabilities

Box A3-1. 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 A3-2. Loss Risk Estimation Data, Methodology, and Key Assumptions

The technical results derive from an actuarial analysis of past floods and wind-related events in Grenada. 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.
- 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. Occurrences of losses above an upstream defined threshold are simulated via a Poisson distribution.
- 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 (DaLA) reports and from an inventory of public assets. They are reasonable approximations.
- The use of the CPI index to update the historical losses to 2015 USD value is legitimate.
- The use of the Poisson distribution and the Extreme Value Theory is legitimate and the fitted statistical distributions are reasonable approximations of the occurrence and loss impact of natural disasters.
- Results derived from the catastrophe risk model for high return periods can be extrapolated to other categories of losses arisen from disasters; each category of loss follows the same type of distribution for high return periods.

Source: World Bank DRFTA Project.



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