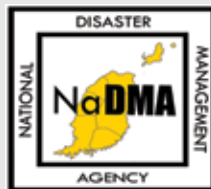


Country Document on Disaster Risk Reduction for **Grenada, 2014**



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November 2014

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UNISDR

The United Nations Office for Disaster Risk Reduction

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- NaDMA committees - NaDMA Shelter Committee, Emergency Telecommunications Committee, Public Information and Education Committee, Damage and Needs Assessment Committee, Marine Pollution and Oil Spills Committee, Welfare and Voluntary Services Committee, Transport and Road Clearance Committee, Health Services Committee.
- Private sector organisations including LIME, Digicel, Sol EC Ltd., Grenada Chamber of Industry and Commerce, Rubis, Tropical Shipping, Trans Nemwil Insurance Company.
- Government ministries and agencies including the Customs and Excise Department, the Land use Division of the Ministry of Agriculture, the Physical Planning Unit, the Maurice Bishop International Airport, the Project Coordinating Unit.
- Representatives from the NGO community including the Grenada Red Cross, the Grenada Conference of the Seventh Day Adventist and the Grenada National Council for the Disabled

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Notwithstanding the wide range of inputs into the process, the responsibility for this draft output rests with the authors and any errors and omissions thereof are not to be attributed to the other participants in the process.

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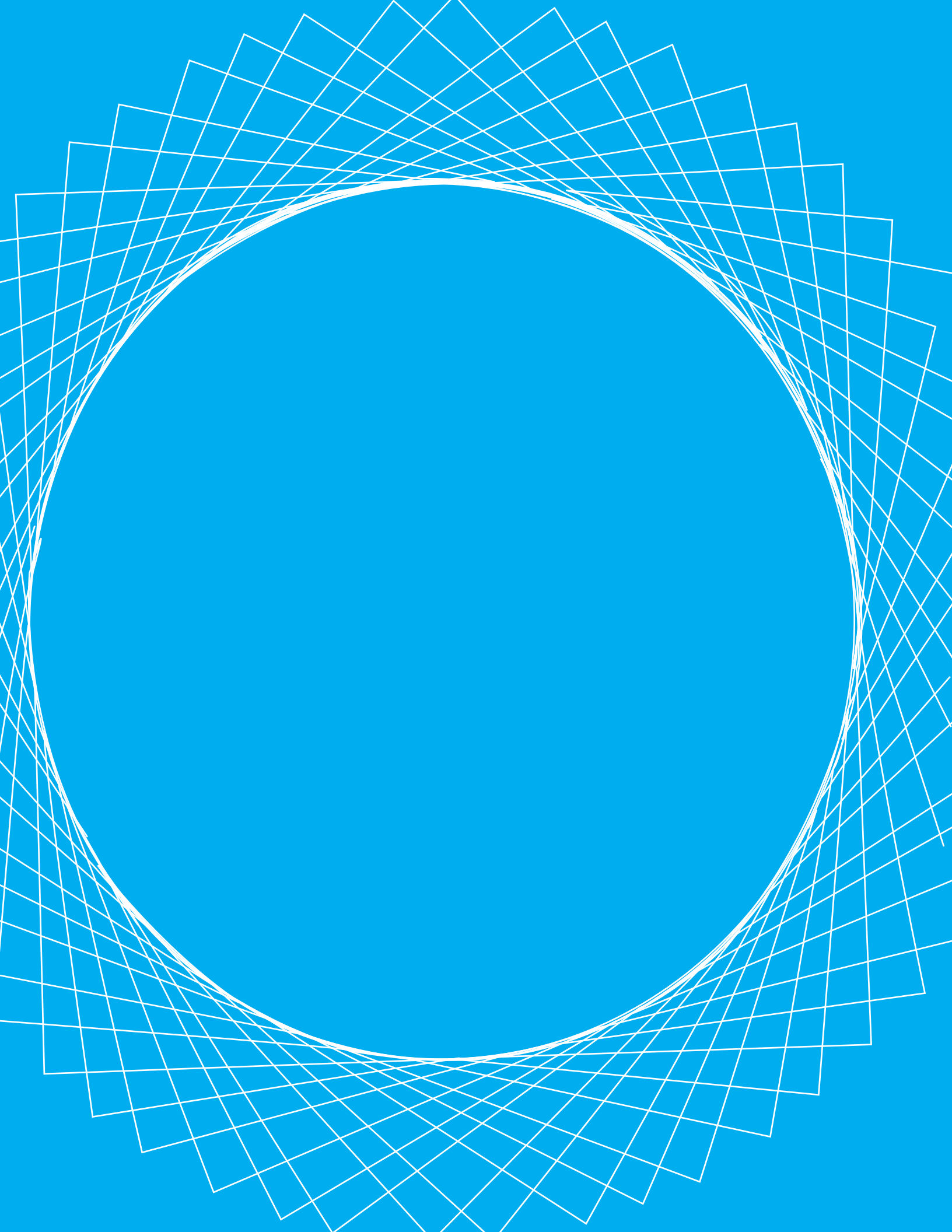


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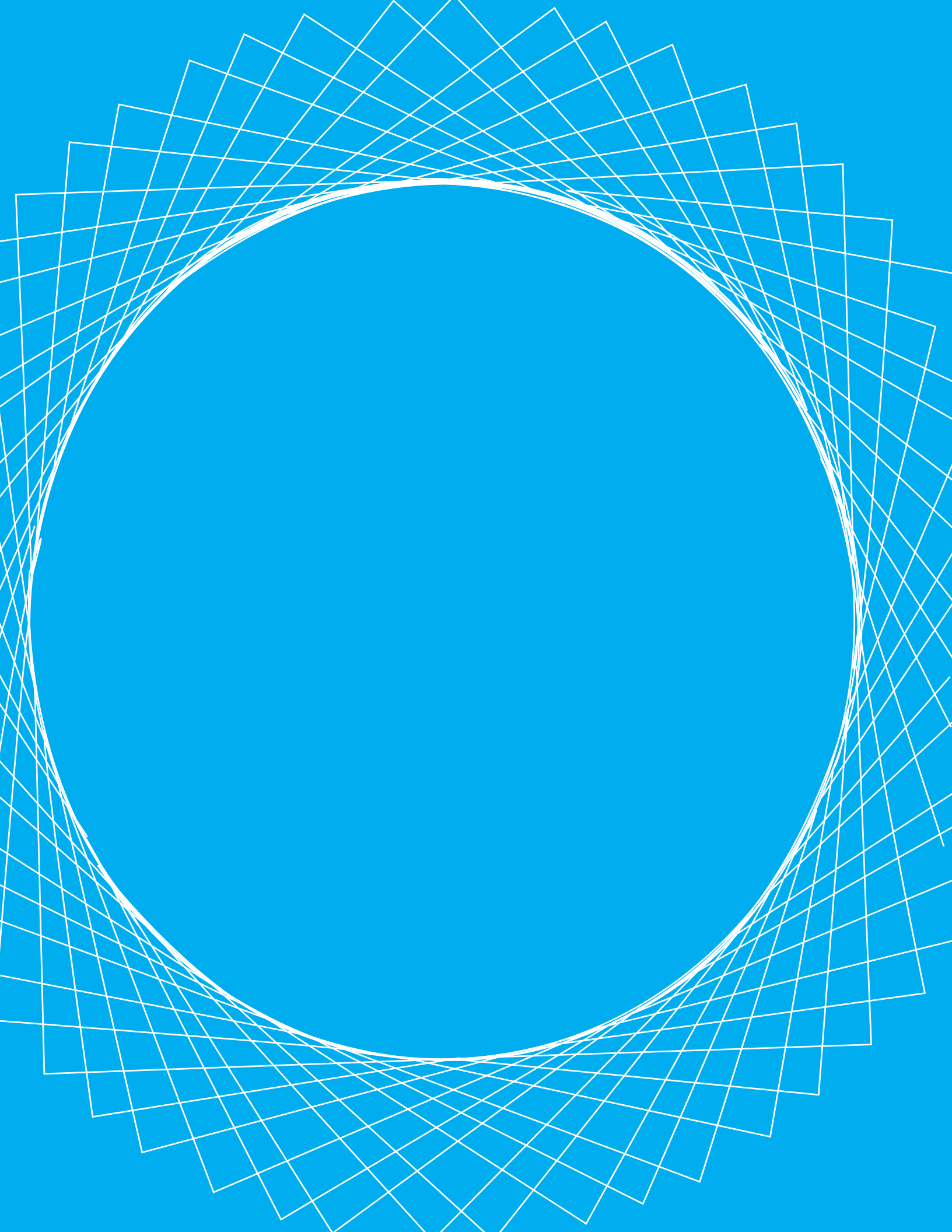
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Message from government authorities



On behalf of the Government and People of Grenada, I extend greetings to all.

As Prime Minister and Minister for Finance, National Security and Disaster Management and Information, it is my responsibility to lead a government that puts in place ample security measures, as well as disseminates timely information that will be helpful in the event of a disaster.

With climate change being a real and global problem, our Caribbean region is especially vulnerable to the effects. Therefore, we need to do whatever we can to protect our natural and human resource, as well as to ensure the future of our societies. Our emphasis has to first and foremost be more on building resilience, and safeguarding our environments.

In recent years, we have come to realize that the sustainable development of Small Island States such as ours is intrinsically linked to climate change adaptation.

The Government of Grenada accepts that we must do all that is necessary to ensure that comprehensive disaster management policies and strategies address all aspects of the disaster management cycle: prevention and mitigation, preparedness, response and recovery.

We understand also that those policies must involve all sectors of society—public and private, because ‘building a culture of safety is the responsibility of everyone’.

As a consequence, in February 2014, the Government of Grenada became the second CDEMA participating state to sign the Comprehensive Disaster Management (CDM) Declaration, giving full support to all CDM initiatives. Additionally, I have been named as CDM Champion for Grenada.

In 2015, our National Disaster Management Agency (NaDMA) will continue to build and enhance institutional capacity, increase community awareness and participation, and enhance the linkages among stakeholders.

Our disaster agencies will increase training opportunities in various disaster management disciplines, as well as enhance public education and awareness campaigns.

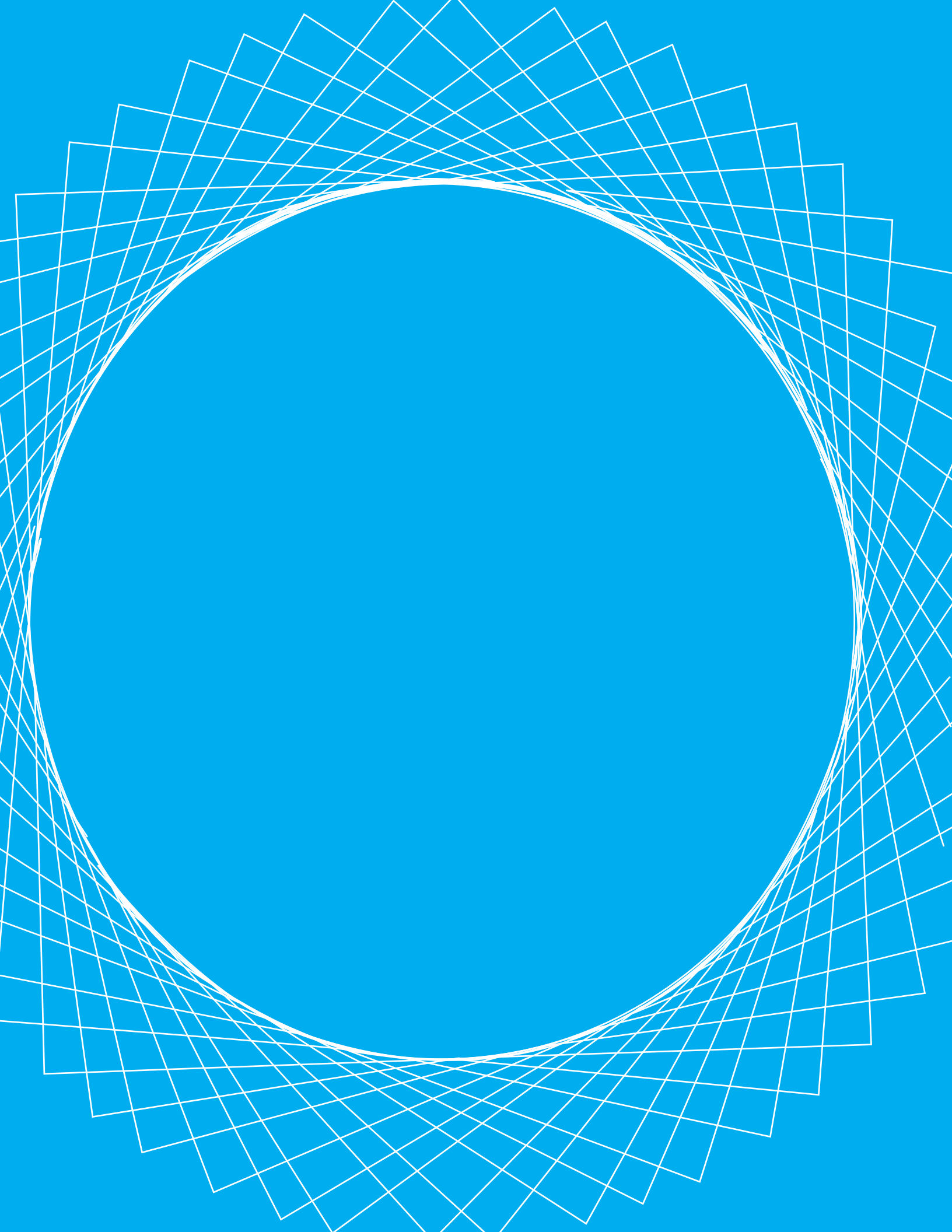
Grenada, through NaDMA, will implement its new five-year Climate Smart Country Work Programme, which will cover the period 2015-2019.

The Agency will collaborate with all stakeholders to conduct Simulation Exercises and drills at the national, district and community levels, to include Schools and businesses.

I will continue to lead a team that is dedicated toward developing a population that wholeheartedly understands and participates in disaster risk reduction initiatives.

I therefore lend full support to any and all endeavours that heighten Comprehensive Disaster Management, not only in Grenada, but also across the region.

Keith C. Mitchell



Terms and definitions

Building Code

A set of ordinances or regulations and associated standards intended to control aspects of the design, construction, materials, alterations, and occupancy of structure that are necessary to ensure human safety and welfare, including resistance to collapse and damage.

Capacity

The combination of all the strength, attributes and resources availability within a community, society or organization that can be used to achieve agreed goals.

Climate Change

“A change in the state of the climate that can be identified (e.g by using statistical tests) by changes in the mean and /or the variability of its properties, and that persists for an extended period, typically decades or longer”.

Contingency Planning

A management process that analysis specific potential events or emerging situations that might threaten society or the environment and establishes arrangements in advance to enable timely, effective and appropriate responses to such events and situations.

Coping Capacity

The ability of people, organizations and systems, using available skills and resources to face and manage adverse conditions, emergencies or disasters.

Disaster

A serious disrupting of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Disaster Risk

The potential disaster losses in lives, health status livelihoods, assets and services which could occur to a particular community or society over some specified future time.

Disaster Risk Management

The systematic process of using administrative directives, organizations and operational skills to implement strategies, policies and improved coping capacities in order to lessen the adverse impacts of hazards and the possibility of disasters.

Disaster Risk Reduction

The concept and practice of reducing disaster risks through systematic efforts to analyse and manage the causal factors of disasters, including reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events.

Disaster Risk Reduction Plan

A document prepared by an authority, sector, organization or enterprise that sets out goals and specific objectives for risks together with related actions to accomplish objectives.

Emergency Management

The organization and management of resources and responsibilities for addressing all aspects of emergencies, in particular preparedness and initial recovery steps.

Emergency Services

The set of specialised agencies that have specific responsibilities and objectives in serving and protecting people and property in emergency situations.

Exposure

People, property, systems or other elements present in hazard zones that are thereby subject to potential losses.

Geological Hazard

Geological process or phenomenon that may cause loss of life, injury or other health impacts property damage, loss of livelihoods, and services, social and economic disruptions, or environmental damage.

Hazard

A dangerous phenomenon, substance, human activity or condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Hydrometeorological Hazard

Process or phenomenon of atmospheric, hydrological or oceanographic nature that may cause loss of life, injury or injury or other health impacts property damage, loss of livelihoods and services, social and economic disruptions, or environmental damage.

Mitigation

The process undertaken by public authorities to identify, evaluate and decide on different options for the use of land, including consideration of long term economic, social and environmental objectives and social and environmental objectives and the implications for different communities and interest groups and the subsequent formulation and promulgation of plans that describe the permitted or accepted uses.

National Platform For Disaster Risk Reduction

A generic term for natural mechanism for coordination and policy guidance on disaster risk reduction that are multi - sectoral, and inter disciplinary in nature, with public, private and civil society participation involving all concerned entities within a country.

Natural Hazard

Natural processes or phenomenon that may cause loss of life , injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruptions, or environmental damage.

Preparedness

The Knowledge and capacities developed by governments, professional response and recovery organizations, communities and individuals to effectively anticipate , respond, to and recover from, the impacts of likely, imminent or current hazard events or conditions.

Prevention

The outright avoidance of adverse impacts of hazards or related disasters

Resilience

The ability of a system, community or society exposed to hazards to resist, absorb accommodate to and recover from the effects of a hazard in a timely and efficient manner, including restoration of its essentials basic structures and functions.

Response

The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of people affected.

Risk

The combination of the probability of an event and its negative consequences

Risk Assessment

A Methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people and the environment on which they depend.

Risk Management

The systematic approach and practice of managing uncertainty to minimise potential harm and loss.

Risk Transfer

The process of formally or informally shifting the financial consequences of a particular risk from one party to another whereby a household, community, enterprise or state authority will obtain resources from the other party after a disaster occur, in exchange for ongoing or compensatory social or financial benefits to that other party.

Sustainable Development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Vulnerability

The characteristics and circumstances of a community, system or assets that make it susceptible to the damaging effects of as hazard.



BACKGROUND

The preparation of the Grenada Country Profile on Disaster Risk Reduction (GND CP-DRR) was made possible through the financial support of the Office of the United Nations for Disaster Risk Reduction (UNISDR) Regional Office of the Americas DIPECHO project in collaboration with the National Disaster Management Agency (NaDMA) and its affiliates.

Methodology

The methodology used for this report included the following, viz:

- Literature reviews and in-depth desk research on the existing policies, procedures and legal framework impacting Disaster Risk Reduction in Grenada.
- Comprehensive reviews and synthesis of relevant documentation.
- Stakeholder interviews with key informants from the relevant institutions and organizations.
- A National validation workshop with key informants from the relevant stakeholder institutions and organizations.

Objective and Scope

The purpose of this country document is to provide a comprehensive overview of the status of disaster Risk reduction (DRR) in Grenada, the progress made in reducing risk, the definition of priorities and strategies, the major challenges faced in reducing loss of life as well as the economic, social and environmental impacts which risks generate.

It is expected that this document will be the national reference document used by all relevant stakeholders to guide the organization of coordinated and complementary actions for DRR in priority intervention sectors.

Using this information as a foundation, this document should be continuously updated with value added information so that the data remains current and relevant. Ultimately, this document should become the institutional DRR memory of Grenada.

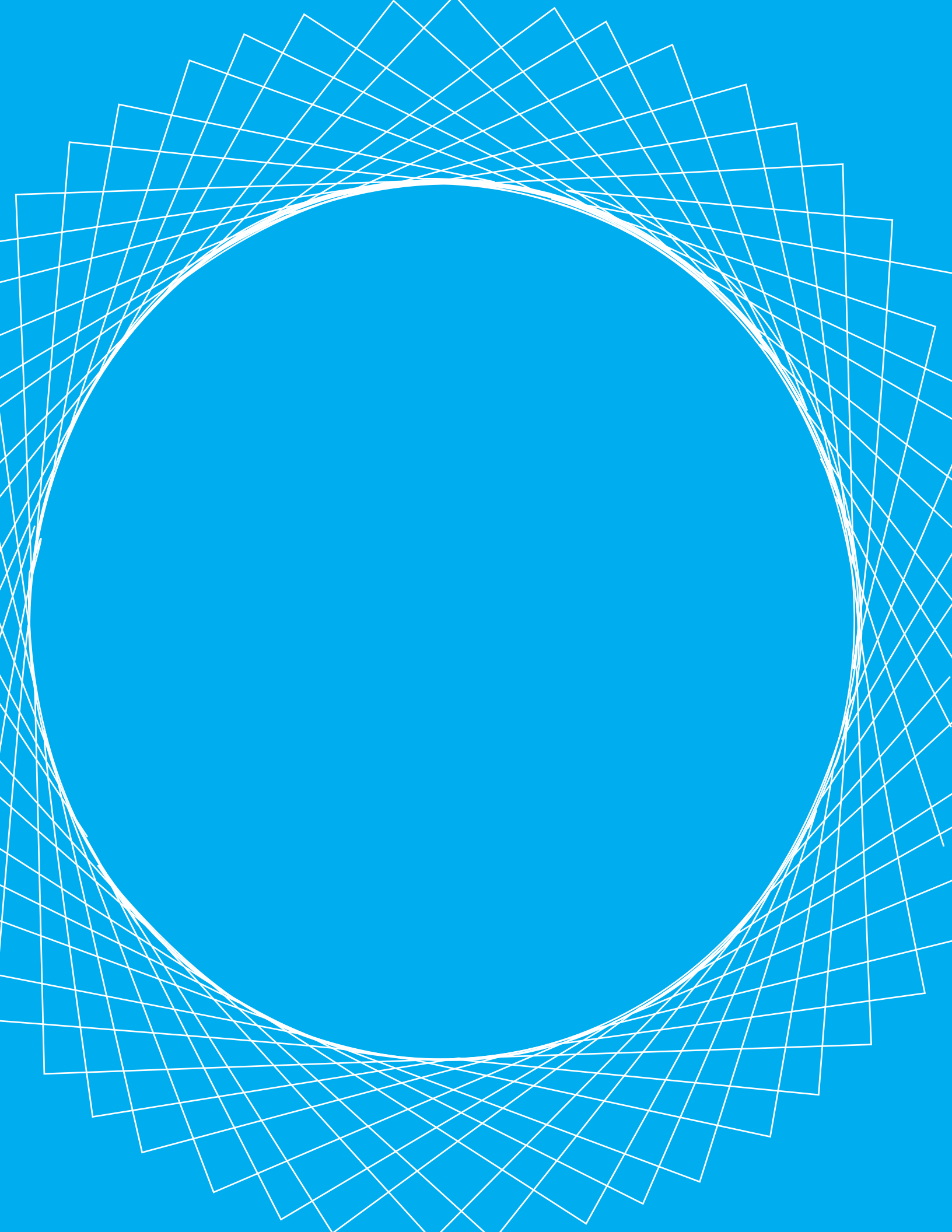
LIMITATIONS

The scope and depth of the assessment was restricted by the unavailability of data and information related to disaster risk reduction in Grenada. This was especially the case with reference to data on the hazards that had impacted Grenada in the past, and the costs of the damages resulting from these impacts. This made it impossible, for example, to develop probabilistic scenarios related to the potential impacts of the identified hazards on Grenada.

Other challenges included difficulties with finding the appropriate persons to speak with on particular subject areas and delays in receiving information that had been requested and/or promised.

It was also challenging in some cases to determine which policies and plans that were in current use. This was not always clear, even when interviewing the relevant persons, who were not sure themselves of the status of such policies and plans.

Notwithstanding these challenges, it is the considered opinion of the authors that the information sourced was sufficient to present an accurate assessment of the state of disaster risk reduction in Grenada and to provide an objective basis for planning strategies to reduce Grenada's vulnerabilities and strengthen its resilience.



1. Executive summary

The purpose of this country document is to provide a comprehensive overview of the status of Disaster Risk Reduction (DRR) in Grenada, the progress made in reducing risk, the definition of priorities and strategies, the major challenges faced in reducing loss of life as well as the economic, social and environmental impacts which risks generate.

The methodology used in preparing the Country Document included:

- Literature reviews and in-depth desk research on the existing policies, procedures and legal framework impacting Disaster Risk Reduction in Grenada.
- Comprehensive reviews and synthesis of relevant documentation.
- Stakeholder interviews with key informants from the relevant institutions and organizations.
- A National validation workshop with key informants from the relevant stakeholder institutions and organizations.

The main conclusions to be drawn from the analysis contained in the Country Document are:

1. Grenada is exposed to a number of natural and man-made hazards, and has a historical experience of being impacted by cyclones, floods, droughts, landslides, rock falls, earthquakes, forest fires, road accidents and epidemics.
2. Grenada is highly vulnerable across a range of domains to the impacts of these hazards and has suffered significant losses from previous impacts over time. These domains include physical vulnerability, economic vulnerability, social vulnerability, political vulnerability, educational vulnerability and environmental vulnerability.
3. There is a need to reduce Grenada's vulnerability to hazards across all domains and to strengthen its resilience. Priority actions that would set Grenada on such a path include:
 - a) Development of a Regulatory Framework for DRM and for Environmental Management.
 - b) Assignment of a Budget for Preparedness and Emergency Response.
 - c) Development of Hazard Maps Based on Probabilistic Criteria.
 - d) Enhancing the Capacity of Institutional Response Structures.

Stakeholders put forward a number of recommendations for addressing the identified priority areas. These recommendations include:

1. Regulatory Framework for DRM and for Environmental Management.

The recommendations for development of the regulatory framework and environmental management focus on three areas, viz:

- a) The need for reviewing and implementing the CDEMA model legislation. This is central to establishing the National Disaster Management Agency as a body with the "teeth" to develop and implement national disaster management policies and activities.

- b) The need for the development and enforcement of a comprehensive Land Use Policy. This was deemed necessary to facilitate a proactive approach to vulnerability management by ensuring, for example, that housing settlements were not built in areas with high levels of vulnerability to hazards e.g. landslides and flooding.
- c) Revisiting Environmental laws to put in place a regime that would safeguard the natural protection provided by environmental resources including mangroves, sea grass beds and coral reefs.

2. Budget for Preparedness and Emergency Response

The recommendations on the Budget for Preparedness and Emergency Response focus on three areas, viz:

- a) An independent operational budget for NaDMA. This would enable it, for example, to provide support to the district committees to implement proactive vulnerability measures in their respective districts. It would also facilitate a more rapid response by NaDMA in the event of a hazard impact.
- b) A dedicated line item for Disaster Management in the budgets of the line ministries. This was seen as necessary in order to facilitate more timely preparedness and response by the various ministries in the event of a hazard impact.
- c) Dedicated budgets for disaster management should be maintained by all private sector organisations involved in high risk operations e.g. petroleum companies. This could be supplemented by a mandated national disaster fund into which private sector organisations would be mandated by law to contribute.

3. Development of Hazard Maps Based on Probabilistic Criteria

The recommendations for the development of Hazard maps focused on five (5) areas, viz:

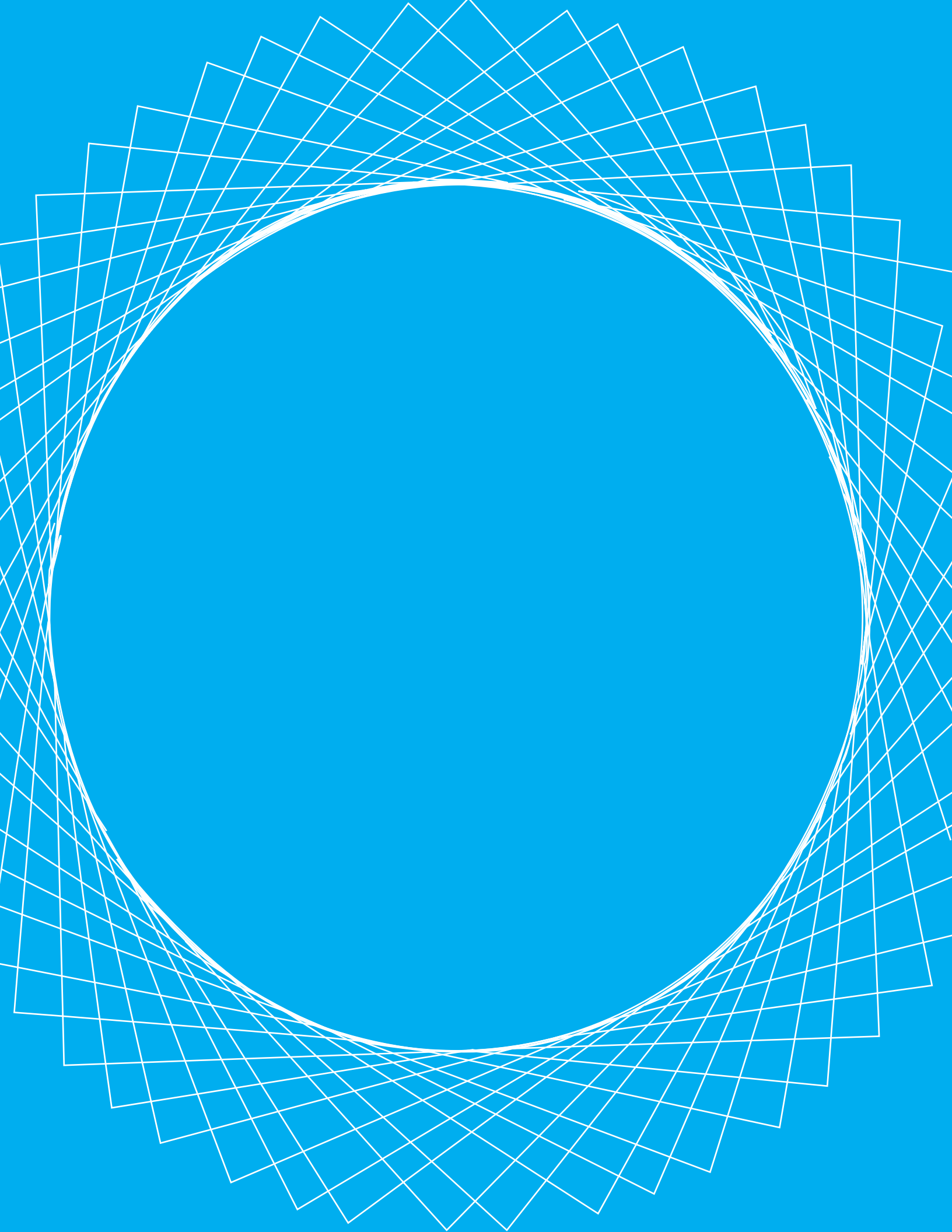
- d) Conduct of risk assessment based on data from credible sources. These risk assessment should focus on the impacts of the high probability events that had been identified by stakeholders as part of the Country Document development process.
- e) Zoning for different hazards should be done based on the outcomes of the risk assessment exercises and the populations in the respective zones should be educated on the risks and the expected responses once there was threat from the identified hazards.
- f) Identify and locate appropriate response units to provide support when there was a threat from the identified hazards.
- g) Clearly identify evacuation routes to be used during emergencies.
- h) Clearly identify the location of the most vulnerable population and develop strategies to assist them when there was a threat from the identified hazards.

4. Enhancing the Capacity of Institutional Response Structures

The recommendations to enhance the capacity of institutional response structures focused on six (6) areas, viz:

- a) Identification of key service providers for all of the areas in which support would be required in the event of a hazard impact.
- b) Development of clear protocols including:
 - a. Clear definition of the roles of all actors in the national disaster response community.
 - b. Memoranda of Understanding between NaDMA and the private and civil society institutions that would be providing support in the event of a hazard impact.

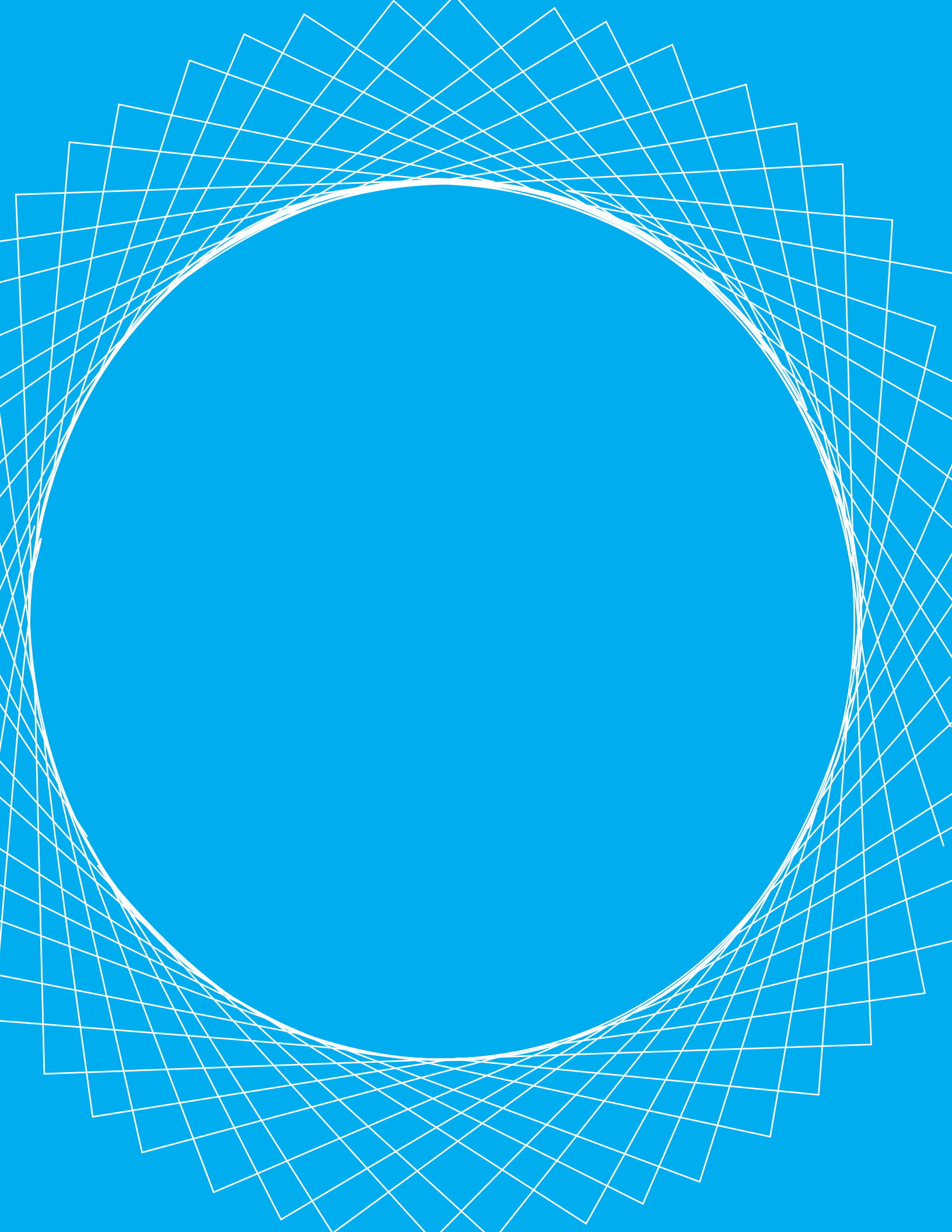
- c. Standard Operating Procedures for responding to various scenarios across the entire disaster response community.
- c) Conduct of regular simulation exercises at all levels of the national disaster management process to ensure that all actors were clear on their various roles and responsibilities and had the capacity to perform them in the event of a hazard impact.
- d) Information sharing across the disaster management community so that all actors were aware of any developments that would affect or enhance their performance in the event of a hazard impact.
- e) Coordination of institutions with similar services or capabilities to avoid duplication and confusion and maximise synergies.
- f) Identify location for waste disposal or storage in the aftermath of a hazard impact, as this could prove to be very challenging depending on the extent of damage that resulted from the hazard impact.



2. Acronyms

BMU	German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CARICOM	Caribbean Community and Common Market
CARIWIN	Caribbean Water Initiative
CCCCC	Caribbean Community Climate Change Center
CCRIF	Caribbean Catastrophe Risk Insurance Facility
CDEMA	Caribbean Disaster Emergency Management Agency
CDERA	Caribbean Disaster Emergency Response Agency
CDRT	Community Disaster Response Team
CDM	Comprehensive Disaster Management
CIMH	Caribbean Institute for Meteorology and Hydrology
DIPECHO	Disaster Preparedness European Commission's Humanitarian Aid
DRR	Disaster Risk Reduction
DVRP	Disaster Vulnerability Response Project
EBA	Ecosystem Based Adaptation
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GNI	Gross National Income
GPS	Grenada Growth and Poverty Reduction Strategy
GRENLEC	Grenada Electricity Services Ltd.
H	Hurricane
HFA	Hyogo Framework for Action
HDI	Human Development Index
ICCAS	Integrated Climate Change Adaptation Strategies
ICI	International Climate Initiative
IFRC	International Federation of the Red Cross
IMF	International Monetary Fund
INSARAG	International Search and Rescue Advisory Group
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction

LPP	Livelihood Protection Policy
NaDMA	National Disaster Management Agency
NADMAC	National Disaster Management Advisory Council
NADMO	National Disaster Management Organization
NAWASA	National Water and Sewerage Authority
NCCC	National Climate Change Committee
NERO	National Emergency Relief Organization
NDMP	National Disaster Management Plan
NDO	National Disaster Office
NGO	Non-Governmental Organisation
NHC	National Hurricane Centre
MARPOL	International Convention for the Prevention of Pollution from Ships
MCII	Munich Climate Insurance Initiative
MOU	Memorandum of Understanding
OAS	Organization of American States
OCHA	Office for the Coordination of Humanitarian Affairs
OECS	Organization of the Eastern Caribbean States
PPU	Physical Planning Unit
RRACC	Reducing Risks to Human and Natural Assets from Climate Change
SDC	Sustainable Development Council
TS	Tropical Storm
USAID	United States Agency for International Development
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Office for Disaster Risk Reduction
VCA	Vulnerability and Capacity Analysis
WIS	Water Information System.



3. International and regional disaster risk reduction context

3.1 INTERNATIONAL CONTEXT

Historically the world has seen significant human suffering and severe disruption of social and economic development as a result of disasters. The threat of climate change has increased the level of risk and vulnerability of many of the world's population to climatic hazards, adding to the urgency with which these issues must be addressed. Over the past couple decades there has been increasing awareness of the negative socio economic impacts of disasters and concerted efforts have been made to both respond to and mitigate against these impacts.

The global efforts at Disaster Risk Reduction are underpinned by a number of international strategies and agreements including the International Decade for Natural Disaster Reduction, The International Strategy for Disaster Reduction, The Yokohama Strategy and Plan of Action for a Safer World, and The Hyogo Framework for Action 2005-2015. These agreements reflect the evolution of the awareness that disaster management must become an integral part of a country's development policy.

The United Nations designated 1990-1999 as the International Decade for Disaster Risk Reduction. This brought the world together for the first time to focus on the need to reduce loss of life, property damage, and social and economic disruptions caused by natural disasters especially in developing countries.

In May 1994, members of the United Nations and other States met in Yokohama Japan for an assessment of the progress made in accomplishing the aims of the International Decade for Disaster Risk Reduction – an assessment which resulted in the development of the Yokohama Strategy and Plan of Action for a Safer World.

The core principles of the Yokohama Strategy *inter alia* were that “Disaster prevention and preparedness are of primary importance in reducing the need for disaster relief” and that “Disaster prevention and preparedness should be considered integral aspects of development policy and planning at national, regional, bilateral and multilateral levels”.² A plan of action was developed to guide the implementation of these principles which emphasized key activities to be taken at the community and national levels, the regional and sub regional levels and the international levels through bilateral agreements and multilateral cooperation.

In 2000, the International Strategy for Disaster Reduction (ISDR) was developed by the United Nations as a successor to the Yokohama Strategy. This global framework had as its primary focus, the integration of the management of disaster risk into development of national policies, programmes and projects. The framework recognized the need to emphasize not only protection against hazards but also awareness, assessment and management of risk.

One concrete outcome from this process was the establishment of a Secretariat - The United Nations International Strategy for Disaster Reduction (UNISDR). This Secretariat was mandated “to serve as the focal point in the United Nations system for the coordination of disaster reduction and to ensure synergies among

² <http://www.unisdr.org/who-we-are/mandate>.

HFA PRIORITY ACTIONS

1. Ensure Disaster risk Reduction is a national and local priority with a strong institutional basis for implementation.
2. Identify, assess and monitor risk and identify early warning systems
3. Use knowledge, innovation and education to build a culture of resilience and safety at all levels.
4. Reduce the underlying risk factors
5. Strengthen disaster preparedness for effective response at all levels.

the disaster reduction activities of the United Nations system and regional organizations and activities in socio-economic and humanitarian fields”.³

The next step in the evolution of the process was the World Conference on Disaster Reduction, which was held in Hyogo, Japan in 2005. One of the main activities was the review of the Yokohoma Strategy to identify lessons learned and existing gaps.

The major outcome from this Conference was The Hyogo Framework for Action (HFA) 2005-2015. The overarching goal of the HFA was to build resilience of nations and communities to disasters, by achieving substantive reduction of disaster losses by 2015 - in lives, and in the social, economic, and environmental assets of communities and countries. The HFA contains five priority areas for action, a series of guiding principles and practical means for achieving disaster

resilience for vulnerable communities in the context of sustainable development.

The HFA is under review and the discussion to date has focused on strengthening the disaster management framework with emphasis on the following:

1. Prevent the creation of new risk by the adoption of risk-informed growth and development pathways that minimize increase in exposure and vulnerability;
2. Reduce existing risk through the action that addresses and reduces exposure and vulnerability, including preparedness for disaster response;
3. Strengthen resilience by social and economic measures that enable countries and people to absorb loss, minimize impact and recover.

The UNISDR was tasked with supporting the implementation of the Hyogo Framework for Action 2005-2015. In addition, UNISDR also organized the Global Platform for Disaster Risk Reduction (UN General Assembly Resolution 61/198).⁴

3.2 REGIONAL CONTEXT

Grenada's Disaster Risk programming is aligned with a number of initiatives within the Caribbean aimed at addressing sustainable development in the context of high levels of risk realized by the Caribbean region. The Declaration of Barbados and the Programme of Action for the Sustainable Development of Small Island Developing States (1994), states that 'Sustainable development programmes must seek to enhance the quality of life of peoples, including their health, well being and safety.'

The St. George's Declaration, an initiative of the OECS governments, has as its overall aim to 'Foster equitable and sustainable improvement in the quality of life in the OECS Region.'

3 <http://unpan1.un.org/intradoc/groups/public/documents/apcity/unpan029311.pdf>

4 <http://www.preventionweb.net/english/professional/contacts/profile.php?id=1171>

The Caribbean Disaster Emergency Response Agency (CDERA) was formed in September 1991, with the primary focus being disaster relief. It was replaced by the Caribbean Disaster Emergency Management Agency (CDEMA) in 2009. This change was intended to refocus the organization on the principles and practice of Comprehensive Disaster Management (CDM), which is an integrated and proactive approach to disaster management.⁵

The Caribbean Community (CARICOM) adopted a strategy and results framework for Comprehensive Disaster Management (CDM) in 2001. The goal was to link CDM to national development decision making and planning. This results framework was revised and a new framework covering the 2014-2024 period was developed. The goal of this new framework is a “safer, more resilient and sustainable CDEMA Participating states through comprehensive Disaster Management”.

In parallel with the developments on Disaster Risk Reduction, CARICOM in 2005 established the Caribbean Community Climate Change Centre (CCCCC). The mandate of the Centre is to coordinate the Caribbean region’s response to climate change and to provide climate change-related policy advice and guidelines to the Caribbean Community (CARICOM) Member States.⁶ It also serves as a repository and clearing house for regional climate change information and data.

The Centre is recognized by the United Nations Framework Convention on Climate Change (UNFCCC), the United Nations Environment Programme (UNEP), and other international agencies as the focal point for climate change issues in the Caribbean.⁷

In furtherance of its objectives, the Centre has developed a Regional Framework for Achieving Development Resilient to Climate Change (2009-2014). This framework, which was approved by the CARICOM Heads of Government in July 2009, established the direction for the continued building of resilience to the impacts of climate change by CARICOM states.

Grenada is also a member of other organizations that work in the disaster risk management field. These include the International Search and Rescue Advisory Group (INSARAG) an organization dedicated to urban search and rescue and The United Nations Office for the Coordination of Humanitarian Affairs (OCHA) - the focal point for coordinating the humanitarian response to natural disasters.

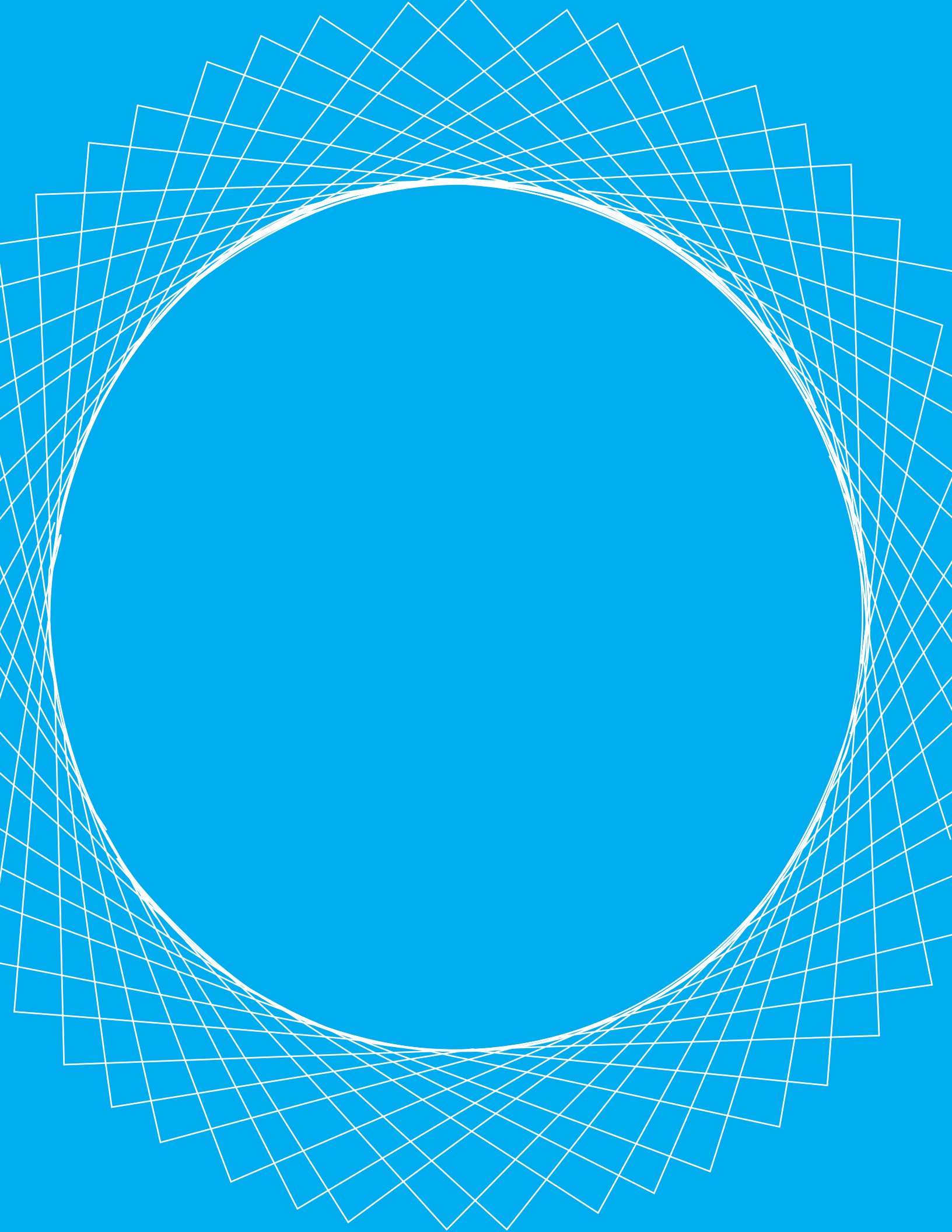
Within this operating context, Grenada’s Disaster Management is led by the National Disaster Management Agency (NaDMA), which works in close collaboration with CDEMA. Together, they have introduced a number of initiatives at the national level aimed at building resilience and disaster preparedness.

There are also a number of other initiatives at the national level whose mandates complement the work of NaDMA. These include the Integrated Climate Change Adaptation Strategy (ICCAS), The Disaster Vulnerability Reduction Project (DVRP), the Sustainable Development Council (SDC) and the National Climate Change Committee (NCCC).

5 http://cdema.org/documents/cdera_to_cdema.pdf

6 <http://www.caribbeanclimate.bz/>

7 <http://www.caribbeanclimate.bz/about-us/about-us.html>



4. National context

4.1 PHYSICAL ENVIRONMENT

4.1.1 Geographic Location

Grenada is located within the Caribbean archipelago, in the Lesser Antilles, at latitude 12 07° N, and longitude 61 40° W. It is 83.8 miles (135 km) northwest of Trinidad and Tobago, 100 miles north of Venezuela and 84 miles south west of St. Vincent and the Grenadines. It is the most southerly of the Windward Islands.

It is a tri-island State consisting of the islands of Grenada, Carriacou and Petit Martinique - Map 1. The total land mass is 133 sq. miles (345 sq. km). Grenada is divided into six parishes namely St. Andrew's (the largest), St George's (Capital City), St. David's, St. Patrick's, St. John's and St. Mark's (the smallest).

4.1.2 Physiography

Topography

Grenada's topography ranges from mountainous rainforest to dry lowlands, coastal mangroves and extensive oceanic coral rings.

These features have been determined to a large degree by the island's volcanic origin.

The island experienced several volcanic episodes from the Miocene to the Pleistocene.

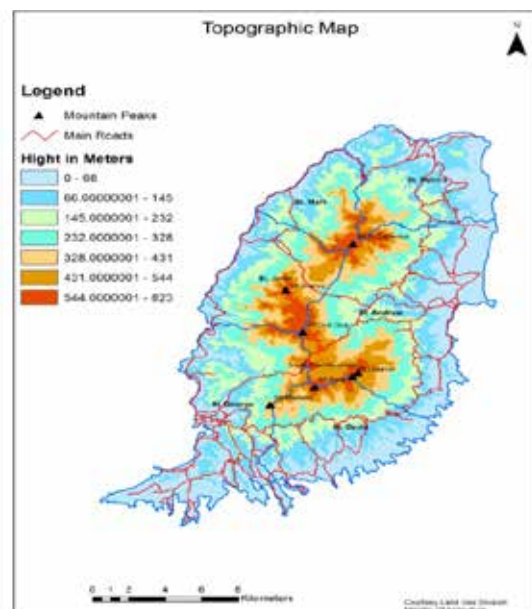
There were at least five different volcanic centers of activity across the island. These are North Domes, South East, Mt. Maitland, Mt. Granby-Fedon's Camp and Mt. St. Catherine.⁹ Several large volcanic boulders are present on upper sections of slopes.

Grenada's most rugged terrain is concentrated in the central part of the island with several major peaks, the highest of

Map 1. Grenada Location



Map 2. Topographic Map⁸



⁸ Maps sourced from Land Use Division, Ministry of Agriculture

⁹ Development of Landslides Hazard Maps for St. Lucia and Grenada. CDB, CDEMA 2006

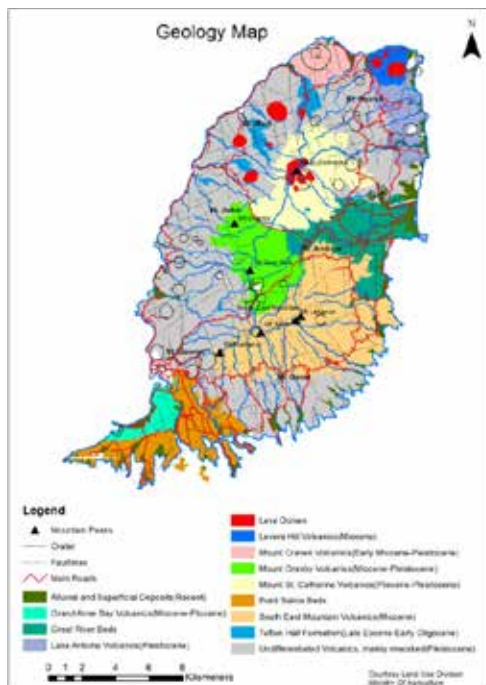
which is Mt. St. Catherine at 840 meters above sea level¹⁰. Other main peaks are Fedon Camp 767 meters, Mount Qua Qua 735 meters, Mount Lebanon 715 meters and Mount Sinai 701 meters – Map 2.

The terrain is characterized by steep slopes and there are six different categories of slopes ranging from A-F. The majority of the terrain has slopes in excess of 20 degrees with Slope category E (20-30 degrees) which is the second steepest, occupying 20,155 hectares or 65.59% of the total land area.

Table 4.1 Slope Categories¹¹

Slopes	Class/Degrees	Area/Hectares	%
A	0-2	583	1.90
B	2-5	959	3.12
C	5-10	1,612	5.25
D	10-20	6,274	20.42
E	20-30	20,155	65.59
F	Over 30	1,146	3.73
ALL	0 - >30	30,729	100

Map 3. Geology



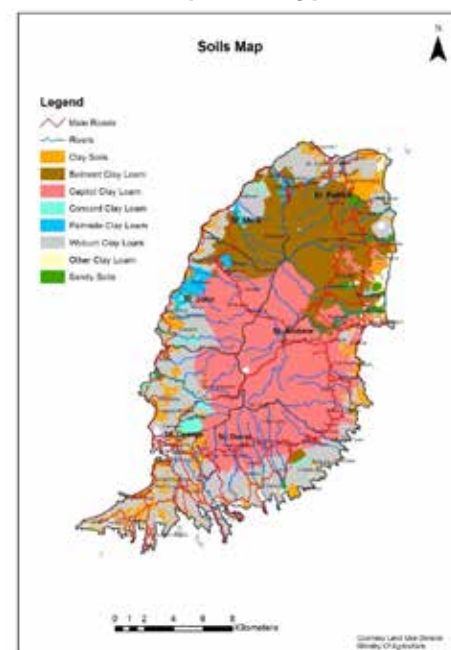
Flat land is scarce (0 -2 degrees) and constitutes 1.9% of the total land area and is found along the coast – Map 2.

The coastal periphery presents a different landscape to the rugged interior – Map 3. The coastal deposits are dominated by “reworked” volcanic rocks including fluvatile and mudslide deposits. Southern Grenada surface geology is mainly comprised of mudslide deposits and fluvatile- deposited volcanic. The eastern coast is also comprised of reworked volcanic deposits which accounts for the gently-rolling topography. The western coast has a more rugged landscape, owing to the asymmetric eruption to the west¹².

Soils

There are three different types of soil textures in Grenada- sand, silt and clay. There are four different types of soils based on textural classification. These are clay, clay loam and sandy loam and loamy sand.¹³ Over 66% of the soil is susceptible to landslides.¹⁴ Map 4 highlights the distribution of soil types.

Map 4. Soil Types



10 Unit for Disaster Studies UWI Mona Jamaica

11 http://www.gov.gd/egov/docs/other/DVRP_%20EIA_March_2011.pdf

12 <https://www.oas.org/dsd/publications/Unit/oea51e/ch06.htm>

13 http://www.gov.gd/egov/docs/other/DVRP_%20EIA_March_2011.pdf

14 Development of Landslides Hazard Maps for St. Lucia and Grenada. CDB, CDEMA 2006.

Map 5. Watersheds



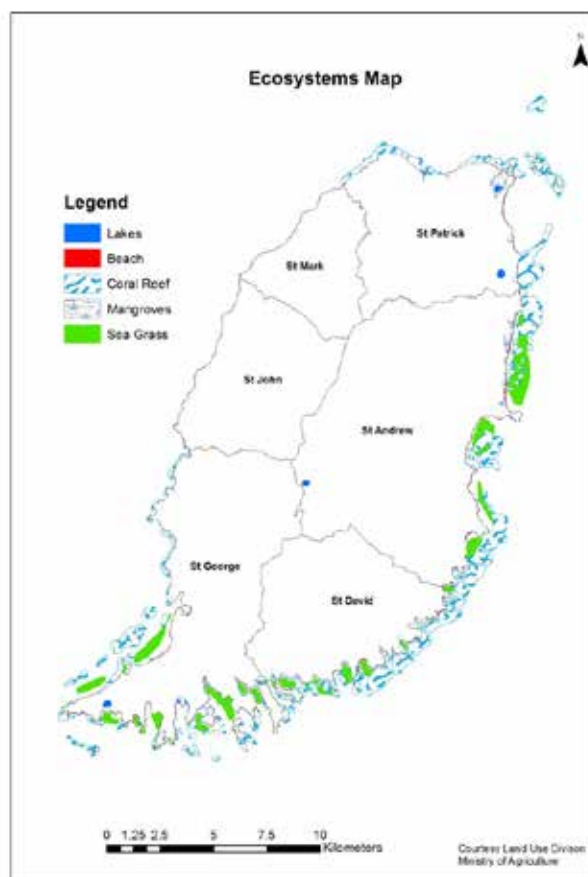
There are 71 watersheds in Grenada. Map 5 shows the distribution of these watersheds.

The watershed regime comprises a system of forested protected areas and national parks. Freshwater resources are found in the many rivers, streams and lakes on the main island of Grenada. This is in marked contrast to Carriacou and Petit Martinique, where no permanent freshwater streams exist.

The freshwater ecosystem of Grenada, Carriacou and Petite Martinique includes three main volcanic lakes (Grand Etang, Levera and Antoine); one man-made lake (Palmiste); several surface water streams including an intricate network of rivers; and a small number of springs.

Map 6. Marine and Coastal Ecosystems

Marine and Coastal Ecosystems



Grenada's coastline of 121 km is home to diverse marine and coastal ecosystems including mangrove swamps, coral reefs, sea grass beds, beaches, lagoons, dry woodlands and cactus shrub.

These marine and coastal ecosystems are important sources of livelihoods for significant segments of the population. They also provide protection during storms and adverse weather events.

Map 6 highlights the locations of the marine and coastal ecosystems. It shows the extensive coral reefs which protect the northern, eastern, southern and south west coastlines, and the sea grass beds on the eastern, southern and southwest coasts.

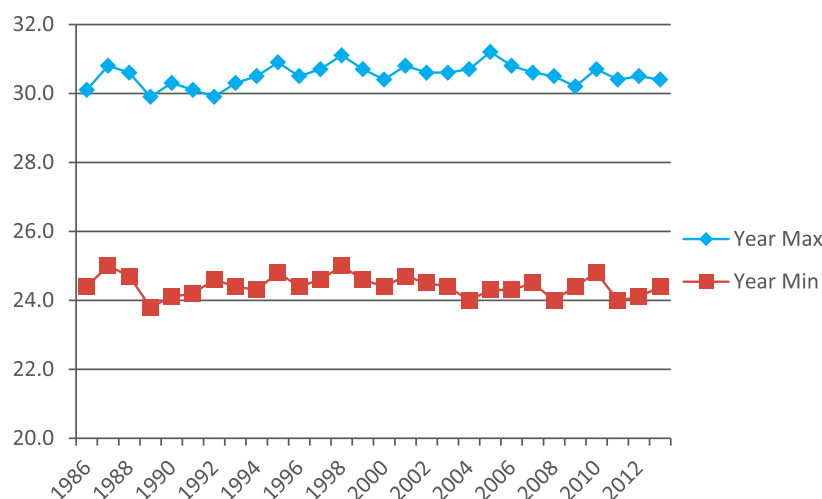
4.1.3 Climate

Temperatures

Grenada is characterized by humid tropical climate, with data from the meteorological office at the Maurice Bishop International Airport for the period 1986 - 2013 showing a mean maximum temperature of 30.5 degrees Celsius and a mean minimum of 24.3 degrees Celsius.

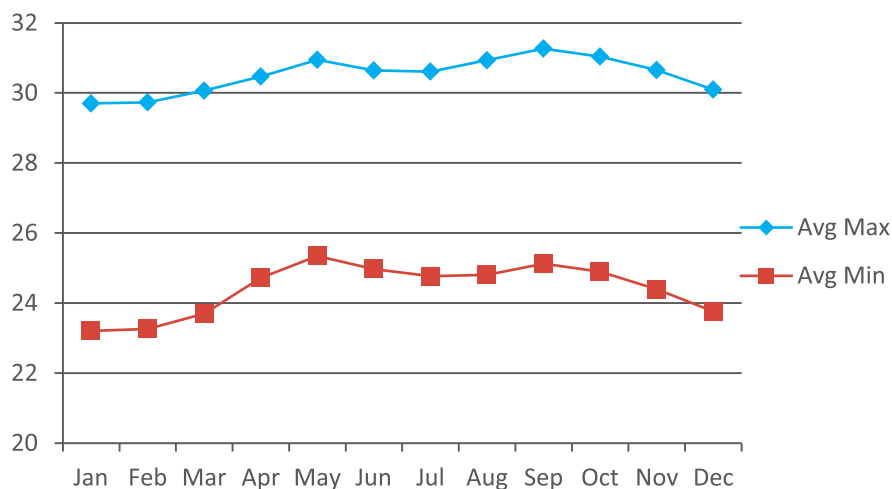
The mean annual temperatures have fluctuated within a very narrow range over the last two decades as highlighted in Fig. 1. The highest mean annual temperature experienced was 31.2°C in 2005 and the highest monthly temperature recorded was 32.4°C in September 2005. The lowest mean annual temperature recorded was 24.1°C in 2012, and the lowest monthly temperature recorded was 22.5°C. This low monthly temperature was reached on three occasions – January 2006, February 2008 and February 2011.

Figure 1. Mean Annual Temperatures 1986 – 2013 (°C)



The mean monthly temperature also moves within a narrow range during the year, with the lowest temperatures been experienced during January to March, while the highest temperatures are experienced during September and October, as illustrated by Fig. 2.

Figure 2. Mean Monthly Temperatures 1986 – 2013 (°C)

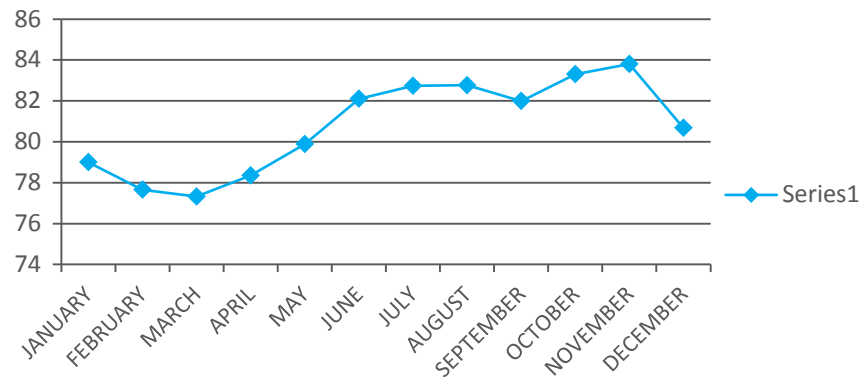


Relative Humidity

Data from the Maurice Bishop International Airport indicate that relative humidity has averaged 81% for the period 1990 – 2013, and varies significantly during the year, from a low of 77% in March to a high of 83% and 84% in October and November respectively – Fig. 3.

The occurrence of the highest relative humidity with the hottest months is a risk factor that needs to be monitored as it means that the heat index will be highest during those months.

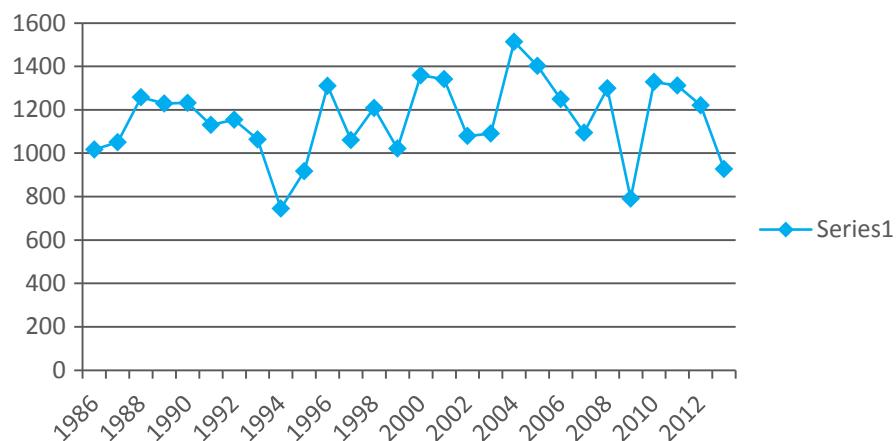
Figure 3. Monthly Trend in Relative Humidity (%)



Rainfall

Data from the Maurice Bishop International Airport for the period 1986 – 2013 report mean annual rainfall of 1157.28 mm – Fig. 4.

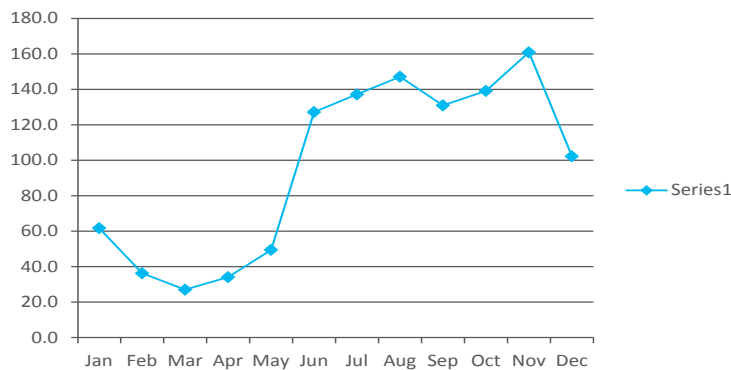
Figure 4. Mean Annual Rainfall (mm) 1986 - 2013



The chart also shows significant inter-annual variation, with the rainfall falling as low as 744.9 mm in 1994 and 790.5 mm in 2009, and rising as high as 1515 mm in 2004.

The average monthly rainfall also shows significant variation, with distinct seasonal rainfall patterns, as illustrated in Fig. 5.

Figure 5. Average Monthly Rainfall (mm) 1986 - 2013



The dry season typically runs from January to May and the rainy season from June to December. The driest month is typically March, while the wettest month is typically November.

The rainy season is characterized by tropical waves which traverse the Atlantic. Some of these develop into tropical cyclones.

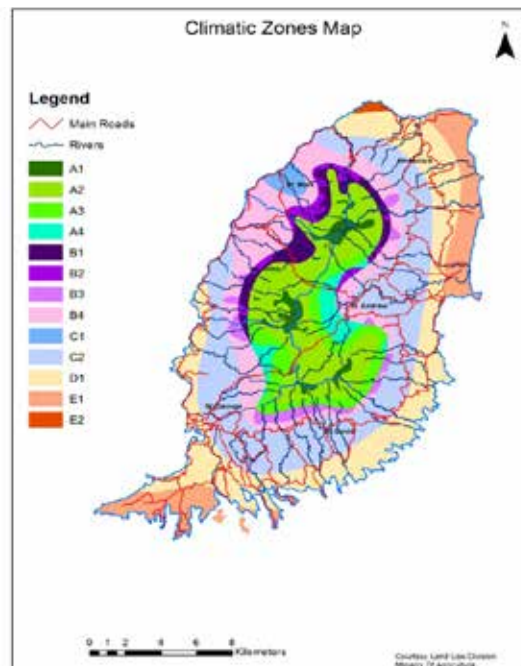
Carriacou and Petit Martinique generally receive lower levels of rainfall and during the dry season can experience severe drought conditions.

Climatic Zones

The variation of the climatic factors across the country has resulted in a number of climatic zones being evident, each with its own unique characteristics. These are illustrated in Map 7 as follows:

Map 7. Climatic Zones

- **A1** - Moderately warm to warm - the mean annual temperature and the temperature during the growing period is between 20°C and 22.5°C. Rainfall is extremely high - more than 4000 mm/year - and there is no dry season, i.e. the mean number of relatively dry months per year¹⁵ is less than one.
- **A2** - Warm - the mean annual temperature and the temperature during the growing period is between 22.5°C and 25°C. Rainfall is extremely high - more than 4000 mm/year - and there is no dry season, i.e. the mean number of relatively dry months per year is less than one.
- **A3** - Warm - the mean annual temperature and the temperature during the growing period is between 22.5°C and 25°C. Rainfall is very high - between 3000 mm and 4000 mm/year - and there is no dry season, i.e. the mean number of relatively dry months per year is less than one.



¹⁵ The mean number of relatively dry months/year has been defined as rainfall being less than half potential evapotranspiration.

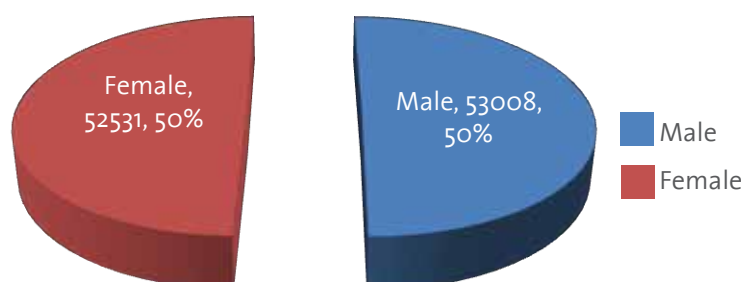
- **A4** - Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is very high - between 3000 mm and 4000 mm/year - and there is no dry season, i.e. the mean number of relatively dry months per year is less than one.
- **B1** - Warm - the mean annual temperature and the temperature during the growing period is between 22.5°C and 25°C. Rainfall is very high - between 3000 mm and 4000 mm/year - and there is a very short dry season, i.e. the mean number of relatively dry months per year is one to two.
- **B2** - Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is very high - between 3000 mm and 4000 mm/year - and there is a very short dry season, i.e. the mean number of relatively dry months per year is between one and two.
- **B3** - Warm - the mean annual temperature and the temperature during the growing period is between 22.5°C and 25°C. Rainfall is high - between 2000 mm and 3000 mm/year - and there is a very short dry season, i.e. the mean number of relatively dry months per year is one to two.
- **B4** - Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is high - between 2000 mm and 3000 mm/year - and there is a very short dry season, i.e. the mean number of relatively dry months per year is between one and two.
- **C1** - Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is high - between 2000 mm and 3000 mm/year - and there is a short dry season, i.e. the mean number of relatively dry months per year is between three and four.
- **C2** - Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is moderate - between 1500 mm and 2000 mm/year - and there is a short dry season, i.e. the mean number of relatively dry months per year is between three and four.
- **D1** - Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is moderate - between 1500 mm and 2000 mm/year - and there is a short dry season, i.e. the mean number of relatively dry months per year is between three and four.
- **E1** - Very warm - the mean annual temperature is between 25°C and 27.5°C while the temperature during the growing period is just over 27.5°C. Rainfall is low - between 1000 mm and 1500 mm/year - and there is a medium long dry season, i.e. the mean number of relatively dry months per year is between five and six.
- **E2** - Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is moderate - between 1500 mm and 2000 mm/year - and there is a medium long dry season, i.e. the mean number of relatively dry months per year is between five and six.
- **F1** - Warm to very warm - the mean annual temperature and the temperature during the growing period is between 25°C and 27.5°C. Rainfall is low - between 1000 mm and 1500 mm/year - and there is a medium long dry season, i.e. the mean number of relatively dry months per year is between five and six.
- **G1** - Very warm - the mean annual temperature is between 25°C and 27.5°C while the temperature during the growing period is just over 27.5°C. Rainfall is low - between 1000 mm and 1500 mm/year - and there is a medium long dry season, i.e. the mean number of relatively dry months per year is between five and six.
- **H1** - Very warm - the mean annual temperature and the temperature during the growing period is just over 27.5°C. Rainfall is very low - between 700 mm and 1000 mm/year - and there is a long dry season, i.e. the mean number of relatively dry months per year is between seven and eight.

4.2 Socio Economic Context

4.2.1 Population and Demographics

The State of Grenada has a population of one hundred and five thousand, five hundred and thirty nine (105,539). 50.2 % of the population is male, while 49.7% is female.¹⁶ – Fig. 13.

Figure 6. Grenada Population – Male: Female Ratio



The population is on an aging trend as illustrated in Table 4.2.

The census data shows a decline in the number of persons less than 19 years old from 43.23% in 2001, to 32.56% in 2011. 50.69% is under thirty years, a decline of 6.46% from 2001. At the same time, there has been a 4.9% increase in the number of persons between the ages of 30-59 from 30.52% in 2001 to 35.45% in 2011. 13.87% is over 60 years, a 1% increase over 2001. 54% of those over 60 years are women.¹⁷

Table 4.2 Age of Population

Age Group	Total 2001	Total 2009	% 2001	% 2009
0 – 19	44,585	34,359	43.23	32.56
20 – 29	14,361	19,131	13.92	18.13
30 – 59	31,481	37,416	30.52	35.45
60+	12,709	14,633	12.32	13.87
Total	103,136	105,539	100	100

The population is predominately of African descent - 82.4%. Mixed races account for 13.3% while East Indians account for 2.2%. Indigenous peoples account for only 0.2% - Table 4.3.

The overall population density is 306.80 persons per square kilometer- a 2.3% decrease from 2001 – Table 4.4. This decrease was reflected in all parishes except St. David's and St George's. In St David's there was an increase of 1.7%, while in St. George's there was a significant increase of 22.7%, making it the most densely populated parish on the island. The population density in St. George's town is more than ten times higher than the density in all of the other parishes. This reflects urban population growth, which, between 2005 and 2015, was projected to grow by an annual average of 1.2%.¹⁸

Table 4.3 Ethnicity of Population

Ethnicity	Total	Percent
African descentent	86,988	82.4
Indigenous people	162	0.2
East Indian	2,283	2.2
Chinese	35	0.0
Portuguese	41	0.0
Syrian/Lebanese	61	0.1
White/Caucasian	782	0.7
Mixed	13,987	13.3
Hispanic	60	0.1
Other	200	0.2
Not stated	939	0.9
Total	105,538	100.0

Source: Population and Housing Census 2011

¹⁶ Grenada Census 2011.

¹⁷ Grenada Census 2011.

¹⁸ <https://data.un.org/CountryProfile.aspx?crName=Grenada>

Table 4.4 Population Densities

PARISH	AREA (SQ.KM)	POP 2011	POP 2001	% CHANGE	POP DENSITY 2011	POP DENSITY 2001
GRENADA	344	105,539	103,136	2.3	306.80	299.81
St. George's Town	1	3,100	3,628	-14.6	3,100.00	3,628.00
Rest of St. George's	64	34,304	27,951	22.7	536.00	436.73
St. John	35	8,404	9,374	-10.3	240.11	267.83
St. Mark	25	4,346	4,676	-7.1	173.84	187.04
St. Patrick	42	10,461	11,537	-9.3	249.07	274.69
St. Andrew	99	26,433	27,114	-2.5	267.00	273.88
St. David	44	12,858	12,637	1.7	292.23	287.20
Carriacou	34	5,633	6,219	-9.4	165.68	182.91

Source: Population and Housing Census 2011

Table 4.5 Land Tenure

Land Tenure	%
Owned/Freehold	64.2
Leasehold	1.4
Rented	8.0
Rented free	8.9
Permission to work land	1.2
Sharecropping	0.5
Squatted	1.9
Other	4.6
Don't know	9.3
Total	100.0

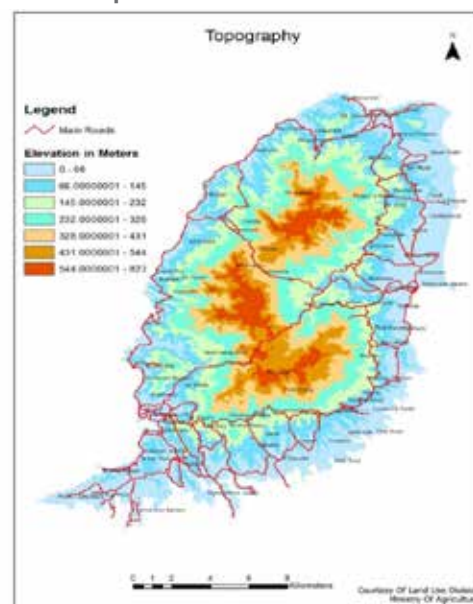
Source: Population and Housing Census 2011

Land tenure is characterized by a high proportion of freehold property – 64.2%. However, there is also a small, but significant group of squatters in St. George's (376), St Andrew's (100) and St. Mark's (140) – Table 4.5.

The main towns and commercial districts are situated on approximately 3% of the land area which is at sea level¹⁹. This has resulted in a significant proportion of the population being located in villages along the coast line. This is illustrated in Map 8 which shows the location of the main settlements.

Grenada has made significant strides on many development indicators. The island's Human Development Index (HDI) for 2013 places it in the "high development" category with a value of 0.744. The island is ranked 79 out of 187 countries and territories²⁰.

Key indicators which contributed to this ranking are, the GNI per capita in 2011 was USD 7403.00²¹; the Life Expectancy for females at 77.7 years and 74.5 for males; primary/secondary gross enrolment ratios (f/m per 100) 106.1/104.7²² and the literacy rate is 96%.

Map 8. Location of Settlements

19 National Disaster Management Plan. Government of Grenada

20 UNDP Human Development Report 2014

21 <https://data.un.org/CountryProfile.aspx?crName=Grenada>

22 Ibid

4.2.2 The Economy

Grenada, like all the other Small Island Developing States (SIDS), has a small open economy which is highly dependent on the outside world for both critical inputs including food imports and as a market for the export of goods and services. The economy has traditionally depended heavily on agricultural exports and tourism. The main agricultural exports were nutmegs, cocoa and bananas, with the latter benefiting from protected European markets until the mid-1990s. Tourism has consistently being the greatest foreign exchange earner.

Over the past two decades, the economy has been affected by a number of challenges including declining fiscal balances, vulnerability to exogenous shocks and increasing national debt. These have stifled economic growth and severely limited the government's ability to provide adequate social services.

During the 1990s, revenues from traditional agricultural exports declined, primarily as a result of changes to the banana export regime. The bombing of the World Trade Center in 2001, the global oil price increase in 2007 and the financial crisis which started in 2008, all contributed to creating a difficult fiscal situation²³ during that period.

This fiscal challenge was further exacerbated in 2004 and 2005, when Grenada was struck by two hurricanes, Ivan and Emily respectively. Hurricane Ivan devastated Grenada's economy, damaging 70% of the Tourism infrastructure, 85% of the nutmeg crop and 60% of the cocoa tree stock. More than 80% of the public and commercial building structures were also damaged. Overall damages were estimated at twice the GDP.²⁴

The impact of the financial crisis was particularly severe and analysis by the World Bank has concluded that the Grenadian economy contracted by 9.7%²⁵ between 2008 and 2012. In 2013, the overall fiscal deficit was 4.9% of GDP and the economy was burdened by high public sector debt - \$2.41 billion, which is 107% of the GDP²⁶. Fig. 7 illustrates Grenada's economic growth performance for the period 1978 to 2013, and highlights the recent economic contraction.

Figure 7. Grenada Economic Growth 1978 - 2013



Source: TheGlobalEconomy.com, The World Bank

23 Grenada Poverty Reduction Strategy Draft 2014

24 Grenada: A Nation Rebuilding. An assessment of reconstruction and economic recovery after Hurricane Ivan, The World Bank.

25 Ibid

26 Grenada 2014 National Budget

The government's response to the economic challenges has been the introduction in 2014 of an International Monetary Fund (IMF) approved, three-year "Home Grown Structural Adjustment Program". This program is intended to result in fiscal adjustment and reform and lead to debt sustainability. Key aspects of the program include an increase in taxes both on personal income and goods and services, a drive to reduce non-essential government expenditures and debt forgiveness from key creditors, both within the local economy and externally.

The 2014 National Budget projects economic growth of 2.7% in 2014, with the leading contributors being construction (20%), fishing (22%) and the wholesale and retail sector (7%). This is consistent with the shift away from a mainly agrarian based economy to a more service oriented economy which accelerated during the last decade.

Table 4.6 presents the composition of Grenada's GDP for the period 2005 – 2012 and highlights the shift to a service oriented economy.

Table 4.6 Percentage Composition of Grenada GDP By Sector²⁷

Year	2005	2006	2007	2008	2009	2010	2011	2012
Agriculture, Forestry, Fishing	3.43	4.53	4.13	4.34	5.28	5.24	5.18	5.61
Manufacturing	3.36	3.94	4.17	3.82	3.78	4.01	3.71	3.60
Electricity & Water	3.37	4.21	4.44	4.60	4.36	4.50	4.54	4.58
Construction	19.29	13.78	12.64	11.25	8.17	8.20	7.25	5.61
Wholesale & Retail	8.58	8.93	8.58	8.49	7.47	7.95	8.17	8.17
Hotels & Restaurants	2.47	4.82	5.14	4.96	4.99	4.02	4.11	4.37
Transport, Storage, Communications	16.14	14.79	14.64	13.47	14.16	13.14	13.17	12.19
Financial Intermediation	7.52	7.33	7.35	7.49	7.56	7.25	7.12	7.07
Real Estate, Renting & Business Activities	13.87	14.17	13.59	12.72	13.41	13.65	13.67	13.67
Public Administration, Defense & Compulsory Social Security	6.01	6.60	6.74	7.73	7.76	8.30	8.42	8.36
Education	11.65	12.47	14.48	16.88	18.93	19.32	20.20	22.46

4.2.3 Poverty and Unemployment

Poverty

The most recent Poverty Assessment Survey for Grenada was done in 2008. Notwithstanding the fact that this survey was done in 2008, the data is still considered as being valid, given the net economic decline since 2008 discussed in the previous sections.

The poverty line represents an estimate of the minimum cost of basic food and non food items an average adult male requires. The poverty line used for the study was ECD 5842.00 per annum or ECD 16.01 per day.

The Poverty Assessment showed that 37.70% of the population was living below the poverty line and that 2.4% were considered as indigent. An additional 14.7% was considered vulnerable to falling into poverty.

²⁷ Grenada's Growth and Poverty Reduction Strategy (GPRS) 2014-2018e

Poverty was reflected across all parishes with the highest incidences being manifested in St Patrick's, St Marks, St Andrew's and St George's – Table 4.7.

Table 4.7 Headcount, Poverty Gap and Poverty Severity by Parish.²⁸

Parish	Poverty Head Count	Poverty Gap	Poverty Severity
St. George's	35.10	10.03	4.23
St. George's Town	15.00	3.40	1.59
St. John's	36.69	8.77	3.05
St. Mark's	54.46	18.29	9.23
St. Patrick's	56.67	15.96	6.80
St. Andrew's	44.86	10.56	3.53
St. David's	29.49	8.68	3.64
Carriacou	6.57	2.40	0.90
All Grenada	37.70	10.13	4.03

Children (0-14), young adults (15-24) and women, were disproportionately affected by poverty. 39.4% of the poor were children, while 27% of the youth were poor.²⁹ In the rural areas, more than 20% of female headed households were poor as compared with 13% of male-headed households. In the urban households, 44% of the female heads lived in the bottom 3 quintile, as opposed to 18.6% for the males.³⁰

Unemployment

The unemployment level is high and is a contributing factor to poverty. 33.5% of the population is unemployed. Among youth (ages 15-24) 55.6% are unemployed.³¹

Although the unemployment link to poverty is inextricable, it is important to note that in Grenada there is the phenomenon referred to as 'the working poor'. According to the poverty survey, almost two-thirds of the population living below the poverty line was employed and more than half were working in agriculture, fisheries or construction.

4.2.4 Most Vulnerable Groups

Vulnerability and risk is allocated differently to segments of the population based on their socio economic status, as this is a significant determinant of their coping capacity. The most vulnerable groups are those which have limited economic and material resources largely due to poverty and those with limited human capabilities. Women, children and the elderly also face unique vulnerabilities.

Households Living in Poverty

The poor are disproportionally affected by the impact of disasters. Persistent poverty which transcends generations, transient poverty and vulnerability to falling into poverty, all increase the levels of vulnerability to the impacts of disasters.

²⁸ http://www.gov.gd/egov/docs/reports/Grenada_CPA_Vol_1_Main_Report_Submitted.pdf

²⁹ Grenada Poverty Assessment Survey 2008

³⁰ Grenada Growth and Poverty Reduction Strategy draft 2014-2018

³¹ Grenada National Budget 2014

Families affected by poverty are constrained in their ability to prepare adequately for the impact of a hazard and to recover in its aftermath. This is due to the fact that they lack financial reserves for buying necessary supplies prior to the event and for purchasing goods and services after the event had occurred.³²

Persons living in poverty usually have inferior quality homes which do not meet building standards and lack basic amenities. This is a significant issue in Grenada where 26% of households do not have access to indoor water and 38% do not have indoor toilet facilities.³³ These vulnerabilities are aggravated by the fact that poor households usually have a large number of occupants, as validated by the 2008 Poverty Assessment Survey which reported that the average size of households in the poorest quintile was five compared to two persons in quintile five.

These households usually recover more slowly from disasters and some never fully regain pre-impact levels thereby increasing their vulnerability to future hazards³⁴.

Based on the poverty survey one can expect that a significant number of such households will be found in parishes which recorded the highest incidences of poverty – St. Patrick's, St. Mark's and St. Andrew's.

Households with Limited Human Capabilities

The level of vulnerability of a household is also directly related to the quality of the human resources within that household. Capabilities such as health, physical ability and education, vary between households.³⁵ The more restrictive those capabilities are, the greater will be the level of vulnerability.

Persons suffering from poor health face increased vulnerability both in terms of their ability to cope during and in the aftermath of the impact of a hazard, where access to and storage of medication becomes problematic. Health statistics indicate that there has been an overall decline in the health of Grenadians. In 2001, 83.2% of the population had no recorded illness; however in 2011 that amount dropped to 76.93%, a 6.27% decline. At the same time there have been marked increases statewide in the numbers of persons suffering from chronic diseases including diabetes, hypertension and asthma.³⁶ These increases must be viewed in the context of very limited health insurance coverage by the population, only 10% has any form of Health Insurance coverage.³⁷

Persons with physical and mental limitations are usually dependant on others to provide needed care and attention on a routine basis. Based on international estimates of disability, it is expected that approximately 10% of the population will have some form of disability³⁸. During a disaster and in its aftermath, these persons are at an increased risk for substandard care and attention.

Persons who are illiterate and ill informed find it more difficult to navigate the process to achieve help prior to and in the aftermath of a disaster. This increases their level of vulnerability. In this regard, it is significant to note that only 13.9% of the population has had any post-secondary education³⁹.

32 Betty Hearn Morrow, Identifying and Mapping Community Vulnerability 2000

33 Grenada Census 2011

34 Betty Hearn Morrow, Identifying and Mapping Community Vulnerability 2000

35 Betty Hearn Morrow, Identifying and Mapping Community Vulnerability 2000

36 Grenada Census 2011

37 Ibid

38 Grenada Social Safety Net Assessment

39 Grenada Census 2011

Women

Women, as a gender, experience vulnerability differently to men, based on socially constructed roles.⁴⁰ Women, especially in female headed households, must meet the needs of their family members, especially dependent children, the disabled and the elderly. In Grenada, 47% of households are headed by women.

These responsibilities become more difficult in the context of disasters, yet in most cases these roles cannot be shifted away from the women. This was evident in the aftermath of Hurricane Ivan when many women were forced to engage in peculiarly unequal relationships to sustain their families.⁴¹ Some women became the victims of domestic abuse and sexual violence from male partners, as a result of their weakened economic situation.

Pregnant women, girls and mothers with young infants experience additional challenges both in terms of mobility and the loss of support systems which can occur due to family disruptions.

Obtaining employment after a disaster is also more difficult for women. In the aftermath of a natural disaster, there is heavy emphasis on reconstruction of infrastructure. Grenadian women have traditionally been excluded from that sector and many lack the skills to transit easily into the sector.

Children

Children are vulnerable to both the physical and psychological effects of disasters. Children are at a greater risk of injury and death based on their age, physical ability and cognitive development.⁴² Additionally poor sanitation and poor nutrition after a disaster can compromise the health of children leading to illnesses and even death. These problems are increased when access to medical care is compromised due to broken infrastructure. Children suffering from pre existing illnesses like asthma, physical and mental disability are more vulnerable in terms of access to medication and special care.

Children are impacted on a psychological level when they witness the violence and traumatic impact of disasters. In Grenada, following Hurricane Ivan, many children were scared of rain and bad weather. Additionally loss of their familiar environment - homes, schools, churches - can have unsettling and long lasting negative effects on children.

The Elderly

The elderly are especially vulnerable during disasters and are more prone to loss of life than younger persons. During the passage of Hurricane Ivan 70% of fatalities were among persons over 60 years old.⁴³

4.3 GOVERNANCE STRUCTURE

4.3.1 Political Structure and Organization

Grenada is an independent nation within the British Commonwealth, having gained independence from Britain in 1974. It is a member of the Organization of Eastern Caribbean States (OECS) and Caribbean Common Market (CARICOM).

40 Pan American Health Organization, Fact Sheet Gender and Natural Disasters

41 Grenada: A Gender Impact Assessment of Hurricane Ivan- Making the Invisible Visible

42 Pan American Health Organization, Gender and Natural Disasters

43 Ibid

Grenada has retained a Westminster style system of government which is underpinned by a Constitution which *inter alia* guarantees the rights and freedoms of citizens. General Elections are constitutionally due every five years and are currently dominated by two main political parties - The New National Party and the National Democratic Congress. The country is divided into fifteen constituencies and the current governing party-The New National Party led by The Right Honorable Dr Keith Mitchell, won all fifteen seats in the most recent elections, which were contested in February 2013.

There are three arms of government, namely the Executive, the Legislative and the Judiciary.

Executive authority is vested in Her Majesty who is represented locally by the Governor General. Executive power lies with the Prime Minister who is the Head of the Government and the Cabinet, whose members are appointed by the Governor General on the advice of the Prime Minister.

The Parliament exercises legislative power and consists of the House of Representatives and the Senate. The House of Representatives is comprised of fifteen elected members while the Senate is comprised of 13 members - 7 selected on advice of the Prime Minister, 3 selected on advice of the leader of the opposition, and 3 on the advice of the Prime Minister after consultation with organizations of interest - in the case of Grenada, the Labour Movement, the Private Sector and Agriculture.

The Judiciary is responsible for the administration of justice.

Grenada is currently engaged in a process of Constitutional Reform, and the population is expected to vote in a referendum on constitutional reform sometime during 2015.

4.3.2 Local Government and Levels of Decentralization

Grenada does not have a system of local government.

4.3.3 Coordination Mechanism between State and Non-Governmental Actors

There are a number of mechanisms in place which facilitate policy consultation and coordination between State and non state actors. Organizations like the Social Partners, the Tripartite Committee and the Non State Actors Panel are platforms through which various aspects of social development are jointly discussed and managed with representatives of the private sector, labour movement, the NGO sector and the Conference of Churches. Likewise, there is significant interface between State and non State actors in the management and coordination of disasters in Grenada.

4.4 DEVELOPMENT CONTEXT

4.4.1 Millennium Development Goals

Figure 8. Grenada Progress on MDGs

Goal 1 - Eradicate extreme poverty and hunger	no data		
Goal 2 - Achieve universal primary education	early achieved	2010	
Goal 3 - Promote gender equality and empower women	on track for 2015	2011	

Goal 4 - Reduce child mortality rate	on track for 2015	2011	✓
Goal 5 - Improve maternal health	off track	2025	✗
Goal 6 - Combat HIV/AIDS, malaria and other diseases	on track for 2020	2020	✓
Goal 7 - Ensure environmental sustainability	on track for 2020	2018	✓
Goal 8 - Develop a global partnership for development	on track for 2020	201	

Sources: TAC mdgTrack, The World Bank: MDGs

Grenada has progressed on many of the Millennium Developmental Goals – Fig.8. There is universal access to health care and a comprehensive primary health care system which ensures immunization of all children. Child mortality rate has been reduced, and there is also universal primary and secondary education.

4.4.2 Growth and Poverty Reduction Strategy

A Grenada Growth and Poverty Reduction Strategy (GPRS) 2014-2018 has been developed as part of the government's efforts to strengthen the economy and is awaiting Cabinet approval. This document presents a paradigm shift from the "old economy" to a "new economy" which is driven mainly by endogenous knowledge, technology, innovation and entrepreneurship.

Table 4.8 GPRS Focus

Thematic Areas	Priority Areas
▪ Building Resilience	Stabilizing the Macro- Economy Enabling the Business Environment Leveraging the Growth Sectors Developing Sustainable Energy
▪ Developing Competitiveness and Equity	Education and Human Resource Development Social Transformation and Social Care Youth Development General Equity
▪ Reducing Vulnerability	Rural Community and Parish Development Local Development Improved Human Settlement Environmental and Sustainable Natural Resource Management
▪ Strengthening Governance and Security	Human Security Governance and Institutional Legal Reform

The Grenada Government envisions that the new economy will comprise *inter alia* a world class tourism, yachting and marina destination complemented by efficient business, finance and information technology

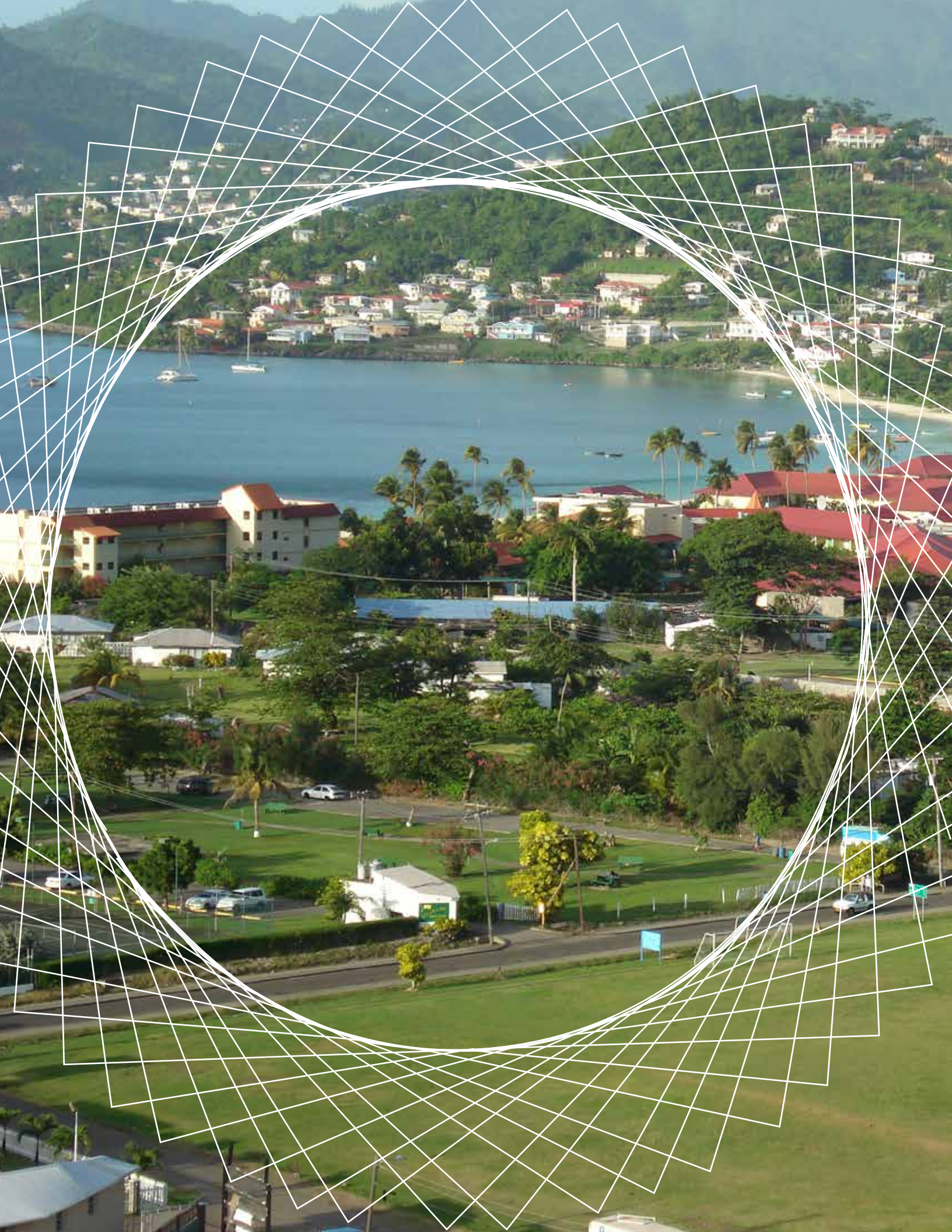
services, an efficient light manufacturing sector, a well diversified agriculture sector focused on value added products, a dynamic oil and gas and renewable energy sector and a highly efficient agro industrial sector cluster dedicated to oils and for extraction for health, food, cosmetic and pharmaceutical applications.”⁴⁴

The creation of the new economy will focus on four thematic areas and accompanying priority areas, as highlighted in Table 4.8.

The process of creating this new economy will not be without challenges. Primary among them will be the threat of natural disasters. In this regard, the GPRS document calls for a legal framework “to guide cooperation and action, to act pre-emptively as well as in recovery and reconstruction”, but it does not address in a substantive manner the institutionalization of disaster management into national policies.

The Government has also indicated its intention to develop a fifteen year development plan to guide the country’s development for the period 2015 – 2030.

44 Grenada Growth and Poverty Reduction Strategy 2014-2018 Draft



5. / Legal, normative and institutional profile/

5.1 LEGAL FRAMEWORK

Grenada's main legal authorities relating to disaster risk reduction and emergency management are constitutional and statutory: the Constitution of Grenada, which outlines roles and responsibilities at state level during an emergency, and various statutes such as the Emergency Powers Act and the National Disaster (Emergency Powers) Act. A number of other statutes are relevant to specific disasters, such as the Agriculture (Hurricane Rehabilitation) Act, and the Housing (Hurricane Damage) Loans Act.

In addition, sectoral laws for development planning, forestry, water, land use, building and health have implications for disaster risk reduction and management, and in the context of the coastal zone and climate change. A list of the legislation and other instruments concerning disaster risk reduction in Grenada as discussed in this chapter may be found in Annex 1.

5.1.1 Constitution

The Constitution of Grenada which came into operation on February 17, 1974, provides for the declaration of a state of emergency (Chapter I, Fundamental Rights and Freedoms).

Pursuant to section 17(1), the Governor General has Constitutional authority to declare a state of emergency by making a Proclamation to that effect. The definition of 'state of emergency' is broad enough to include a natural disaster, although that term is not explicitly mentioned in the Constitution.⁴⁵ The Proclamation must be published in the Gazette. Section 17(3) empowers the Governor General to revoke such declaration at any time, which must also be gazetted.

When Parliament is sitting, every declaration of emergency will lapse after a period of seven days, beginning with the date of publication of the declaration. In any other case, the declaration will lapse at the expiration of twenty-one days, beginning with the date of publication of the declaration, unless it has in the meantime been approved by a resolution of both Houses of Parliament. Once approved by Parliament, the proclamation of a state of emergency remains in force for a period of six months from the date of proclamation or for a shorter period. In the event it is extended beyond six months, another resolution has to be passed by Parliament, but this later resolution may be revoked at any time by another resolution of Parliament. Any resolution pertaining to the declaration of an emergency must be supported by a majority vote of all the members of the House of Parliament.

5.1.2 Law and Legally Binding Provisions

The Emergency Powers Act 1987 makes provision for matters relating to security during a state of emergency. The Act supports section 17 of the Constitution by defining a period of emergency as "a period beginning with

⁴⁵ This was used in 2004 with the passing of Hurricane Ivan – Statutory Rules and Orders No. 20 of 2004. See OAS, 2010. Caribbean Emergency Legislation Project: Improving the Legal and Institutional Framework Related to State of Emergency, at p. 32.

a declaration made by the Governor General of the State that a state of emergency exists therein and ending either with a declaration so made that a state of emergency no longer exists therein or in accordance with the provisions of section 17 of the Constitution of Grenada”. Section 3(1) outlines situations in which a state of emergency shall be declared, specifically:

If at any time it appears to the Governor-General that action has been taken or is immediately threatened by any person or body of persons of such a nature and on so extensive a scale as to be likely to endanger the maintenance of public order or the defense of Grenada or the maintenance of public safety or the defense of the community or any substantial portion of the community or any supplies or services essential to the life of the community.

Section 3(2) empowers the Governor General to revoke a declaration of emergency at any time. The power relating to a declaration of an emergency is qualified by the requirement that the Governor General act on the advice of the Cabinet when exercising such powers as set out in section 3. Section 4 empowers the Cabinet to make regulations during a period of emergency in Grenada; to wit, prohibiting persons from being out of doors during specific hours, or from travelling. Section 6 concerns the publication of these regulations in the Gazette or by affixing to public buildings, public distribution, or via radio announcement as may be required. Section 7 addresses indemnity and compensation in relation to lawful acts conducted pursuant to the provisions of the Act. Section 8 provides for the establishment of an Emergency laws tribunal as may be necessary in such circumstances.

The National Disaster (Emergency Powers) Act 1984 provides for the maintenance of supplies and services essential to the life of the community on the occurrence of a national disaster. National disaster is explicitly defined in section 2 of the legislation as “a disaster occurring as a result of earthquake, hurricane, flood, fire, outbreak of pestilence or infectious disease or other calamity whether similar to the foregoing or not.” Section 3 vests the Prime Minister with the authority to declare that a national disaster has occurred, with the aforesaid gazetted requirements for declaring and revoking such declarations applying. Section 4 lists the Prime Minister’s powers which may be delegated, and they include regulating means of communication and transport, food and liquor supplies, water, and the use of electricity and gas. Section 9 addresses the matter of immunity from liability for any acts lawfully performed under this Act.

With reference to specific disasters, the *Agriculture (Hurricane Rehabilitation) Act 1955* and the *Housing (Hurricane Damage) Loans Act 1957* outline the procedures to be followed by owners of agricultural properties and homes who have been affected by hurricane. The *Agriculture (Hurricane Rehabilitation) Act* establishes area committees for agricultural areas in Grenada and a central agricultural committee appointed by the Minister to administer relief where a landowner has applied via his area committee for an agricultural loan to re-establish and maintain his land after there has been hurricane damage. The *Housing (Hurricane Damage) Loans Act* concerns hurricane rehousing and makes provision for the establishment of an Authority, comprising persons appointed by the Minister including a Housing Officer, for the purpose of granting loans out of funds provided by Parliament. Persons eligible for these loans are those who experience hardship in financing the repair and reconstruction of houses damaged or destroyed by hurricane.

Other laws provide legislative support for the management of hazards directly and indirectly, and are supported by activities under various multilateral environmental agreements (MEAs) which overlap with DRR and DRM, and to which Grenada has become party.

The Fire Brigades Act 1957 establishes the firefighting service and makes provision for the appointment of volunteer firemen. Protection is provided for firemen in the course of duty.

The National Water and Sewerage Authority Act establishes NAWASA as the authority for the provision of water supplies and the treatment and disposal of sewage. Section 31 states that there is to be no charge for the use of water by an official fire service during emergencies. The water sector has undergone a comprehensive review and draft legislation exists, which outlines new and expanded institutional arrangements for water resource management in Grenada that may impact disaster management in the future. In addition, Grenada is currently implementing on a project-by-project basis activities in support of the Land Based Sources of Pollution (LBS) Protocol to the Cartagena Convention, to regulate water use, watershed management, and lessen impacts on the marine environment.

The Forest, Soil and Water Conservation Act 1949 advocates disaster risk reduction on private forested lands. Section 7 states that private land may be declared a private forest for protection against storms, winds, rolling stones, floods and landslides, for the protection of roads, bridges, airstrips, and other lines of communication, and for the preservation of health. Where necessary such areas may also be declared prohibited areas under section 13.

The Petroleum Act 1956 concerns the storage of petroleum in garages and service stations, including construction and infrastructure for storage and transport. The Petroleum and Natural Gas Deposits Act 1989 governs the duties and procedures for petroleum extraction in Grenada. Section 25 outlines the responsibilities of the licensee where hazards related to petroleum occur in the terrestrial, aquatic and or marine environments, including the penalties incurred should the section be contravened. Any spills or leakages are to be recorded in writing and reported to the Minister. While the Oil in Navigable Waters Act 1928 is outdated, Grenada has ratified both the Oil Spills Protocol to the Cartagena Convention, as well as the Fund Convention, and implementing legislation exists for the latter. Nevertheless, Grenada remains the only Eastern Caribbean country that is not party to the MARPOL Convention, an international treaty that governs pollution of the sea, including dumping, oil and exhaust pollution from marine vessels.

The Public Health Act 1925 makes provision for preventing the spread of infectious diseases. Part V addresses the powers of the Sanitary Authority to gazette regulations regarding prevention of the spread of specific diseases and the power of the Minister to extend the definition of infectious disease. Part VI addresses epidemic and endemic diseases. The immunization of children is prioritized in the Public Health (School Children Immunization) Act 1980, which recognizes their vulnerability to certain communicable diseases.

The Pesticides Control Act 1973 governs the importation, sale, use and storage of pesticides, but has no updated framework such as that developed under the Stockholm and Rotterdam Conventions to address the storage of hazardous chemicals.

The Quarantine Act 1947 empowers the Quarantine Authority to make orders in an emergency, but this Act is regulation-dependent. The Quarantine (Air) regulations and Quarantine (Marine) regulations pursuant to the Quarantine Act concern the spread of infectious diseases and require the Quarantine Authority to keep airports sanitary, and to detain ships to prevent the spread of such diseases.

The Mosquito Destruction Act 1952 addresses the eradication of mosquitoes and requires that owners and occupiers of premises refrain from actions that would create breeding grounds for mosquitoes.

In terms of waste, there is very little provision for waste management apart from the Grenada Solid Waste Management Authority Act 1995 and Grenada is not a party to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.

The storage of explosives is covered by *the Explosives Act 1956*. In 2005, Grenada became party to the Chemical Weapons Convention (CWC), which outlaws the production, stockpiling and use of chemical weapons. Parties are obligated to destroy any such weapons stockpiled and Grenada has enacted implementing legislation, the Chemical Weapons Act 2013. United Nations Security Council Resolution 1540 is currently being implemented in Grenada and complements the CWC with its focus on the proliferation of chemical, biological, radiological and nuclear weapons (CBRN). The resolution obliges States to refrain from supporting by any means non-State actors from developing, acquiring, manufacturing, possessing, transporting, transferring or using nuclear, chemical or biological weapons and their delivery systems. The United Nations Regional Centre for Peace, Disarmament and Development in Latin America and the Caribbean (UNLIREC) has recently held meetings in Grenada concerning implementation and recommended specific legislation to address issues such as transportation, the transfer and shipment of CBRN materials. Assistance will also be provided to Grenada for development of comprehensive control lists for proliferation-sensitive materials.⁴⁶

The Physical Planning and Development Control Act 2002 concerns land development and use in Grenada. Section 13 addresses the duty to prepare physical plans for transport and communications, and public utilities. Section 25 empowers the Planning and Development Authority to request an environmental impact assessment where a development can significantly affect the environment. Such developments include developments storing hazardous materials, toxic waste disposal sites, and any coastal zone developments which have the potential for disaster-related risks, but no national standards or guidelines are in place to guide such developments.

The Grenada Building Code is administered by the Planning and Development Authority and applies to the design and construction of new buildings and the alteration, reconstruction, demolition, removal, relocation, maintenance and occupancy of existing buildings or any appurtenances connected or attached to such buildings. The Code provides for regular review in the interests of sound, efficient and safe construction practice in Grenada. There are mandatory precautions to be taken by the owner, occupant or user to secure buildings, structures, material or equipment during periods designated as being a hurricane watch. The Grenada Building Guidelines cover, inter alia, the procedure for the construction of earthquake and hurricane resistant buildings.⁴⁷

The prevailing trend concerning the majority of these laws is a reactive approach that lays emphasis on traditional “response and relief”, rather than developing an institutional framework that supports a coordinated response involving prevention, preparedness and contingency planning. There have been successive amendments to these laws, but they remain sectoral in scope, and mostly reliant on traditional command and control measures.

5.1.3 Draft Model Comprehensive Disaster Management Bill

Previous legislative reviews of Grenada’s disaster management legislation have indicated that the current framework is fragmented, with roles and responsibilities in need of clarification. Procedures need to be clearly defined and articulated, and institutional arrangements streamlined.⁴⁸

The draft model comprehensive disaster management bill prepared by CDEMA addresses a number of these concerns by legislating key elements currently found in the draft National Disaster Management Plan (see normative framework, below). Part IX of the draft model law outlines a multi-hazard alert system

46 See: <http://bioprepwatch.com/government/international-policy/grenada-begins-effort-to-implement-u-n-resolution-on-wmds/338282/>

47 Caribbean Planning for Adaptation to Climate Change: Review of Legislation (Grenada).

48 OAS. 2010. Caribbean Emergency Legislation Project: Improving the Legal and Institutional Framework.

49 Briefing Note: Checklist for Disaster Risk Reduction Legislation IFRC-UNDP Project 2012-2015 (updated 14 March 2014).

which consists of a National Emergency Broadcast System, siren warnings, and such early warning systems as may be prescribed. Institutional arrangements are created for disaster management with clear roles and responsibilities for all actors, including a disaster management agency. Also given legislative basis is the national disaster management plan. Procedures are outlined for shelters, volunteers, evacuation and international assistance. A fund is established in Part VII. For Grenada, the Model Bill would update and consolidate existing provisions in the Physical Planning and Development Control Act and sections 7 and 13 of the Forest Water and Soil Consolidation Act by providing for a precautionary approach in declaring special vulnerable areas (Part VI of the Model Bill).

The International Federation of the Red Cross (IFRC) and UNDP have jointly prepared a draft checklist for guiding DRR legislation. The checklist is adapted, in summarized form, in Table 5.1 below. It contains important criteria for ensuring that laws provide the best support for DRR and promote safety and resilience.⁴⁹ They are supplemented by the recommendations of the Hyogo Progress Report and the OAS 2010 review, and act as a benchmark for identifying the gaps in the existing DRR framework in Grenada, and assessing the extent to which the model legislation demonstrates the capacity to adequately address these gaps.

Table 5.1 Summary Comparison of Existing DM Framework and Draft Model Legislation

Elements of a comprehensive disaster management legislative framework	Existing legislation and policy instruments	CDEMA draft model legislation
The needs of vulnerable groups (women, children, the elderly and the physically challenged) are adequately addressed and provided for.	-	Not explicitly identified in the legislation although specially vulnerable areas are provided for in Part VI. 26(3)(f) notes that the information system must include communities vulnerable to disasters, and 26(1)(d) addresses dissemination of pertinent information to such communities. The evacuation regulations note vulnerable families with small children in its evacuation procedures.
Standardized terminology for disaster, emergency; more flexible to include impacts causes and results?	Varying definitions in legislation but standardized in the draft NDMP.	Yes, section 2 also includes definition for climate change.
Legal status for a disaster management agency with clear roles and responsibilities for various actors as part of revised institutional arrangements for disaster management.	None in legislation, but the draft National Disaster Management Plan (revised 2012, hereinafter draft NDMP) has revised institutional arrangements and organizational structure for disaster management.	An inter-ministerial committee on disaster management in Part II, national disaster management technical and advisory council in Part III, National Disaster Management Agency in Part IV, and District Disaster Management Committee in Part V.
Decision support tools for disaster management	Draft NDMP articulates a strategy and guidance on developing disaster plans at various levels and sectors.	National Disaster Management Policy in s 7, National Comprehensive Disaster Management Strategy in s 24 and s 60; comprehensive disaster management plan in s 59.

49 Briefing Note: Checklist for Disaster Risk Reduction Legislation IFRC-UNDP Project 2012-2015 (updated 14 March 2014).

Elements of a comprehensive disaster management legislative framework	Existing legislation and policy instruments	CDEMA draft model legislation
Risk and vulnerability mapping	Institutionalized mapping and standardized mapping methodologies mentioned in the Hazard Policy and prioritized under the Hazard Mitigation Plan.	S 20(1)(j) Requires agency to collaborate with entities as required in the conduct of such assessments.
Capacity to engage civil society and the private sector is legislated	Role for stakeholders only mentioned in the draft NDMP.	The Disaster Management regulations make provision for civil society to work in collaboration with the Agency to implement the disaster policies as required.
Instructions for disaster and or emergency declarations.	S 17, Constitution Ss 3 and 4, Emergency Powers Act Ss 3 and 4 National Disaster (Emergency Powers) Act, NDMP.	Part IX addresses declarations generally.
Declaration procedure clearly outlined: powers, duration and co-ordination	S 17, Constitution Ss 3 and 4, Emergency Powers Act Ss 3 and 4 National Disaster (Emergency Powers) Act.	S 66 national multi-hazard alert S67 national emergency broadcast system S 68 declaration of disaster.
Well-defined mechanisms for publication of declarations	S 17 Constitution Emergency Powers Act National Disaster Act.	Consolidated in s 68.
Roles, responsibilities and powers during a declared emergency clearly laid out	Draft NDMP provides new system that updates 2005 National Disaster Plan.	S 68, as modified by country.
Mechanisms for the initiation and termination of international disaster assistance	Responsibility rests with NADMA	Part X addresses international assistance.
Legislated procedure for receiving international assistance	-	Part X, and in the Disaster Relief and Assistance Regulations
Privileges and immunities for international relief agencies and workers, immigration and customs, goods and equipment including medical supplies	Limited- S 7, Emergency Powers Act.	Ss76 and 77 provides for protection from liability and compensation.
Immunity from relief activities (general)	Limited - section 9 of the National Disaster (Emergency Powers) Act addresses the matter of immunity from liability for any acts lawfully performed under the S 7, Emergency Powers Act.	Ss76 and 77 address protection from liability and compensation.
Disaster Management Information System	-	Section 26 outlines scope and requirements for a Disaster Management Information System.

Elements of a comprehensive disaster management legislative framework	Existing legislation and policy instruments	CDEMA draft model legislation
Telecommunication systems/telecommunications assistance and funding/Tampere Convention	Telecommunications needs during an emergency are addressed as part of draft NDMP.	Section 25
Accountability and governance of disaster funding – amount, procedures, management, funding mechanism, supplementary fund, funds allocated on basis of risk assessment		Sections 37 to 43 address the budget, fund and accounts of the Agency. Part VII establishes a National Disaster Management Fund with provisions for managing accounts and audits.
Volunteers	Addressed in the draft NDMP	Section 31
Evacuation	Addressed in the draft NDMP	Sections 34, 35
Shelters	Addressed in the NDMP. A Shelter Policy is also being developed.	Sections 29 and 30.

Sources: Laws of Grenada, Draft National Disaster Management Plan, Draft Model Legislation Bill, OAS Caribbean Emergency Legislation Project: Improving the Legal and Institutional Framework related to State of Emergency, and the IFRC/UNDP DRR draft Checklist.

5.2 NORMATIVE FRAMEWORK

5.2.1 Normative Instruments

There is no national disaster policy. However, a draft Comprehensive Disaster Management Policy and Strategy for the period 2015-2019 has been compiled and is to be the subject of national consultations before it is finalized and adopted. The draft CDM Policy is supported by CDEMA and is based on CDEMA's model framework for creating an enabling environment for integrated risk management.

The draft National Disaster Management Plan (NDMP) (revised 2012) is the main planning tool and places emphasis on disaster preparedness and response. The plan has wide scope to include natural hazards such as earthquakes, volcanic eruption, floods and landslides, as well as man-made hazards. However, there is inconsistent use in terminology as it applies to institutional arrangements eg. 'NaDMO' (referring to National Management Organization or alternatively, National Disaster Management Organization) and 'NaDMA' are both used, as well as NAMAC and NADMAC for the National Disaster Management Advisory Council. The organizational structure also requires elaboration and clarification.

The plan outlines responsibilities, specific plans and procedures for all stakeholders in the disaster management process. Thematic committees, their responsibilities and functions, are also explained. The plan seeks to establish the threshold for considering events as disasters; and the types of response, recovery, and mitigation measures available to assist communities throughout the country that have been affected by a disaster.⁵⁰

According to the draft plan, Grenada's comprehensive disaster management strategy to implement the plan seeks to create a culture in which NADMA and citizens are able to mitigate and/or prevent the impact of hazards, and if that is not possible, to effectively and quickly respond to and recover from these impacts.

⁵⁰ Government of Grenada, 2011. National Disaster Management Plan (draft).

This will be achieved by:

- a) Establishment of a dedicated emergency management office and staff;
- b) Development of plans;
- c) Country-wide training at all levels;
- d) Establishment of monitoring, forecasting and warning capability;
- e) Provision of budget and resources for disaster management activities;
- f) Simulation exercises and drills; and
- g) Decentralization of disaster management by establishment of Operational, District, Ministry, Agency and Community Committees.⁵¹

As part of its mandate to mainstream hazard risk reduction into national development planning, the Government of Grenada also articulated a National Hazard Mitigation Policy and Plan in 2003 and 2006 respectively.⁵² The emphasis was on risk reduction and stakeholder empowerment. Coastal erosion, flood and landslide mapping exercises were undertaken to inform the plan, but there is no reference to this plan in the National Disaster Management Plan, even though it is intended to apply to the period 2007-2016.

The Hyogo Progress Report for the period 2011-2013 described and appraised the existing framework, reviewed trends in Grenada concerning DRR and made recommendations for improving institutional arrangements to facilitate Grenada's implementation of the Hyogo Framework for Action. These include, inter alia:

- The need for a comprehensive policy on DRM and supporting legislative framework, overarching national guideline for building resilience in the recovery and rehabilitation phases of a disaster.
- Capacity building, both at individual and institutional levels for DRM, hazard mapping, and cost/benefit analyses.
- Sourcing funding sources for sustainable financing.
- Integrating DRM into social policies to ensure vulnerable persons such as those with disabilities and the elderly, are accounted for. Gender considerations also apply.
- Integrating DRM in the sectoral work of line ministries.
- Placing more emphasis on establishing financial risk transfer schemes including financial contingency planning, to address lack of financial strategy and resource mobilization strategy.
- Addressing the unsystematic approach to disaster risk reduction in human settlement planning and management.
- Integrating DRM into the school curriculum.
- The need to address the unsatisfactory development and testing of preparedness plans at sectoral, district and community levels.
- Prioritizing DRR research and evidence based analysis.
- Developing a formal public awareness strategy on DRM.⁵³

A number of these issues are addressed in the draft CDM Policy, which is explicitly aligned with the Hyogo Framework for Action. The draft CDM Policy represents a proactive approach to disaster management and incorporates considerations of climate change adaptation, as well as the needs of the most vulnerable. Also considered in the drafting of this policy is its harmonization with the existing policy framework, of which the most relevant elements to DRM are discussed below.

⁵¹ Ibid, at p. 22.

⁵² Government of Grenada. 2013. National Progress Report on the implementation of the Hyogo Framework for Action 2011-2013.

⁵³ Ibid.

5.2.2 Public Policy

A number of instruments exist and attempt to guide and supplement the legal framework for disaster management in Grenada. The National Environmental Policy and Management Strategy (2005-2010) was completed during the post-Hurricane Ivan period to implement the St. George's Declaration and a key outcome focused on the need to integrate environmental considerations into the reconstruction process.

With regard to land use and zoning, the National Physical Development Plan 2003-2021 envisages an integrated coherent framework to promote and guide Grenada's development in a sustainable manner, including management of the physical environment. Legislative support for implementation of the Plan is provided via the Physical Planning and Development Control Act 2002, which also makes provision for the conduct of Environmental Impact Assessments to promote wise use of environmental resources, including disaster risk mitigation⁵⁴. However, in spite of substantial work in the areas of land tenure and sustainable land management, there is no Land Use Policy for the state of Grenada to guide land use and zoning.

Grenada is part of a regional financial risk transfer mechanism - the Caribbean Risk Adaptation and Insurance Programme - implemented by the Munich Climate Insurance Initiative (MCII) in partnership with the Caribbean Catastrophe Risk Insurance Facility (CCRIF), insurance services provider MicroEnsure and global reinsurer Munich Re. This programme is part of the International Climate Initiative (ICI) and supported by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

Budgetary allocation for DRR through national avenues is low, and DRR programming is linked to external funding and not to a cohesive integrated human resources and financial strategy adopted at national and sectoral levels.⁵⁵ International donor agencies such as CDEMA, the OAS and USAID provide assistance to Grenada for pre and post disaster emergency situations. Assistance is also received by government and non-governmental organizations to provide relief, rehabilitation and reconstruction assistance to victims of natural and man-made disasters and emergency situations, as during Hurricane Ivan, and as noted earlier, there is legislation via the Agricultural Loans Act and Hurricane Loans Act.

The Climate Change Policy and Action Plan prepared for the period 2007-2011 addressed the need for a long term response to climate change. The Action Plan was intended to initiate an analytical and capacity building process to enable the development of a sustained national response to climate change.

The 2012 - 2015 Grenada Growth and Poverty Reduction Strategy integrates climate resilience as part of its strategic vision.

The National Water Policy 2007 was developed as a result of the national water sector review. A major priority is the reduction of vulnerability to natural disasters, and the policy requires that the potential impacts of natural disasters and climate risk be considered during the preparation of water resource management plans and adopting appropriate mitigation and adaptation strategies to minimize the negative impacts of such disasters.

Grenada has recently prepared a new Food and Nutrition Security Policy, which emphasizes the need to strengthen food production systems to build resilience to the threats of natural and man-made hazards and climate change. Policy goal 3 addresses the reduction of risk caused by natural disasters. Special attention is paid to food security in the context of vulnerable groups.

⁵⁴ Hyogo Progress Report, p. 27.

⁵⁵ See the Hyogo Progress Report, p. 7.

A Draft Coastal Zone Policy to guide, regulate and manage activities in the coastal zone, including reducing vulnerability to hazards and climate change, has been prepared and is one component of the German-Grenadian four-year programme on Integrated Climate Change Adaptation Strategies.

The 2006 National Health Sector Disaster Management Plan prepared by the Ministry of Health elaborated a National Health Sector Disaster Management which broadly addresses the process of integrating risk reduction into the recovery phases of an emergency situation.

5.3 INSTITUTIONAL FRAMEWORK

5.3.1 Organisation of the National System

The National Disaster Management Agency (formerly the National Emergency Relief Organization (NERO)) is the body responsible for the overall management of disasters and emergency situations in Grenada. It was renamed by Cabinet conclusion in 2005 to reflect the agency's expanded and re-orientated mandate towards disaster risk reduction and management. NADMA is a department of the Office of the Prime Minister and is headed by the Prime Minister. The day to day functions of the NADMA are executed by a Secretariat which is the National Disaster Office located at Fort Frederick, Richmond Hill, St George's.

NADMA's mission is to reduce the loss of life and property within Grenada, Carriacou and Petite Martinique by ensuring that adequate preparedness, response and mitigation measures are in place to deal with the impact of the hazards. Its function has been divided into 5 categories:

1. *Informing* - the development and dissemination of information which will enhance the capability of the individual or the private Organization to cope with emergencies, to get help when needed.
2. *Warning* - the analysis and forecasting of the nature of potential emergencies and the development and operation of systems designed to maximize warning time and precision for the benefit of both victims and volunteers.
3. *Coordinating* - the development of systems to enable resources to be effectively applied to emergencies and disasters.
4. *Providing* - the provision and maintenance, when necessary, of extra-ordinary resources as well as the diversion of normal resources to meet emergency or disaster needs.
5. *Evaluating* - the review of the performance of the Organization with a view to its improvement.⁵⁶

NADMA's operations dovetail with the mandate of the Caribbean Disaster Emergency Management Agency, which promotes a comprehensive approach to DRM that includes preparedness and response.

NADMA is chaired by the Prime Minister. The Executive Group comprises the Prime Minister, the Permanent Secretary, Office of the Prime Minister and three Cabinet members. The Permanent Secretary, Office of the Prime Minister also acts as Deputy Chairman of NADMA in the absence of the Prime Minister.

NADMA is further comprised of the National Disaster Office (NDO) which is the NADMA Secretariat, thirteen (13) National Committees chaired by Permanent Secretaries/Heads of Departments at national level, and seventeen (17) District Disaster Management Committees, each chaired by a volunteer District Coordinator at the district level - see Fig. 9.

⁵⁶ See <http://www.gov.gd/departments/NaDMA.html>

Other permanent members are the Grenada Red Cross, the Chief Meteorological Officer, and the Commissioner of Police, all of whom sit on National Disaster Management Committees.

The position of the National Disaster Management Advisory Council (NAMAC or NADMAC) vis-à-vis the revised organizational structure in the draft National Disaster Management Plan is not clearly defined but its main functions are:

- a) To ensure that all disasters and emergency preparedness processes and resources are adequate.
- b) To mobilize, direct and co-ordinate preventative, mitigation, preparedness, response, rescue and relief mechanisms for all hazards and emergency situations.
- c) To promote preventative mechanisms and activities and rapid response techniques by all Organizations and agencies with disaster functions or services especially Police, Fire, Health Services, etc.
- d) To prepare for approval by Cabinet, guidelines and administrative policy for all sections of the National Disaster Management Organization.
- e) To ensure the acquisition and dissemination of adequate public information.

In the absence of local government, civil society and community residents partner with NADMA via the 17 District Disaster Management Committees chaired by the volunteer District Coordinator, as described above.⁵⁷ The result is a government-coordinated platform for a community-based grassroots preparedness and response programme.

The prominent community- based institutions are as follows:

- Grenada Red Cross Society;
- St. John's Ambulance Brigade;
- Volunteer Firefighters and Coastguard Auxiliary;
- Local churches, particularly the Grenada Mission of Seventh Day Adventist; and
- Principals and teachers attached to the Ministry of Education who provide the use of schools for safe shelter during emergency situations.

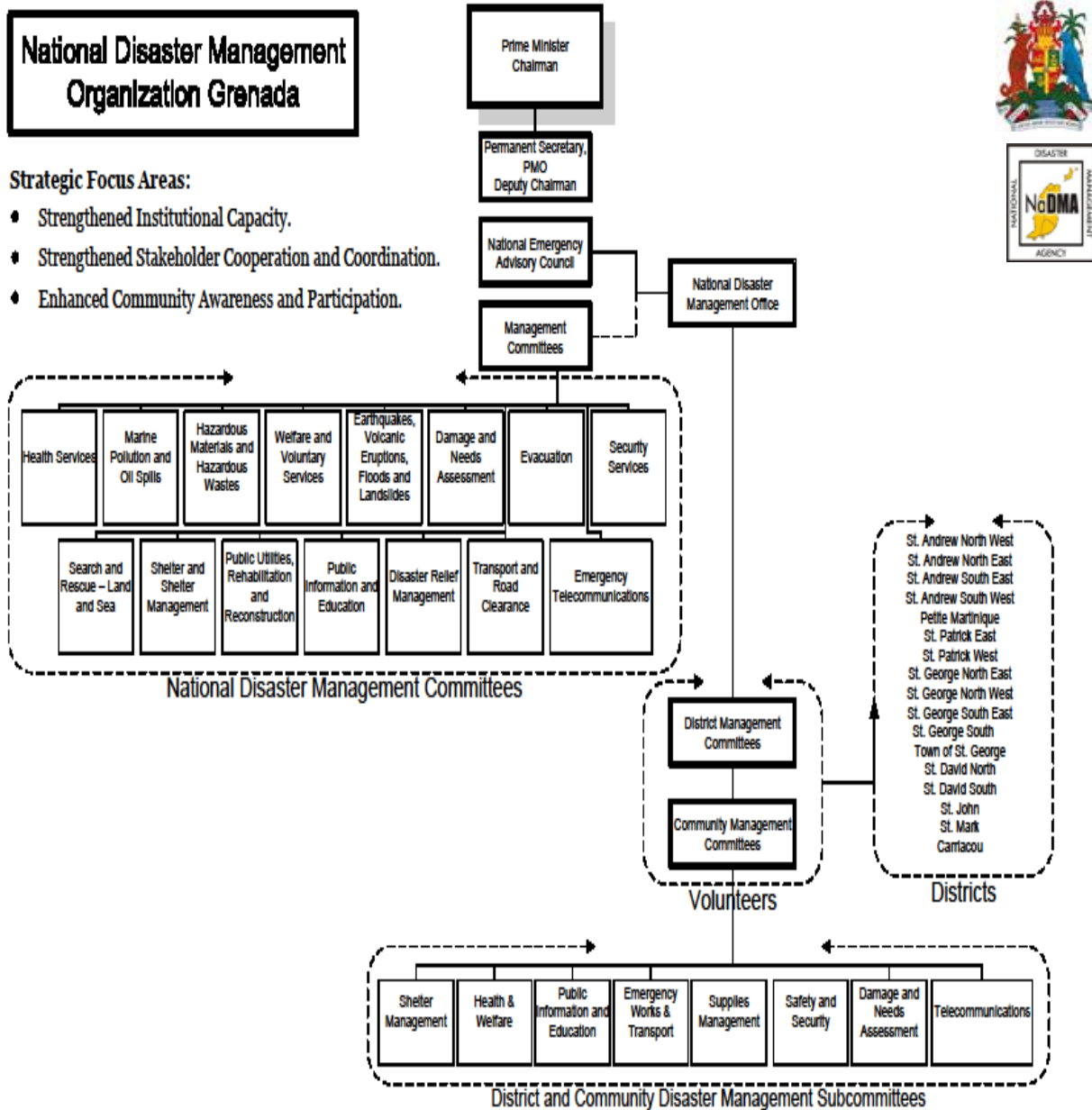
There are also institutional mechanisms in place to monitor, archive and disseminate data on key hazards, with specific emphasis on hydro-meteorological (e.g. floods, droughts and tropical systems), geological (e.g. earthquakes and Tsunami) and biological (pest and diseases) hazards.

The following outlines the responsible institutions for monitoring the above hazards:

1. *Flood and drought*: Land Use Division, Ministry of Agriculture (In partnership with the Caribbean Institute for Meteorology and Hydrology - CIMH);
2. *Tropical Storms and hurricanes*: Meteorological Services, Maurice Bishop International Airport;
3. *Earthquakes and Tsunami*: University of the West Indies Seismic Research Centre and the University of Hawaii (monitors sea level rise); and

⁵⁷ Hyogo Progress Report, p. 8 and the National Disaster Management Plan (revised 2012), pp 24-25.

Figure 9. NADMA Organisational Structure



4. *Pest and Diseases including invasive species*: Ministry of Agriculture, Forestry and Fisheries with partnering institutions.⁵⁸

With respect to monitoring drought and flood at the national level, a well-established Water Information System (WIS) is institutionalized in the Land Use Division, Ministry of Agriculture established through the

⁵⁸ Hyogo Progress Report, p. 14.

CARIWIN project led by the Centre for Water Resources Management at Mc Gill University, Canada and the CIMH based in Barbados. The Grenada WIS uses an up-to-date Web based platform to provide reliable and easy access to water related data (Refer to <http://cariwin.gd/webmap/app/db/index.php>).

Data and information generated from monitoring priority hazards are used to some extent by sectoral ministries such as the Ministry of Agriculture for drought preparedness. However, the extent of utilization across all line ministries is not clear. Very little vulnerability assessment is undertaken, with some localized work done by the Grenada Red Cross Society. A disaster loss database is not yet available.⁵⁹

There is no dedicated budget for DRM, as it is incorporated into the Budget for the Office of the Prime Minister. High national indebtedness limits government spending on critical prevention and mitigation work outlined in national and sectoral policies and strategic plans. The budget includes small capital projects such as repair to facilities. The Ministry of Finance, Planning, Economic Development, Trade, Energy & Cooperatives provides budgetary support for emergency expenditures to design, update, test and evaluate continuity of operations and emergency response plans and procedures. The Ministry provides estimates for the amounts of financial and other relief and rehabilitation requirements as well as collects, collates and maintains damage statistics and assists with coordination of supplies and other assistance received by government and non-governmental organizations. There is need for an integrated financial mobilization strategy for disaster risk reduction that outlines plans for mobilization of finances from external, internal and innovative sources.⁶⁰

As noted in the previous section on the normative framework, Grenada is part of a regional financial risk transfer mechanism, the Caribbean Risk Adaptation and Insurance Programme. The Climate Risk Adaptation and Insurance in the Caribbean project is implemented by the Munich Climate Insurance Initiative (MCII) in partnership with the Caribbean Catastrophe Risk Insurance Facility (CCRIF), insurance services provider MicroEnsure and global reinsurer Munich Re.

The “Livelihood Protection Policy” (LPP), which was developed by the Climate Risk Adaptation and Insurance project was launched in Grenada on January 22, 2014. Grenada is now the third country in the region – following Saint Lucia and Jamaica – to offer this new product. The LPP is a new insurance product which aims to protect low-income earners, including small-holder farmers, as well as day labourers in other sectors, against extreme weather risks. The intention is to cover losses to people’s livelihoods caused by heavy rainfall and high winds. It enables affected people to recover more quickly after a damaging weather event. The LPP is being offered in Grenada through Trans-Nemwil Insurance Limited in collaboration with Grenada Co-Operative Bank Limited and Grenville Co-Operative Credit Union.⁶¹ Grenada is also participating in WINCROP, the Windward Island Crop Insurance Ltd. (WINCROP) which provides insurance for banana growers in the Eastern Caribbean. It is hoped that this agricultural insurance will expand to provide coverage for other crops in time.⁶²

5.4 SUMMARY

The legislation for DRR in Grenada is outdated and fragmented. There are clear gaps in the legislation in terms of making a declaration of disaster. The Constitution and the Emergency Powers Act have designated the Governor General as the person with power to determine that a state of emergency exists, and to make a declaration, while the National Disaster (Emergency Powers) Act gives the Prime Minister the power to declare

59 GOG. 2013. National Progress Report on Implementation of the Hyogo Framework for Action 2011-2013, p. 8.

60 Hyogo Progress Report, p. 7.

61 See: <http://www.ccrif.org/news/livelihood-protection-policy-launched-january-22-2014-grenada>

62 See: <https://openknowledge.worldbank.org/bitstream/handle/10986/17030/762050BRI0Box30nBreve01830Eng0Print.pdf?sequence=1>

a national disaster. This existing arrangement has the potential for conflict.⁶³ In addition, specific laws address aspects of disaster management but there is no holistic, integrated approach to disaster management and disaster risk reduction. Outmoded mechanisms for implementation are either ineffective where in use or not used at all eg. private forests under the FSW Act. Focus is on penalties for violations of provisions within the law, rather than prevention. There are provisions that indirectly impact disaster risk reduction and management but are not readily apparent because they are found in laws not directly related to DRR. Rationalization of the legal framework would assist in flagging these provisions and harmonizing the legal environment for DRR.

NADMA lacks the legislative status that would strengthen its ability to carry out its responsibilities. The draft National Disaster Management Plan lays down the authority for disaster declaration, international funding, defines disaster and emergencies and important terminology, outlines procedures and significantly diversifies institutional arrangements for disaster management, but it is not effectively aligned with existing legislation or policies. While the Plan has updated its 2005 predecessor, there remain gaps in the organizational structure and in relation to legislation. The Plan notes that the model legislation is to be reviewed but fails to make linkages with its international obligations relating to natural and man-made hazards that are cross-cutting for DRR. Examples include the UNFCCC, MARPOL, and the chemicals management treaties – the Stockholm, Basel and Rotterdam Conventions.

Co-ordination with community and non-governmental organizations reflects a strong participatory flavor, as local government no longer exists in Grenada and volunteerism supports the country's district and community approach. However, these arrangements with civil society are not captured in legislation.

The normative framework has been more responsive in its attempts to supplement the legislation and meet the nation's needs, but this has also resulted in an array of policies that complicate rather than streamline decision-making and management processes. It is not always clear which policies currently apply to DRM in Grenada. In addition, as noted in the Hyogo Progress Report, few instruments make special provision for vulnerable groups in relation to disaster management, such as women, children, youth, the elderly and the disabled. The draft CDM policy and strategy 2015-2019 is intended to provide the comprehensive framework necessary for mainstreaming disaster management in Grenada and can therefore address many of the gaps described herein.

The model legislation presents a disaster management regime that clearly outlines institutional arrangements for disaster risk reduction, identifies key stakeholders and actors in the process, and allocates roles and responsibilities according to respective capacities. Clear procedures are also set out for planning, declaration of emergencies, evacuation, and funding. Many of these provisions found in the model legislation can provide guidance in fine-tuning the draft National Disaster Management Plan. Cognizance should also be taken of the CCCCC's recommendations for a climate change policy framework and best practice such as that reflected in the developing DRR checklist for DRR legislation prepared by IFRC and UNDP. Governance that is centred on the needs of the most vulnerable and integrates the social dimensions of DRM has the potential to be most appropriate for Grenada.

63 OAS. 2010. Caribbean Emergency Legislation Project: Improving the Legal and Institutional Framework related to State of Emergency, p. 61.



6. The state of disaster risk in the country

6.1 HISTORICAL DATA ANALYSIS

Historical records indicate that Grenada has been adversely affected by a range of natural hazards on a frequent basis throughout its recorded history. These include hydro-meteorological hazards - droughts, floods, wind, storm surges, tropical cyclones (hurricanes, tropical storms and tropical depressions); geological hazards - landslides and rock falls, and seismic hazards – earthquakes and tsunamis. Fires and road accidents have also resulted in loss of life and destruction of property.

There is no systematic documenting and archiving of information on the occurrence and impact of these hazards, no mechanisms to systematically compile, store, update and manage the data and information relating to these hazards in a central location. The information that is available is stored in an ad hoc manner by a number of different local, regional and international entities.

Table 6.1 Hazards which Impacted Grenada 1800 - 2014

Type of Hazard	# of Impacts
Floods (Rainfall)	12
Tropical Cyclones	34
Droughts	10
Landslides	0
Rock falls	1
Earthquakes	22
Road Accidents (2009 – 2013)	1,503 per year
Fires (2009 – 2013)	Forest - 425 acres/yr Structural – 45/yr

A synthesis of the information available from these sources shows that Grenada has experienced the impacts of a range of hazards over the last 200 years – Table 6.1.

A detailed listing of the occurrences of each hazard is presented in the following sections.

It should be noted here that NaDMA has initiated a process to develop a database of hazard occurrences, but the results were not available in time for use in this country document. The data here should therefore be treated as preliminary and should be updated once the NaDMA database has been completed.

6.1.1 Floods

Significant flooding as a result of rain-storms of varying intensities has affected the island over the past three centuries, with records dating back to 1894. Table 6.2 summaries these flooding events and identifies

the basins of the rivers flowing through St. John's, St. Mark's, St. George's and St. Patrick's as areas that are vulnerable areas to significant flood events.

Table 6.2 Frequency and Impacts of Rain-storm on Grenada from 1877 – 2003⁶⁴

Year	Type of Event	Impacts
September 28, 1894	Rain	Persistent rainfall for 24 hours led to rivers overflowing their banks in the parish of St. Andrew's. Roads, bridges and crops were damaged.
1896	Rainfall	On November 15 th heavy rains resulted in damage to the river bank at Gouyave from overflowing streams. On November 30 th approximately six inches of rain fell in St Patrick's during a two hour period resulting in damage to roads, crops and the demolition of the river embankment at Belmont.
December 6, 1897	Rain-storm	On December 6 th , downpours occurred in the Northern side of the island. Both boulder bridges at Gouyave and Victoria were practically demolished and the stone bridge in the mouth of the Gouyave river was destroyed.
November 8, 1899	Rain-storm	Heavy rain in St. John's caused the Gouyave River to overflow damaging boulder –bank.
July 5, 1901	Rain-storm	Heavy rains resulted in damages to roads; and Dunfermline bridge.
September 24, 25, 1911	Severe storm	Heavy rainfall resulted in damage to roads and agriculture. Gouyave and Concord were most severely affected.
October, 1938	Rain-storm	Unprecedented violent rain-storm resulted in the loss of 5 lives, widespread damage to cultivation, roads, bridges and telephone lines over the southern portion of the island. The main bridge over the St. John' river which led to the town of St. George's was completely destroyed.
October 4, 1945	Severe rain-storm	Heavy rains led to the loss of 15 lives. 13 houses were washed away. Estimated damage 20,000 pounds.
November 1975	Heavy Rains	US\$4.7 million in losses. ⁶⁵
December 12, 2003	Heavy rain	The St. John's River overflowed its banks causing damage to private houses, vehicles, schools, commercial buildings, and the newly built National Stadium. Estimated cost of damage was EC\$1.2M. ⁶⁶
April 2011	Heavy Rain	Torrential rains caused major flooding in the towns of St Mark and St John, leaving dozens of homes and businesses damaged, roads blocked and a number of fishing boats destroyed. 19 families had to be relocated. Estimated cost of damage ECD 11.2M. ⁶⁷

6.1.2 Hurricanes and Tropical Storms

Tropical cyclones of varying intensities have impacted the island, based on records dating back to 1856. Most of the recorded information reports the occurrence of the event, but with very little information on the impacts – damages, costs and the like - of the event. Table 6.3 summaries the events for which recorded information is available.⁶⁸

64 Sources: The Grenada Hand Book, 1946; NERO Report, 2003

65 https://www.climateinvestmentfunds.org/cif/sites/climateinvestmentfunds.org/files/final%20grenada%20_SPCR_%20mar%204%202011.pdf

66 Grenada Meteorological Office MBIA

67 Damage Assessment Report on Torrential Rainfall Damage in St. John's and St Mark's April 2011

68 In reading the table, H1, H2 and H3 refer to category one, two and three hurricanes respectively, while TS refers to tropical storms. Wind category refers to the maximum measure while the system moved through the region in miles per hour.

One of the significant features of the data is the time of year during which these tropical cyclones affect Grenada. The data shows that 50% (17) of the recorded events took place in September or later, and that a further 30% (11) took place in August. The historical record therefore shows that Grenada is susceptible to late season cyclones and this needs to be taken into account in national disaster management plans.

The most significant cyclones to affect Grenada were hurricanes Janet in 1955, Lenny in 1999⁶⁹ and Ivan in 2004.

Table 6.3 List of Hurricanes and Tropical Storms Which Affected Grenada⁷⁰

Date	Wind	Category	Name	Impact
August 14, 1856	81	H1	Not Named	
September 22, 1877	81	H1	Not Named	
September 2, 1878	92	H2	Not Named	
August 16, 1886	109	H2	Not Named	
July 20, 1887	69	TS	Not Named	
October 12, 1891	40	TS	Not Named	
October 7, 1892	40	TS	Not Named	
October 15, 1895	58	TS	Not Named	
November 28, 1896	52	TS	Not Named	
October 9, 1897	46	TS	Not Named	
August 20, 1901	52	TS	Not Named	
September 7, 1905	58	TS	Not Named	
August 1, 1918	40	TS	Not Named	
August 23, 1918	75	H1	Not Named	
August 3, 1928	40	TS	Not Named	
September 6, 1931	40	TS	Not Named	
August 12, 1933	40	TS	Not Named	
August 17, 1933	40	TS	Not Named	
September 17, 1933	46	TS	Not Named	
August 10, 1938	52	TS	Not Named	
July 24, 1944	52	TS	Not Named	
October 6, 1954	86	H1	Hazel	
September 22, 1955	115	H3	Janet	120 persons ⁷¹ killed, 95% of nutmeg crop destroyed, 6000 dwelling houses destroyed, 40% of schools seriously damaged.
July 20, 1961	52	TS	Anna	
October 1, 1963	127	H3	Flora	Estimated ⁷² damage GBP 20,000.
August 11, 1978	52	TS	Cora	
September 8, 1986	58	TS	Danielle	

69 Lenny did not hit Grenada directly. However, the storm surge created by Lenny wrought significant damage in coastal areas.

70 www.stormcarib.com/climatology/TGPY_all_isl.htm

71 Natural Hazards in the Windward Islands. University of Bradford Disaster Research Unit 1977

72 The Grenada Hand Book 1964

Date	Wind	Category	Name	Impact
October 14, 1988	52	TS	Joan	
July 25, 1990	58	TS	Arthur	
December 1999			Lenny	Estimated cost 27.0% of GDP
October 1, 2000	40	TS	Joyce	
September 24, 2002	58	TS	Lili	
August 15, 2004	45	TS	Earl	
September 7, 2004	115	H3	Ivan	39 killed; Estimated cost 200% GDP; 91% of forest and watershed lost vegetation
July 8, 2005	90	H1	Emily	1 Killed

6.1.3 Droughts

Grenada has experienced 10 periods of drought since 1900, with a number of consecutive years in the early part of the 1970s. Information on the impact of these drought events was not readily available. Table 6.4 lists the events and the information that is available on them.

Table 6.4 Periods of Drought in Grenada⁷³

Year	Impact
1904	Severe drought
1905	Severe drought
1970	Lack of sufficient rainfall for 5 months
1971	Lack of sufficient rainfall for 5 months
1972	Lack of sufficient rainfall for 6 months
1973	Lack of sufficient rainfall, for 8 months
1974	Lack of sufficient rainfall for 5 months
1975	Lack of Sufficient rainfall for 5 months
1994	Lack of sufficient rainfall for 6-7 months. Tourism belt affected by lack of pipe borne water.
2009-2010	Severe drought. In 2009 a 24 year lowest annual rain fall total recorded. 17% decline in banana production. ⁷⁴

6.1.4 Landslides

There are no comprehensive historical records of the quantities of landslides which affected Grenada. Anecdotal information does indicate that significant landslides have occurred over the years, especially during the rainy season when rainfall amounts are significant.

6.1.5 Rock falls

The historical record shows that rock falls have been an issue of concern for many years. Records indicate that in 1905, concern was raised about the occurrences of such events.⁷⁵ Although there are no comprehensive

⁷³ Natural Hazards in the Windward Islands. University of Bradford Disaster Research Unit 1977

⁷⁴ <https://www.wmo.int/pages/prog/drr/events/Barbados/Pres/4-CIMH-Drought.pdf>

⁷⁵ The Grenada Hand Book 1964

records that can be sourced, the most damaging event occurred in 1991 in the village of Cotton Bailey parish of St. John when a large boulder fell on a passenger bus, resulting in the loss of nine lives.

6.1.6 Earthquakes

Grenada has a long history of earthquake events dating back to 1822. In the intervening years to 1954, the records show that the island experienced 18 earthquakes. 38.8% (7) of them has resulted in minor damage to property.

Table 6.5 is an inexhaustive list of the major earthquake events.

Table 6.5 Earthquake Occurrences in Grenada⁷⁶

Year	Measurement	Impact
1822 (1 Dec)	VIII (Richter Scale)	Buildings were damaged
1822 (29 Dec)	VII	Enormous rocks rolled off mountains
1831 (4 Dec)	VII	Walls cracked slightly, church bells rang
1834	VI	Cracks in walls of houses. Many minor damage
1844	VII	Partial wall collapse in St. Georges
1846	VI	
1885	V	
1886	V	
1887	V	
1888	VIII	Buildings and churches seriously damaged
1890	V	
1892	V	
1898	V	
1905	V	
1906	V	
1918	V	
1924	V	
1954	VI	Slight cracking of walls in buildings in St. Georges
2012 (January)	3.5 (Richter Scale) ⁷⁷	
2012 (February)	4.0 ⁷⁸	
2013	4.8 ⁷⁹	
2014	4.0 ⁸⁰	

⁷⁶ Natural Hazards in the Windward Islands. University of Bradford Disaster Research Unit 1977

⁷⁷ <http://www.uwiseismic.com/NewsDetails.aspx?id=244>

⁷⁸ Ibid

⁷⁹ Ibid

⁸⁰ Ibid

6.1.7 Road Traffic Accidents

Over the period 2009 - 2013, Grenada has averaged 1,503 road traffic accidents per year – from a high of 1599 in 2011 to a low of 1359 in 2013. The records indicate that a number of citizens have been seriously injured and some have died each year from these road accidents. Table 6.6 summaries the numbers of road fatalities for the period 2009 – 2013.

Table 6.6 Inventory of Road Traffic Accidents⁸¹

Year	Number of Accidents	Number of Fatalities
2009	1,548	9
2010	1,582	5
2011	1,599	5
2012	1,447	3
2013	1,359	9

6.1.8 Fires

Forest Fires, wild bush fires and structural fires pose a threat to the population, the forest health and many endangered species. Data for the period 2009 - 2013 indicate that a total of two thousand, one hundred and forty six (2,146) acres of forest were destroyed by fires – an average of 429 acres per year. The worst years on record were 2007, 2008 and 2010.

These fires occurred mainly in the dry season, during the months of March, April and May, and were a direct result of human interaction with the environment viz:

1. Tossed cigarettes
2. Debris burning
3. Charcoal production from the public
4. Slash-burning from farmers
5. Hunters burning out their quarry
6. Children playing with fire
7. Arson

Table 6.7 provides information on the number of acres destroyed by forest fires on an annual basis between 2006 and 2010.

Table 6.7 Inventory of Forest Fires 2006-2010⁸²

Year	Acreage Destroyed
2006	345
2007	495
2008	567
2009	258
2010	481
Total	2,146

81 Royal Grenada Police Force Traffic Department

82 Royal Grenada Police Force Fire Department

Structural fires are also cause for concern and the data in Table 6.8 shows that there were 225 reported structural fires between 2009 and 2013 – an average of 45 per year. The causes of these fires were:

1. Arson
2. Children playing with matches
3. Candles, lamps etc left lightening unattended
4. Over loaded circuits

Table 6.8 Inventory of Structural Fires⁸³

Year	Number of Fires	Fatalities
2006	n.a.	4
2007	n.a.	1
2008	n.a.	n.a.
2009	46	1
2010	41	0
2011	61	0
2012	45	0
2013	32	0

6.1.9 Lessons Learnt and Good Practices

Table 6.1 shows that the most frequently occurring natural hazard is tropical cyclones, and this has received the major focus by the national authorities. In the aftermath of Hurricanes Ivan and Emily, a number of initiatives were taken by the Grenadian Government to mitigate against the level of impact of future events, viz:

- The development of a national mantra to “Build back better” - In rebuilding the buildings that were destroyed by Hurricane Ivan, stricter adherence was paid to the building codes. Additionally better construction practices were employed, including the use of hurricane straps to reinforce roofs.
- Strengthening of the national response systems. The National Emergency Organization was restructured, and investment was made in training and upgrading key personnel at the national and district levels. The scope of operations was broadened from disaster response to disaster management, including vulnerability reduction, prior to an impact from a hazard. The National Disaster Management Plan was also updated.
- Strong support for the establishment of the Caribbean Catastrophe Risk Insurance Facility. This provides rapid financial support to governments in the region affected by disasters.
- Replanting of the Grand Etang Forest.
- Implementation of a number of Disaster Vulnerability Risk Reduction Projects both nationally and in specific high risk communities.

⁸³ Royal Grenada Police Force- Fire Department

6.2 HAZARDS/THREATS

Grenada's human capital and resources - natural and man-made - continue to face exposure to natural hazards, some of which are projected to increase and/or intensify as a result of the effects of climate change. Anthropogenic hazards and various other emergencies which affect public health increase the magnitude of the threats.

6.2.1 Natural Hazards

The location, topography and geology of Grenada make it susceptible to a range of natural hazards. The Grenada National Disaster Management Plan (2011) itemized the following as the most commonly occurring natural hazards:

- Tropical cyclones - hurricanes, tropical storms, tropical depression and accompanying storm surge.
- Floods - riverine and coastal.
- Landslides.
- Volcano.
- Forest Fires

Tropical Cyclones pose an annual threat to Grenadian lives, property and natural resources. Grenada, like all the islands in the Caribbean basin, is located in the hurricane belt and consequently, during the hurricane season - May to November - the island is at risk of being impacted by a cyclone.

Cyclones can cause significant damage, and given the small size of the island, the impact of one cyclone can affect the entire island with devastating consequences. This was evidenced during the passage of hurricane Ivan in 2004 when over 90% of the buildings in the island were damaged or destroyed in a few hours. Fig. 10 depicts the damage wrought by hurricane Ivan to buildings in Grenada.

Flooding is usually localized, affecting various communities which are situated in flood prone areas - usually low lying coastal areas.

Much of the flooding is as a result of heavy rainfall and/ or storm surges usually occurring, but not limited to the months of June - November.

Figure 10. Buildings in Grenada Damaged by hurricane Ivan



Photograph: Jack Russell/AP

Major rivers run through many of the towns and settlements in a number of parishes including St Andrew's, St John's, St George's and St. Mark's. The extent of the rain fall results in swollen drains and rivers which eventually overflow their banks.

Fig. 11 depicts the effects of flooding in the town of Grenville.

Landslides are a common feature along the network of Grenada's roads. This is usually prompted by prolonged or intense rainfall which usually occurs between June-November annually.

Figure 11. Flooding in the town of Grenville – Nov 2011



Rock falls - Weathered rocks and volcanic boulders can also become dislodged, presenting danger to citizens. This is particularly pertinent on the western side of the island where the land slopes very steeply into the sea. Fig. 12 depicts the results from one such incident.

Figure 12. Rockfall in Maran St. John's, April 2011⁸⁴



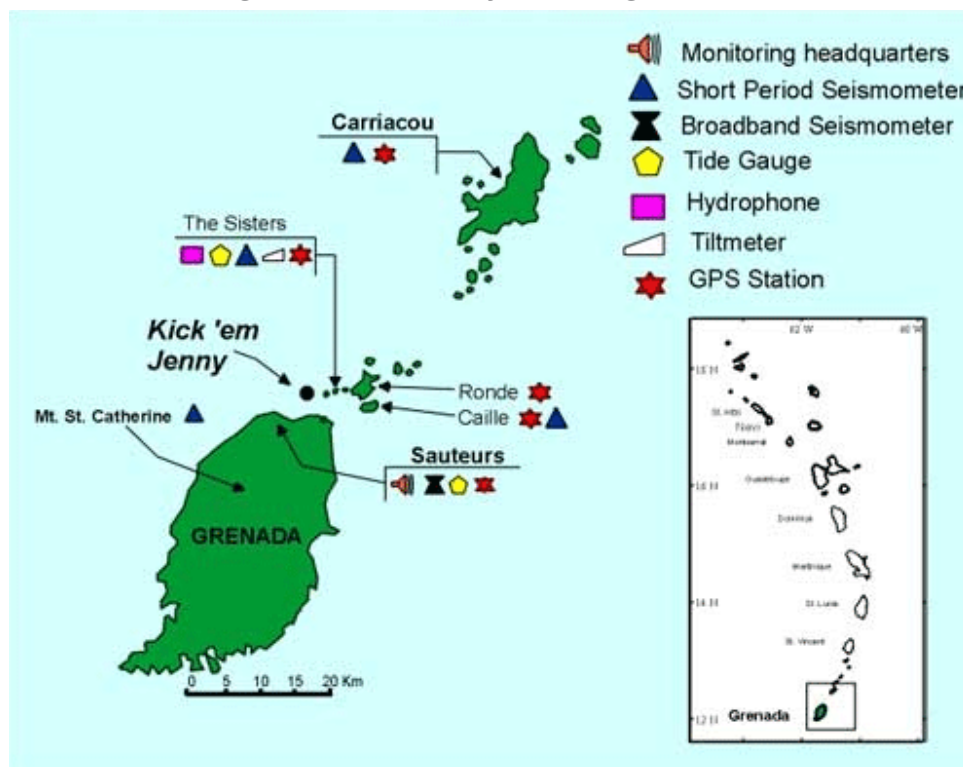
⁸⁴ Google.com

⁸⁵ <http://www.uwiseismic.com/General.aspx?id=54>

Volcanic activity is another hazard that Grenada is exposed to. The island has two volcanoes – Mt. St. Catherine and Kick ‘em Jenny. Kick ‘em Jenny is an undersea volcano located 8 km north of the island. It reaches a depth of approximately 180 meters. The volcano has erupted 12 times since 1939. The University of the West Indies Seismic Research Center has assigned a yellow alert level for the volcano indicating that “the volcano is restless: seismicity and/or fumarolic activity are above the historical level, or other unusual activity has been observed, or can be expected without warning.”⁸⁵

Given the risk, a monitoring network has been established. This network is depicted in Fig. 13 below.

Figure 13. Kick ‘em Jenny Monitoring Network⁸⁶



Given the close proximity of the volcano to Grenada, the possibility of a tsunami reaching the shores of Grenada in less than five minutes after an eruption can be threat to Grenadian life and property depending on the size of the wave generated.

There are no historical records of eruptions of Mt. St. Catherine.

Earthquake risk is considered moderate to low, classified in seismic zone 2 under a 4 zone system. However an eruption of Kick Em Jenny does have the potential to produce a significant earthquake which can affect the state.⁸⁷

⁸⁶ Ibid

⁸⁷ Disaster Risk Management in Latin America and the Caribbean Region. GFDRR Country Notes Grenada. The World Bank.

6.2.2 Anthropogenic/Man-made Hazards

Socio-natural hazards results from high population densities in urban areas with inadequate basic services provision including water, health, education and transportation. In St. George's, the most densely populated town, such a hazard is linked to the state of poverty of the persons occupying specific areas and not necessarily in the provision of the services. Generally these social services are available; however access is restricted to some persons due to their limited financial resources.

Civil unrest is a hazard which Grenada experienced in the past with significant consequences. This included loss of lives and injury to an unspecified number of persons on October 19, 1983. The political environment has changed significantly since, however the potential for and impact of civil unrest must be given necessary attention.

Technological hazards include fires, pollution, toxic spills and accidents in highly sensitive areas. Forest fires are an annual threat and the fire department is challenged to respond adequately to all reports due to limited resources. In many instances structural (house) fires are often given priority over forest fires. It must be noted also that after bush fires and other soil disturbances, invasive non-native species populate the open areas (e.g. guinea grass) and this is an area of concern.

Landfill fires are also of concern as it contributes to air pollution. The burning of garbage at the lone landfill site in the town of Beausejour is an ongoing activity.

Figure 14. Structural Fire



Photo courtesy of Leon DeCoteau, ©2014

Structural fires have been a significant hazard in Grenada and this continues to affect lives and property. Thus far in 2014 there have been nine business place fires and ten dwelling house fires. To date these fires have occurred in the towns of St. George's, Sauteurs, Carriacou, Grenville and Gouyave. On March 8th 2014 in the town of Gouyave, seventeen (17) members of one family had their homes completely destroyed by one such fire. It is important to note that approximately 90% of houses destroyed by fire were uninsured.⁸⁸

⁸⁸ Royal Grenada Police Force, Fire Department.

Oil spills

Grenada and its environs do not have a history of frequent occurrences of oil spills. The last noted event occurred in 1979 when two tankers collided between Grenada and Tobago. However the impact of a significant spill can be potentially devastating to Grenada's natural resources in terms of destruction of beaches, coral reefs and marine life. In addition, the existence of the storage facilities of two liquid petroleum gas companies in the community of Grand Mal, a densely populated area through which a major road network runs, is a significant threat to lives and property. The transportation of fuel on the road by the two main companies creates an additional potential for significant damage and oil spills if they are involved in accidents.

Road accidents are the most persistent form of transportation accidents recorded in Grenada. These are due mainly to driver errors. In 2014, thus far there have been eight hundred and fifty seven (857) accidents, with one fatality⁸⁹.

6.2.3 Emergencies Affecting Public Health and Safety

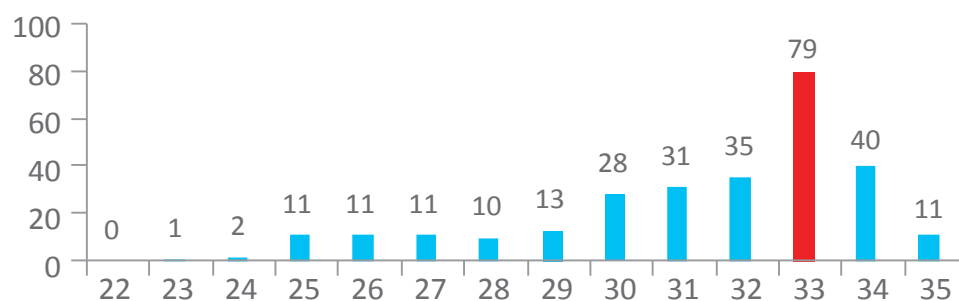
Historically, Grenada has experienced outbreaks of illnesses and epidemics which negatively impacted public health. The most significant these in recent years have been Acute Respiratory Infection, Gastroenteritis, Chicken Pox, Dengue Fever, Scabies and Chikungunya. Table 6.9 and Fig. 15 provide details of the incidence of these disease outbreaks.

Table 6.9 Communicable Disease of Significance 2006-2013⁹⁰

Communicable Disease	2006	2007	2008	2009	2010	2011	2012	2013
Acute Respiratory Infection	7,608	7,535	6,282	8,292	11,027	10,064	11,129	10,042
Gastroenteritis	2,052	1,155	1,509	1,819	2,416	1,713	3,744	1,795
Chicken pox	52	33	61	88	46	197	116	21
Dengue	14	7	7	28	134	92	85	155
Scabies	197	N/A	215	260	200	244	230	177

Source: Ministry of Health

Figure 15. Chikungunya Cases by Week of onset of illness Grenada 2014 -Epidemiologic Week 22-35. Week 35 ending August 30⁹¹



Chikungunya: Suspected Cases 283, confirmed cases 21. Total 304.

⁸⁹ Royal Grenada Police Force, Traffic Department.

⁹⁰ Ministry of Health.

⁹¹ Ibid - Chikungunya - Suspected cases 283; Confirmed cases 21; Total 304.

Public health can also be compromised in the aftermath of the impact of natural hazards including tropical cyclones, floods, earthquakes and volcanic eruptions and become secondary hazards e.g. damage to infrastructure can affect hygiene practices, which, in turn, can lead to rapid transmission of communicable diseases.

Densely populated areas in which good sanitation practices are compromised on an ongoing basis facilitates the spread of illness.

6.3 VULNERABILITY

Vulnerability as defined within UNISDR terminology refers to “the characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard” (UNISDR 2009).

Grenada as a small island developing state has inherent vulnerabilities due *inter alia* to its geographic location, small size, remoteness, small economy, dependence on natural resources and limited human resources. It is particularly vulnerable to the impacts of natural hazards, where the impact of one significant hazard could reverse years of positive economic growth and development. The vulnerability to the impact of specific hazards is due to local factors embedded in its geography, socio-economic development and institutional organization.

6.3.1 Analytical Criteria and Methodology

The analytical criteria and methodological approach used to assess vulnerability is based on the work of the [Deutsche Gesellschaft für Internationale Zusammenarbeit \(GIZ\)](#)⁹² which views vulnerability as comprising the following components:

$$\text{Vulnerability (V)} = f(\text{Exposure} \times \text{Sensitivity} \times \text{Resilience or Adaptive Capacity})$$

This is consistent with the approaches used by other international organisations working in Grenada including The Nature Conservancy and is used here given the incorporation of climate change into the analysis.

6.3.2 Components

The key concepts underlying the methodology are:

- **Exposure:** “people, assets, systems or other elements present in hazard zones and which are thereby subject to potential losses. Measures of exposure can include the number of people, or types of assets in an area. These can be combined with the specific vulnerability of the exposed elements to any particular hazard to estimate the quantitative risks associated with that hazard in the area of interest” (UNISDR 2009).
- **Fragility:** refers to “the level at which a system is affected both positively and negatively when facing the impact of a hazard or danger; that is, the relative disadvantage or weakness of a social unit because of socioeconomic conditions. In practice this translates into structural weakness in buildings as a result of inadequate construction practices” (GIZ –MEF, 2006).

⁹² From: UNISDR, GIZ and Peru Ministry of Economy and Finance. 2010. Peru Country Document 2010: “Methodological guide for the inclusion of risk analysis of natural hazards in the formulation and assessment of projects in the Public Investment System”

- **Resilience**⁹³: “The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions” (UNISDR 2009).

The use of this analytical criteria and methodology was supplemented by the application of the various approaches to vulnerability referenced by Wilches-Chaux (1993). These approaches include, inter alia:

- *Physical vulnerability* - refers to the location of population in an area of physical risk;
- *Economic vulnerability* - refers to income levels, unemployment, exploitation, work instability, difficulty in accessing education services, health and leisure;
- *Social vulnerability* - refers to the level of organization and internal cohesion of the society at risk;
- *Political vulnerability* - refers to the concentration of decision making power, centralization in governmental organizations and weakness in the autonomy of regional, local and community levels, which pose an obstacles to facing problems;
- *Educational vulnerability* - refers to a lack of educational programs, inadequate instructor capacity and materials, unavailability of educational programs that include DRR at local and regional levels, level of understanding of the community members of their vulnerabilities and the capacity to get involved in the reduction of the risks.
- *Environmental vulnerability* - Refers to coexistence with the environment without domination and destruction. Vulnerability of ecosystems to direct and indirect human action and high risk of communities that exploit or inhabit them.

The analysis was also informed by the use of the OECS Benchmarking Tool⁹⁴, which facilitated a more detailed analysis of the following underlying processes and capacities, which also contribute to the construction of vulnerability, viz:

- Risk identification;
- Hazard Mitigation;
- Risk Transfer;
- Disaster Preparedness;
- Emergency Response; and
- Rehabilitation and Response.

6.3.2 Vulnerability Analyses Based on Selected Criteria

Exposure

Physical

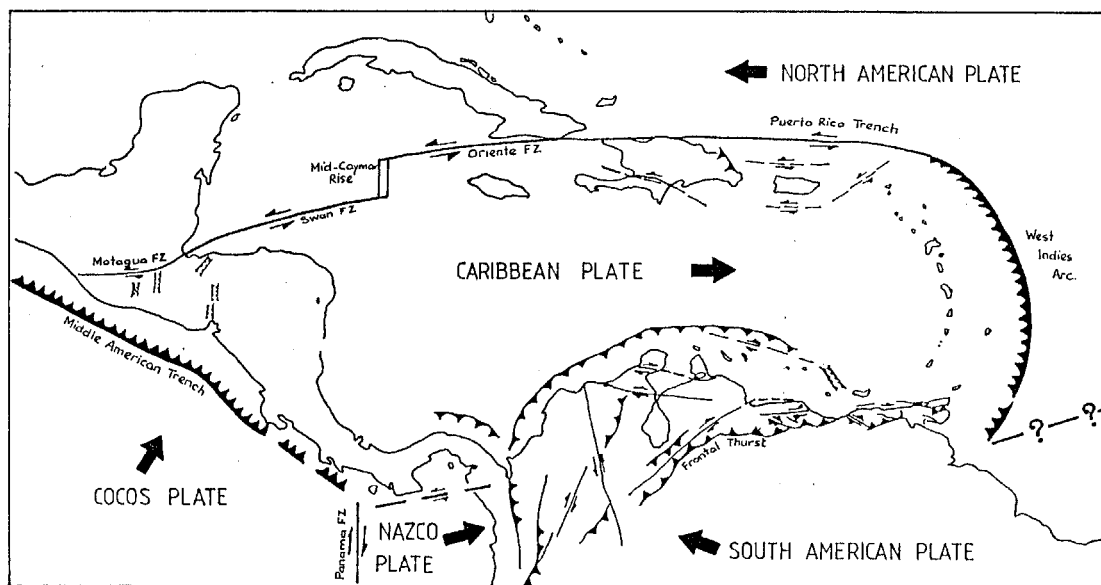
Grenada, as a country, has a very high degree of physical exposure to natural hazards, both on a national and a local/community level. It's geographic location and geological origin exposes it to tropical cyclones, earthquakes and volcanic activity, viz:

⁹³ Another definition was used by UNISDR during May 2012 Working Party on Humanitarian Aid and Food Aid (COHAFA); it states resilience as followed: “Capacity to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning”.

⁹⁴ OECS: Vulnerability Benchmarking Tool

- Tropical Cyclones - Grenada's geographic location in the southern Caribbean places it within the Atlantic Ocean hurricane belt. This exposes it to tropical cyclones on an annual basis during the hurricane season (June to November). This exposure has been evidenced by the number of cyclones that have affected the island over its recorded history, some with very damaging impacts like hurricanes Janet and Ivan.
- Earthquakes - Its geographic location also exposes it to earthquakes, situated as it is close to the eastern boundary of the Caribbean Plate - Fig. 16.

Figure 16. Tectonic Setting in the Caribbean



Tectonic Setting of the Caribbean
(after Molnar and Sykes, 1969)

This exposure has been evidenced by the number of earthquakes that have affected the island over its recorded history.

- Volcanic Activity/Tsunami – Grenada is a volcanic island, with active volcanoes, although there have not been any active eruptions in its recorded history. It is also located close (8 km) to an active submarine volcano – Kick'em Jenny – which has the potential for volcanic eruptions that could trigger a tsunami.

In addition to the exposures that result from the above-identified hazards, some segments of the population also have a high degree of physical exposure to natural hazards due to the location of their settlements and activities, viz:

- Coastal populations – exposed to tropical cyclone storm surges;
- Hillside populations – exposed to landslides and rock falls;
- Settlements at the mouth of river basins – exposed to flooding from excessive rainfall events.

Formal Assessments of Exposure

The national authorities in Grenada have not done a formal assessment of the hazards that Grenada is exposed to and the risks related to the respective hazards. However, the Grenada Red Cross has conducted a series of 35 Vulnerability and Capacity Analyses (VCAs) in 35 communities between 2005 and 2013.

The situation as regards risk identification by the national authorities is as follows:

- a) Hazard Identification - Hazards have been identified based on historical experience and expert assessment, at the national and community levels.
- b) Hazard Mapping - This has been done through the Physical Planning Unit for flood, land slippage and coastal erosion. However, the analyses are qualitative and does not specify vulnerable social and economic infrastructure in communities. They are based on information of specific areas where flooding has taken place in the past, that was submitted by key informants. More quantitative analyses are planned for late 2014.

Seismic vulnerability maps focusing on Kick 'Em Jenny have also been done.

Communities do not know the specific impacts zones of the various hazards and there is no formal recording and storage of disaster incidence. There is no formal policy, standards and regulations on the preparation, publication and revision of hazard maps, and no legislation that mandates the preparation.

There is technical capacity in country to conduct hazard mappings and assessments using GIS tools. This can be done by the Physical Planning Unit and the Land Use Division of the Ministry of Agriculture. Both departments also receive support from regional and international agencies.

- c) Vulnerability Assessment - There are no formal vulnerability assessments at the community level, and the District Coordinators are guided by historical precedent and expert knowledge. Their assessments are not based on data and not linked to hazard maps. However they attempt to incorporate the needs and desires of vulnerable segments of the population - women, aged, young, chronic ailment sufferer and persons with physical and mental challenges.

Airports, seaports and transport facilities are the responsibility of the respective management teams and there is no specific attention paid to bio-geophysical assets - coral reefs and ecologically sensitive sites.

There is also an absence of formal policy, standards and regulations on the preparation, publication and revision of hazard maps, and no legislation that mandates the preparation.

- d) Risk Assessment - risk assessments done are based on historical precedent and expert knowledge. There is no formal, hazard specific risk assessments of persons, social and economic infrastructure, bio-geophysical assets.
- e) Hazard Monitoring and Assessment

There are hazard monitoring systems in place for the following hazards, viz:

- Weather related hazards - cyclones, excess rainfall, drought - at the national level. This is monitored through the Meteorological Office at the Maurice Bishop International Airport and the Land Use Department at the Ministry of Agriculture.
- Volcano Monitoring Observatory - There is a monitoring system in place for volcanic activity that is managed by the UWI Seismic Research Centre.
- Earthquake Monitoring Site - There is a site located at Byelands which is linked to UWI Seismic Research Centre.

- Flood monitoring systems have been installed in two communities - Balthazar in St. Andrew's and Gouyave in St. John's. These systems are challenged by vandalism.

The monitoring at these sites is real time and capable of forecasting the behavior of the hazards that they monitor. However, no work has been done on identifying and evaluating disaster risks at the community level and on building "what if" scenarios; no formal policy, standards and regulations on the preparation, publication and revision of hazard maps are in place and there is no legislation that mandates the preparation.

f) Summary

Grenada has high exposure to multiple hazards, but there is limited knowledge of specific exposures - population, social and economic assets, bio-geophysical assets - and quantification of levels of vulnerabilities and risks.

Some hazard monitoring is available, but this has not been extended to the development of vulnerability assessments and "what if" scenarios.

Table 6.10 is a non exhaustive illustrative summary of the physical exposures to the different hazards based on the available information.

Table 6.10 Physical Exposure to Hazards

Hazard	Scope	Illustrative Specific Exposure
Tropical cyclone wind and rainfall	National	Entire island especially communities located on hillsides e.g. Grand Anse valley, Morne Tute.
Tropical cyclone storm surge	Coastal	Coastal areas: town of St George's ; town and villages on the East Coast - Telescope, Grenville, Soubise, Marquis; towns and communities on the west coast; town of Gouyave; towns of Victoria and Sauteurs.
Flooding from excess rainfall	Community	The flood prone areas are within category A 0-2degrees (Slopes – Ref: map 2) which occupy 583 hectares or 1.9% of the land. ⁹⁵ They include the river basins in St. John's, St. Mark's, St. Patrick's, St. Andrew's and communities at the mouth of these rivers e.g. River Road, Gouyave, Victoria and long these rivers e.g. St. Cloud's in St. Andrew's.
Earthquakes	National	Entire island
Landslides	Community	Parish of St John's - Mabouya, towns of Grenville, Sauteurs and Victoria ⁹⁶ and their environs.
Rock falls	Community	St. George's next to Sendall Tunnel, Entire west coast from the Park Bridge to Sauteurs.
Forest Fires	Community	Highest acreages burnt 2006-2010- Pedmontemps, Corinth, Bell-Isle, Mt Moritz, Grand Bras, Mt Craven.
Structural Fires	Community	Random occurrence
Health Epidemics	National	Random occurrence - Chikungunya cases August 2014: Carriacou, St George's, St. Andrew's, St. Patrick's, St David's.
Road accidents	Community	Random occurrence
Hazardous Waste/Spills	National	Fuel farms on west coast; St. George's port; Maurice Bishop International Airport
Tsunami	National	Northern and eastern coastal communities

95 http://www.gov.gd/egov/docs/other/DVRP_%20EIA_March_2011.pdf

96 http://pdf.usaid.gov/pdf_docs/PNABH224.pdf

Economic

Grenada's economy is vulnerable to the effects of natural hazards. The tourism sector, which is the primary foreign exchange earner, is highly dependent on natural resources - beaches, flora and fauna - all of which can be severely impacted upon by tropical cyclones. Damage to hotel and other tourism infrastructure can lead to loss of employment by persons in this sector as was evidenced after the passage of hurricane Ivan. Additionally, sea level rise from climate change can lead to beach erosion, which will reduce the competitiveness of the tourism product.

Agriculture, the second important foreign exchange earner, is also very vulnerable to the impacts of cyclones, as was evidenced during the passage of Hurricane Ivan and Emily, with impacts from wind damage, landslides and flooding. Total direct and indirect costs to the agriculture sector inclusive of the cropping, livestock and fisheries sub-sectors as a result of Ivan were EC\$55 million and EC\$46 million respectively (OECS, 2004), while hurricane Emily resulted in EC\$35.51 million worth of damages to the sector.

The fact that all of the main population centres and the major economic infrastructure are located on the coast, with the towns at the mouth of the major rivers, makes the economy very vulnerable to impacts from multiple hazards. These include hurricane wind damage, hurricane storm surge damage, earthquakes and flooding events from cyclones and excessive rainfall and sea level rise from climate change. Impacts in these areas can easily result in a slow down or cessation of economic activity in the immediate aftermath of the hazard.

Social

In Grenada, social vulnerability is inextricably linked to socio economic status. Poverty is the underpinning of the vulnerability of all high risk segments of the population - women, children, the elderly, the physically and mentally challenged.

There is a significantly higher level of exposure to risk among the poor population based on a number of factors. The location of housing settlements on the coastline, on the river banks and steep slopes by the poor significantly increases their level of exposure to the effects of tropical cyclones, and excess rainfall.

The high concentration of the poor in certain parishes - St. Mark's, St Patrick's, St Andrew's, St George's and St John's therefore imply that communities in those parishes would be challenged to cope effectively with a disaster and its aftermath.

A large quantity of Grenada's social infrastructure is located in towns which are at sea level. These include education facilities, health facilities and police stations. Additionally many of the main roads and bridges linking the various parishes are located on the coast. The General Hospital has experienced flooding of the ground floor in the past. Currently there is no identified location in which all patients can be transferred to in the event that such transfer is required.⁹⁷

The social vulnerabilities are significant especially for the poor and the impact of damages to key infrastructure including education and medical facilities crosses socio economic boundaries as was evidenced during the passage of hurricane Ivan.

97 MOH personnel

Political

Grenada does not have a system of local government and all key decisions are taken by the central Government. This can pose some difficulty when a hazard impacts and can result in delayed responses at the local/ community level in the aftermath of the impact of a hazard, at a time when an urgent response is required. Some efforts have been made to redress this through providing flexibility to operations of the NaDMA District Management Committees, but these do not have very significant decision-making power and/or control over resources.

Educational

There is limited information on a community level relating to community specific hazards. In most communities there has not been any vulnerability assessments done of potential hazards and the residents' knowledge is limited to historical experience and anecdotal information. There is no formal hazard mitigation plan, and, with the exception of two communities located in flood prone areas – St. Cloud's, St. Andrew's and Gouyave - there are no formal early warning systems.

Grenada's formal education infrastructure was significantly compromised during hurricane Ivan with all but two primary, secondary and tertiary schools being affected. Financial contributions from CDB, USAID, the World Bank and the European Union were instrumental in refurbishing the damaged school stock.

Environmental

Grenada's ecosystems, biodiversity, marine and coastal resources, forest and watersheds provide useful protection from hazards. However, they are also vulnerable to these hazards and to the effects climate change. This was clearly demonstrated during hurricane Ivan, when 90%⁹⁸ of the forest reserves were damaged. There is also evidence that coral reefs⁹⁹, mangroves¹⁰⁰ and sea grass beds¹⁰¹ are vulnerable to damage by tropical cyclone events and climate change. This vulnerability of the ecosystems is further increased by the impact of land based activities like sand mining, agricultural practices which result in chemical runoff and soil erosion, and development initiatives that conflict with ecosystem sustainability.

Fragility

The ability of Grenada's infrastructure and social and economic sectors to withstand the impact of natural hazards was exposed by hurricane Lenny in 1999 (coastal infrastructure) and hurricane Ivan in 2004 (social and economic sectors). These experiences clearly demonstrated Grenada's inherent fragility and limited abilities to withstand the impacts of natural hazards.

a) Physical and engineering mitigation works

One of the main strategies for enhancing a country's ability to withstand the impacts of hazards is through the development of formal hazard mitigation plans. However, Grenada does not have any formal hazard mitigation plans for any of the hazards by the public sector.

98 Augustus Thomas (2005). Overview Of Biodiversity In Grenada

99 Ibid

100 Gregg E. Moore, Ben F. Gilmer, and Steven R. Schill (2014) Distribution of Mangrove Habitats of Grenada and the Grenadines. Journal of Coastal Research In-Press.

101 Mats Bjork1,2, Fred Short3, Elizabeth Mcleod4 and Sven Beer5,2 Managing Seagrasses For Resilience To Climate Change

Hazard mitigation functions are the remit of the NaDMA and the District Committees at the community level. Their role includes the identification of potentially hazardous structures and infrastructure and the reduction of the risks posed by these structures. However they are limited in their ability to respond to any challenges that are identified, as they do not control the budgetary and technical resources needed to respond.

There is no national plan to identify and reduce the risks posed by buildings and structures that do not meet the building code.

b) Land Use Planning and Building Codes

The development and enforcement of appropriate Building Codes are another strategy to strengthen a country's ability to withstand hazards. In Grenada, new legislation to guide building construction was introduced in 2002 with provisions for countering the impacts of tropical cyclones and earthquakes.

The Physical Planning Unit (PPU) of the Ministry of Finance has the responsibility for implementation of the Code, but is constrained in its ability to implement the code as it does not have the capacity to do so. It requires a building monitoring unit that is staffed by a qualified engineer and supported by field staff, but it does not have such skill sets on staff.

c) Socio-economic incentives for pro-mitigation behavior

There are no incentives for pro-mitigation behavior, and no budgetary allocations

d) Education, training and awareness about risks and prevention

e) Efforts have been made to raise the level of awareness of the population about hazard risks and prevention activities. These have included the following, viz:

- Hazard and vulnerability education is a part of the school curricula.
- Some local communities are involved in vulnerability planning. The Red Cross conducts education and awareness programs in all of the communities that they work in and some of the District Committees are also active within their assigned areas.
- There have been some national level public education activities on the impacts of hazards and the benefits and costs of mitigating hazards, but this has been inconsistent.
- Public information guides and materials are available to help raise public awareness of natural hazard risks.

f) Disaster Preparedness

Another approach to strengthening the ability to withstand an impact is through appropriate disaster preparedness. The situation with disaster preparedness in Grenada is as follows:

Early Warning And Communications Systems

Early Warning Systems exist at the national level for meteorological related hazards, volcanoes led by the Meteorological office at the Maurice Bishop International Airport, in collaboration with NaDMA. At the community level, flood warning systems are in place for two communities.

The warnings from the Meteorological office are informed by regional networks and international agencies and the data is accessed and processed in real time. The data analysis, prediction and warning are based on

acceptable scientific and technical methodologies and the data is archived and accessible for verification and research purposes.

The Land use Division of the Ministry of Agriculture provides a 3 month forecast for drought and precipitation. Attempts have been made to integrate this forecast with the NaDMA operations with limited success. The Meteorological Office is not a part of the drought management system.

The authority to issue warnings resides with NaDMA and warning system partners are guided by information from NaDMA. The private sector participates through amateur radio and there are provisions to inform the community when the threat has ended.

Contingency Planning

Contingency plans are not mandated by law and their review and testing have not been mandated by law.

The NaDMA has established 17 District Disaster Management Committees. All of these sub-committees have developed contingency plans in recent years and these plans include inventories of available transportation and equipment, radios and satellite communications, procedures for incoming relief workers and in kind contributions. However, in many instances, these committees have not met during 2014 and these plans have not been updated on an annual basis. Some elements of the plans may therefore not be totally functional e.g. the inventories of available transportation and equipment, inventories of radio and satellite communication equipment and the like.

There are contingency plans that govern the storage of hazardous chemicals but no plans for the disposal of these chemicals. There is also no provision for maintaining a register of hazardous chemicals in communities.

Networks of emergency responders

At the national level, NaDMA has a designated National Emergency Operations Centre which is activated once an emergency is confirmed. At the district level, each NaDMA District has a management team that will guide emergency response. In some districts, this management team is supported by a network drawn from the local communities.

At the national level, there are arrangements in place for involvement of additional personnel from public and private agencies and ground rules for media relations and advocacy activities. Training and simulation activities are conducted on a regular basis and there has been one national simulation in each of the last three years.

Shelter Facilities and Evacuation Plans

A Shelter Policy is currently being developed. The draft policy provides a time frame for the occupation of essential services identified as shelters.

The current shelters are accessible to all vulnerable communities and are generally safe from the impacts of meteorological hazards although some need minor repairs, but are vulnerable to earthquake, volcanic, technological and biological hazards.

There is a national emergency evacuation plan, but evacuation routes to shelters have not been clearly defined and demarcated. Training in shelter management is provided and there are security guidelines for the operation of the shelters and a separate sub-committee that is responsible for effective coordination of transport and communication networks for shelters.

Emergency evacuation is not mandated by law.

g) National Initiatives

The central government has also initiated a number of project interventions aimed at strengthening the country's ability to withstand the impact of hazards. These include the following:

Disaster Vulnerability and Reduction Project (DVRP)

The World Bank financed DVRP focuses on vulnerability reduction through *inter alia* the climate proofing of bridges; climate proofing of physical infrastructure including schools and homes for the elderly; landslip and flood mitigation activities; specific improvement works targeted for two low-income communities; capacity building for disaster response; climate change awareness, hazard and risk evaluation; and applications for improved decision making. This project is ongoing and is targeted to be completed in 2016.

The Integrated Climate Change Adaptation Project (ICCAS)

This project is funded by the German Government and is a pilot program which takes an integrated approach to adaptation. The overall goal of the project is to "Increase resilience of vulnerable communities and ecosystems to climate change risks in Grenada through integrated adaptation approaches". It is scheduled to be completed in October 2016.

The project focuses on achievement of the following goals:

- Strengthened capacity of the Government of Grenada to mainstream adaptation considerations.
- Enable access to public and private funding for climate change measures and strengthened understanding and awareness of climate change risks.
- Improved planning, management and efficient use of the water and coastal zone resources.

Eco-system-based Adaptation(EBA) Project

This UNEP-funded demonstration project (2013 - 2016) will develop an integrated land sea vulnerability and adaptation scenario-planning and coastal zone plan. The project will also seek to enhance the resilience of Grenada's coastal ecosystems and reduce the vulnerability of the coastal population to climate change by developing coastal managed areas and increasing human capacities in environmental management. EBA scenario planning will be applied alongside UNEP's EBA Decision Support framework to advise national and local governments and communities in Grenada in the selection, planning and Implementation of EBA approaches.

St. Mark's Flood Mitigation Project

The objective of this China funded project was to enhance the protection of Victoria town from flooding, situated as it is at the mouth of a river. The project involved watercourse dredging, slope protection and reconstruction, flood mitigation structure and construction and waterfront and road sub grade repairs. Steps to better access the river were laid and clearly marked swimming basins/areas were put in place to further cater to the needs of the community. It was completed in July 2014.

The Grenada Rockfall and Landslip Project

This project was funded by the Caribbean Development Bank and targeted two communities - Melville Street in St. George's and Concord/Cotton Bailey in St. John's. The objective of the project is to reduce the risks of rockfalls by doing remedial work which includes the following:

- Temporary fencing during construction for safety of road users
- Removal of vegetation and loose rocks
- Grouting of rocks
- Drilling and installation of rock anchors
- Ring nets installation

Reducing Risk to Human and Natural Assets Resulting from Climate Change (RRACC)

This USAID-funded OECS wide project conducted a climate change vulnerability analysis of sections of the northern coastline at Fond in St. Patrick's and followed it up with the development of an adaptation plan for the Sauteurs area and the implementation of one of the recommended activities i.e. coastal restoration and replanting of mangroves along Mount Rodney Bay. It also implemented a "hard" adaptation option at its demonstration site at Sanchez in Petite Martinique where it constructed sea defenses and implemented a coastal restoration project. These activities were done in 2013 and 2014.

At the Water's Edge

This project is not government-led and is being implemented by The Nature Conservancy. It is working with partners to assess national and local vulnerability and provide a holistic picture of risk to help design and implement locally relevant solutions. This project runs from 2011 to 2016.

h) Summary

Grenada has initiated some ad hoc initiatives at the sectoral and individual level to strengthen its ability to withstand the impact of a hazard. However, no formal national or sectoral level hazard mitigation plans exist. The Building code has been strengthened, but the PPU lacks enforcement capacity. Hazard and vulnerability education is a part of the school curricula, and there has been ad hoc community level education by NaDMA. The Grenada Red Cross also does public education in the communities in which it works.

Resilience

The ability to respond to the impact of a hazard varies across communities and sectors. Traditional mechanisms like risk transfer are not widespread and the planning and organisation for emergency response leaves a lot to be desired.

a) Risk Transfer

Insurance of public infrastructure and private assets

Acquisition of insurance is not required by law and there are no incentive schemes to encourage risk transfer. Only about 20% of the population use commercial indemnity insurance for their private assets¹⁰² and most of these are done as part of mortgage arrangements with the commercial banks. The remainder of the private

¹⁰² Estimate provided by industry representative.

assets not insured due to cost and socio-cultural factors. The latter includes a lack of trust of insurance companies and a low level of understanding of how insurance works.

As a result, the uninsured especially the poor will be significantly challenged to recover from disasters, as they lack both financial resources and risk transfer mechanisms and any losses suffered can be permanent.

Most public assets not insured, but the government has general parametric insurance coverage through the Caribbean Catastrophe Risk Insurance Facility (CCRIF) and will receive payments once the parametric thresholds have been triggered.

Another innovative parametric insurance product targeted at low income persons -the Livelihood Protection Policy - was launched in January 2014. It is available in “slices” of \$1000 at a cost of \$100 and provides coverage against heavy rainfall and high winds. It was developed through a collaborative effort between Munich Climate Insurance Initiative (MCII), the Caribbean Catastrophe Risk Insurance Facility (CCRIF), insurance services provider Micro Ensure and global reinsurer Munich Re. The local counterparts are the Trans-Nemwil Insurance Limited, the Grenada Co-Operative Bank Limited and the Grenville Co-Operative Credit Union.

There are no official records of public or private insured properties.

Financial market instruments

Disaster risk insurance is compulsory for mortgaged assets. There are no business catastrophe insurance facilities that cover the operations and staff of registered businesses. There are no financial market instruments like catastrophe bonds and catastrophe pools.

Social safety nets exist and can be used in the event of a disaster, but are not designed for risk transfer purposes.

Public services with safety regulation

Private companies/NGOs are represented on the National Disaster Committee. However, the relationship is not formalised through an MOU and their contingency plans are not reviewed by NaDMA, nor are they mandated to have insurance instruments.

Calamity Funds

The government has not allocated a Calamity Fund in its budget. Calamities are provided for through participation in the CCRIF.

b) Emergency Response

Emergency Response Plan and humanitarian assistance

NaDMA does not have a specific Emergency Response Committee and does not have response plans for all prevalent hazards. It handles emergency response through its 15 sub-committees and their district response plans, guided by the National Emergency Operations Centre.

The district response plans do not have provisions for the evacuation of children, the elderly and persons with mobility challenges. Agencies that offer humanitarian assistance like the Red Cross are involved in pre-event planning.

The Grenada Red Cross has also developed Community Disaster Response Teams – CDRTs - in all the communities that it works in. These teams are trained in First Aid, Emergency Response, Communication, Search and Life Rescue, Shelter Management, Damage and Needs Assessment and participate in simulation exercises. Their work is supported by the availability of two pre-positioned warehouses with non-food items – one in St. George’s and the other in St. Patrick’s.

Clean-up, temporary repairs and restoration of services

Clean-up, repair and restoration teams have been identified and trained at the District level and the tools and transportation required for cleanup have been identified in some of the Districts. There is no formal database of past damages.

Damage Assessment

Damage assessment is done at both the district and national levels following the impact of a hazard. Damage assessment is coordinated by a dedicated sub-committee at the national level and there is a common damage assessment methodology that has been adopted for the country. Damage assessment teams have been identified in each community and have been trained in the use of the standardised methodology.

There is no national database of damage to properties and no legislation or policy requiring the undertaking of damage assessments and training.

Mobilisation of recovery resources

There is no formal disaster recovery policy. Some of the district committees have provisions for the mobilisation of resources in the aftermath of a hazard including:

- An inventory of government resources that may be used in disaster recovery efforts;
- An inventory of private sector resources that may be used for disaster recovery efforts;
- Agreements with private sector companies to assist in disaster recovery efforts;
- An inventory of community resources that may be used for recovery efforts;
- Strategic pre-positioning of resources for quick responses.

c) Emergency Management

At the organisational level, NaDMA will be hard-pressed to provide coherent leadership, if a significant hazard was to impact Grenada, under its current *modus operandi*.

The agency needs significant institutional and capacity strengthening including enhancement of its legal and institutional status and its human and technical resources including its staff complement, its technical capacities and its leadership.

It must also be noted here that many of the District Committees are not functional and have not met in over a year. In addition, many of them either do not have plans in place, or have not updated their plans in a number of years. Their ability to mount a coherent response in the event of need is therefore very much in doubt, and is an area that needs to be addressed urgently.

One positive development to note is that many of the key private sector companies have developed their own Disaster Management Plans and update them on a regular basis. Companies involved *inter alia* in shipping, supply of oil and gas and telecommunications, have updated and tested Disaster Management plans for their operations. They are also ready to work with NaDMA in the event a need arises

d) Summary

The ability to recover from the impact of a hazard varies across communities and segments of the population.

Emergency response leaves a lot to be desired with no national Emergency Response Plan and no formal Emergency Response Policy. The District Committees are expected to take the lead in emergency response at the community level and have been trained in damage assessment methodologies. They also have access to public and private resources to assist in the initial emergency response. However, many of them are not fully functional.

Rehabilitation and recovery from damages will be difficult for the most vulnerable segments of the population. They are at highest risk as they do not use insurance/risk transfer products and therefore have to cope with damages to property from their limited resources. The Government does not have ready resources to draw upon as it does not have a calamity fund and relies on the insurance coverage provided by the CCRIF to provide short term cash flow in the aftermath of a disaster. At the national level, there is no recurrent or capital budget allocation for rehabilitation and reconstruction in the event of a disaster. At the sectoral level, there is no policy to encourage the incorporation of risk management and resilience building into the ongoing operations of the sectors.

6.4 CAPACITIES

6.4.1 Analytical Criteria and methodology

Capacity, for the purposes of this analysis is defined as *“the process through which individuals, organizations and societies obtain, strengthen and maintain the capabilities to set and achieve their own development objectives over time.”*¹⁰³

The information in this section was generated using the OECS Benchmarking Tool and other tools which were developed by the consultant, which were used to facilitate discussions with a representative grouping of stakeholders.

The information generated by the benchmarking tool indicates that Grenada’s capacities for addressing Disaster Risk Reduction is limited. Table 6.11 summarises the capacities of the key stakeholder groups.

Table 6.11 Capacities of key Stakeholder Groups

Key Stakeholder	Risk Perception	Access to Resources	Technology/ Networks	Capacities to include DRR in plans	Response Capacities	Coordination and Exchange
NaDMA Secretariat	High, but not scientific	Limited	Low	Low	Medium/Low	Medium
NaDMA Sub-Committees	High, but not scientific	Limited	Low	Low	Medium/Low	Medium
NaDMA District Committees	High, but not scientific	Limited	Low	Low	Medium/Low	Medium
Privat Sector	High, but not scientific	Good	Medium	Medium	Medium	Medium

103 UNDP (2010) Capacity Development for Disaster Risk Reduction

NGOs	High, but not scientific	Limited	Low	Medium	Medium	Medium
Gen. Public	Medium	Limited	Low	Low	Low	Medium

6.4.2 Institutional and Coordination Mapping

The main institutions involved in Disaster Risk Management in Grenada are all a part of the NaDMA with specific roles assigned in the National Disaster Management Plan¹⁰⁴. The key stakeholders listed are:

Public Sector

- Office of the Prime Minister - Deputy Chairman
- Ministry of National Security
- Ministry of Foreign Affairs
- Ministry of Finance
- Ministry of Tourism
- Royal Grenada Police Force
- Ministry of Education
- Ministry of Health
- Ministry of Communication & Works
- Ministry of Agriculture.
- Government Information Service

Statutory Bodies

- Maurice Bishop International Airport
- Grenada Ports Authority
- National Water & Sewage Authority
- National Telecommunications Regulatory Commission
- Grenada Solid Waste Management Authority

Private Sector

- Grenada Electricity Services Ltd. (Grenlec)
- LIME
- DIGICEL
- Grenada Private Sector Organization
- FLOW
- Rubis
- SOL
- Saint George's University School of Medicine
- Marketing & National Importing Board

NGOs

- Grenada Red Cross Society
- Conference of Churches Grenada
- Service Clubs – Rotary & Salvation Army
- Trades Union Council
- National Youth Council

104 Government of Grenada National Disaster Management Plan 2011

The work of these stakeholders are coordinated through the fifteen National Disaster Management Committees which will be responsible for the planning and execution of the National Disaster Management Plan./ These are detailed in the National Disaster Management Plan¹⁰⁵.

6.4.3 Tool Inventory

The agencies that are involved in disaster risk management in Grenada use a number of different tools in carrying out their activities. These tools are summarised in Table 6.12.

Table 6.12 Tools Inventory

Agency	Tools Used	Purpose
Meteorological Office at Point Salines International Airport	Models provided by Caribbean Institute for Meteorology and Hydrology (CIMH) and the National Hurricane Centre (NHC) in Miami	Monitoring and forecasting meteorological events - rainfall, wind, tropical cyclones
Land Use Division of the Ministry of Agriculture	CIMH Models DEWETRA Platform GIS tools	Developing scenarios, analysing data and forecasting drought events Developing scenarios Mapping and developing scenarios
Physical Planning Unit	CAPRA Analysis Tool GIS Tools GeoNode	Risk assessment and hazard analysis of drought, flood, land slippage, coastal erosion, storm surge, wind Developing scenarios based on existing maps Planning/management Information System for natural hazard risk information
Grenada Red Cross	Red Cross Proprietary tools for Vulnerability and Capacity analyses	Community level vulnerability and capacity analyses

6.5 REDUCTION OF UNDERLYING RISK FACTORS¹⁰⁶

The HFA Priority 4, is focused on reducing underlying risk factors and states that “Disaster risk related to changing social, economic environmental conditions and land use and the impact of hazards associated with geological events, weather, water, climate variability and climate change are addressed in sector development planning and programmes as well as disaster situations”.

The following discussion assesses Grenada’s progress on the core indicators used to monitor progress on this Priority. It is based on the findings of Grenada’s National Progress Report on the implementation of the HFA as it relates to Priority 4.

6.5.1 Core indicator 1

Disaster risk reduction is an integral objective of environment related policies and plans including for land use natural resource management and adaptation to climate change.

105 Ibid

106 Grenada. National Progress Report on the Implementation of the Hyogo Framework for Action (2011-2013)

Achievements

Disaster Risk Reduction has been included in national policies, including:

- The National Environmental Management Policy (2005) which provides an overarching frame work for environment management.
- The National Water Policy (2007) provides a blue print to maximise the contribution of the water sector to sustainable development.
- The Climate Change Policy and Action Plan 2007-2011 lays the foundation for a structured approach to climate change.
- The National Physical Development Plan 2003-2021 establishes an integrated and coherent framework to promote and guide development activity in the State of Grenada in a sustainable manner.

Constraints

The integration of DRR into the implementation of national environmental policies is generally weak due to a number of factors, *inter alia*:

- Inadequate human resources assigned to the principal environmental related ministries;
- Limited financial resources to drive the implementation process;
- Inadequate political will and environmental champions;
- Conflicting point of views among technicians.

6.5.2 Core Indicator 2

Social development policies and plans are being implemented to reduce the vulnerability of populations most at risk.

Achievements

- Grenada Home Improvement Scheme provides a consolidated, integrated national approach to housing development post 2008 which includes house repair, soft loans, emergency housing programmes.
- Turnkey operations which provide low income housing for informal settlers.
- Public Assistance provided to vulnerable families who fall below the poverty line.¹⁰⁷ Cash transfers are made to the elderly, mentally ill, and persons who are physically and mentally challenged.
- Necessitous Fund provides financial support to children to ensure that they¹⁰⁸ remain in school by means of cash transfer made to the school or to the family. It targets children from poor and large families, those in child care homes and foster care, and those who do not attend school regularly.
- Burial Assistance is granted to families whose relatives need assistance to ensure a proper burial of their loved ones.¹⁰⁹
- Disaster Fund is provided to families that have suffered a personal disaster.¹¹⁰

¹⁰⁷ http://www.gov.gd/ministries/social_development.html

¹⁰⁸ Ibid

¹⁰⁹ Ibid

¹¹⁰ Ibid

Constraints

- Limited available financing in the national budget to address all macro-economic challenges.
- High prevalence of insecure tenure among the most vulnerable groups.

6.5.3 Core Indicator 3

Economic and productive sectoral policies and plans have been implemented to reduce the vulnerability of economic activities.

Achievements

- National Policy and Strategy for Modernizing Agriculture (post Ivan).
- Food Security Strategy Plan (2009).
- Food and Nutrition Security Policy (Being developed).
- Disaster Mitigation and Restoration Rockfall and Landslip Project 2006-2011. This project funded by the Caribbean Development Bank focused *inter alia* on restoration and preservation of road infrastructure, including slope stabilization to mitigate landslips and rock-falls related risks. Work was also undertaken in a number of high risk communities to address rock- fall risks.

Constraints

- Limited human and financial resources.
- Ambiguous national and sectoral plans with unclear implementation of institutional arrangements, unsatisfactory collaboration and integration into existing work programmes.
- Low culture of innovation within the public sector, compounded by apathy among some employees.

6.5.4 Core Indicator 4

Planning and Management of human settlement incorporate disaster risk reduction elements including enforcement of building code.

Achievements

- Relocation of informal settlers from a flood prone coastal community in Moon Shadow park (2009).
- Commissioned approximately 350 low income housing in three communities spanning two parishes (2012). These will be occupied by informal settlers, persons affected by hurricane Ivan and vulnerable individuals.
- Implementation of the Regional Disaster Vulnerability Reduction Project which is designed to improve infrastructure in two communities of informal settlers.
- Capacity Building and Mainstreaming of Sustainability Land Management Project.
- Development of local area plans to determine the best use of land.
- Regularization of land title on State lands.

Constraints

- Unsystematic approach adopted by settlement planners - lack of infrastructure to support community development and environmental conservation such as drainage, sewer and the like prior to the move.

In addition, government often regularizes land rights in squatting and/or in relocated communities without addressing the inherent infrastructural deficiencies. This results in increased likelihood of land degradation, sanitation problems and man-made hazards such as fires.

- Inadequate human capital attached to the Ministry with responsibility for housing and lands. Although a Squatting Unit is institutionalized in the above ministry designed to stop and minimize informal settlement, no staff is recruited due to budgetary constraints, affecting the Unit's effectiveness (As quoted in Roberts, D.2012. Land tenure and DRM in Grenada).
- Government's ability to access funds from international agencies for improvement of housing for resettled informal communities continues to be impeded by informal and/or illegal land tenure arrangements.

6.5.5 Core Indicator 5

Disaster Risk Reduction measures are integrated into post disaster recovery and rehabilitation processes

Achievements

Agriculture:

- Agriculture DRM Policy.
- Implementation of FAO funded project "Assistance to improve local agriculture emergency preparedness in Caribbean countries highly prone to hurricane related disasters".
- Small Farmers Vulnerability Reduction Project funded by the World Bank.

Health:

- National Health Sector Disaster Management Plan 2006

Environment

- The Ministry of Environment is presently implementing the "Strategic Program for Climate Resilience" with the view to improving resilience of infrastructure (housing, schools, institutional homes etc.), forestry resources, the national water supply, coastal zone management, and use of GIS for climate change adaptation.
- Implementation of the 4-year German funded "Program of Integrated Adaptation Strategies in Grenada".

Constraints

- Lack of an overarching national guideline for building resilience post disaster.

6.5.6 Core Indicator 6

Procedures are in place to assess disaster risk impacts of major development projects especially infrastructure.

Achievements

- The Physical Planning and Development Control Act 2002 is the principal legislation governing development control within the state. Section 25 stipulates that an Environmental Impact Assessment

(EIA) could be deemed necessary as a prerequisite to develop land if the proposed development could significantly affect the environment.

Constraints

- The high cost implications associated with the conduct of detailed risk assessments is a major deterrent affecting integration of the methodology in the national Environmental Impact Assessment process for self-paying clients.
- Expertise in detailed risk assessment methodologies are low among national environmental and engineering professionals thus affecting adoption of the approach.

6.6 CLIMATE CHANGE AND DISASTER RISK

6.6.1 Global Trends

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as “... a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods”.¹¹¹

Working Group I (WG I) of the Intergovernmental Panel on Climate Change (IPCC), in its contribution to the IPCC Fifth Assessment Report, has reported that observed climate change at the global level¹¹² has included:

- *Mean surface temperature increases* - observed increase of 0.85°C, over the period 1880 - 2012;
- *Ocean temperatures* - ocean warming is largest near the surface, and the upper 75m warmed by 0.11°C per decade over the period 1971–2010.
- *Sea level rise* - Over the period 1901 - 2010, global sea level rose by 0.19 m.
- *Ocean acidification* - Carbon dioxide concentrations in the atmosphere have increased 40% since pre-industrial times and atmospheric concentrations of carbon dioxide (CO₂), methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. The ocean has absorbed about 30% of the emitted anthropogenic carbon dioxide, causing ocean acidification. The pH of ocean surface water has decreased by 0.1 since the beginning of the industrial era, corresponding to a 26% increase in hydrogen ion concentration.
- *Precipitation changes* - Averaged over the mid-latitude land areas of the Northern Hemisphere, precipitation has increased since 1901. For other latitudes area-averaged long-term positive or negative trends have *low confidence*.
- *Extreme Events* - Changes in many extreme weather and climate events have been observed since about 1950.

It projects further increases by the year 2100 as follows:

- *Mean surface temperature increases* - The global mean surface temperature change for the period 2016–2035 relative to 1986–2005 will *likely* be in the range of 0.3°C to 0.7°C. Global surface

¹¹¹ UNFCCC, Article 1

¹¹² Working Group I Contribution to the IPCC Fifth Assessment Report. Climate Change 2013: The Physical Science Basis. Summary for Policymakers. September 2013

temperature is expected to continue to increase and is *likely* to exceed 1.5°C relative to 1850 to 1900 for all scenarios used, except the lowest emissions scenario (RCP2.6). Near-term increases in seasonal mean and annual mean temperatures are expected to be larger in the tropics and subtropics than in mid-latitudes.

- *Ocean temperatures* - The global ocean will continue to warm during the 21st century. Heat will penetrate from the surface to the deep ocean and affect ocean circulation. The strongest ocean warming is projected for the surface in tropical and Northern Hemisphere subtropical regions and can range from 0.60°C to 2.00°C, depending on the level of emissions.
- *Sea level rise* - Global mean sea level will continue to rise during the 21st century and Global mean sea level rise for 2081-2100 relative to 1986–2005 will *likely* be in the ranges of 0.26 to 0.98m. By the end of the 21st century, it is *very likely* that sea level will rise in more than about 95% of the ocean area. It is *virtually certain* that global mean sea level rise will continue beyond 2100, with sea level rise due to thermal expansion to continue for many centuries. The IPCC notes that “many semi-empirical model projections of global mean sea level rise are higher than process-based model projections (up to about twice as large), but there is no consensus in the scientific community about their reliability and there is thus *low confidence* in their projections”.
- *Ocean acidification* - Earth System Models project a global increase in ocean acidification. The corresponding decrease in surface ocean pH by the end of 21st century is in the range 0.06 to 0.32.
- *Precipitation changes* - In many mid latitude and subtropical dry regions, mean precipitation will *likely* decrease, while in many mid latitude wet regions, mean precipitation will *likely* increase by the end of this century under the highest emissions scenario.
- *Extreme Events* - Extreme precipitation events over most of the mid-latitude land masses and over wet tropical regions will *very likely* become more intense and more frequent by the end of this century, as global mean surface temperature increases.

The IPCC WG I Report further notes that surface temperatures will remain approximately constant at elevated levels for many centuries after a complete cessation of net anthropogenic CO₂ emissions. Due to the long time scales of heat transfer from the ocean surface to depth, ocean warming will continue for centuries. Depending on the scenario, about 15 to 40% of emitted CO₂ will remain in the atmosphere longer than 1,000 years.

6.6.2 Climate Change and Grenada

The Government of Grenada has not developed or adopted a specific climate change scenario for Grenada. However, modeling done for the UNDP Climate Change Country Profiles¹¹³ have reported observed climate change for Grenada, as follows:

- *Temperature increases* - Mean annual temperature in Grenada has increased by around 0.6°C since 1960, at an average rate of 0.14°C per decade.
- *Precipitation changes* - Mean rainfall over Grenada has increased in September, October and November by 12.0 per month (6.3%) per decade since 1960, but this increase is not statistically significant. This increase is offset partially by decreases of around 4.5mm per month (2.5%) per decade in June, July and August.

113 UNDP Climate Change Country Profiles, Grenada. C. McSweeney¹, M. New^{1,2} and G. Lizcano¹

The UNDP Climate Change Country Profiles also developed projections of future climate change for Grenada and concluded as follows:

- *Mean Surface Temperature increases* - The mean annual temperature is projected to increase by 0.7 to 2.6°C by the 2060s, and 1.1 to 4.3 degrees by the 2090s. All projections indicate substantial increases in the frequency of days and nights that are considered 'hot' in current climate.
- *Precipitation* - Projections of mean annual rainfall from different models in the ensemble are broadly consistent in indicating decreases in rainfall for Grenada. Ensemble median changes for all seasons are negative. Annual projections vary between -61 and +23% by the 2090s, with ensemble median changes -13 to -21%.

The Country Profiles did not report on other parameters specifically for Grenada, although it did provide general guidance on sea level rise for the region, viz:

- *Sea Level Rise* - The Country Profile states that the Caribbean islands are vulnerable to sea-level rise. Sea-level in this region is projected by climate models to rise between 0.13 and 0.56m by the 2090s, relative to 1980-1999 sea-level.

Regional trends in other relevant parameters were obtained from relevant scientific sources, viz:

- *Ocean acidification* - is also a factor in the region with trends in pH reductions off the Canary Islands, Bermuda, Hawaii, and in the Caribbean amounting to about 0.09; 0.04; 0.08; and 0.09 units per decade respectively¹¹⁴.
- *Extreme Events* - There is an ongoing scientific debate about the link between increased North Atlantic hurricane activity and global warming. However, in the North Atlantic there has been a clear increase in the frequency of tropical storms and major hurricanes. This increase in frequency correlates strongly with the rise in North Atlantic sea surface temperature, and recent peer-reviewed scientific studies link this temperature increase to global warming. In addition, several peer-reviewed studies show a clear global trend toward increased intensity of the strongest hurricanes over the past two or three decades¹¹⁵.

6.6.3 Climate Change and Disaster Risk in Grenada

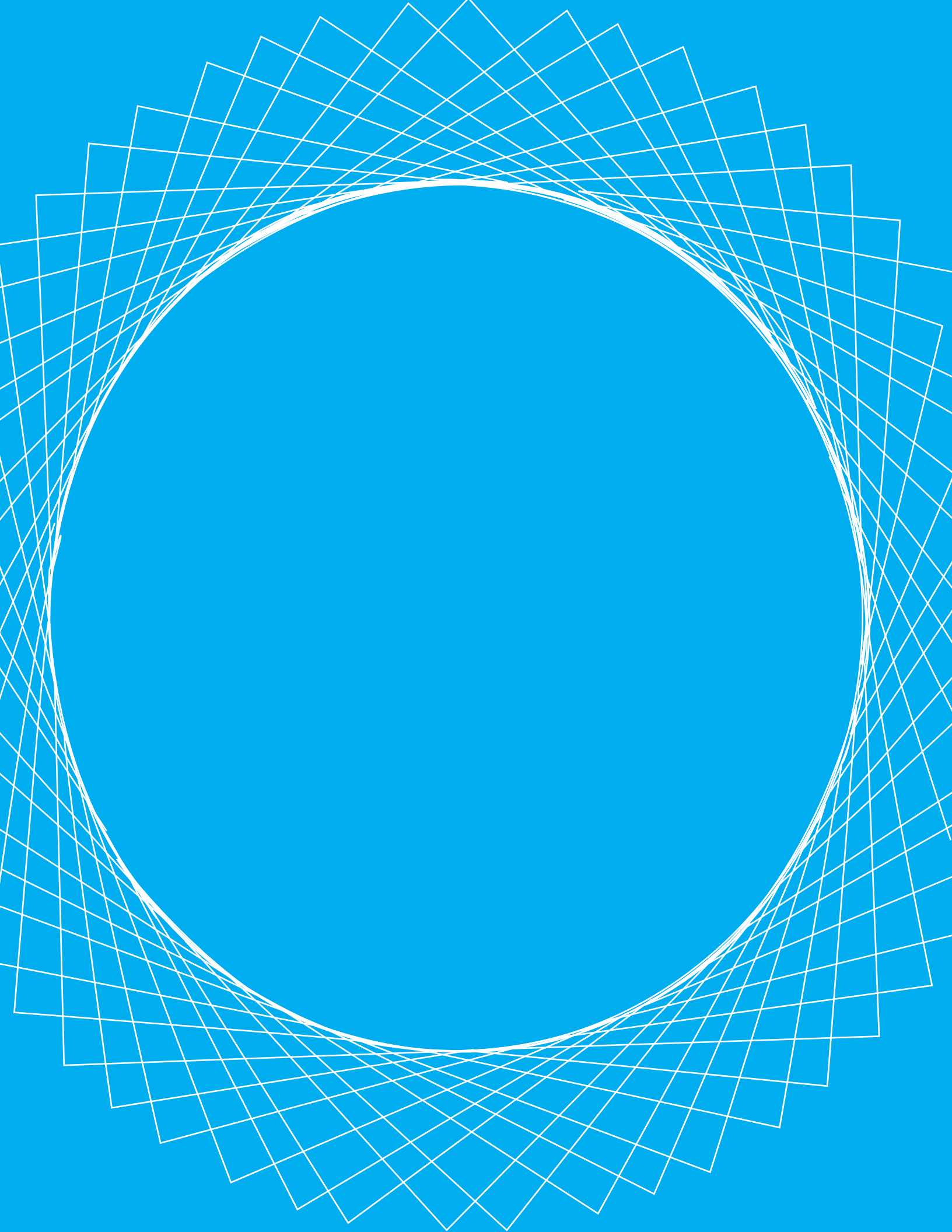
Climate change is a threat multiplier which will increase and intensify the impacts of weather related hazards. Of particular relevance to Grenada are the projected increases in mean surface temperature, the projected decrease in rainfall and the projected increases in number and intensity of tropical cyclones, viz:

- *Mean surface temperatures* - The increases in mean surface temperatures can introduce new hazards in the form of heat related impacts e.g. heat stress. This is not a hazard that is currently being planned for, but the increase in the heat index as a result of increasing temperatures and high humidity needs to be monitored.
- *The projected reduction in rainfall* has the potential to trigger drought conditions, especially during the dry season.

114 Detecting regional anthropogenic trends in ocean acidification against natural variability. T. Friedrich, A. Timmermann, A. Abe-Ouchi, N. R. Bates, M. O. Chikamoto, M. J. Church, J. E. Dore, D. K. Gledhill, M. González-Dávila, M. Heinemann, T. Ilyina, J. H. Jungclaus, E. McLeod, A. Mouchet, J. M. Santana-Casiano. Nature Climate Change, Published Online: 22 January 2012.

115 Centre For Climate and Energy Solutions (C2ES). WWW.c2es.org.

- The increased moisture in the rainfall has the potential to result in very heavy rainfall over short periods of time. This could trigger increased flash flooding in affected areas.
- The projected increases in the number and intensity of extreme events is also an area that needs to be monitored and planned for given the relatively high incidence of tropical cyclone impacts in the historical record. Climate change has the potential to increase the wind speed, rainfall volume and severity of storm surges, the latter as a result of the overall strength of the cyclones happening in tandem with the sea level rise resulting from climate change.
- The specter of climate change also adds to the threat of illnesses and epidemics. As the climate becomes warmer, it is projected that there will be an increase in vector borne diseases. One can expect that mosquito borne illnesses like Dengue Fever and Chikungunya will continue to affect the population in the future. Additionally the possibility of lower rainfall can result in droughts with the potential to compromise sanitation practices.



7. Disaster risk analysis of the country

7.1 DEFINITION OF ANALYTICAL CRITERIA AND METHODOLOGY¹¹⁶

The Disaster Risk Analysis was conducted by stakeholders at the National Validation Workshop.

The methodology used was based on the development of risk scenarios for seven (7) critical sectors/stakeholders in Grenada –Telecommunication, Agriculture, Security, Health, Maritime, Disaster Management and the meteorological office at the Maurice Bishop International Airport (MBIA).

The risk scenarios were based on the following four (4) analytical criteria:

- The hazard(s) representing the greatest threat to the sector/stakeholder;
- The intensity of that hazard that Grenada should prepare for;
- The vulnerable geographical areas and vulnerable assets specific to the sector/stakeholder; and
- The criteria that should be used to prioritize the risk scenarios identified.

These risk scenarios were evaluated in the context of their socio-economic impacts, physical impacts and environmental impacts to determine the priority scenario(s) that should be focused on.

7.2 DEFINITION OF RISK SCENARIOS

The detailed Risk Scenarios as defined by the respective sectors/stakeholders is contained in Annex 2. A summary of these scenarios is presented in this section, viz:

- a) **Telecommunication** – The hazard which represented the greatest threat to that sector was the hurricanes. This could result in extensive damage/or loss of overhead power lines and submarine landings sites resulting in complete disruption of telecommunications island wide. This will occur with the impact of a category three hurricane or greater.
- b) **Agriculture** – This sector was vulnerable to a range of hydro-meteorological hazards including cyclones, droughts, floods, excessive rainfall and landslides, as well as the impact of pests and diseases. These could impart extensive damage to agricultural plantations islandwide, resulting in destruction of crops, plants, livestock, farming equipment and chemical storage facilities. This will result in a loss of food security, a decline in the export capacity and a general slowdown of the national economy.
- c) **Security/Police Force** – The hazard which represented the greatest threat to the security establishment was that of forest/bush fires. Inability to respond in an effective manner to forest/brush fires as a result of poor or inadequate equipment could lead to extreme depletion of the forest, the destruction of wildlife, the loss of agricultural crops and injury to, or death of, fire fighters.

¹¹⁶ See Annex 3

- d) **Health** – This sector was vulnerable to a number of hazards including hurricanes, floods, tsunami, landslides, disease outbreaks and accidents. Key vulnerabilities included the potential for flooding of the General Hospital in the context of a lack of evacuation capabilities; the inaccessibility of the Princess Alice Hospital due to landslides and floods along its access route and the limited ability of the health system to manage mass casualties.
- e) **Maritime** – The hazard which presented the greatest threat to the maritime sector was that of major oil spills resulting from accidents at sea caused either by natural or hydrogenic disasters. This could leading to destruction of coastal and marine resources and have a significant negative effect of the national economy.
- f) **Disaster Management** – The hazards which posed the greatest threats to the disaster management community were cyclones, earthquakes, and localized flooding.
- g) **MBIA Meteorological Office** – The hazard which was viewed as the greatest threat was the increasing occurrence of micro-climatic events, some of which had created significant damage in the recent past on local communities in various part of the country. These events were proving very difficult to forecast, leaving very little time for the issuance of warnings to the “at-risk” communities.

7.3 PRIORITIZATION OF RISK SCENARIOS AND AREAS FOR INTERVENTION

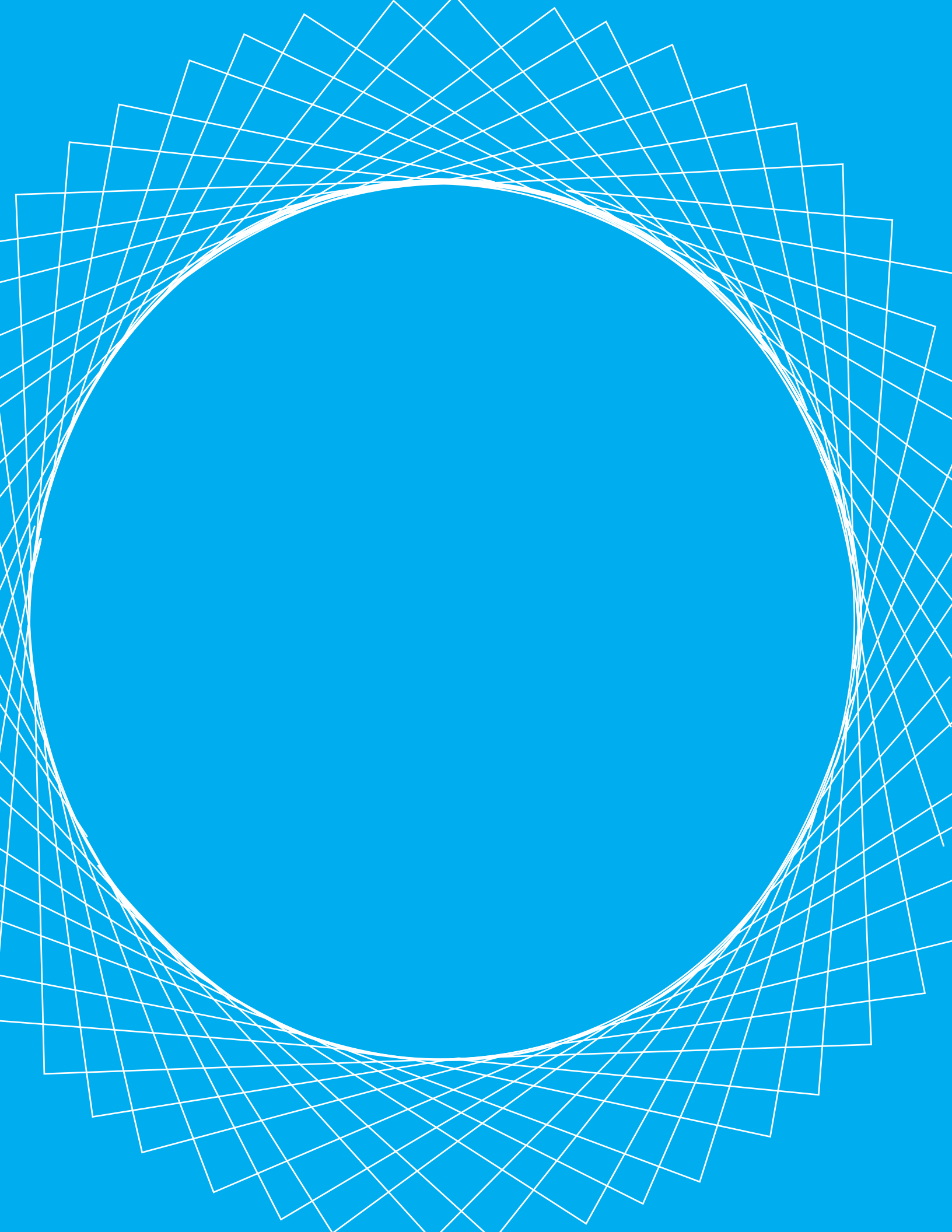
The prioritization of risk scenarios was based on expert knowledge of stakeholders at the national validation workshop in the absence of quantitative probabilistic data. Participants considered two criteria - (a) probability of occurrence based on historical impacts and (b) Extent of impacts at the national level.

The categorization of hazards based on this criteria is found in Fig. 17.

Figure 17. Categorization of Hazards

<u>High Probability/Low Impact</u> ▪ Floods (localised) ▪ Landslides (localised) ▪ Excess rainfall (localised) ▪ Micro – climates (localised) ▪ Rock falls (localised) ▪ Forest fires (localised)	<u>High Probability/High Impacts</u> ▪ Cyclones (national) ▪ Drought (national)
<u>Low Probability/Low Impact</u>	<u>Low Probability/High Impact</u> ▪ Oil spills ▪ Earthquakes ▪ Volcanic/Kick ‘em Jenny ▪ Tsunami ▪ Disease outbreak ▪ Civil Unrest

It was agreed that the high probability hazards should be prioritised for planning, but that efforts should be made to develop planning for the low probability events, given that many of them could have significant negative national impacts.



8. Strategic directions for disaster risk reduction in the country

The strategic direction for disaster risk reduction in Grenada was identified by applying the “Criteria for Identifying Key Actions for Disaster Risk Reduction (DRR) in Latin America and the Caribbean”¹¹⁷. This process identified nine (9) high priority areas for action and eight (8) medium priority areas. The nine high priority areas were further streamlined into four priorities for immediate action.

8.1 High Priority

The high priority areas identified were:

1. Development of Hazard Maps or forecasts based on probabilistic criteria.
2. Development and maintenance of geo-referenced and territorially disaggregated records of frequent impacts of hazards related to seasonal events.
3. Development of studies and implementation of action plans on multi-hazard or trans-border conditions including extreme climate variability events such as the impacts of climate change.
4. Development of strategies for reducing vulnerabilities among the poor population.
5. Improve access to the sectors of the population with limited access to essential services and reduce the vulnerability of essential services.
6. Develop and implement a legal framework for DRM, or for environmental management.
7. Implement planning processes or control over the implementation of the urban and rural land use planning regulations. Implement physical control mechanisms for the occupation, use and transformation of the urban landscape.
8. Enhance the capacity of institutional response structures.
9. Budgetary allocations for resources for preparedness and emergency responses.

8.2 Medium Priority

The eight medium priority areas were:

1. Development of formal coordination mechanisms by State agencies for Risk Management and Environmental Management.
2. Reduction in environmental degradation that generates severe impacts and can interact with the hazards, increasing the exposure and vulnerability of the population.

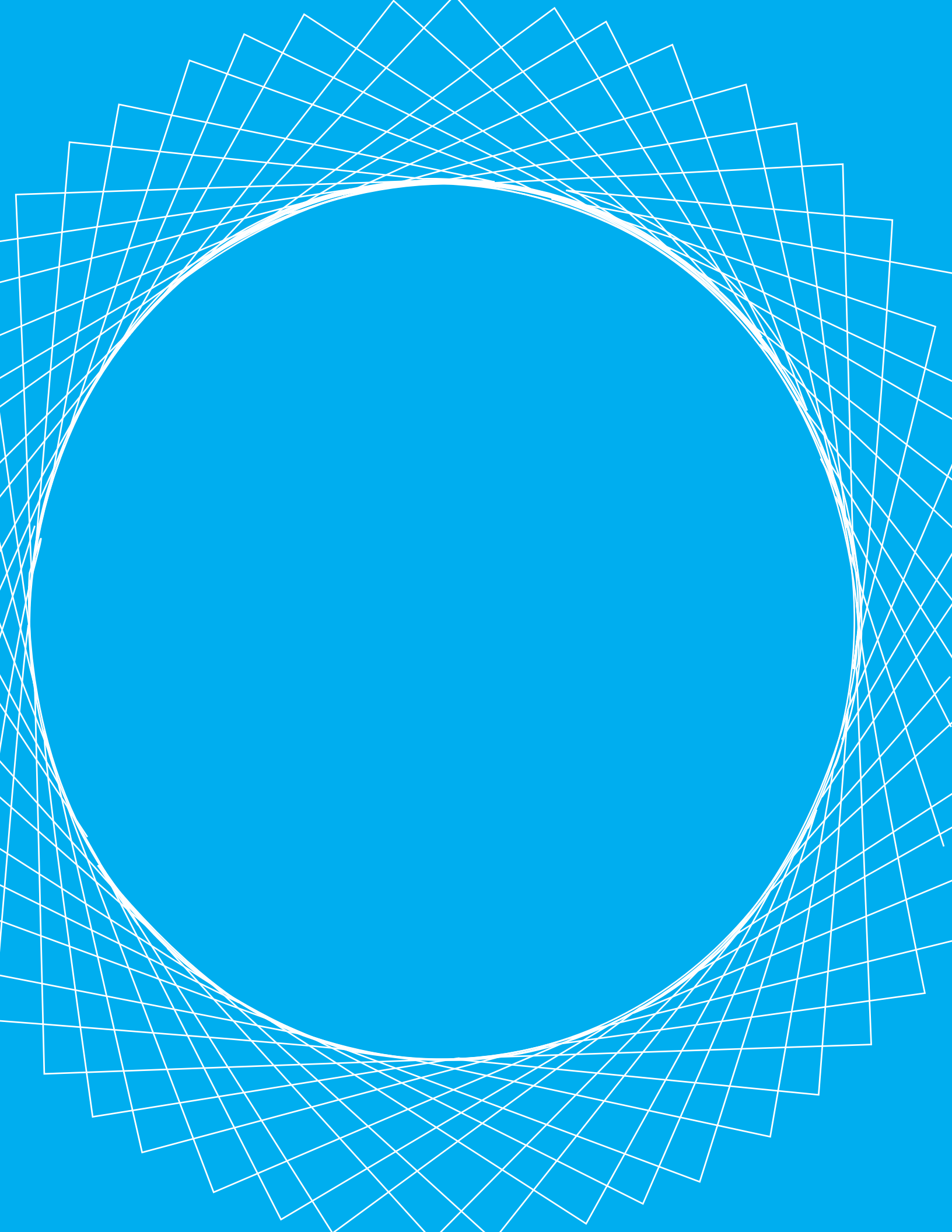
¹¹⁷ Guidelines for the Application of Criteria for Identifying Key Actions for Disaster Risk Reduction (DRR) Planning in Latin America and the Caribbean. Revised version in the framework of the DIPECHO Action Plan 2013-2014 South America. Published in February 2014.

3. Enhancing the capacity of institutional response structures.
4. Enhancing the application of early warning systems.
5. Strengthen inter-agency structures linked to form a coordinating and participation system and functioning of various committees at the national and districts levels.
6. Development of internal risks plans by various government ministries.
7. Integration of scenarios about impacts of climate change in the Risk Management Strategies.
8. Development of mechanisms for risk trend analysis.

8.3 Priorities for immediate action

The priorities identified for immediate action in Grenada are:

1. Development of a Regulatory Framework for DRM and for Environmental Management.
2. Assignment of Budget for Preparedness and Emergency Response.
3. Development of Hazard Maps Based on Probabilistic Criteria.
4. Enhancing the Capacity of Institutional Response Structures.



9. Conclusions and recommendations

9.1 Main Conclusions

The main conclusions to be drawn from the foregoing analysis are:

1. Grenada is exposed to a number of hazards, and has a historical experience of being impacted by cyclones, floods, landslides, rock falls, earthquakes and forest fires.
2. Grenada is highly vulnerable to the impacts of these hazards and has suffered significant losses from previous impacts over time.
3. There is a need to reduce Grenada's vulnerability to hazards and to strengthen its resilience. Priority actions that would set Grenada on such a path include:
 - a) Development of a Regulatory Framework for DRM and for Environmental Management.
 - b) Assignment of a Budget for Preparedness and Emergency Response.
 - c) Development of Hazard Maps Based on Probabilistic Criteria.
 - d) Enhancing the Capacity of Institutional Response Structures.

9.2 Recommendations

Stakeholders put forward a number of recommendations for addressing the identified priority areas. These recommendations are summarised in Table 9.1. The information in the table also identifies key activities that will have to be carried out in the implementation process, as well as the institutions that are best placed to undertake these activities.

9.2.1 Regulatory Framework for DRM and for Environmental Management.

The recommendations for development of the regulatory framework and environmental management focus on three areas, viz:

- a) The need for reviewing and implementing the CDEMA model legislation. This is central to establishing the National Disaster Management Agency as a body with the "teeth" to develop and implement national disaster management policies and activities. For this legislation to be effective, the review process should include the review and adoption of the draft Comprehensive Disaster Management Policy and Strategy, which would identify the national priorities for CDM, the existing gaps and capacity constraints of the underlying policy framework.
- b) The need for the development and enforcement of a comprehensive Land Use Policy. This was deemed necessary to facilitate a proactive approach to vulnerability management by ensuring, for example, that housing settlements were not built in areas with high levels of vulnerability to hazards e.g. landslides and flooding.

- c) Revisiting Environmental laws to put in place a regime that would safeguard the natural protection provided by environmental resources like mangroves, sea grass beds, coral reefs and the like.

9.2.2 Budget for Preparedness and Emergency Response

The recommendations on the Budget for Preparedness and Emergency Response focus on three areas, viz:

- a) An independent operational budget for NaDMA. This would enable it, for example, to provide support to the district committees to implement proactive vulnerability measures in their respective districts. It would also facilitate a more rapid response by NaDMA in the event of a hazard impact.
- b) A dedicated line item for Disaster Management in the budgets of the line ministries. This was seen as necessary in order to facilitate more timely preparedness and response by the various ministries in the event of a hazard impact.
- c) Dedicated budgets for disaster management should be maintained by all private sector organisations involved in high risk operations e.g. petroleum companies. This could be supplemented by a mandated national disaster fund into which private sector organisations would be mandated by law to contribute.

9.2.3 Development of Hazard Maps Based on Probabilistic Criteria.

The recommendations for the development of Hazard maps focused on five (5) areas, viz:

- a) Conduct of risk assessment based on data from credible sources. These risk assessment should focus on the impacts of the high probability events that had been identified by stakeholders.
- b) Zoning for different hazards should be done based on the outcomes of the risk assessment exercises and the populations in the respective zones should be educated in the risks and the expected responses once there was threat from the identified hazards.
- c) Identify and locate appropriate response units to provide support when there was a threat from the identified hazards.
- d) Clearly identify evacuation routes to be used during emergencies.
- e) Clearly identify the location of the most vulnerable population and develop strategies to assist them when there was a threat from the identified hazards.

9.2.4 Enhancing the Capacity of Institutional Response Structures.

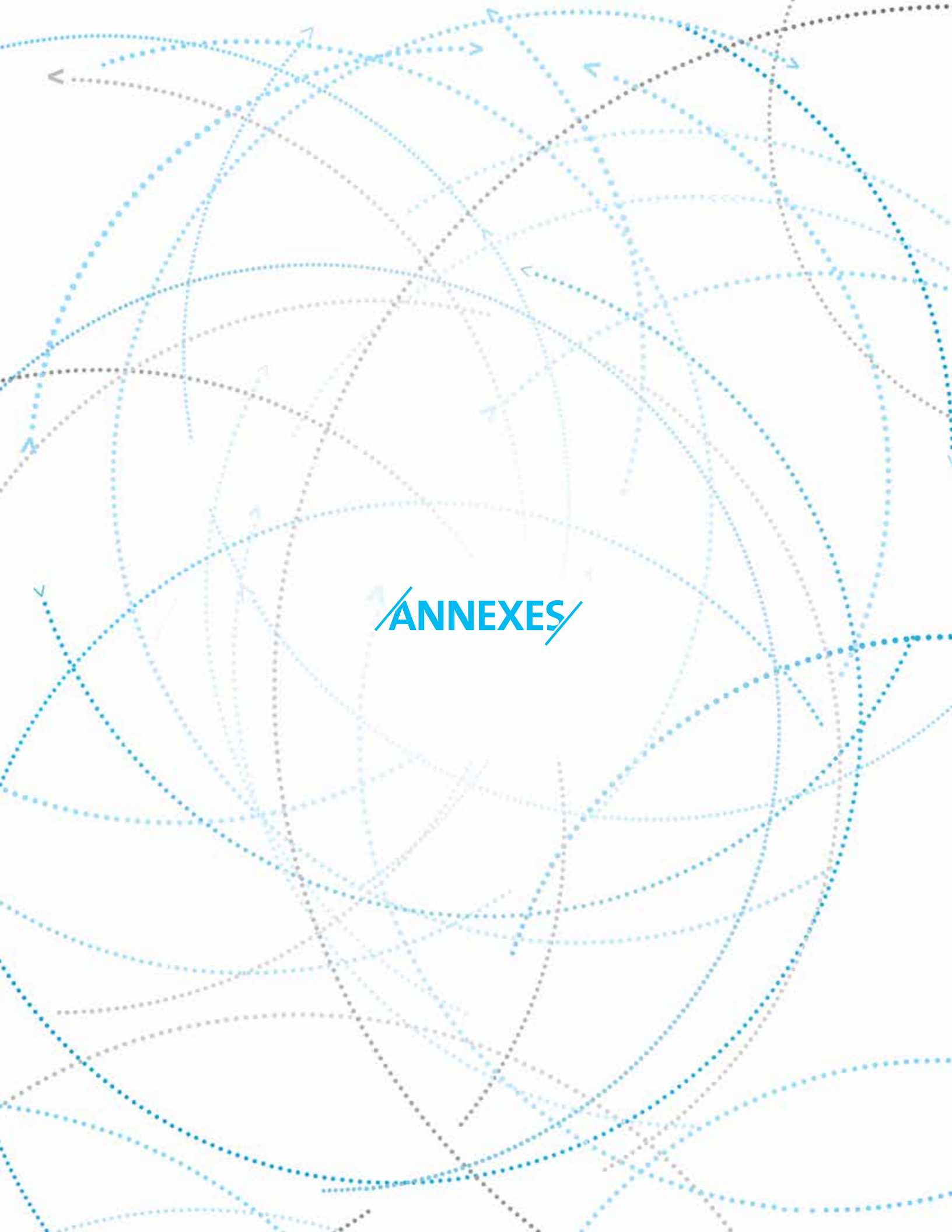
The recommendations to enhance the capacity of institutional response structures focused on six (6) areas, viz:

- a) Identification of key service providers for all of the areas in which support would be required in the event of a hazard impact.
- b) Development of clear protocols including:
 - Clear definition of the roles of all actors in the national disaster response community.
 - Memoranda of Understanding between NaDMA and the private and civil society institutions that would be providing support in the event of a hazard impact
 - Standard Operating Procedures for responding to various scenarios across the entire disaster response community.

- c) Conduct of regular simulation exercises at all levels of the national disaster management process to ensure that all actors were clear on their various roles and responsibilities and had the capacity to perform them in the event of a hazard impact.
- d) Information sharing across the disaster management community so that all actors were aware of any developments that would affect or enhance their performance in the event of a hazard impact.
- e) Coordination of institutions with similar services or capabilities to avoid duplication and confusion and maximise synergies.
- f) Identify location for waste disposal or storage in the aftermath of a hazard impact, as this could prove to be very challenging depending on the extent of damage that resulted from the hazard impact.

Table 9.1 Recommendations for Implementation of High Priority Actions

DRR Priority Actions	Key Activities	Responsible Agencies
Development of a Regulatory Framework for DRM and for Environmental Management	▪ Develop legislation for DRM - Adopt the draft CDM Policy - Review CDEMA Model Legislation - NEAC/CDEMA ▪ Revisit Environmental Laws - Consolidate and update - Enforcement with punitive measures ▪ Formulate comprehensive Land Use Policy - Zoning for environmental hazards - Integrate CCA	NaDMA
Assignment of Budget for Preparedness and Emergency Response.	▪ Advocate for an operational budget for NaDMA ▪ Advocate for Line ministries to have a dedicated line item for Disaster Management in their budgets ▪ Private sector organizations involved in high risk operations must have a dedicated budget for disaster response or be mandated by law to contribute to a fund for national disaster response.	NaDMA Secretariat at the meetings of the NEAC Permanent Secretaries Civil society
Development of Hazard Maps Based on Probabilistic Criterion	▪ Conduct Risk Assessment based on data from credible sources. ▪ Develop and implement Zoning for different hazards - Hazard Specific - Land use ▪ Identify and locate appropriately response units. ▪ Clearly identify evacuation routes to be used during emergencies. ▪ Clearly identify the location of the most vulnerable population and develop strategies to assist them in times of disasters.	NaDMA/Local community/Red Cross Physical Planning Department; Ministry of Communication and Works; Ministry of Health; Land Use Department NaDMA; Ministry of Works; National Security Services. National Security Services. Ministry of Social Development, Civil Society.
Enhancing the Capacity of Institutional Response Structures	▪ Development of clear protocols including MOU & SOPS ▪ Simulation exercises. ▪ Information sharing. ▪ Coordination of institutions with similar services or capabilities. ▪ Identifying key service providers. ▪ Identify location for waste disposal or storage in the aftermath of a hazard impact	NaDMA; Red Cross; Tele-communication companies; Police Force, Meteorological services; Health services; Energy companies; Ministry of Works; and private companies. Grenada Solid Waste Management Authority



ANNEXES

Annex 1

SELECTED LEGISLATION RELEVANT TO DISASTER RISK REDUCTION

Global Treaties and Instruments

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1989)
 United Nations Framework Convention on Climate Change (1992)
 United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (1994)
 Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction (1997)
 Kyoto Protocol to the United Nations Framework Convention on Climate Change (1997)
 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (1998)
 Stockholm Convention on Persistent Organic Pollutants (2001)
 Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters (2005)

National Legal Instruments

Constitution of Grenada 1974

Disaster Risk Management

Emergency Powers Act 1987
 Explosives Act 1956
 Fire Brigades Act 1957
 Housing (Hurricane Damage) Loans Act 1957
 National Disaster (Emergency Powers) Act 1984
 Quarantine Act 1947

Planning and Public Sector Investment

Physical Planning and Development Control Act 2002

Construction

Grenada Building Code

Protection of Natural Resources and the Environment

Agriculture (Hurricane Rehabilitation) Act 1955
 Chemical Weapons Act 2013
 Forest, Soil and Water Conservation Act 1949
 Grenada Solid Waste Management Authority Act 1995
 Mosquito Destruction Act 1952

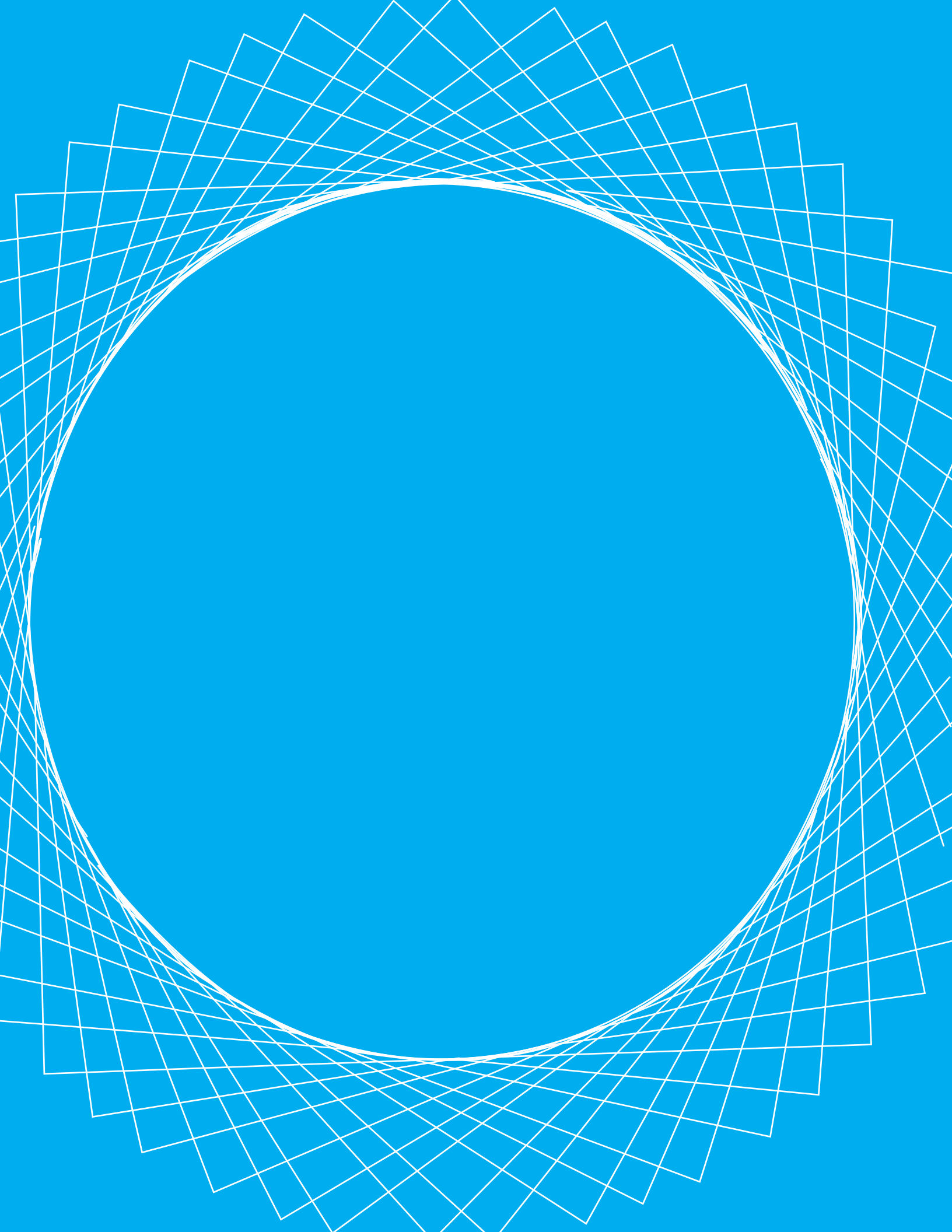
National Water and Sewerage Authority Act 1990
Oil in Navigable Waters Act 1928
Pesticides Control Act 1973
Petroleum Act 1956
Petroleum and Natural Gas Deposits Act 1989
Public Health Act 1925
Public Health (Immunization of School Children) Act 1980

Policies, Plans and Strategies

Climate Change Policy and Plan 2007-2011
Coastal Zone Policy (draft)
Comprehensive Disaster Management Policy and Strategy (draft)
Food and Nutrition Policy and Plan of Action 2007 (draft)
Food and Nutrition Security Policy 2013
National Disaster Management Plan 2011 (draft)
National Environmental Policy and Management Strategy 2005-10
National Hazard Policy (2003) and Plan (2006)
National Health Sector Disaster Management Plan 2006
National Physical Development Plan 2003-2021
National Water Policy 2007

Annex 2

	TELE-COMMUNICATION	AGRICULTURE	SECURITY/POLICE	HEALTH	MARITIME	DISASTER MANAGEMENT	MBIA MET. OFFICE
Which hazard(s) represent the greatest threats to your business/area of work and why have you selected these hazards?	- Hurricane - Tsunami	- Cyclones - Drought - Floods/Excess rainfall - Pest and Disease - Landslides	Wildfires/ bush fires	- Hurricane – affect 40+ buildings - Flooding – General Hospital - Tsunami - Landslides - Access to PRH - Disease outbreaks - Accidents - Mass Casualty events/5 or more persons ... 5 dedicated rooms for response	- Cyclones – affect structure - Oil spills – maritime assets	- CDM - Cyclones - Earthquakes - Flooding – specific areas	- Unseasonal rainfall ...low lying areas ... farmers lose - Micro-climate - Tornados ... fishermen ... pumps
For the hazard(s) identified, what is the intensity of the hazard that Grenada should prepare for?		- Prolonged drought – affect production - Heavy rain-fall – affect production - Hurricanes not frequent			- Major spill - > 700MT - CAT 3 cyclones		
What are the vulnerable geographical areas (eg. entire island, particular communities) in Grenada and vulnerable assets (for example people, buildings etc) for your business in those areas?	- Entire island – lines overhead - Host sub-marine landings	- Entire island - Livestock - Crops - Farm machinery - Chemical storage	- Safety of firefighters - Environmental impact - Depletion of the forest - Agriculture crops lost - Health impacts - respiratory problems - Need right eqpt	- Entire island - No evacuation capabilities	- Oil spills and hurricanes – entire island - Impact natural and built environment - Commercial and non commercial	- Entire island – east and south coast for cyclones... - EWS - Flooding – specific areas - Earthquake – entire island/no EWS - Need hazard maps	Flooding in discrete areas
What criteria should Grenada use to prioritise the risk scenarios described above?	# persons impacted- pop density			Ability to respond	- Formal Safety Assessment by IMO - Cost to avert 1MT of spill		



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