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Mainstreaming disaster risk management strategies in development instruments

Policy briefs for selected member countries
of the Caribbean Development
and Cooperation Committee

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ECLAC

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Abstract

This policy brief has the objective of profiling disaster risk management policies in five selected member states of the Caribbean Development and Cooperation Committee: The Bahamas, Belize, The Dominican Republic, Haiti and Jamaica, and analyze their interactions with broader development issues and instruments, such as national development plans and climate change adaptation strategies. To this end, firstly, it presents the five pillars for Disaster Risk Management (DRM), namely risk identification, risk reduction, preparedness, financial protection, and resilient recovery, as well as their applications to disaster assessments.¹ Secondly, it describes the integration of DRM into development policies. The structure of the analysis will allow countries to identify strengths and weaknesses of the DRM policies and how they interact with other planning and development instruments. Finally, it presents policy recommendations to strengthen the role of DRM and to improve the use of resources through multisectoral projects that build resilience to disasters and climate change.

¹ The assessment of disasters is a field in which ECLAC has made important contributions since 1973, including by demonstrating the importance of assessing a disaster in order to understand its causes, and proposing recommendations for resilient reconstruction. Starting with the assessment of the effects and impacts of Hurricane Joaquin in The Bahamas (December 2015), ECLAC has incorporated the five pillars in policy recommendations after a disaster.

Introduction

Disasters are commonly occurring phenomena, and their frequency has been increasing. According to the Emergency Events Database (EM-DAT) of the Office of Foreign Disaster Assistance and the Centre for Research on the Epidemiology of Disasters (OFDA/CRED) of the Catholic University of Louvain in Brussels, which has the most extensive record of disasters² around the world, between 1970-2010, there were 10,271 disasters worldwide, of which 23.7 per cent occurred in America (16.9 per cent in Latin American and Caribbean countries), while Asia was the worst affected continent (39.3 per cent of disasters).

Disasters derive from a combination of two factors:

- Natural phenomena capable of unleashing processes that lead to physical damage and the loss of human lives and capital, and
- Vulnerability of individuals and human settlements.

Natural phenomena with the potential to cause destruction to a territory are identified as hazards. Vulnerability is a precondition (which manifests itself during the disaster) as well as an indicator of the exposure of capital and the ability of individuals, households, communities and countries to tolerate and recover from damage (see ECLAC, 2014).

Disasters have relatively larger effects and impacts in developing countries than in developed ones. According to Raddatz (2009), on average, the cost of a disaster in low-income countries is equivalent to one per cent of the Gross Domestic Product (GDP), while in high-income countries it is reduced to 0.25 per cent. Cuaresma et al. (2008) observed that only countries with a certain development level succeeded in improving their capital stock following a disaster.

Disaster impacts are magnified for Small Island Developing States (SIDS). According to the Global Assessment Report on Disaster Risk Reduction 2015, “compared to Europe and Central Asia, SIDS are expected to lose on average 20 times more of their capital stock each year in disasters.

² The database defines a disaster as an event that meets one of the following criteria: (i) 10 or more deaths are reported; (ii) at least 100 people are reported as being affected; (iii) a state of emergency is declared; or (iv) a request for assistance is issued.

The expected annual losses in SIDS are equivalent to almost 20 per cent of their total social expenditure, compared to only 1.19 per cent in North America and less than one per cent in Europe and Central Asia.”

This pattern is reflected in the LAC region, where the cost of disasters with respect to the size of national economies in the Caribbean is greater than in South and Central America (Bello 2017). Thus, Caribbean countries face a potentially greater reversal in the economic and social improvements achieved in recent years due to disasters. In addition, their portfolio of investments could be affected by spending shifts that force the diversion of resources destined for productive sectors and social spending into reconstruction efforts.

Until the 1990s, public policies on disasters were focused on reaction and preparedness. The end of the decade, however, marked a new understanding of disasters and the way they could impact development, especially in the poorest countries. As a result, the focus of public policies has evolved toward the more holistic concept of disaster risk management (DRM).³ The new focus of the conceptual framework has been geared more towards reducing community vulnerability while building capabilities in disaster response.

The international community has taken on the task of mainstreaming disaster risk reduction into a series of international agreements, such as the Hyogo Framework for Action 2005-2015, as well as its continuation through the Sendai Framework for Disaster Risk Reduction 2015-2030. SIDS have also recognized the importance of DRM in the Samoa Pathway agreement, while the 2030 Development Agenda also envisages increased resilience through the implementation of 17 Sustainable Development Goals.

This policy brief has the objective of profiling disaster risk management policies in five selected countries, and analyze their interactions with broader development issues and instruments, such as national development plans and climate change adaptation strategies. To this end, firstly, it presents the five pillars for DRM, namely risk identification, risk reduction, preparedness, financial protection, and resilient recovery, as well as their applications to disaster assessments.⁴ Secondly, it describes the integration of DRM into development policies from a sample of five member states of the Caribbean Development and Cooperation Committee: The Bahamas, Belize, The Dominican Republic, Haiti and Jamaica. The structure of the analysis will allow countries to identify strengths and weaknesses of the DRM policies and how they interact with other planning and development instruments. Finally, it presents policy recommendations to strengthen the role of DRM and to improve the use of resources through multisectoral projects that build resilience to disasters and climate change.

A. Conceptual framework

Planning for development and disaster risk management are closely related concepts; development is not sustainable if it remains at high risk of disasters. But a process of disaster risk reduction is not feasible unless it is accompanied by a considerable reduction of social vulnerabilities and a strategy to make a disaster-affected territory economically viable. Disasters set back accomplishments in social and economic gains, whilst highlighting existing vulnerabilities and disparities, and putting strains on national budgets.

UNISDR (2009a) found that disasters have major social impacts that are manifested in different dimensions of human development and poverty. The empirical evidence seems to indicate that disasters negatively affect anti-poverty efforts. This cycle is not sustainable in social or economic terms, hence the relevance of striving towards disaster risk reduction.

³ Jackson (2005) explains this transformation in the public policy of Jamaica.

⁴ The assessment of disasters is a field in which ECLAC has made important contributions since 1973, including by demonstrating the importance of assessing a disaster in order to understand its causes, and proposing recommendations for resilient reconstruction. Starting with the assessment of the effects and impacts of Hurricane Joaquin in The Bahamas (December 2015), ECLAC has incorporated the five pillars in policy recommendations after a disaster.

DRM is “the concept and practice of reducing disaster risks through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events” (UNISDR 2009b). This definition considers four fundamental elements; firstly, disaster risk reduction is an on-going and dynamic process that requires permanent attention. Secondly, disaster risk management refers both to reducing the existing risks, and preventing new risks from arising through the identification of risks and vulnerabilities. Thirdly, DRM should be an integrated effort that incorporates stakeholders from different sectors and disciplines in order to mainstream its principles. Finally, it is a comprehensive process, not a set of isolated measures. As such, disaster risk reduction is best achieved as part of a systematic program.

For these reasons, DRM is a complex process. Note that after a disaster, a society demands quick action. Emergency response should be timely, fast and efficient. Meanwhile, reconstruction must follow general guidelines for a local development vision. Since reconstruction is usually expensive, it should be subject to a social cost-benefit assessment. If a decision is made to undertake a reconstruction process, it must contain: a) a master plan defining criteria for location and resilient reconstruction of the affected structures; and b) criteria of economic and social viability of the territory affected by the event.

Resilient reconstruction is a combination of structural and non-structural measures and processes. DRM should be intertwined with policies to address already identified social and economic vulnerabilities in a specific territory.

Considering the complex dynamics of disaster risk management, the conceptual framework developed by the Global Facility for Disaster Reduction and Recovery (see Table 1) and adopted by the Sendai Framework for Disaster Risk Reduction 2015-2030, is used to organize a resilient reconstruction. Starting with the assessment of Hurricane Joaquin in The Bahamas (2015), ECLAC’s disaster assessments have two sections: a) estimation of damage, losses and additional costs; and b) recommendations for a resilient reconstruction. The second part is based on these five pillars for disaster risk management.

Table 1
Pillars of action of disaster risk management

Pillar 1	Risk identification	Improved identification and understanding of disaster risks through building capacity for assessments and analysis
Pillar 2	Risk reduction	Avoided creation of new risks and reduced risks in society through greater disaster risk consideration in policy and investment
Pillar 3	Preparedness	Improved capacity to manage crises through developing forecasting and disaster management capacities
Pillar 4	Financial protection	Increased financial resilience of governments, private sector and households through financial protection strategies
Pillar 5	Resilient recovery	Quicker, more resilient recovery through support for reconstruction planning

Source: Global Facility for Disaster Risk Reduction (GFDRR), “Strategy 2013-2015. Managing Disaster Risks for a Resilient Future.”

These pillars are closely interrelated, and should be accompanied by an enabling institutional, political, normative and financial environment that allows for the allocation of resources, roles and responsibilities. A brief description of each pillar is presented in the next section.

Pillar 1. Risk identification

This pillar suggests that, in order to manage the risks of disaster, first it is necessary to understand the hazards, exposure and vulnerabilities faced by a community. By identifying the risks, it is then possible to foresee the potential effects and impacts that a disaster could have on a society and its economy. Implementation of data sharing, mapping and modeling are some activities that could better guide this process.

Risk identification focuses on two aspects. First, it considers the assessment of multiple threats, including frequency, intensity and magnitude. Second, it identifies exposed infrastructure, services, communities and other elements, as well as their vulnerabilities.

Pillar 2. Risk reduction

When risk exposure and its potential harmful effects are identified and understood, it is then possible to take actions to reduce such risk. In this pillar, instruments such as policies and investment programs are critical to reducing existing risks and preventing new ones from arising, in this regard, it is necessary to also consider the effects associated with climate change. Depending on the type of risk, it could be reduced, or at least reduce the exposure of a community or asset to a particular threat. Structural and non-structural prevention and mitigation measures are core components of this pillar.

Pillar 3. Preparedness

Even if risks can be identified and addressed, it is not possible to completely eliminate them. Therefore, preparedness refers to the knowledge and capacities developed by governments, businesses and communities to anticipate, respond to, and recover from the effects of a natural hazard or disaster. This pillar should contribute to an organized transition from response to recovery.

Most Latin American and Caribbean countries have focused their efforts in this pillar through warning systems, contingency plans, and emergency response. At the same time, this has resulted in reduced attention to other areas of disaster risk management, highlighting the need for strengthening other pillars. The degree and quality of preparedness will be closely linked to a sound analysis of risks and to existing warning systems.

Pillar 4. Financial protection

This pillar attempts to create strategies to protect governments, businesses and households from the economic impact of a disaster. Considering that risks cannot be eliminated, it is therefore important that countries protect their fiscal balance from shocks while they are still able to respond to the emergency. Financial protection refers to insurance at the sovereign and household levels, but also in terms of social protection for vulnerable populations.

Pillar 5. Resilient recovery

If a disaster cannot be prevented, then recovery and reconstruction can be used to improve resilience in the affected areas. Even if disasters have harmful effects on societies and economies, they are also an opportunity to change policies and practices that do not incorporate disaster risk management. It is important to plan a multi-risk reconstruction process that can respond not only to the hazard that caused the disaster, but to any hazard to which the country or community is exposed.

B. Integrating disaster risk management into national development policies

After hurricanes Mitch and Georges (1998) affected Central American and Caribbean countries, a broad consensus was generated that disaster risk reduction should be considered as an investment and a comprehensive strategy in development processes and instruments.⁵ The results of ECLAC's

⁵ See CEPAL, BID (2000) "Un tema de desarrollo: La reducción de la vulnerabilidad frente a los desastres." LC/MEX/L.428.

assessments of the effects and the socioeconomic and environmental impacts of disasters contributed decisively to this outcome. ECLAC also contributed to the understanding of the impact of disasters by developing and updating a methodology for disaster assessment.

Specifically, in this consensus reached by international institutions regarding the issue of disasters two major areas for action were identified:

- Establishing a policy and institutional framework to ensure comprehensive disaster risk management, including the following actions:
 - Identify measures to reduce vulnerability to disasters, such as: a) estimation and allocation of resources for investments in preventative and corrective actions, and b) strategies and processes of planning and territorial planning;
 - Include disaster risk management elements into the preparation and evaluation of development projects and programs;
 - Develop an intersectoral and decentralized institutional framework for disaster risk management;
 - Promote resilient recovery plans and programs to avoid rebuilding vulnerabilities;
 - Establish information systems for risk management by sectoral and territorial entities;
 - Strengthen observation, forecasting, research, monitoring and early warning systems;
 - Ensure that countries have mechanisms for articulation and cooperation with civil society organizations, affected communities and the private sector.
- Strengthening macroeconomic capabilities. This required two measures:
 - Generate the fiscal or borrowing capacity that allows them to make ex-ante investments to reduce disaster risks, as well as to prepare for a timely and effective response;
 - Develop financial protection strategies that consider instruments of risk transfer, which would alleviate the burden of the State in the processes of response and recovery.

By implementing these measures it was anticipated that countries would be better able to absorb the economic effects of disasters. For example, they could have the resources to face the costs of both emergency and reconstruction, without being forced to reschedule investments.

In this policy brief, these measures were reformulated as a set of key elements that are used as indicators to assess the integration of a DRM strategy in the development of the countries of the region. Seven key elements were identified: (i) governance framework for disaster risk management; (ii) quality information for decision making on disaster risk management; (iii) integration of DRM into the project preparation and evaluation cycle; (iv) territorial approach; (v) sectoral approach; (vi) macroeconomic policies; and (vii) integration of disaster risk management in development policies and other instruments. The scope of analysis of each element is detailed as follows.

a) Governance framework for disaster risk management

The legal framework should have normative and policy instruments that assign roles and responsibilities to different public sectors, businesses, academia and civil society, and that allow for the implementation of DRM actions in each sector. Likewise, DRM governance should aim at improving citizen participation and facilitating access to information by stakeholders or who requires it. In addition, from a development perspective, the legal framework of the DRM strategy would be expected to be linked to other cross-cutting strategies and themes such as environment, climate change and water resources, as well as productive sectors such as agriculture and tourism.

b) Quality information to guide decision making on disaster risk management

Generating quality information requires strong institutions that provide technical assistance and guidance for the generation and use of information, as well as a platform to keep such information current and available to local authorities and other public, private and social institutions and organizations.

In addition, institutions that are usually in charge of the study, monitoring and warning of geological, hydro-meteorological and other phenomena must coordinate with other actors so as to ensure that the data they collect and analyze are converted into accessible and useful information for planning and decision-making. In this regard, the importance of promoting and providing incentives for the generation and dissemination of information and knowledge from technical and scientific institutions and universities should be noted.⁶

c) Integration of disaster risk management into the project preparation and evaluation cycle

There is consensus that the incorporation of considerations for DRM from the moment of designing an investment project is one of the most effective ways to reduce the risk of disaster. The results of disaster risk studies carried out at the different stages of the project cycle should lead to modifications of the project and to the implementation of mitigation and risk reduction measures.

The standards and instruments used in some countries for carrying out environmental impact assessments already integrate disaster risk analysis, as well as the design and implementation of disaster risk reduction measures.

d) Territorial approach

Legislation and technical instruments for planning (including physical planning) that consider aspects for the identification and reduction of risk are key instruments for local authorities in the identification and zoning of threats.

The importance and role of local communities and local authorities in the preparation and response to disasters was recognized even before the shift from emergency management to disaster risk management began in the late 1990s. There was consensus that public institutions, private sector, community organizations and the general population living in a given territory are the first to respond in the event of disasters, and they are also the ones who know best about their conditions, capabilities and resources.

In view of the above, and under the principle of subsidiarity between the different levels of government, the normative and institutional frameworks for DRM have gradually established competences for territorial management units. The responsibilities have varied by country, both in their roles in regards to DRM, and in the tools to be developed to implement DRM measures. This is how, in some countries, the development of (regional, provincial, municipal) DRM plans has been promoted, while in other countries it has been encouraged that development plans incorporate DRM, or that both types of instruments coexist. However, this definition of roles and responsibilities has not always been accompanied by the allocation of financial resources or budget incentives that allow territorial authorities to implement the actions they plan.

When DRM policy frameworks and national policy instruments are mainstreamed in a country (i.e. integrated into existing instruments that govern different territorial levels), the allocation of human, technical and financial resources is also facilitated.

e) Sectoral approach

A DRM strategy must have a systemic and inter institutional approach. The region has evolved from having a national institution in charge of disasters to national systems of disaster risk management, which have generated normative and institutional frameworks that have gradually defined the roles and responsibilities of the different sectors and institutions in charge of matters related to DRM. As with the

⁶ Using the disaster management cycle as a framework, ECLAC identified a series of recommendations detailing ways in which telecommunications companies and national disaster offices can enhance their working relationship. For a complete analysis see: ECLAC (2017), “Strengthening cooperation between telecommunications operators and national disaster offices in Caribbean countries.”

territorial approach, the definition of sectoral roles and responsibilities for disaster risk management has not always been accompanied by the allocation of financial resources or budget incentives.

In addition, although the DRM normative framework or strategy assigns competencies to the sectors, it does not necessarily translate in the effective adoption and fulfillment of such roles and responsibilities. However, it is evident that the sectors that have modified their norms and structures to incorporate a DRM strategy show better performance through the incorporation of specific actions in planning and sectoral budgets.

The role of international organizations such as PAHO/WHO, FAO, UNICEF and UNESCO, or sectoral intergovernmental platforms such as RESSCAD, ORAS CONHU and CECC/SICA, should also be highlighted in promoting the appropriation of risk management as part of the usual activities of specific sectors such as health, agriculture and education, among others.

f) Macroeconomic policies

Countries are required to have macroeconomic policies for the allocation of resources for both ex-ante DRM activities and disaster response. A basic condition is that the ministry of finance explicitly assigns roles and responsibilities for DRM. In this regard, it is advisable to: a) design and implement policies for the financial management of the risk of disaster; b) elaborate the scope of annual needs for resources to cover the processes of response, rehabilitation and reconstruction for different types of events; c) have an item of expenditure in the national budget to allocate resources to disaster risk management activities; and d) establish a structure of retention and transfer of disaster risk in the country.

Evidence of progress in macroeconomic policies is the creation of specific funds for risk management. Thus, some normative frameworks for DRM in LAC consider the creation of national funds. Some of these are qualified for the financing of ex-ante activities and others are only qualified to meet the emerging needs of disaster response. However, the fact that legal frameworks consider the creation of these funds does not necessarily mean that the required resources have been estimated or effectively allocated.

It should be noted that institutions such as the World Bank, the IDB, and CAF Development Bank of Latin America offer contingent credit lines or similar mechanisms explicitly linked to the financing of emerging expenditures in disaster situations.

g) Integration of disaster risk management and development

The incorporation of the DRM strategy into national development policies and plans is the ultimate goal of disaster risk management and constitutes the mainstreaming of the approach as an inherent part of sustainable development. Post-disaster recovery processes represent an opportunity to rectify the previously followed course and rebuild with resilience by incorporating disaster risk management into development strategies. Reducing prevalent social, economic and environmental vulnerability, and increasing the resilience and general well-being of the population with a rights-based approach, is also an end goal of comprehensive risk management. Recovery must be resilient and must encompass infrastructure as well as access to basic services and livelihoods, essential for development. Sustainability in this context automatically becomes a *sine qua non* requirement for future resilience.

C. Methodology

The analysis presented in this policy brief are based on secondary information, including national reports on the application of DRM measures, as well as an analysis of the institutional and regulatory frameworks that govern DRM. Additionally, the study was informed by data on the application of the Governance and Public Policies Index in Disaster Risk Management (iGOPP), and other Disaster Risk Indicators developed by the IDB.

For each country, the data sources of the Governance Index and Public Policies in Disaster Risk Management are legal instruments, plans, reports and minutes.

They make it possible to identify the formal and verifiable existence of a number of basic legal, institutional and budgetary conditions so that disaster risk management processes can be implemented.

It should be borne in mind that, even if normative and institutional conditions exist, they do not necessarily ensure implementation of DRM measures and subsequent improvement in DRM performance.

Additionally, the National Progress Report on the Implementation of the Hyogo Framework for Action aims to measure the level of performance of the country in different areas of disaster risk management and is a self-assessment by national institutions involved in disaster risk management. Finally, the Risk Management Index (IGR) developed by the IDB aims to measure the performance of the country, but the evaluation is based on the opinions of national experts related to different sectors and areas of DRM.

The analysis included relevant data for country-level progress and findings in each of the key elements of the integration of risk management into sustainable development. For each country, it is also necessary to consider whether the DRM has been considered in the National Development Plans or similar planning instruments which the sample countries may possess.

I. The Bahamas

A. Governance framework for disaster risk management

1. Instruments to promote disaster risk management

a) National

The Bahamas enacted the Disaster Preparedness and Response Act in 2006 (amended in 2011) with the goal of coordinating and implementing mitigation, preparedness, response and recovery actions in regards to emergencies and disasters.

The Act establishes the National Emergency Management Agency (NEMA) as the Department of Government responsible for disaster relief management. According to the act, NEMA and its Director have the following main responsibilities:

- Review and assess programs and activities which have an impact on the mitigation, preparedness, response and recovery from emergencies and disasters
- Develop and recommend national policies to foster and promote the mitigation, preparedness, response and recovery from emergencies and disasters
- Gather information concerning the conditions and trends in the quality of the environment, both current and prospective, as these relate to the likelihood of disasters
- Analyze and interpret the information for the purpose of determining challenges to the achievement of mitigation, preparedness, response and recovery activities
- Conduct research on ecological systems and environmental quality and document and define changes in the natural environment as these relate to the likelihood of disasters
- Prepare and review disaster risk assessment maps of The Bahamas
- Conduct programs of public information and education
- Liaise with persons, institutions and organizations for the purpose of exchanging information and facilitating the harmonization of policies

Other tasks include the establishment and maintenance of a list of shelters, and their operational procedures. The act also allows for the designation of specially vulnerable areas and the elaboration of special area precautionary plans, which should consider specific strategies, policies and standards for the development of structures in the area, standards for environmental impact assessments and other prohibitions.

Although the first mention of NEMA refers only to its role in relief management, throughout the act it is observed that the scope is widened and activities related to disaster risk management (DRM), such as mitigation, preparedness, and recovery are also tasked to the agency. NEMA groups these tasks into four main themes: (i) mitigation planning, (ii) community preparedness, (iii) public information, and (iv) recovery coordination.

It should be noted that the act goes beyond recognizing the importance of data and information related to disaster risk management, and also highlights the need for environmental information as it acknowledges the strong linkages between environmental conditions and the risk of disaster. In order to produce, collect, analyze and disseminate data and information, both on DRM and environmental issues, the act highlights the need for collaboration between NEMA and other government institutions, as well as with the private sector. In addition to incorporating the role of information in NEMA's tasks, the act also establishes obligations for other public officers, and mandates that every Permanent Secretary and head of Department of Government designates liaison officers to communicate with, and support the work of NEMA.

Besides the explicit mandate to collaborate in the production of useful information, the act also establishes an Advisory Committee of NEMA, comprised of several institutions, such as the Offices of the Prime Minister and the Cabinet, the Ministries of Health, Environment and Housing, Works and Urban Development, and Local Government, the Royal Bahamas Police Force and Defence Force, the Fire Service, the Public Hospitals Authority, public utilities, the Department of Meteorology, the Department of Aviation, The Bahamas Broadcasting Corporation, as well as other relevant stakeholders identified by the Prime Minister. The main task of the Advisory Committee is to support NEMA in the elaboration of annual National Disaster Preparedness and Response Plans. The plan should consider mainly issues of preparedness and response, such as its coordination and implementation, dissemination of information, evacuation procedures, mobilization of services and systems, preparation and maintenance of inventories, protection and restoration of communications, distribution and replenishment of emergency relief, and provision of shelter, among others. Additionally, NEMA is required to prepare annual Disaster Preparedness and Response Policy Reviews related to the mitigation of, preparedness for, response to and recovery from emergencies and disasters in The Bahamas.

The issues and themes presented in the Disaster Preparedness and Response Act are also reflected in the (working draft) National Development Plan of The Bahamas – Vision 2040, which frames the country's development agenda within the Sustainable Development Goals (SDG). Therefore, the 15 National Development Plan goals and their implementation strategies are directly linked with the SDGs.

b) Territorial

The Disaster Preparedness and Response Act establishes that an office or post of NEMA shall be located on a Family Island that can be readily accessible to two or more neighboring Family Islands. The responsibility of fulfilling NEMA's functions in the Family Islands will reside with the Administrator of the Island.

Additionally, the Prime Minister, in coordination with NEMA's Director and each Administrator on the respective Family Island, shall designate a Disaster Consultative Committee consisting of at least five residents of each settlement, town area or district. The Committee will support the Director and the Administrator in the elaboration of plans for disaster preparedness. In the event of a disaster emergency and in the absence of the Administrator, the Committee's Chairperson will be regarded as a representative of the Administrator.

Regarding the functions of the Advisory Committee, the act authorizes the establishment of other committees and subcommittees to fulfill particular responsibilities, including considerations of geographical location.

Another territory-related task is the establishment and maintenance of a national emergency operations center, which will function as the headquarters, and the establishment of supplementary centers distributed according to geographical location or local government unit.

c) Sectoral

The Disaster Preparedness and Response Act highlights the importance of collaboration among government agencies in the gathering of data and the production of valuable information. It emphasizes the importance of environmental data due to its connection with disaster risk management. Additionally, every Permanent Secretary and head of Department of Government designates liaison officers to communicate with and support the work of NEMA.

The Advisory Committee of NEMA is also an example of intersectoral coordination for the elaboration of annual National Disaster Preparedness and Response Plans. Although the act recognizes the need for collaboration between institutions and sectors, it is done in light of NEMA's functions and requirements. The considerations included in the act are intended to guide NEMA's work.

2. Articulation of disaster risk management with climate change

The National Policy for the Adaptation to Climate Change (NPACC) enacted in 2005 acknowledges the negative impacts of climate change, and establishes linkages with the country's risks of disaster, especially in regards to changing weather patterns that affect temperature and rainfall, as well as flooding, tropical storms and other climatic events. The policy also considers exposed infrastructure in coastal areas, which can be affected by climate-change-related sea level rise, but also by erosion and damage due to natural hazards such as tropical storms, hurricanes and storm surges. In this regard, the Government of The Bahamas highlights the importance of climate change adaptation under a precautionary principle.

The NPACC is based on several principles that include integrating climate change adaptation policies, plans and projects in national planning and budgets; promoting public participation and awareness; improving the enabling environment to implement climate change related activities; promoting research; and strengthening physical and socioeconomic planning. Additionally, a strong principle present throughout the policy is environmental protection and conservation, acknowledging that a healthy environmental sector increases overall resilience; therefore, the policy highlights the importance of restoring degraded ecosystems and ensuring consistency between national social, economic, and environmental developmental goals and adaptation measures.

The sectoral component is comprehensive as it is recognized that most societal sectors both affect and are affected by climate change dynamics. The policy identifies challenges and opportunities in various sectors, including agriculture and fisheries, coastal and marine resources, energy, finance and insurance, forestry, human health, human settlements, biodiversity, tourism, transportation and water. Some identified challenges are changes in rainfall patterns (intense rainfall and drought), sea level rise, beach erosion, increased ocean temperatures, and extreme events such as hurricanes, storms and surges. Although the policy does not focus on the DRM component, it foresees the impact of such challenges and seeks to avoid, minimize, or respond to the negative impacts of climate change on economic activities, human settlements, and infrastructure. Therefore, a linkage between climate change adaptation and mitigation, and disaster risk reduction is observed.

The National Policy for the Adaptation to Climate Change, the National Development Plan and the Planning and Subdivision Act recognize the critical role played by physical planning and highlight the importance of a national land use plan to ensure the establishment of sustainable human settlements that are resilient to climate change and disasters. Hence, the NPACC includes considerations for improved physical planning and development in most sectors, including human settlements, coastal and marine, biodiversity, and tourism.

In addition to setting sectoral goals and strategies, the policy also incorporates climate change considerations in planning and management. Some elements considered under this category are the development of a National Land Use Management Plan, a National Climate Change Database and a National Water Management Plan; development and enforcement of a building code and other engineering standards that incorporate climate change concerns; incorporation of climate change considerations in national budgets; and incorporation of climate change issues into the national disaster planning and response process of NEMA.

Although the policy identifies climate change and weather variability as important causes for increased risks of disasters, it does not fully incorporate the role of disaster risk reduction or management, but only a perspective from climate change adaptation and mitigation. However, measures to adapt and mitigate the effects of climate change and to protect the environment can also be used to build resilience to disasters.

Complementarily, the country's Intended Nationally Determined Contribution (2015) under the UNFCCC identifies several vulnerabilities faced by The Bahamas, namely geographical, environmental, socioeconomic, infrastructure, dependence on tourism and limited institutional capacity. The country has already started addressing some of these challenges and proposes measures to solve others. Some relevant issues identified are to protect 20 per cent of the near shore marine environment by 2020, rehabilitate degraded ecosystems (including wetlands), relocate communities from the shoreline, build and strengthen coastal defenses, and continue strengthening building codes. The document also takes precautions to ensure continuity in the provision of basic services such as water and electricity through a diversified and sustainable energy matrix.

3. Access to information and public participation

The National Development Plan (NDP) proposes an Open Government Strategy that requires ministries to proactively release data, improve public communications and increase transparency. Another strategy is related to participatory governance and community engagement. This is expected to be accomplished through several actions, such as strengthened decentralization and local governments, civil society engagement, and promotion of volunteerism.

The NDP also proposes a SMART Bahamas through the use of ICTs to improve the quality of life of citizens, encourage competitiveness and provide better public services. The concept of SMART Bahamas goes beyond simply access to information, but personalized services based on interactions with the system. According to the plan, it “would provide information in real time and the necessary evidences for optimal decision making, ensuring transparency in all processes and real-time information to stakeholders and citizens” (NDP 2016). Complementarily, the strategy to Develop Information and Communication Technologies proposes the use of ICTs in all government levels, including for public safety, health, education and disaster management.

Both the NDP and the NPACC underscore the importance of reliable and consistent data for decision making in all sectors. The latter establishes the need to ensure that every societal sector and level is adequately informed about climate change issues and their implications.

Regarding specific DRM information, the Disaster Preparedness and Response Act mandates NEMA to conduct programs of public awareness, information and education on mitigation, preparedness, response and recovery. NEMA shall also establish procedures to inform the population of the state of affairs during and after a disaster, and liaise with organizations for the exchange of information and harmonization of procedures. In terms of public participation, Consultative Committees must be composed of no less than five residents of each settlement, town area or district.

Further, the Freedom of Information Act (2012) applies to all public authorities and any other organization that provides public services or receives government appropriations. The act has three main objectives: (i) governmental accountability, (ii) transparency, and (iii) public participation in national decision making. Therefore, even if some norms do not explicitly refer to access to information or opportunities for the public to participate in decision making processes, the Freedom of Information Act

explicitly mandates for the sharing of information and the promotion of public participation. Therefore, these principles are expected to be applied by every data-producing organization.

4. Standards for integrating recovery into development policies

The Disaster Preparedness and Response Act considers recovery as an element to be included in the National Disaster Preparedness and Response Plan. However, the act does not establish explicit dispositions or recommendations for a resilient recovery process.

The NDP proposes the development and implementation of sectoral business continuity plans in the public and private sectors, and the development of protocols to ensure access to essential services such as electricity, water, waste management, and health. It includes certain themes that should guide a resilient reconstruction. Most notably, it emphasizes on the need to strengthen the conduct of post-disaster assessments to better inform future policy decisions. The most important outcomes of this action are to use the disaster assessments to inform rebuilding and to better inform disaster management policies. The plan also seeks to mainstream DRR considerations into planning procedures for major infrastructure projects, and to amend legislation on building codes, standards and reconstruction practices. Combined with other strategies, such as land use management, these considerations should guide resilient reconstruction processes.

B. Quality information to guide decision making on disaster risk management

1. Responsibility for technical guidelines

The Freedom of Information Act tasks the Permanent Secretary in the Ministry with responsibility for Information, Privacy and Data Protection with the elaboration of a code on standards and best practices to publish information, additionally, the ministry must support the efforts of other institutions in producing information.

The Bahamas Spatial Data Infrastructure Act (2014) establishes The Bahamas National GIS Center as a Department of Government responsible for the collection and management of geospatial data. In regards to geospatial data, the Center has the responsibility for implementing, coordinating and monitoring GIS policies, procedures and activities; providing GIS services to other government agencies, coordinating cross-agency projects and data collection, ensuring that the information produced is used and available for decision making, and ensuring access, use, exchange, sharing and dissemination of non-confidential information. In addition, it mandates the development of mechanisms to integrate land, marine, air and sub terrain administration and topographic mapping programs.

Regarding information for DRM, The Bahamas National GIS Center identified spatial data themes, including utility infrastructure, buildings and facilities, climate and meteorological/geographical features, coastal and marine mapping, elevation, flood hazards and natural risk zones, geology, housing, hydrography, shoreline, transportation network, watershed boundaries, wetlands, land use and zoning, and energy resources, among others. A strong collaboration between NEMA and the Center would yield important information for risk identification that would lead to risk reduction measures. In this sense, NEMA is part of the Geospatial Advisory Council.

The Disaster Preparedness and Response Act considers access to information and production of environmental information. There are no clear guidelines as to the type of information NEMA should produce, or its role in assisting other government organizations in this task.

However, The Bahamas Environment, Science and Technology (BEST) Commission elaborated the Roadmap for the Advancement of Science and Technology in The Bahamas (2005), which establishes priorities for most government agencies. Specifically for NEMA, its aims are:

- To promote disaster preparedness and develop a National Emergency Preparedness Plan and ensure its implementation.

- To implement mitigation measures for the environmental and social impacts of disasters.
- To promote construction and design, especially in coastal areas, that will ensure protection and management of coastal systems during disasters.

The roadmap also defines a research agenda based on national priorities or strategies; some themes are land use and exploitation, disaster preparedness, marine conservation and coastal management, urban development and design, and mitigation of the social impacts of disasters.

2. Incentives to the generation and dissemination of information and knowledge

In order to promote openness the Freedom of Information Act mandates that every public authority shall appoint an Information Manager who will manage internal information and liaise with the public to respond to their information needs. In addition, it establishes protections for whistleblowers who report legal breaches, wrongdoing or threats to health, safety or the environment.

Additionally, previous sections expand on the considerations for access to and dissemination of information explicit in instruments such as the National Development Plan, the National Policy for the Adaptation to Climate Change and the Disaster Preparedness and Response Act.

C. Integration of disaster risk management into the project preparation and evaluation cycle

The NDP and the NPACC consider the integration of climate change adaptation policies, plans and projects in national planning and budgets, as well as the elaboration of Environmental Impact Assessments in certain cases. Although there is no direct reference to DRR through improved public investment, it is expected that budgetary allocations for climate change adaptation and mitigation would have positive effects on DRM and resilience building. Moreover, the NDP observes that infrastructure is often built “based on emergency or political expediency” (2015). Therefore, it proposes the elaboration of a Capital Investment Framework and a 25 year rolling plan that includes priorities, funding, specific needs of the Family Islands, PPP opportunities and best practices in climate change resistant design and construction.

The country has not developed conceptual models for the incorporation of DRM or climate change adaptation in public investment portfolios, either for new developments or for post-disaster reconstruction. Although some projects are required to undergo an environmental impact assessment and present a mitigation plan, it is not mandatory for approval. This requirement also varies by agency. For example, the BEST Commission and the Ministry of Public Works often consider disaster and climate change risks in feasibility studies (IDB 2016). The country also has a strong set of norms regulating investment; however, the incorporation of DRM in public investment portfolios (PIP) is still incipient as described in Table 2.

Table 2
Incorporation of disaster risk management criteria in public investments

Criterion	Parameter	Evaluation
Development of conceptual models, methodologies and tools for incorporation of DRM in PIP	Existence of conceptual models for the incorporation of DRM in public investment portfolios	Red
	Existence of methodologies for incorporation of DRM in PIP	Green
	Existence of technical tools for the incorporation of DRM in national public investment systems	Green
	Existence of mechanisms of technical approval of the PIP with inclusion of risk analysis	Red
	Existence of mechanisms of technical approval of the PIP for the phase reconstruction	Red

Table 2 (concluded)

Criterion	Parameter	Evaluation
Political consensus and follow-up for the gradual adoption of the technical tools in the incorporation of DRM in PIP	Existence of other instruments such as building codes, environmental impact assessment which are used at a general level both in public and private sector	Yellow
	Update the regulations governing the minimum parameters of the DRM in public investment	Yellow
	Existence of reasonable deadlines for the incorporation of DRM in PIP and the verification of its obligation	Red
	Existence of mechanisms to identify, exchange and dissemination of successful experiences	Yellow

Source: IDB (2016), "Status of Incorporation of Disaster Risk Management and Climate Change Adaptation in National Public Investment Systems."

Key:

Green: parameter fulfilled or accomplished.

Yellow: progress in the fulfillment of the parameter, some actions are pending.

Red: actions aimed at the fulfillment of the parameter are non-existent or very incipient and isolated.

D. Territorial approach

1. Decentralization of disaster risk management process

According to the Disaster Preparedness and Response Act, an office or post of NEMA will be located in Family Islands that can be reached by two or more neighboring islands, and emergency operations centers should also be established according to geographic location or government unit. The act also establishes the creation of Disaster Consultative Committees that have the responsibility of elaborating plans for disaster preparedness. In the event of a disaster emergency and in the absence of the Administrator, the Committee's Chairperson will be regarded as a representative of the Administrator. However, the tasks assigned to local governments are limited and there is no specific mention of processes to decentralize DRM.

The Local Government Act (1996) tasks Town Committees and District Councils with the maintenance and upkeep of public infrastructure, including roads, public spaces, and public wells and water tanks. They should also collaborate with the pertinent authorities in maintaining public buildings, ports, docks, hospitals and schools, and in issuing guidelines for the upkeep, restoration, design or alteration of any building or any part of a building normally visible from a street. Although the act does not make reference to the role of local government in DRM, the fulfillment of these tasks would contribute to disaster risk reduction and preparedness.

The National Development Plan proposes a strategy for an effective local government, and highlights the need to evaluate the powers and financing of local governments with a view to strengthening decentralization and empowerment of the Family Islands. In this regard, the Local Government Act is expected to be amended by June 2019, and a White Paper on the future of local governments should also be produced, giving an opportunity to strengthen the role of local governments in DRM. Previous experiences indicate that an important issue that can be solved or addressed through the White Paper is the allocation of funds to local governments and an increased decentralization of functions and budgets. Additionally, the NDP and other instruments highlight the role of local governments in land management, a critical theme within DRM (see section below).

2. Land-use planning

The Town Planning Act, through the Town Planning Committee, establishes the authority to prescribe areas restricting and forbidding building, as well as the responsibility to control, regulate or modify the architectural design of any new building or control, regulate or prohibit any alteration to the exterior of any existing building. However, the act applies only to New Providence. The Governor-General has the authority to direct that all or certain provisions are extended to the Out Island district. In addition, according to the Local Government Act, District Councils shall have and exercise the functions assigned to the Town Planning Committee under the provisions of the Town Planning Act, and the powers of the Buildings Control Officer to grant building permits under the provisions of the Buildings Regulations Act.

The Planning and Subdivision Act (2010) applies to New Providence and could be extended to any Family Island. It intends to promote sustainable development through land use planning including land use designations and zoning, maintenance and improvement of the physical and natural environments, provision of efficient infrastructure and services, and planning for the development and maintenance of safe and viable communities. The structure and administration of the act are tasked to the Town Planning Committee, and it also mandates the establishment of a Department of Physical Planning that should address two main areas, these being policy planning and development review.

Overall, applications for developments should consider “the health, safety, convenience and welfare of the present and future inhabitants.” In this regard, some relevant criteria are the development’s conformity to the Land Use Plan and related national policies, suitability of the land for the intended purpose, flood control, availability of services, topography of the land, encroachment into the surrounding coastline, and conservation of natural resources, including critical ecosystems such as wetlands. To this end, it requires that certain projects submit an Environmental Impact Statement (EIS). Some developments that will require an EIS are those that are likely to give rise to effects on the environment due to their nature, size or location, projects of national importance and developments in sensitive/important natural lands.

Each island is expected to develop Land Use Plans that contain land use designations for different purposes, location of existing and planned roads, policies to prevent or minimize conflicts, provisions for the development of public infrastructure (including cemeteries), and designation of areas that should not be developed. These include areas affected by flooding, erosion, subsidence, instability and other hazards, as well as areas of natural importance including wetlands. Before approval, plans should be discussed with the public, who should also be kept up to date. However, the act does not establish specific timelines nor does it establish periodicity or contents. Nevertheless, it also mandates that the Governor-General adopts National Land Use Development Policies.

The National Development Plan emphasizes the importance of land administration for the country’s development. It underscores the need for a National Land Use Plan and a sound land administration system (including an Integrated Coastal Zone Management Plan) that guides the country’s physical development, and recognizes its linkages with DRR and environmental conservation. An improved land management system would contribute to addressing land ownership and development challenges faced by the Family Islands. Land use plans are expected to incorporate DRR actions for each city or settlement, and for different types of zoning.

E. Sectoral approach

The National Development Plan and the National Policy for the Adaptation to Climate Change (NPACC) establish strong correlations between climate change and disasters, and multiple sectors such as physical planning, energy, health, tourism, natural resources management, and tourism, among others. Both instruments insist on the linkages between environmental protection and conservation, and resilience to disasters and climate change. The climate change policy shows a stronger sectoral approach, but it is worth highlighting that certain climate change adaptation and mitigation strategies could prove beneficial for disaster risk management.

The NDP and the NPACC are supported by sectoral policies, including the Environmental Health Services Act, the Fisheries Resources Act, the Agriculture and Fisheries Act, the Forestry Act and the Environmental Planning and Protection Act, among others.

As it has been detailed, land use management also plays a central role in the development of the country, and it is present in multiple instruments, including related acts, the NDP and the NPACC. Enforcement and implementation of the measures proposed should yield important benefits in reducing the risk to disasters and the vulnerability of certain human settlements and other infrastructure.

The Energy Policy acknowledges the correlation between climate change mitigation and adaptation and sustainable energy policies. Although its reference to DRM is limited, it includes provisions to improve infrastructure and ensure service continuity, and a strong component to promote

the deployment of renewable energies. These issues relate to DRM in the sense that such interventions should improve the sector's resilience through modern infrastructure, a diversified and decentralized energy matrix, and business continuity. In addition, the approach of the policy is echoed by the NDP and the NPACC, which underscore the need to ensure access to services (electricity and water) during emergency events, and to consistently maintain the sector's infrastructure.

F. Macroeconomic policies

1. Policies

Regarding the effects of catastrophic events, the NPACC identifies several opportunities to strengthen financial protection. It considers the implementation of fiscal and financial measures to achieve equitable distribution of the economic burden between stakeholders, and collaboration with the financial sector to develop risk management measures and regimes to address the impacts of climate change. In addition, both the NDP and the NPACC highlight the need to incorporate climate change adaptation and mitigation strategies in national planning and budgets.

The Intended Nationally Determined Contribution suggests the reduction of insurance costs for high-elevation lots and to increase insurance for properties in low elevations.

Even though the importance of financial protection is mentioned in several instruments, the country does not have a financial strategy or policy for disaster risk management.

2. Management of funds

The Emergency Relief Guarantee Fund Act (1999) allows the Government to guarantee loans for the relief of persons who have suffered hardship and loss as a result of a disaster. The purpose of the loans is to repair or replace occupied residential property and businesses, furnishings, and appliances damaged or destroyed by any disaster. The maximum amount of a loan for residential property is \$ 50,000, and \$ 75,000 for businesses; the first has a repayment period of 20 years and the latter of 10 years. The aggregate amount of all borrowings should not exceed \$ 20 million (a greater sum could be approved by the House of Assembly).

The act establishes certain requirements in order to have access to the fund. A documentary title of the property is necessary to apply for a loan. However, in cases where the applicant does not have the documentation, it is possible to present an affidavit stating possession of the property. It may also be required that every property that is a security for a loan shall be insured.

The act indicates that the Emergency Relief Fund shall be paid one million dollars, and it will consist of (i) two per cent of every loan guaranteed under the act, and (ii) funds provided, from time to time, out of the Consolidated Fund of The Bahamas.

3. Management of risk transfer mechanisms

The Bahamas was a member of CCRIF SPC (former Caribbean Catastrophe Risk Insurance Facility) for approximately 10 years, and as part of this membership has a comprehensive Country Risk Profile developed by the facility. However, the lack of payouts after emergency events led to the cancellation of the membership in the aftermath of Hurricane Joaquin. According to national news, the annual premium of \$ 900,000 could be allocated to the Emergency Relief Fund.

G. Integration of disaster risk management and development

1. Disaster risk management in the national development strategy

The National Development Plan considers DRM within the Natural Environment as a strategy to integrate disaster risk reduction in development policies. The plan recognizes the role of a healthy environment in increasing resilience to climate change and other natural hazards. In this sense,

throughout the plan a strong link between quality of the environment and disaster risk reduction is observed, with multiple measures addressing environmental degradation and the effects of climate change, which also have positive impacts on DRR.

The DRR strategy identifies six main areas of action:

- Incorporate comprehensive disaster risk management strategies for disaster response, including the implementation of the Comprehensive Disaster Management Strategies developed by CDEMA and the revision of Emergency Operations Plans.
- Strengthen land use policies and legislation, including hazard mapping in all islands, identification of safe areas for human settlement, disaster risk considerations for major infrastructure projects, and revised building codes and other related standards.
- Further strengthen early warning and evacuation systems and procedures, which considers acquisition and/or upgrade of infrastructure, systems, equipment and other early warning tools; maintenance of systems and equipment, community engagement, and revision of the Disaster Preparedness and Response Act.
- Strengthen other pre-disaster response by strengthening Disaster Consultative Committees in the Family Islands, harmonizing public and private response plans, and establishing business continuity plans and protocols for the provision of essential services (health, waste management, electricity, water, emergency supplies and clearing of debris).
- Strengthen the conduct of post-disaster assessments to better inform future policy decisions. It should be noted that the Government of The Bahamas has requested the assistance of the Economic Commission for Latin America and the Caribbean in the assessment of the effects and impacts of hurricanes Joaquin and Matthew, the two latest events to affect the country.
- Build national and local technical staff capacity in disaster management, data management and in the generation of environmental vulnerability assessments. Some expected outputs are strengthening capacity building and identifying priority research/training areas, and training on data management and vulnerability assessment.

Complementarily, the plan recognizes the importance of infrastructure development and includes the need to identify and classify the condition of existing public infrastructure, develop an asset inventory database with asset condition and a long term asset management and maintenance plan.

2. Post disaster recovery, an opportunity for sustainable development

Although the country does not have a specific policy for post-disaster reconstruction, several development instruments highlight the importance of environmental conservation and land management to face the challenges posed by climate change, as well as to mitigate and adapt to their effects. As analyzed, the NPACC and the NDP establish strong linkages between land management and environmental conservation as elements that can help build resilience to climate change and disasters.

The country has multiple land management-related norms, and all of them insist on the role that adequate land management plays in reducing vulnerabilities and increasing resilience. Some activities considered are relocation of human settlements to safe areas and adoption of protection measures, such as coastal defenses. Complementarily, a comprehensive building code and other standards have been developed; implementation and compliance with the code are stressed in the NDP and the NPACC. The enforcement of the engineering standards established in the code should guide a resilient reconstruction process of affected infrastructure, and should reduce the risk of disaster in new structures. The plan goes beyond DRR and into resilient development as it indicates that settlements should be “relatively self-sufficient in terms of local commercial, educational, health, transport, social and recreational facilities”.

In addition, both the NPACC and the NDP underscore the need to address economic, social, environmental, geographic, infrastructure and institutional vulnerabilities.

This suggests an understanding of the underlying drivers of vulnerability which could lead to an increased risk of disaster, highlighting a transition to a proactive approach to DRM.

The country is also seeking to strengthen its post-disaster assessment capabilities, which would shed light into vulnerabilities that led to the event, as well as potential risks that could arise in the future. A consistent and systematic effort to estimate the effects of disasters would evidence the cumulative effects of small and large disasters in national economies and their negative impacts on the attainment of development goals, it is expected that these assessments would help improve DRM and support other sectoral efforts to manage the risk of disaster.

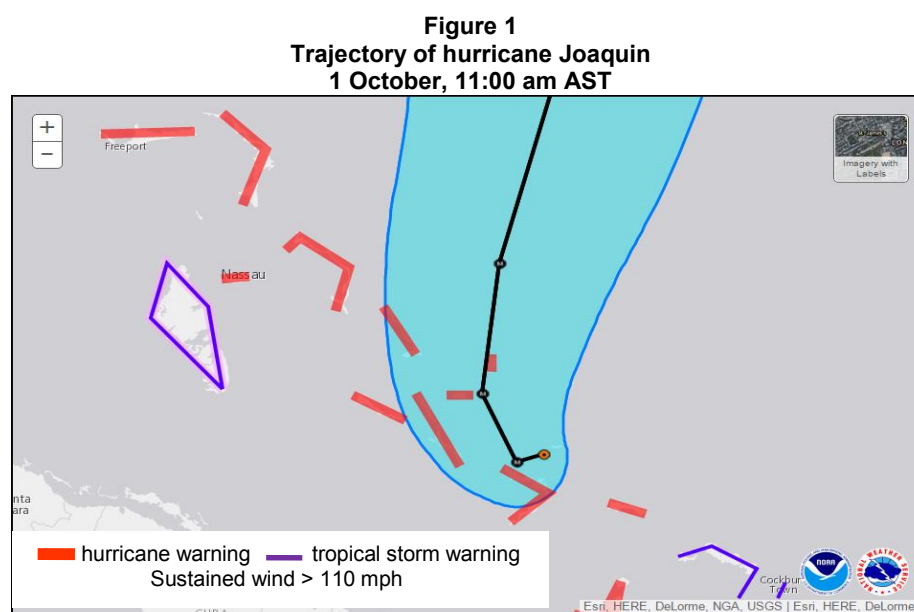
3. Building resilience through post-disaster reconstruction

The assessment of the effects and impacts of a disaster evidences risks and vulnerabilities faced by a country or local area, but it also provides a space for discussion and identification of recommendations for a resilient reconstruction. This section presents a summary of specific recommendations for reconstruction in the aftermath of Hurricane Joaquin (2015) in The Bahamas.

The first section provides a brief description of the event and its main characteristics, in an effort to visualize the behavior and extent of the effects. The second section offers a series of recommendations for reconstruction, which were organized in light of the pillars proposed by the Global Facility for Disaster Reduction and Recovery, namely: (i) risk identification, (ii) risk reduction, (iii) preparedness, (iv) financial protection, and (v) resilient recovery. It should be noted that the country has continued strengthening its efforts to reduce the risk of disaster; therefore, certain recommendations might have been already addressed, while others could be in development.

a) Description of the event

Hurricane Joaquin was upgraded to Category 4 on 1 October at 3:00 p.m. AST at latitude 23.0 north, longitude 74.2 west, with maximum sustained winds reaching 130 mph (210 km/h). Joaquin was a large hurricane in terms of area affected, with outward hurricane-force winds extending 50 miles (80 km) from the centre, and tropical-storm-force winds reaching as far as 185 miles (295 km). The central Bahamas were expected to experience 12-18 inches of rainfall, and isolated maximum amounts to reach 25 inches, while the southeastern Bahamas were expected to receive 5 to 10 inches, and 2 to 4 for the northwestern, with flash flood warnings throughout the country. Storm surges were expected to reach 6-12 feet in the central Bahamas, and 2-4 feet for the rest of the country. The hurricane was expected to continue moving west through the night, and to pick up speed and turn toward the north on 2 October. Map 1 shows the trajectory of Hurricane Joaquin on 1 October.

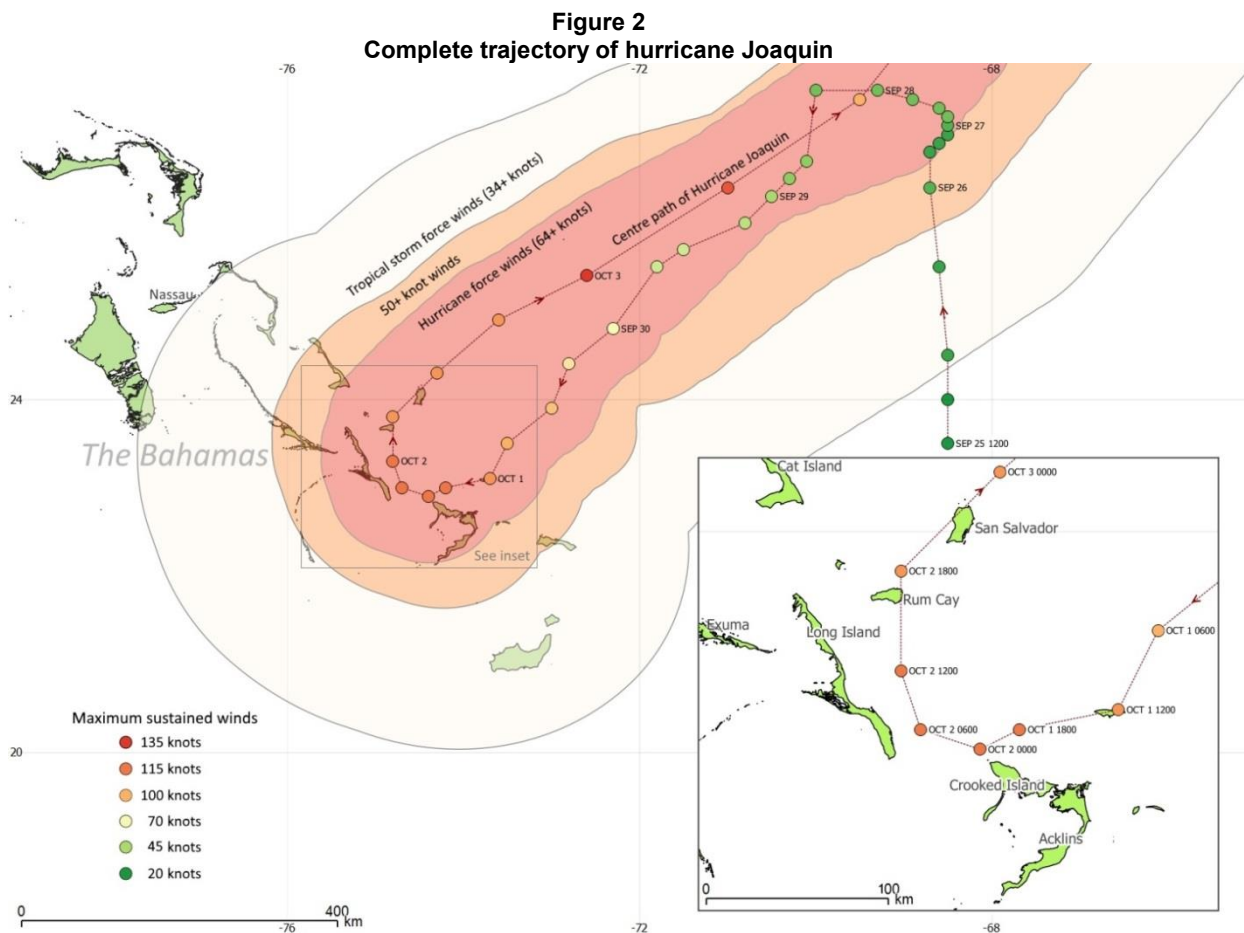


Source: National Oceanic and Atmospheric Administration, National Hurricane Centre, Advisory #15.

Joaquin hovered 15-20 miles (25-35 km) from Clarence Town, Long Island, until early morning Friday 2 October, when it began to move north-northwest at 3 mph (5 km/h). The permanence of the hurricane close to Acklins, Crooked Island and Long Island caused sea surge of up to 6 feet. As Joaquin picked up speed it continued north, as the core of the hurricane passed over Rum Cay, and came within 25 miles (40 km) southwest of San Salvador. A hurricane warning was in effect for the rest of the central Bahamas (Cat Island, the Exumas, Long Island), as well as the northwestern Bahamas (Abacos, Berry Islands, Eleuthera, Grand Bahama and New Providence) and Acklins, Crooked Island, and Mayaguana of the southeastern Bahamas. Tropical-storm-force winds still reached as far as 205 miles (335 km) from the centre of the storm.

At 6:00 p.m. AST on 2 October, Joaquin was downgraded to a Category 3 hurricane, as the maximum sustained winds decreased to near 125 mph (205 km/h), and was forecasted to continue to weaken over the following 48 hours. The Bahamas Meteorology Department in San Salvador reported the minimum central pressure at 944.3 mb (27.88 inches). Joaquin increased in forward speed to 7 mph (11 km/h) and began to move north-northeast late on 2 October. Figure 2 shows the complete path of Hurricane Joaquin.

The Government of The Bahamas discontinued all warnings and watches for the northwestern Bahamas (Abacos, Berry Islands, Eleuthera, Grand Bahama and New Providence) at 12:00 a.m. AST on 3 October, as Joaquin continued to move 13 mph (20 km/h) northeast. By 12:00 p.m. AST all warnings and watches for The Bahamas for Joaquin had been discontinued, as the eye of the storm was located at latitude 26.0 north, and longitude, 72.5 west, and continued to move away from The Bahamas. Water levels were expected to slowly subside throughout the day, with 2-5 inches of additional rainfall expected.



Source: National Oceanic and Atmospheric Administration, National Hurricane Centre.

b) Recommendations for resilient reconstruction

This section summarizes certain reconstruction measures proposed in regards to the five pillars of disaster risk management; an extended version was shared with the government of The Bahamas.

Pillar 1. Risk identification

In The Bahamas, 88 per cent of the population lives at an elevation of less than 10 meters above sea level,⁷ and most of its critical infrastructure is also located near a coast. This makes it relevant for NEMA to continue to strengthen collaboration with the Bahamas National Geographic Information Systems Centre (BNGIS) and with the Ministry of Environment to utilize maps of vulnerabilities in the affected islands, which can inform the reconstruction process in terms of location of settlements, public infrastructure and public services. This could also allow NEMA to prioritize its response to an emergency and provide relief to vulnerable populations and settlements.

In addition, the Ministry of Works and Urban Development, the Water and Sewerage Corporation, the Bahamas Electricity Company and the Bahamas Telecommunications Company could benefit from partnering with BNGIS to map and update the location of each sector's infrastructure. This would contribute to planning and monitoring maintenance of the infrastructure, but also to identify vulnerabilities due to location. In addition, when assessing the effects of a disaster, maps of roads and other critical infrastructure allow identifying location of affected assets, priority areas for intervention and need for relocation. Improved quality and availability of spatial data would also inform future investments in public infrastructure.

Another instrument to identify risks is through the assessment of disasters. Disasters expose strengths and areas that need improvement. This gives an opportunity to plan better for potential hazardous events and make the necessary changes to prevent similar disasters from happening in the future. Instruments such as the Disaster Assessment Methodology are intended to provide a comprehensive assessment of the social, economic and environmental effects and impacts of a disaster. The Bahamas has been proactive in adopting this approach, and has requested the assessment of the two most recent events, hurricanes Joaquin and Matthew.

The assessment of disasters could be substantially improved by having detailed and updated economic statistics and national accounts. This requires the allocation of more financial resources to the Department of Statistics. Some improvements include:

- Draw up an annual Supply-and-Use Table.
- Breakdown variables such as gross value added by industry, total production (output) by industry and employment by activity and by island or district.
- As a country that depends primarily on tourism, it is essential to have an updated Tourism Satellite Account (TSA). This is especially important as this sector is usually affected by a disaster.
- Develop a system of quarterly national accounts that enable intra-annual monitoring, allowing the analysis of cyclical trends and determining the possible inflection points of economic activity. This tool not only has an analytical and policy use, but also strengthens macroeconomic and sectoral projections.
- Strengthen national accounts through the consolidation of basic statistical infrastructure whose central core is the Directory of Companies and Establishments (DCE) to the universe of resident economic units in the Bahamas. The DCE should be periodically updated. In addition, it should incorporate economic variables such as the amount of sales, the amount of assets and number of employees. Besides serving as a sampling frame, it would make possible some estimates by DCE segments (large, medium and small companies) and the GDP by island.

⁷ See McGranahan et al. (2007).

More in-depth economic data such as GDP per island could inform development and investment programs; while in times of disaster management, it can help to have a better understanding of the impact of the event on the island's economy, and subsequently its population.

The availability of economic data must be accompanied by appropriate metadata as the only way to ensure transparency and better use of information by decision makers in the public and private sectors, planners, analysts and civil society.

Besides producing information, it is vital that institutions share their knowledge with other institutions. This pillar is fundamental for risk reduction and preparedness, as it can inform policies and decision makers with specific information on social, economic, environmental and physical vulnerabilities of populations and infrastructure. Information should also be readily available for the population to raise awareness in regards to hazards and risk areas, communicate measures to manage the risk of disaster, and promote research from public and private sectors, including non-governmental organizations and academia.

Pillar 2. Risk reduction

The most widespread measure to reduce risk in the islands is to enforce the use of the building code in the recovery and reconstruction process, as well as in any new development. Most dwellings that complied with the standards of the code withstood the effects of the hurricane or only suffered minor damage. Therefore, it is evident that during the reconstruction process of new homes, the code should be enforced as a measure to grant access to government assistance.

The Bahamas has a modern building code; however, it was most recently updated in 2003 and international practice suggests updating it every five years. Particular measures should be considered for shelters, schools, and clinics; their location must be adequate and the building characteristics must meet multi-hazard criteria.

Structural measures are important but must go hand in hand with adequate planning and land use, this issue is addressed in several instruments analyzed in previous sections. Considering the low-lying nature of the affected islands, the presence of marshes, and the effects that climate change is already having on the islands, land use studies are fundamental in identifying the most apt and sustainable areas to locate private and public infrastructure. It is recommended to study the quality of the soil and its suitability for different types of development, such as urbanization, agriculture, and conservation, among others.

Another role played by the Ministry of Environment and Housing in coordination with other public service providers, is the identification of safe locations that could be fit for settlement in each island. Settlements and populations are dispersed and small in the affected islands, which affects the availability and quality of public services and utilities. Therefore, locating private and public infrastructure in risk prone areas is unsustainable in financial terms and also in regards to human development. If relocation processes are undertaken, they should be carried out in a coordinated and inter institutional manner. Settlements should be located in areas that provide basic public services and infrastructure, as well as opportunities to develop productive activities.

Safe location is also relevant in terms of institutional presence and provision of services. During and after an emergency, it is critical to have a strong network of institutions that inform and guide the population from response to recovery. Construction guidelines and adequate location are especially important in the case of public buildings and services, including sectors such as electricity and telecommunications. Relocation measures could be enforced for structures located in risk prone areas. If buildings cannot be relocated, it is necessary to analyze the terrain and identify soft or hard defenses to minimize the effects of disasters and climate change.

There is a need to diversify power generation to increase resilience in the islands, so that the failure of a single power station—and the destruction of the power lines—would not result in a total loss of electricity to the community.

Damaged or destroyed diesel generators could be replaced by lower capacity diesel systems, with the aim of using that to supplement a combination of solar and wind-powered generation systems located at geographically dispersed points on the island. The geographic dispersal of power-generation assets would substantially reduce the risk of total loss of power generation capability in future disasters. Additionally, by placing consumers closer to sources of power generation, it would make communities less reliant on far-flung power lines that remain highly vulnerable to wind damage.

In terms of access to safe water and sanitation, most of the population relies in desalination plants, and wells to a lesser extent. The provision system is designed to supply a dispersed and small population. However, it carries very high per capita costs and it is an energy intensive process. It is recommended to create decentralized supply systems by providing isolated communities with water storage solutions. It should be encouraged that houses install rain water catching and storage systems, as it is already considered in the building code.⁸ Even if desalination is energy intensive and could have detrimental impacts on the environment, it is possible that it must be used in the short and medium terms; therefore, it would be necessary to expand the use of renewable energy and improve energy efficiency to reduce the economic costs and the environmental impact associated with this practice.

Freshwater aquifers on many islands are superficial, so it is important to regulate private wells and analyze the quality and condition of freshwater to identify contaminated sources and guide basin interventions to recover or rehabilitate the resource. Information about wells, combined with environmental studies to determine the recharge rate of groundwater would allow the establishment of sustainable extraction rates. Considering that these islands are considerably drier than islands in the north, the recovery or rehabilitation of water sources and the regulation of private uses could improve water quality, and increase resilience in times of disaster as water would be readily available and treated safely.

Vulnerability to natural hazards such as floods, hurricanes, sea level rise related to climate change, and the need to increase resilience all impose an effort for the preparation of a global strategy for the development of cost effective public infrastructure. This strategy must consider relocation, if relocation is not possible in the short or medium term, alternative retrofitting measures could be used to protect the structures. This process must be accompanied with an improvement in the availability of quality spatial data, in order to identify suitable locations. Additionally, such infrastructure must incorporate climate change adaptation technologies to improve resilience. It is therefore advisable that the Government of The Bahamas considers the incorporation of disaster risk reduction in future investments. This will guarantee that any new infrastructure project incorporates a multi-hazard approach to withstand future events. At the same time, it will protect the government's investments.

Pillar 3. Preparedness

There is a need to review the lessons of this experience and consider ways to improve the dissemination of early warnings. While mobile phone-based warnings can reach substantial parts of the population, it must also be recognized that significant numbers of people do not make regular use of mobile phones. This includes some of the most vulnerable portions of the population, such as the poor, children, and the elderly. Thus, there is a need for alternate channels of warning, such as a network of warning sirens within earshot of each settlement. The use of warning sirens would re-enforce the message being broadcast through mobile phones and other channels, increasing the sense of urgency prior to a disaster. These warning sirens could potentially be mounted on existing mobile network towers, which have an appropriate geographic spread to suit the needs of the system.

In terms of response, the multiplicity of agencies involved in the attention of Hurricane Joaquin demonstrated the importance of coordination. It is recommended to strengthen a network of public and private organizations that meet periodically and define roles and responsibilities in case of a disaster. It is important to promote the participation of the Family Islands, and identify clear communication channels between members, regardless of their location.

⁸ Section 3617.12: Rainwater Disposal. (a) Minimum requirements: (2) "Rain water may be either collected on roofs and conveyed to storage tanks or connected to drains."

It is advisable to conduct simulations to assess individual participation and overall performance, and to consider the incorporation of new stakeholders. Simulations and protocols should inform each other, hence the importance of strong collaboration between agencies. Protocols should consider accountability in the management of public funds for the attention of the emergency.

Pillar 4. Financial protection

The repeated impact of tropical weather systems on The Bahamas clearly indicates that the disasters are a development problem in the country. This suggests that in the same way that the government budgets and programs resources for other key development programs such infrastructure and education; disaster risk reduction and resilience building should be programmed in development planning process. These measures should strike a balance between risk mitigation and risk transfer mechanisms to reduce overall vulnerability and build up resilience to hazards.⁹ The National Development Plan (working draft) and other instruments consider the incorporation of climate change measures in plans and programs, some of these measures will contribute to increasing resilience to disasters.

With respect to catastrophic risk insurance, The Bahamas is a former member of CCRIF SPC. The CCRIF provides coverage for its members based on a number of parameters, including the intensity of the hazard (wind speed and amount of rainfall) in the case of tropical weather systems. Nevertheless, parametric insurance frameworks like the CCRIF have some constraints in that countries might not get a pay-out or the amount of pay-out expected after a disaster impact. Hurricane Joaquin did not trigger a CCRIF payout to The Bahamas despite hitting some of the affected islands as a category 4 hurricane, resulting in major damages to housing and other infrastructure and livelihood assets. As the CCRIF report noted, the “loss model did not generate government losses due to wind and storm surge damage in the affected countries and therefore no payout is due.”¹⁰ This suggests that The Bahamas could explore more favorable conditions with the facility, as well as other insurance and risk transfer mechanisms.

It is possible to mention four potential options: (i) a government initiated recovery fund to provide liquidity to facilitate recovery after a disaster, (ii) incentivized private insurance, (iii) a micro-credit scheme for micro, small and medium enterprises and poorer households, and (iv) a resilience fund for longer-term structural reconstruction. The Emergency Relief Guarantee Fund Act sets the foundations for the strengthening of this practice. The fund would be guided by two broad principles: i) giving highest priority to reconstruction projects and programs that provide the highest return in terms of growth and development and risk mitigation, ii) at the same time giving special attention to the most vulnerable.

The likelihood of events such as Hurricane Joaquin and the development of settlements in risk areas underscore the pertinence of household insurance. This is particularly relevant considering that the Government of The Bahamas has undertaken the task of reconstructing private homes. Besides public financial measures to minimize the risk faced by these assets, it is imperative to raise awareness among the population and inform them about the risks faced by their communities and properties. The recurrence of these types of events should encourage the widespread use of insurance, especially if the government is subsidizing the reconstruction process. Therefore, a key component in a disaster risk management plan should be education and awareness regarding the critical need for private insurance.

⁹ Miller and Keipi (2005) note that a balanced approach is key to a successful risk mitigation strategy.

¹⁰ CCRIF SPC (2015), Tropical Cyclone Joaquin (AL112015) Wind and Storm Surge Event Briefing, 9 October.

II. Belize

A. Governance framework for disaster risk management

1. Instruments to promote disaster risk management

a) National

The Disaster Preparedness and Response Act (2000) established the National Emergency Management Organization (NEMO) and the post of the National Emergency Coordinator (NEC), who is responsible for coordinating the general policy of the Government of Belize relating to the mitigation of, preparedness for, response to, and recovery from emergencies and disasters, and for implementing the provisions of the National Disaster Preparedness Plan. Among the activities tasked to the NEC are:

- Elaborate an annual National Disaster Preparedness Response Plan
- Develop and recommend national policies to foster and promote mitigation, preparedness, response and recovery from emergencies and disasters
- Conduct investigations, studies, surveys, research and analysis relating to ecological systems and environmental quality in collaboration with other agencies
- Prepare and review disaster risk assessment maps of Belize
- Conduct programs of public information and education
- Promote the exchange of information and the harmonization of practices
- Provide technical advice on issues related to the mitigation, preparedness, response and recovery from emergencies and disasters
- Establish and maintain a National Emergency Operations Center (EOC), and supplementary EOCs based on geographic or local government units

Although the act refers only to preparedness and response activities, it is observed that the scope is widened to other disaster risk management activities, such as risk identification and recovery. Thirteen Operational Committees have been established to support the organization's activities:

- Education, Communication and Warning
- Medical and Public Health
- Housing and Shelter
- Search and Rescue
- Economic and Recovery
- Damage Assessment and Needs Analysis
- Foreign Assistance
- Transport and Evacuation
- Environment and Utilities
- Human Resources Management
- Relief and Supplies Management
- Restoration of Utilities
- Mitigation, Access and Infrastructure

Many of the tasks assigned to each committee are focused on response activities. However, their responsibility goes beyond this phase and incorporates other activities such as sectoral mitigation measures, provision of information to the public, gathering of data, monitoring, revision and upgrade of sectoral policies and programs, and elaboration of sectoral response/continuity plans, among others.

The Disaster Preparedness and Response Act (DPRA) stipulates the establishment of a National Disaster Preparedness and Response Advisory Committee. The NEC, in consultation with the Advisory Committee, shall establish other committees and subcommittees charged with particular responsibilities, whether defined by geographical area or otherwise, and elaborate the National Disaster Preparedness Plan.

Other tasks included in the act are the establishment and maintenance of a list of shelters, and their operation procedures. The DPRA also allows for the designation of specially vulnerable areas and the elaboration of special area precautionary plans, which should consider specific strategies, policies and standards for the development of structures in the area, standards for environmental impact assessments and other prohibitions.

Additionally, the Belize National Hazard Mitigation Plan (2006) establishes two main goals:

- To enhance sustainable social and economic development, and environmental management through the integration of hazard risk reduction into national development processes.
- To build the capacity of national institutions to more effectively implement programs and projects to reduce vulnerability of the nation and people to natural and technological hazards.

The mitigation plan recognizes the multiplicity of sectors that intervene in such a strategy, including agriculture, tourism, fisheries, forestry and housing. It also acknowledges the links between environmental degradation and the risks of disaster, and establishes synergies between DRM and environmental conservation, poverty alleviation, climate change adaptation and mitigation, and tourism. The attainment of the plan's goals is supported by eight strategic interventions:

- Streamlining hazard risk reduction into national development and sector policy planning
- Recognizing the inter relationship between hazard risk reduction, environmental management and economic development
- Strengthening legislative framework for hazard risk reduction
- Building institutional and individual capacity to manage risk

- Establishing a Hazard Risk Reduction Information Management System
- Empowering and mobilizing communities to manage risk
- Public outreach, education and training
- Accessing alternate financial resources

The National Development Framework for Belize, Horizon 2010 – 2030 recognizes the importance of managing external shocks, including the risk of disaster, to improve the country's economic resilience. Thus, the plan considers issues of planning and mitigation to incorporate disaster risk management and reduce the country's vulnerability, as well as the implementation of a National Disaster Management Strategy.

b) Territorial

The Disaster Preparedness and Response Act establishes centralized responsibility to NEMO and the NEC. However, it stipulates that the National Disaster Preparedness Response Plan shall include procedures related to disaster preparedness and response of public officers, including provisions for local government units. It also considers the establishment and maintenance of supplementary Emergency Operations Centers distributed according to geographical location or local government unit. Furthermore, the Advisory Committee shall be comprised, among others, by the Ministry responsible for local government.

c) Sectoral

The Disaster Preparedness and Response Act provides for collaboration among government agencies in the gathering of data and the production of valuable information. It emphasizes the importance of environmental data due to its connection with disaster risk management, since the condition of the environment directly affects the achievement of the mitigation, preparedness, response and recovery from emergencies and disasters.

Additionally, every Permanent Secretary and head of Department of Government designates liaison officers to communicate with the NEC. They must also support the activities of the organization by providing relevant information as it may be required.

The National Disaster Preparedness and Response Advisory Committee is also an example of intersectoral coordination for the elaboration of the National Disaster Preparedness Response Plan. The Committee is comprised of representatives from the ministries responsible for public health, environment, public works, local government, as well as the Police Department, the Belize Defense Force, the Fire Brigades and other relevant sectors identified by the Prime Minister.

2. Articulation of disaster risk management with climate change

The National Climate Change Policy, Strategy and Action Plan to Address Climate Change in Belize recognizes the socioeconomic dependence of the country on its natural resources and their condition. The policy establishes a strong correlation between environmental conditions and poverty alleviation, disaster risk management, climate change and tourism, as they are intertwined in the country's development path.

The policy has several guiding objectives, notably its consideration of issues of financing, and suggests that adaptation and mitigation activities should be incorporated in national development plans, strategies and budgets. It also recognizes the importance of capacity building and seeks to benefit from the negotiation processes around climate change for the betterment of the country and its industries. Further, the policy acknowledges that all sectors must be involved in the process, including private sector, academia and the media.

The multisectoral policy includes provisions for agriculture, forestry, education, energy, environment, fisheries, forestry, housing, information, tourism, transportation, water resources, and coastal management. Every sector is expected to undertake climate change vulnerability studies and prepare adaptation options.

The policy also stipulates the establishment of the New Belize National Climate Change Committee for providing policy guidance and facilitating the mainstreaming of climate change adaptation and mitigation.

Complementarily, the country's Intended Nationally Determined Contribution (2015) under the UNFCCC identifies several vulnerabilities and mitigation potential. The country has already enacted several policies to respond to climate change related challenges, including the National Energy Policy, the Sustainable Energy Action Plan, and the Growth and Sustainable Development Strategy. Some new proposals include the development of a REDD+ Strategy, improvements in the transportation sector and in waste management.

In addition to national instruments, sectors have also developed adaptation and mitigation strategies, including the National Adaptation Strategy to Address Climate Change in the Water Sector and the National Adaptation Strategy to Address Climate Change in the Agriculture Sector.

3. Access to information and public participation

The National Development Framework (NDF) recognizes the importance of a comprehensive information and communication strategy to ensure the regular and consistent publication of government information, especially related to the attainment of the goals set out in the plan. Sectors are required to publish information and, in an effort to strengthen transparency and accountability, the NDF proposes to expand the information which the government is required to regularly publish.

The Freedom of Information Act (2000) applies to all public authorities and grants access to institutional documents to every person.

Regarding specific DRM information, the Disaster Preparedness and Response Act mandates the NEC and NEMO to conduct programs of public awareness, information and education on mitigation, preparedness, response and recovery. The organization is also tasked with establishing procedures to inform the population of the state of affairs during and after a disaster, and to liaise with organizations for the exchange of information and the harmonization of procedures.

4. Standards for integrating recovery into development policies

The Disaster Preparedness and Response Act incorporates recovery in its considerations and it should also be included in the National Disaster Preparedness Response Plan. However, the act does not establish explicit dispositions or recommendations for a resilient recovery process.

The Economic and Recovery operational committee is tasked with three main activities:

- To develop and maintain the National Recovery Plan
- To ensure mitigation and prevention are integrated into recovery planning
- To manage and direct recovery operations following a disaster

The National Hazard Mitigation Plan recognizes the importance of data availability and quality, and seeks to identify linkages and conflicts between hazards and development options. The plan suggests that “NEMO must be the repository of data and the linkage between agencies that generate, analyze and store data” (2006). It recommends the development of information systems that can be accessed by public and private sectors, academia and NGOs.

The NDF proposes the development and implementation of a National Disaster Management Strategy that ensures protection, cohesiveness and restoration before, during and after a disaster.

B. Quality information to guide decision making on disaster risk management

1. Responsibility for technical guidelines

The Disaster Preparedness and Response Act considers access to information and production of environmental information. There are however no clear guidelines as to the type of information that should be produced, or the role of NEMO in assisting other government organizations in this task.

The National Climate Change Policy, Strategy and Action Plan to Address Climate Change in Belize suggests that every sector carries out vulnerability assessments and accompanying adaptation and mitigation plans.

2. Incentives to the generation and dissemination of information and knowledge

In order to promote openness the Freedom of Information Act applies to every public institution and promotes the consistent publication of information.

Additionally, previous sections expand on the considerations for access to, and dissemination of information explicitly in instruments such as the National Development Framework, the National Climate Change Policy, Strategy and Action Plan to Address Climate Change and the Disaster Preparedness and Response Act.

C. Integration of disaster risk management into project preparation and evaluation cycle

The NDF recognizes the importance of allocating financial resources for DRM; therefore, it establishes an objective to lend greater financial support to public sector institutions with a role in natural resource management and hazard risk reduction. The National Climate Change Policy, Strategy and Action Plan to Address Climate Change seeks to integrate climate change adaptation and mitigation in development plans, strategies and budgets, and to secure financing for effective adaptation and mitigation responses.

The country does not have a national strategy to incorporate DRM in public investment projects. However, the National Climate Resilience Investment Plan is an important step towards managing public investments and could set the foundations for introducing a DRM component in future projects.

D. Territorial approach

1. Decentralization of disaster risk management process

Although most tasks within the DPRA are centralized, NEMO is supported by nine District Emergency Committees in Belize, Corozal, Orange Walk, Cayo, Stann Creek, Toledo, Belmopan, San Pedro and Caye Caulker.

District Emergency Coordinators are responsible for local coordination and management. Some activities included are to:

- Coordinate the resources necessary to restore normalcy after an emergency
- Conduct monthly meetings of emergency managers throughout the district
- Coordinate and guide training activities for public officers, schools and youth groups
- Solicit voluntary assistance from members of the community before and after an emergency
- Identify strengths and weaknesses in the Emergency Action Plans of the district

- Maintain public awareness of local emergency management activities

District organizations are also responsible for identifying vulnerable zones and populations that would be affected in case of a disaster.

The National Development Framework proposes a strategy to strengthen accountability of village administration, which includes clarifying, in law and regulations, the roles and responsibilities at the various levels of government.

2. Land-use planning

The Housing and Town Planning Act establishes the Central Housing and Planning Authority, which may acquire lands or buildings for multiple purposes, including erection, construction, maintenance and improvement. This mandate can also be exercised for acquisitions adjacent to a slum clearance area or re-development area. The Authority is also responsible for regulating and controlling the layout of housing areas (including the density, spacing, grouping and orientation of houses in relation to roads, open spaces and other buildings) and the provision and siting of community facilities, including shops, schools, meeting halls, and recreation grounds, relative to the number and siting of houses. In addition, it is tasked with providing for the zoning of land in town and country areas, and for reserving lands for specific purposes, such as agriculture, forestry, industry, commerce, housing, recreation and preservation/conservation. In order to carry out its tasks, the Authority may be supported by other government institutions and local authorities.

Additionally, villages are also responsible for certain land-related activities. The Village Council is responsible for elaborating maps showing the lands in the village, and it may constitute a Lots Committee to make recommendations to the Ministry with regard to the distribution of lots and lands within, or affecting the boundaries of the village. The NDF proposes to amend the Village Councils Act to make the establishment of Lots Committees mandatory. It also gives emphasis to the importance of planning development based on environmental sustainability criteria.

The Land Utilization Act establishes a Land Subdivision and Utilization Authority to carry out its mandate. The National Emergency Coordinator appointed under the Disaster Preparedness and Response Act is a member of the Authority, as well as sectoral specialists, namely lands, engineering, forests and agriculture. Similarly, the Land and Development Authority Act creates the Belize Land Development Authority, in which the NEC is also a member of the entity's board, signaling the relevance of land use planning for disaster risk management.

The National Hazard Mitigation Plan seeks to strengthen and harmonize the legislative framework for hazard risk reduction, and advocates for the enactment of complementary policies that are critical for DRM, such as land use, human settlement planning and transportation policies. In addition to strengthening the governance framework, it also considers education in order to transmit the importance of these issues to the population.

E. Sectoral approach

The National Development Framework and the National Climate Change Policy, Strategy and Action Plan to Address Climate Change establish strong correlations between socioeconomic resilience and climate change and disasters. Both strategies identify opportunities in multiple sectors such as forestry and biodiversity, waste management, tourism, energy, transportation, and education, among others. The climate change policy shows a strong sectoral approach, but it is worth highlighting that certain climate change adaptation and mitigation strategies could prove beneficial for disaster risk management.

Both instruments are supported by sectoral policies, including the National Biodiversity Strategy and Action Plan, the Integrated Coastal Zone Management Plan, the National Sustainable Tourism Master Plan, and the Sustainable Energy Action Plan 2014-2033.

F. Macroeconomic policies

1. Policies

The objectives established in the National Climate Change Policy, Strategy and Action Plan to Address Climate Change seek to integrate climate change adaptation and mitigation in development plans, strategies and budgets, and to secure financing for effective adaptation and mitigation responses. To this end, the policy proposes the creation of a Climate Change Trust Fund to structure and manage funding for climate change adaptation and mitigation activities. According to the policy, the country has extensive experience in managing these types of funds, since it established the Protected Areas Conservation Trust in 1996 to encourage and promote the provision, protection, conservation and enhancement of the natural and cultural resources of the country.

Notably, the country has taken steps towards mainstreaming climate change projects into national development and budgets through the elaboration of a National Climate Resilience Investment Plan. The plan is data oriented, gender informed and led by finance and planning. It seeks to improve climate resilience to support the country's economic growth and safety, and it is aligned with the Horizon 2010 – 2030. The estimated cost of implementation is US\$ 231.4 million. Although the plan focuses on climate resilience, it also aims to improve disaster risk management activities in all sectors.

Accordingly, the NDF recognizes that financial resources for DRM are limited but opportunities exist in areas such as poverty alleviation, natural resource management, climate change, equity and sustainable development. The plan establishes an objective to lend greater financial support to public sector institutions with a role in natural resource management and hazard risk reduction. Complementarily, the plan proposes to increase access to finance for farmers and small businesses, as well as develop agriculture insurance options to cover crop losses.

Even though the importance of financial protection is mentioned in several instruments, the country does not have a financial strategy or policy for disaster risk management.

2. Management of funds

Although a disaster risk management fund or similar has not been implemented in Belize, as noted previously, the NDF and the climate change policy consider the creation of specialized funds to support climate change adaptation and mitigation activities, as well as investments in DRM.

3. Management of risk transfer mechanisms

Belize is a member of CCRIF SPC (former Caribbean Catastrophe Risk Insurance Facility-CRIF), and as part of this membership has a comprehensive Country Risk Profile developed by the Facility. In the aftermath of Hurricane Earl, the country's excess rainfall policy was in effect and triggered a payout of US\$ 261,073.

G. Integration of disaster risk management and development

1. Disaster risk management in the national development strategy

The economic resilience pillar of the National Development Framework is founded on the understanding that external shocks have detrimental effects on Belize's economy and development, specifically international economic crises and disasters. The NDF expects to attain the goal of building economic resilience, promoting productivity and competitiveness and ensuring the environmental sustainability of economic activity. Hence, mitigation and recovery measures are considered necessary in order to improve the quickness with which the economy can return to a normal situation.

The NDF seeks to “pursue fiscal policies that are prudent, sustainable, and reflected in consistent fiscal performance and controlled growth of the public debt.”

This approach, combined with the National Climate Resilience Investment Plan, could set the foundation for improvements that incorporate DRM in the lifecycle of all public investment projects.

The plan also recognizes the importance of infrastructure development, as well as providing support to relevant and/or vulnerable sectors such as agriculture, tourism, and small businesses.

Regarding environmental protection and conservation, the plan recognizes the importance of healthy ecosystems for the country's economic development. DRM is addressed by proposing the development and implementation of a National Disaster Management Strategy. In addition, other issues are put forward to increase overall resilience, namely, promote sustainable energy, implement a National Protected Areas Systems Plan, incentivize reforestation, and introduce natural resources into the GDP.

2. Post disaster recovery, an opportunity for sustainable development

Although the country does not have a specific policy for post-disaster reconstruction, several development instruments highlight the importance of environmental conservation and adaptation and mitigation strategies for confronting the challenges posed by climate change. It should be noted that the Reconstruction and Development Corporation Act evidenced a serious commitment towards resilient reconstruction, and in 1970 it facilitated the relocation of the government's administrative center from Belize City to Belmopan. The decision was made by the Government after the effects and impacts of Hurricane Hattie in 1961, signaling an understanding and commitment to reducing the country's exposure and risk of disaster.

The country has also continued to strengthen its post-disaster assessment capabilities, which would shed light into vulnerabilities that led to the event, as well as potential risks that could arise in the future. A consistent and systematic effort to estimate the effects of disasters is observed in the country. This expertise could be used to evidence the cumulative effects of small and large disasters in national economies and their negative impacts on the attainment of development goals. It is expected that these types of assessments would help improve DRM and support other sectoral efforts to manage the risk of disasters, including public investments.

3. Building resilience through post-disaster reconstruction

The assessment of the effects and impacts of a disaster evidences risks and vulnerabilities faced by a country or local area, but it also provides a space for discussion and identification of recommendations for a resilient reconstruction. This section presents a summary of specific recommendations for reconstruction in the aftermath of Hurricane Earl (2016) in Belize.

The first section provides a brief description of the event and its main characteristics, in an effort to visualize the behavior and extent of the effects. The second section offers a series of recommendations for reconstruction, which were organized in light of the pillars proposed by the Global Facility for Disaster Reduction and Recovery, namely: (i) risk identification, (ii) risk reduction, (iii) preparedness, (iv) financial protection, and (v) resilient recovery. It should be noted that the country has continued strengthening its efforts to reduce the risk of disaster; therefore, certain recommendations might have been already addressed, while others could be in development.

a) Description of the event

The storm that was to become Hurricane Earl began as a tropical wave off the coast of West Africa, and was first monitored by the United States National Hurricane Center (NHC) on 25 July 2016. The fast moving system crossed the Atlantic Ocean and entered the Eastern Caribbean Sea on 31 July, and brought heavy rains to the Lesser Antilles and Puerto Rico. Continuing on a course nearly due west, it became stronger and more organized as it passed south of the Dominican Republic on 1 August and south of Jamaica on 2 August. At 16:00 UTC on 2 August, (10:00 AM local time in Belize) the NHC issued its first statement classifying the system as Tropical Storm Earl – the fifth named storm of the 2016 Atlantic Hurricane Season.

The NHC announced that the Government of Belize had issued a tropical storm warning, and that hurricane watch had been issued for Belize and parts of Honduras and Mexico. By the evening of 3 August, as it began to enter Belizean waters, the storm had intensified to a Category 1 hurricane.

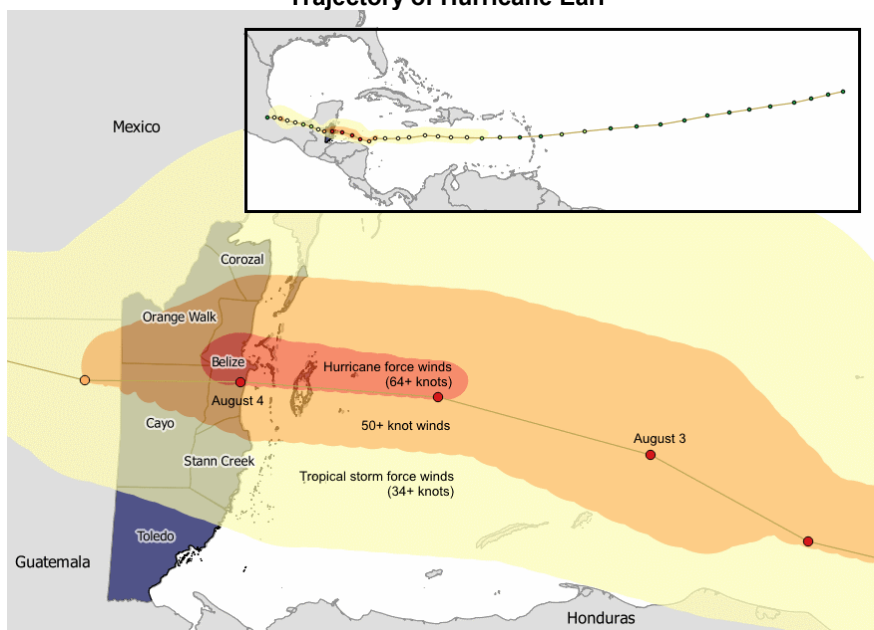
The storm's approach had been anticipated for days, leaving ample time for preparations to be made. Committees established by the National Emergency Management Organizations (NEMO) were activated throughout the country. Starting on the Sunday prior to landfall, warning flyers written in English and Spanish were distributed throughout Belize City, with special focus on low-lying and low-income neighborhoods. SMS-based text messages were sent out to mobile phone customers, and warnings were broadcast via radio and television. These warnings were widely heeded, as memories were fresh of a major flooding event the previous October, during which many had been stranded in their homes.

The offshore cays were the first parts of the country to be affected by the hurricane, starting at about 8:00 PM local time. Recording devices on the outermost island, Half Moon Caye, measured a maximum sustained wind speed during a five-minute period at 64.6 knots (74.3 mph), with a record gust of 90.4 knots (104 mph). Sustained winds at San Pedro, Ambergris Caye, were measured at 52.7 knots (60.6 mph) for a one-minute period, gusting up to 64.3 knots (72.8 mph). The highest sustained winds were estimated to have been around 70 knots (80 mph), in the area between Belize City and Ambergris Caye. However, no meteorological observation stations exist in that area to provide ground-based verification of this figure.

Model-based estimates indicate that storm surge in San Pedro ranged from 3-6 feet (CCRIF 2016), with high wave action compounding damage to docks and infrastructure on the east-facing front of the island. The highest storm surges on the mainland were in the Ladyville and Vista del Mar areas, where high-water marks were measured at 4.5 feet, and in some cases were reported to have reached 8 feet or more. The storm's surge-related damage was compounded in this area due to the presence of canals that brought high water to inland areas, as well as by the lack of shoreline-protecting mangroves, which in many cases had been removed to enhance waterfront access. Several feet of storm surge also occurred in Belize City, especially in downtown areas adjacent to canals and in low-lying southern areas.

According to the Belize National Meteorological Service, the storm made landfall as a Category 1 hurricane at about midnight on 4 August. At that time, the center of circulation was about 13 miles south-southwest of Belize City, near Northern Lagoon in the Belize District. This was a slight alteration of its projected path, which would have taken it to the north of Belize City. However, because the highest winds were located on the northern side of the storm, Belize City and its suburbs were subjected to the maximum winds at landfall, and there was significant damage to roofs and trees. Fallen trees in the Rio Bravo Forest Reserve suggest that tornados were spawned by wind shear as the storm moved inland. The center of the storm followed a path past Rockville, Belmopan, and San Ignacio before crossing the western border. The All Clear was declared at 9:00 AM on Thursday morning, as Hurricane Earl took approximately 15 hours to cross the country. After departing Belize, heavy rains from the storm triggered landslides in Mexico, causing at least 54 deaths.

Figure 3
Trajectory of Hurricane Earl



Source: United States National Hurricane Center, 2016.

b) Recommendations for a resilient reconstruction

The following sections include a summary of certain reconstruction measures proposed in regards to the five pillars of disaster risk management; an extended version was shared with the government of Belize.

Pillar 1. Risk identification

The task of identifying hazards and vulnerabilities can build on several important projects that are currently being developed to map and understand the most serious hazards faced by Belize City. It is recommended to expand these analyses to other parts of the country by mapping natural hazards and identifying potentially exposed communities and public infrastructure, such as schools, health centers, and roads, as well as water, power and telecommunication systems. The abovementioned studies are comprehensive and provide a great level of detail. Thus, it is recommended to use a similar approach when developing studies for other parts of the country. In an attempt to use existing information and not duplicate efforts, it is recommended to first analyze all the information and recommendations presented in such studies, in order to structure and guide future hazard and vulnerability assessments. It is also highly recommended that this type of studies are consistently published to improve access to information, not only from government officials, but also to increase use by the academia, private sector and individuals.

During this mapping process, it is recommended that public institutions geo-reference their infrastructure and identify which facilities are in a risk area. This would also allow creating risk profiles for critical infrastructure such as schools and health centers. Mapping can be supported by ongoing efforts of the Statistics Institute of Belize. Similarly, it is recommended that critical infrastructure is assessed to determine the level of deterioration, which would affect the structure's performance in a future event. The School Building Guide of the Ministry of Education could be applied by school managers to create an initial profile of the conditions of the sector.

The assessment of disasters, such as Hurricane Earl, could be substantially improved by having detailed and updated economic statistics and national accounts.

This requires the allocation of more financial resources to the Statistical Institute of Belize. Challenges encountered during the assessment process suggest actionable needs in five areas:

- Breakdown variables such as gross value added by industry, total production (output) by industry and employment by activity and by district.
- As a country where tourism is an important economic activity, it is crucial to have a Tourism Satellite Account.¹¹
- Inclusion of the environmental sector in the national accounts in order to improve baseline information, which limited the scope of the environmental assessment.
- Develop a system of quarterly national accounts that enable intra-annual monitoring allowing the analysis of cyclical trends and determining the possible inflection points of economic activity. This tool not only has an analytical and policy use, but also strengthens macroeconomic and sectoral projections.
- Strengthen national accounts through the consolidation of a basic statistical infrastructure whose central core should be a Directory of Companies and Establishments that tracks the universe of resident economic units in Belize.

The availability of economic data must be accompanied by appropriate metadata, as to ensure transparency and better use of information by decision makers in the public and private sectors, planners, analysts and civil society. This is part of a broader need to construct effective platforms for knowledge sharing. It is vital that, in addition to producing information, institutions share their knowledge with other institutions. This pillar is fundamental for risk reduction and preparedness, as it can inform policies and decision makers with specific information on social, economic, environmental and physical vulnerabilities of populations and infrastructure. Information should also be readily available for the population in terms of raising awareness in regards to hazards, risk areas, and communicating other measures to manage the risk of disaster.

In this section, it is worth mentioning the single information system of beneficiaries of the Ministry of Human Development Social Transformation and Poverty Alleviation. The system is already operational; however, it could be populated with information from multiple ministries and agencies. Disasters highlight existing vulnerabilities, one of them is poverty; therefore, a detailed database of beneficiaries would facilitate response and relief efforts during an emergency. In addition, information on lower income population would facilitate the efficient allocation of welfare resources.

An inventory of past events and assessment of future disasters would allow the country to build a clear disaster profile and to quantify the impacts of disasters in the national finances. By understanding past events, it is possible to incorporate changes in future projects and identify risk-prone areas. Highlighting the effects and economic impacts of disasters would also create momentum for establishing more comprehensive disaster risk reduction strategies, such as the incorporation of multi-hazard analyses in every public investment project.

The Government of Belize prepared a comprehensive DANA report, so it is recommended to provide further training on the disaster assessment methodology to representatives from different institutional sectors. This would allow different institutions to use one standardized methodology, and would simplify data collection processes.

Pillar 2. Risk reduction

Belize City has a comprehensive Master Plan since 2012. The plan includes considerations for multiple issues such as water and sewer management, environmental management, flood mitigation and land use. It is recommended that Master Plans be designed for all districts, with special considerations depending on the economic activities of each area, such as agriculture and tourism development.

¹¹ See Department of Economic and Social Affairs, United Nations (2008).

The recommendations included in this section are in line with, and in some cases complementary to, the stipulations included in the Master Plan and other studies carried out by the Inter-American Development Bank.

Probably the most urgent measure in this pillar is the adoption of a mandatory building code in the country. It is recommended that every project is revised and approved by a certified engineer or a supervision unit within the CBA, and that standards and guidelines are published and enforced. This initiative must be preceded by a comprehensive analysis of the hazards faced by the country, as this would allow designing specific norms and standards based on the country's characteristics. In the short term, an analysis of building codes from countries with similar characteristics would allow Belize to incorporate initial and basic requirements in the construction process. Once the country is ready to design its building code, it is suggested to take specific note of the following two aspects:

- Incorporate the concept of essential infrastructure. These structures usually hold large numbers of people and are part of the country's critical infrastructure. Based on an analysis of regional building codes, some examples of essential infrastructure are health and education centers, government buildings, and water and power systems. Besides protecting the population, these structures should also ensure continuity of services during and after an emergency. In order to increase structural and community resilience, essential infrastructure should be built under special considerations to withstand the most common threats, such as hurricanes and earthquakes.
- Develop a construction manual. Given the current state of unclear construction guidelines, it is recommended to produce a construction manual that can be used by construction specialists regardless of their educational level. This initiative has been implemented in countries where informal construction presents a serious hazard, and has been successfully adopted by all types of contractors. The manual should contain explanations to guide the construction process and indicate when particular permits or approvals are required. It should include instructions to ensure safe connections to the electricity grid, and hygienic means for the disposal of human waste. It is recommended to start with a construction manual for housing, as most informal construction is observed in this sector.

In line with this recommendation, the audit and supervision tasks of the Central Building Authority (CBA) should be strengthened. As responsible for construction, the CBA must guarantee that design and construction processes comply with standards to ensure the integrity of every structure. The first stage of this process is the nationwide adoption of a mandatory building code, and then the supervisory capabilities of the CBA should be improved.

Another important recommendation under this pillar is to strengthen spatial planning at the national and district level. Findings from the hazard and vulnerability assessment should be used as guiding criteria to create zoning and land use plans. This is particularly relevant considering the low-lying nature of the country and the extensive presence of wetlands. Identification of hazards and vulnerabilities and subsequent spatial planning should reduce the amounts of exposed assets and populations, and would allow for sustainable development and growth of cities, as wetlands provide great protection against natural threats and contain vast biodiversity, which is one of the main touristic attractions in the country.

If relocation processes are viable, they should be carried out in a coordinated and inter-institutional manner. Settlements should be located in areas that provide basic public services and infrastructure, as well as opportunities to develop productive activities. In cases where relocation is not possible in the short term, floodplain regulations requiring higher structure elevations in areas close to the seashore and canals should be enforced. However, it is recommended to carry out land use studies previously to avoid future flooding, and opt for a long-term solution to the situation. This component is particularly relevant considering population growth and tourism-associated developments. Growing population and specialization of the tourism sector will require expansion of towns and cities. Therefore, spatial planning, zoning and land use studies are fundamental in the establishment of sustainable cities.

Legal measures should also be put in place to discourage the continued destruction of mangroves, which provide natural coastal defenses, and programs should be established to encourage their regrowth and protection.

Water supply in rural areas is a matter of serious concern with no chlorination and distribution of untreated water. It is recommended to conduct a survey of the sewerage and water systems in urban and rural areas to improve health conditions, especially in those sectors not coupled with the system. PAHO's situation report after the event indicated that most health care facilities had no water storage integrated into their water supply system, or that tanks were too small to ensure service for an extended period of power outage. It is recommended that every facility has a 500,000-liter (125,000 gallons) water storage tank providing four days of water, considering a daily consumption of 30,000 gallons.

In terms of wastewater, it is suggested to consider alternative solutions for small (and isolated) communities through the development of low cost infrastructure, small diameter sewers, and cost effective waste water treatment and management. Belize City Master Plan also considers improved collection services, as well as an education and sensitization scheme to promote mitigation strategies and reduce negative environmental impacts.

It is recommended that the Ministry for Transportation, Works and NEMO establishes a set of minimal standards for roads, bridges, drainage, and any other road components. These guidelines should be applied by any developer of public works. Regarding funding, concessions and other public-private agreements could be explored. However, conditions and standards must be carefully designed by the government, so that future infrastructure incorporates disaster risk reduction in its design and management. Beyond financial considerations, roads must withstand certain types of disasters as they provide multiple social and economic services, hence the importance of considering financial protection for every public development and ensuring service continuity.

Regarding the importance of access to telecommunications in a pre- and post-disaster situation, the country's mobile providers should be encouraged to develop policies that ensure that no-one who is affected by a storm will be unable to communicate due to a low balance of pre-paid airtime. They could follow the example of carriers in Dominica, which provided a few dollars of credit to each mobile account in the country, for use during a limited period following the impact of Tropical Storm Erika in 2015.

Broadleaf forests in Belize, such as in the Rio Bravo Conservation and Management Area, sustained substantial damage beyond lost timber revenues that will impact the region for years to come. The fuel-wood that has been created is highly likely to cause widespread fires that surpass Program for Belize (Pfb) or the Forest Department's capacity to control. In addition to the high value of timber, carbon offsets, and ecosystem services that is now at risk to loss from fire, it is likely that fires will contribute to further agricultural encroachment on the extent of forests and their ability to recover from Earl.

In addressing the risk of fire, it would be valuable to use information learned as a result of the forest fire outbreaks following Hurricane Richard, which was also a Category 1 storm that passed over parts of Rio Bravo in October of 2010. To mitigate the risk of fire, it is imperative to immediately harvest timber that has been blown down in the hurricane, so as to reduce the available fuel wood for the fire season. It is important that this be attended to on a timely basis, particularly because, according to Pfb and Forest Department staff, after one year, any marketable timber that was felled loses its market value. Thus, as time goes by there may be a need to market the downed timber at lower costs, or provide incentives to harvesters for recovering timber with-and-without market value. To enable this, a study should be commissioned to discover other potential market uses of fallen timber, such as mulch, fire wood, charcoal, biogas, feedstock for biomass-based electricity generation or construction materials.

Pillar 3. Preparedness

It should first be noted that warning systems were activated in a timely manner. Approximately 5,000 people were sheltered and 2,400 evacuated, denoting that the country had enough time to prepare. In this sense, it is recommended to continue strengthening education and awareness efforts. This should be done under the consideration that the warning systems that worked in this instance may not have been as effective had there been a significantly reduced lead-time prior to the storm. Thus, there is a need to

ensure that procedures are in place –and tested– to ensure that they would work in the event of a more quickly emerging disaster situation.

Additionally, it is suggested to promote awareness raising campaigns about natural hazards, and educate the population on measures to prevent and mitigate potential disasters. In this sense, initiatives such as a construction manual would provide technical tools at the same time that it helps prevent future disasters. The Ministry of Education has also produced education materials for teachers and students, this knowledge could be shared with the population during Disaster Awareness Weeks or similar events organized by NEMO and supported by other government institutions to promote various disaster-related issues. Some important topics could include environmental awareness, preparedness and mitigation strategies in general, information on flooding, storms, hurricanes and earthquakes. In addition, the population could be incorporated and consulted during the elaboration process of future district Master Plans in an effort to increase appropriation of development instruments and benefit from local knowledge of the zone.

Pillar 4. Financial protection

It is commendable that the government of Belize is a member of CCRIF SPC under the excess rainfall insurance policy; as a result, the country received a payout of US\$ 261,073 on 18 August. However, due to the country's exposure to disasters and climate change, it is recommended to strengthen financial protection instruments.

When exploring new forms of protection, consideration could be given to weather-derivatives, which cover high-probability events, like drier/wetter than expected seasons. This type of protection is triggered by changes in sunlight or precipitation patterns, without excessive bureaucratic assessments. In order to use this type of protection, it is necessary to have series of information on rain patterns, and other elements depending on the type of derivative.

As is known the agricultural sector of Belize is highly exposed to natural phenomena, from drought to floods, the promotion of crop insurance products alongside market chain development could foster a more resilient sector. The insurance industry in Belize has not yet developed products in this area, but there was some interest in developing them and learning from experiences in other regions. However, the low returns for some of the crops and the weak and volatile markets to which the sector is exposed to still remains a barrier to overcome to generate interest in the private insurance sector.

As it has been mentioned, the use of eco-infrastructures would increase structure protection and allow healthy ecosystems to provide additional protection against natural hazards. Hurricane Earl also showed the importance of mangroves and coral reefs as protection barriers. Therefore, such efforts should favor better insurance rates, at the same time that they protect Belize's biodiversity and tourism-related income.

Disaster risk reduction can be truly mainstreamed by incorporating a specific component on every public investment undertaken by the country. It is recommended to adapt public investment procedures, so that any new public development incorporates disaster risk reduction from its feasibility or predesign studies to the completion of the work. The analysis of projects should be done under a multi-hazard approach to address all identified risks. This task should be undertaken by the entity responsible for approving public investments, and should be done in coordination with the Ministry of Finance. The assessment of the effects and impacts of disasters –regardless of the magnitude- would be an important input to demonstrate the impacts of disasters in public finances, and hence, justify the need to incorporate disaster risk reduction in every public investment.

It is worth mentioning that the United Nations Office for Project Services (UNOPS) could provide assistance in the development and implementation of projects. Considering financial constraints in Belize the use of public-private partnerships, such as the concessions model could be explored. In this regard, UNOPS provides project management, infrastructure and procurement services with a focus on sustainability and national capacity development. The agency provides three services (UNOPS):

- Implementation – implementing partners' projects efficiently and effectively, with the involvement of all stakeholders
- Advisory – developing national capacity in our core mandated areas
- Transactional – providing stand-alone human resource management and procurement services

Pillar 5. Resilient recovery

Every storm that hits Belize has cumulative effects, and even though environmental damage may seem negligible immediately after single storm events, the chronic effects will eventually begin to severely impact tourism, fisheries and coastal protection to the point where recovery costs will be exorbitant. This is why regular, comprehensive, baseline updating is so important to closely monitor impacts as a way to inform the management of these resources.

The Damage and Needs Assessment developed by the government of Belize indicated the need for more detailed surveys to appropriately calculate environmental damage and their associated costs. This report echoes that need, while also recognizing that surveys and monitoring activities should occur as soon as possible, while also tracking the progress of recovery or degradation of these habitats over the next 12-18 months or longer if possible.

It was noted that a substantial amount of mangrove and littoral forest fragmentation is occurring to make room for utility lines and to mark property boundaries. This fragmentation, while not a result of Hurricane Earl, increases the vulnerability of these cays in different ways:

- Areas where canals are cut allow hypersaline water to infiltrate areas of the mangroves that are normally used to less saline water, thereby changing the ecology of the area and possibly causing vegetation to die.
- This practice weakens the islands and increases the amount of shoreline available to erosive forces, and leads to channeling waves and storm surge deeper into habitable areas, and sensitive ecological areas.

It is important to consider the development or update of a coastal and marine management plan to include considerations such as construction requirements for docks (height, distance from each other and materials), and establishment of construction restrictions in coastal and marine areas to ensure protection of ecosystems and promotion of tourism. Likewise, it is important to analyze the possibility of relocating some of the most affected communities, which are located in risk-prone areas, and avoid similar situations in the future.

It should be mentioned that, based on previous experiences and lessons learned, the Central Building Authority in coordination with NEMO has developed a new structural design plan for new construction of affected dwellings. The idea of this plan is to prevent reconstruction under the same quality that existed before the event.

Hurricane Earl provided the opportunity to field test the health sector preparedness, response and resilience during a disaster and served to expose vulnerabilities in the system. The SMART Health Facilities - Phase II, a PAHO/DFID funded project which is currently being introduced in Belize, provides a timely intervention to assess these vulnerabilities and propose solutions. The Ministry of Health and the Government of Belize, by signing on to the SMART Project, have committed to the concept of safer, more resilient and more efficient health facilities. The objective is to avoid creation of new risks and to reduce risks through greater disaster risk consideration in policy and investment in the health sector. One of the tenets of the SMART project is that a percentage of savings from improved efficiencies in energy and resource consumption be reserved for upkeep of facilities. This will require changes in policy direction and a commitment by Government to allocate annual funds specifically for infrastructure upkeep and regular maintenance.

Another measure to increase resilience is through the incorporation of decentralized solar installations into the common grid. When power is generated close to its point of use, there is reduced dependence on far-

flung transmission and distribution lines that are at risk of storm damage or other causes of blackout. This is particularly important to remote communities with tenuous connections to the grid. While photovoltaic solar generation capacity has already been established in many locations, these installations are not currently tied to the national grid, and cannot sell any excess electricity generated on the national market. Thus, it should be a priority to establish national standards to support net-metered connections between solar installations and the public grid. Such a program would have the potential to draw significant private investment into sustainable energy generation, and could provide supplementary income to institutions with available rooftop space, including schools, guest-houses, and government facilities.

III. Dominican Republic¹²

A. Governance framework for disaster risk management

1. Instruments to promote disaster risk management

a) National

The Dominican Republic has had a regulation that promotes a comprehensive approach to DRM since 2002, when the Law on Risk Management was approved. This law is the main normative framework that regulates DRM in the country. Subsequently, the accompanying regulatory framework of the law was enacted in 2009.

At the national level, this law establishes the creation of a National System for Prevention, Mitigation and Response to Disasters (NSPMRD) defined as "... the set of guidelines, norms, activities, programs and institutions that allow the implementation of the objectives of DRM contained in this law." In addition, it establishes the creation of other implementation instruments to achieve risk management objectives, such as the National Risk Management Plan, the National Emergency Plan, a National Integrated Information System, and a National Prevention, Mitigation and Disaster Response Plan. These instruments address both the ex-ante and ex-post components of DRM, and explicitly include and define state responsibility for post-disaster recovery. This integrality was reinforced in the Regulation of the Law on Risk Management, which defines, for example, that the National Fund for Prevention, Mitigation and Response to Disasters is empowered to "(i) take preventive measures to reduce risks; (ii) assist the population in the event of disasters; and (iii) foster post-disaster rehabilitation."

b) Territorial

The regulatory framework for DRM, expressed in the Law on Risk Management, establishes instances of coordination of the NSPMRD for each political-administrative level: national, regional, provincial and municipal. The regulation also specifies responsibilities at different territorial levels.

Regional, provincial and municipal Committees for Prevention, Mitigation and Response to Disasters have been created to organize the prevention, mitigation and response in their respective

¹² This section is based on Osorio and Khamis (2016).

territorial units. For example, supporting risk identification by technically assessing its magnitude, as well as contributing to the "formulation of alternative solutions" and "supporting and promoting the identification of human settlements in risky areas and promoting the achievement of resources for the improvement of their conditions or their relocation."

c) Sectoral

The DRM regulatory framework establishes responsibilities at the sectoral level and specifies minimum responsibilities of the different sectors within the framework of the NSPMRD.

2. Articulation of disaster risk management with climate change

The National Risk Management Plan recognizes that the effects of climate change are affecting the frequency and intensity of hydro-meteorological phenomena, but there is no articulation of risk management regulations with this or other critical cross-cutting issues. On the other hand, the Dominican Republic does not yet have a regulatory framework for climate change. The normative framework on the domain of terrestrial waters and the distribution of public waters should be updated taking into account all the challenges associated with climate change.

3. Access to information and public participation

In 2004 the country enacted a law that guarantees free access to public information. Although it does not make explicit the obligation to deliver information relevant to DRM to citizens, it does oblige public administration bodies to allow free access to information generated by public administration as well as "any other body or entity that performs public functions or executes public budgets (...)."

In addition, the Law on Risk Management includes an important policy instrument, the National Integrated Information System. Although the system has not yet been implemented, it is expected to function as the mechanism and instrument for the exchange of information. Similarly, the regulation of the law establishes as a responsibility of the NSPMRD the "socialization of prevention and mitigation of risks" and "knowledge of risk management." In this legislation, the obligation to guarantee access to information at the time of emergencies and disasters is defined as an obligation of the Emergency Operations Committees.

With respect to the participation of community organizations and civil society, the law defines a series of spaces for participation for organized citizens and the private sector and, for example, has the participation of three representatives of civil society in the National Council for Prevention, Mitigation and Response to Disasters. Likewise, each of the coordination bodies at the different territorial levels must include "representatives of organized civil society chosen from trade associations, professional bodies or community (...)."

4. Standards for integrating recovery into development policies

The regulatory framework of DRM in the Dominican Republic does not explicitly define how post-disaster processes should be integrated with the country's development process. However, it can be inferred that the sustainability of recovery and reconstruction processes are important since this is a responsibility of the National System for Prevention, Mitigation and Response (NSPMR). The main function of this system is "to design efficient mechanisms for the coordination and orientation of reconstruction processes and sustainable recovery".

B. Quality information to guide decision making on disaster risk management

1. Responsibility for technical guidelines

There are advisory groups and technical advisory bodies to the NSPMR institutions. However, there is no national actor responsible for providing technical assistance and guidelines at territorial and sectoral levels for disaster risk analysis; neither has a scale for risk analysis been defined at different levels of government.

The National Bureau of Seismic Assessment and Vulnerability of Infrastructure and Buildings (NBSAVIB) provides a technical advisory service. The NBSAVIB should support state agencies with information on seismic aspects. This is an input for the design and execution of infrastructure works and buildings. The country also has the National Meteorological Service which is responsible for organizing the meteorological network of the country, and the University Seismological Institute, which has among its functions to maintain and develop the national seismological network. The National Meteorological Office is also responsible for the monitoring and warning of tsunamis.

2. Incentives for the generation and dissemination of information and knowledge

The scientific knowledge about the risk of disasters in the country is promoted through the existence of the National Fund for Innovation and Scientific and Technological Development. This fund has supported the development of scientific research activities, programs and projects for DRM in accordance with the Strategic Plan for Science, Technology and Innovation 2008 – 2018. Among the priority areas is the Geology and Earth Sciences Program, which emphasizes the importance of knowledge of the risk of geological disasters, including "the management of watershed systems and in particular the development of conductive assessments of the vulnerability of urban infrastructures and services given the seismic risks in the country (...)." This strategy also promotes the development of scientific knowledge on climate change and recognizes its value in terms of the vulnerability of the country.

C. Integration of disaster risk management into project preparation and evaluation cycle

In 2010, disaster risk analysis was integrated into the pre-investment phase of the cycle of public investment projects through the Technical Standards of the National Public Investment System (NPIS) of the Ministry of Economy, Planning and Development. However, these standards do not consider performing risk analysis in other phases of the project cycle. NPIS is not required to include disaster risk reduction or mitigation measures in other stages of the project cycle. Nevertheless, such measures would allow the integration of DRM into the cycle of preparation and evaluation of public and private projects.

Since 2011, the Regulation for the Analysis and Design of Seismic Structures of the Ministry of Public Works and Communications has defined a series of minimum requirements to be met in the analysis and seismic design of all the country's infrastructure, "so that its structure remains stable, mainly guaranteeing human security." These standards are mandatory for public and private infrastructure, and "shall be of mandatory application for the proper design of the projects; as well as for the execution, inspection and supervision of the works in question. In the same way, other existing regulations necessary for these purposes will be applicable (...)."

It should be noted that environmental assessments are included in the Regulation on Environmental Authorization. However, a component of disaster risk reduction is not mandatory.

D. Territorial approach

1. Decentralization of disaster risk management process

As mentioned above, the DRM regulatory framework defines responsibilities for each territorial level expressed in the functions of the Prevention, Mitigation and Response Committees. Additionally, the law that regulates the functions of the national district and of the municipalities establishes that they are qualified to take actions of DRM. However, these territorial units do not have specific budget items to perform DRM actions, neither is there a culture of insuring public assets at the local level, or a regulation that obligates it.

2. Land-use planning

Territorial units are responsible for the reduction of disaster risk in their respective territories in accordance with the NSPMR. Specifically, they must organize prevention, mitigation and response activities such as: “a) technically support the identification of risks, evaluation of their magnitude and formulation of alternative solutions. To this end, it should have the advice of the National Technical Committee on Risk Prevention and Mitigation; b) support and promote the identification of human settlements in areas at risk and promote the achievement of resources for the improvement of their conditions or their relocation; c) promote the inclusion of the DRG within the development plans of the region, province or municipality, providing the necessary information (...).”

The analysis found that there are neither obligations to identify risk areas in the cities, nor norms for the elaboration of territorial planning plans, which seriously limits the capacities to reduce the risk of disaster and to fulfill the objectives of the National Development Strategy 2030.

The National Development Strategy is of a binding nature and includes the objective of *Decent Housing in Healthy Environments*, which seeks to "facilitate the access of the population to affordable, safe and dignified housing, with legal security and in sustainable, socially integrated human settlements, which meet the criteria of adequate DRM and universal accessibility for people with physical motor disabilities." Among the actions that are identified is that of "relocating settlements in conditions of risk to natural phenomena, pockets of pollution, or risks derived from human action."

E. Sectoral approach

As part of the NSPMR, all sectors are required to have a Risk Management Plan. However, there are no specific budget items for different sectors to implement DRM actions, nor are they required to transfer the risk of their public assets through insurance policies or other similar mechanisms. However, an insurance facility is being implemented with the IDB that could reverse this trend and allow financial protection to be considered as an integral component of DRM, as set out in the National Development Strategy 2030.

There is evidence in the country that sectors have incorporated their responsibilities in DRM into their regulatory frameworks. For example, the agriculture, infrastructure and environment sectors define their responsibility for risk analysis, disaster risk reduction and preparedness for response within their scope of action. The agriculture sector also recognizes its responsibility to prepare ex-ante plans in order to promptly promote the recovery of the sector. However, none of these sectors has a Contingency Plan. Likewise, the lack of a budget expenditure classifier for DRM actions makes it difficult to identify resources allocated for this purpose, so that it is not possible to demonstrate to what extent the legal provisions have translated into concrete public investments.

F. Macroeconomic policies

1. Policies

There is no specific expenditure category for ex-ante management of disaster risk. However, the Ministry of Economy, Planning and Development has estimated expected annual losses for extreme or severe events, such as hurricanes and earthquakes. In 2012, the institution carried out the study "Natural Hazards and Risks, Map Compendium", using the CAPRA platform, and probabilistically evaluated economic losses for different return periods of 200, 475, 1,000 and 2,500 years. The study does not include estimates for emergencies of small scale and high recurrence.

The Dominican Republic has a contingent credit facility with the IDB for the case of disasters. However, the Ministry of Finance does not have legal responsibilities for the country's financial protection in disaster situations, nor does it have a strategy for the financial management of the risk of disaster. However, as mentioned above, these types of mechanisms are considered in the National

Development Strategy 2030, the National Risk Management Plan, and National Plan for the Reduction of Seismic Risk. There is also a Planned Risk Transfer Program that has not yet been implemented.

2. Management of funds

The country has a National Fund for Prevention, Mitigation and Disaster Response enabled for the financing of ex-ante and ex-post DRM actions. This notwithstanding, it only had funds in 2013 thanks to a contribution from AECID. In addition, since 2006 it is established by law that "the Project of Revenue Budgets and Public Expenditure Law will annually allocate an appropriation intended to cover contingencies generated by public calamities that will be equivalent to one percent of the estimated Current Income of the Central Government." This appropriation is not cumulative in time.

Both sources are important financing instruments because DRM is not considered in funds that finance climate change actions or development activities.

3. Management of risk transfer mechanisms

The contracting of insurance as risk transfer mechanisms is being promoted in various plans and strategies that have already been discussed in this report. The public sector must develop strategies and advance the use of these types of instruments. But in case of disasters, no standards have been defined for the insurance of public buildings. It should be noted that concessionaires operating airports, ports and highways are required to contract insurance to protect critical infrastructure against disasters.

In addition, the country has a "Contingent Emergency Natural Disaster Loan" signed with the IDB for US\$ 100 million. The contract states that it has the objective of "cooperating in the execution of a program to improve the efficiency of financial management of natural disaster risks in the Dominican Republic (...)."

One challenge will be to underpin the insurance of public and private assets in probabilistic risk assessment models endorsed by the regulator of the sector.

No incentives were identified for home insurance or for territorial levels to cover their public assets. Sectoral incentives for the financial protection of their assets were not identified either.

G. Integration of disaster risk management and development

1. Disaster risk management in the national development strategy

The National Development Strategy 2030 has four strategic axes,¹³ six transversal policies, 19 general objectives, 58 specific objectives and 460 strategic lines of action. The Strategy is binding and defines priorities and promotes the articulation of strategies of all sectors of government around common goals. The fourth strategic axis is the one that is most related to DRM. Specifically, it seeks to achieve "a society with a culture of sustainable production and consumption, which equitably and effectively manages the risks and protection of the environment and natural resources and promotes adequate adaptation to climate change." The second general objective of this fourth strategic axis is effective risk management to minimize human, economic and environmental losses. In addition, the fourth transversal policy establishes that environmental sustainability criteria and adequate integrated risk management must be incorporated.

¹³ These strategic axes are: 1) democratic social state of law; 2) society with equal rights and opportunities; 3) sustainable, inclusive and competitive economy; 4) society of production and consumption environmentally adapted to climate change.

2. Post disaster recovery, an opportunity for sustainable development

One of the clearest opportunities for integrating DRM into development is in the post-disaster recovery and reconstruction phase, as spaces for risk reduction are generated. In the Dominican Republic, there is no legal framework that establishes the recovery of livelihoods as a goal of post-disaster recovery, but there are indications that in practice efforts are being made in this direction, even though they are not regulated ex-ante.

The law that creates the NSPMR aims to avoid reproducing the same risk conditions, stating that the "(...) rehabilitation and reconstruction activities will include the prevention and mitigation measures of the risks of the case, to improve before the action of future dangerous events." This is an opportunity to promote policies for the reduction of preexisting vulnerabilities. These actions contribute to integrate DRM in the development processes at national and local levels.

The country could also benefit from integrated and accessible quality information for DRM for the zoning of threats, a pending task in the country. In addition, disaster risk information could support the empowerment of sectors and territories to implement actions in line with their commitments to strengthen the country's resilience to climate and disaster risks.

IV. Haiti¹⁴

A. Governance framework for disaster risk management

1. Instruments to promote disaster risk management

a) National

Haiti's institutional framework for risk management has evolved, along with other countries in Latin America and the Caribbean, from an emphasis on response to a systemic and preventive approach. However, the current institutional framework is not supported by a regulatory framework, since it operates without the support of a constitutive law. The National Plan for Risk and Disaster Management (NPRDM), approved in 2001 by the Council of Ministers, establishes general guidelines but not legal norms.

The NPRDM does not specify a defined period for its implementation but includes specific objectives and targets for the various areas of DRM, which include provisions for rehabilitation and reconstruction. Neither the financial resources for DRM, nor the emergency funds linked to it are identified. However, the Budget Law of 2013 shows allocation of resources to address emergencies at the territorial level.

b) Territorial

The NPRDM recognizes the decentralized character of DRM in the country and identifies territorial responsibilities. Among others, it establishes the function of elaborating a plan of DRM in each territorial unit (departmental, communal and local), as well as elaborating and updating the emergency plans. However, it does not detail how such plans should be considered, neither how to include them in development and land use planning.

c) Sectoral

The NPRDM establishes a sectoral approach that gives responsibilities to the different ministries based on the scope of their competences, and all state institutions must establish committees (thematic, sectoral and institutional). These committees are responsible for defining the actions necessary to reduce the

¹⁴ This section is based on Osorio and Khamis (2016).

vulnerability of the sector/institution, avoiding the creation of vulnerabilities affecting third parties, and developing disaster response plans.

2. Articulation of disaster risk management with climate change

In the absence of binding normative frameworks in the areas of DRM, climate change and integrated water resources management, there is no clear integration between these issues.

3. Access to information and public participation

The NPRDM does not establish the responsibility to inform the public about disaster risks. However, the participation of civil society is considered through a support group that meets periodically. Nevertheless, the Ministry of the Environment is responsible for developing public information programs on areas identified as having environmental risks (climate, seismic or hydrological).

4. Standards for integrating recovery into development policies

The NPRDM identifies general actions for rehabilitation and reconstruction, but does not establish a definition of responsibilities.

B. Quality information to guide decision making on disaster risk management

1. Responsibility for technical guidelines

The Decree on Environmental Management and the Regulation of the Guide for Citizens for Sustainable Development establish that the Ministry of the Environment is responsible for developing public information programs on areas of environmental risk (climate, seismic or hydrological) that are identified. Additionally, it establishes: the obligation to provide information on disaster risks, and to use this information as an input for land use planning.

The Haitian Mines and Energy Office is the national entity responsible for generating information on geological phenomena, while the National Meteorological Center is responsible for generating information on hydrological and meteorological phenomena. However, the information that these and other relevant institutions generate is not consolidated in an information system for DRM.

2. Incentives to the generation and dissemination of information and knowledge

There are no institutions that promote a strategy for science, technology or innovation in Haiti, nor are there permanent incentives to promote knowledge about disaster risk. However, there are organizations that observe natural phenomena.

C. Integration of disaster risk management into project preparation and evaluation cycle

Prior to the Port-au-Prince earthquake, the Ministry of Planning and External Cooperation had made progress in establishing a Public Investment Bureau, but the reform process was halted following the disaster and destruction of government institutions, including the National Commission for Public Procurement and other ministries. Therefore, the country does not have a normative framework that mandates the conduction of disaster risk analysis in the pre-investment phase and other phases of the project cycle.

The decree that regulates environmental assessments requires all policies, plans, programs, projects or activities that may potentially impact the environment to be subject to an environmental assessment by the responsible institution. This environmental assessment process includes the

Environmental Impact Assessment (EIA), environmental impact statement, environmental permits and environmental audits. However, these instruments do not explicitly integrate disaster risk analysis.

D. Territorial approach

1. Decentralization of disaster risk management process

The NPRDM recognizes the decentralized character of DRM in the country and defines the responsibilities of each territorial unit in the development of DRM plans, as well as the preparation and updating of disaster response plans. It should be noted, however, that the rules of territorial collectivities¹⁵ do not establish this type of responsibility.

Similarly, no budgetary incentives are identified for territorial units to implement DRM actions. Furthermore, there are no strategies, norms or guidelines that promote insurance of their assets, or similar mechanisms of financial protection.

2. Land-use planning

The NPRDM establishes the responsibility of each territorial unit to elaborate a plan for its DRM, but does not indicate how these plans (or other pertinent information) should be considered in its land use. However, as indicated above, the Decree on Environmental Management and the Regulations of the Guide for Citizens for Sustainable Development assign to the Ministry of the Environment the development of public information programs on hazardous areas, while establishing the obligatory use of this information in territorial planning.

E. Sectoral approach

The NPRDM adopts a sectoral approach with responsibilities for the different ministries within the scope of their competencies. It establishes that all State institutions must create committees (thematic, sectoral and institutional) with the responsibility for defining the actions necessary to reduce the vulnerability of the sector/institution; avoiding the creation of vulnerabilities to third parties; and elaborating emergency plans. However, there are no budget incentives for sectors to implement actions for disaster risk management.

Still, sectors such as environment and agriculture show progress. They consider, within their sectoral norms, their responsibility to analyze and reduce risk in the scope of their competencies, as well as in disaster preparedness and response activities. This has been accompanied by the allocation of financial resources for these tasks, although the sectors do not have formal plans for both DRM and disaster response.

F. Macroeconomic policies

1. Policies

Haiti does not have a budget classifier to allocate ex-ante resources for DRM. However, in the Finance Law, a specific program linked to river basin management can be identified. In addition, there is an allocation of resources for sectors such as environment and agriculture to finance both risk analysis and reduction actions and for emergency response.

The Ministry of Economy and Finance has not yet been assigned powers in terms of financial protection against the risk of disaster, so a financial strategy for DRM has not been developed.

¹⁵ See Décret portant sur le cadre général de décentralisation, organisation et fonctionnement des collectivités territoriales haïtiennes (2006).

2. Management of funds

In the institutional framework of DRM, funds are not considered to finance ex-ante activities. Likewise, there is no evidence of other funds in the country that are qualified to finance ex-ante DRM activities. However, starting in the Budget Law for the period 2013-2014, the Local Authorities Development Fund includes resources for an emergency fund.

3. Management of risk transfer mechanisms

The country is a subscriber to CCRIF SPC, for which risk assessment studies were carried out. However, the country does not have a national mechanism for the contracting of disaster risk transfer instruments for public goods.

It is important to note that the Haitian Strategic Development Plan (2012), in recognition of the limited public resources, considers a subprogram to improve access to insurance and make it compulsory for different assets and types of disasters. Based on this, it is expected to identify and implement the necessary measures to improve insurance coverage especially in relation to:

- car insurance
- life insurance
- health insurance
- agricultural insurance
- occupational hazards
- movable and immovable property
- comprehensive insurance

This shows that the insurance market and its regulations are still under development. For this reason it is not yet established that the estimation of financial funds for goods is based on probabilistic risk assessment models defined or certified by the sector regulator. Nor have standards been defined for the insurance of public buildings in case of disasters, or for entities at the territorial levels to cover their public assets with insurance policies.

G. Integration of disaster risk management and development

1. Disaster risk management in the national development strategy

DRM is explicitly included in the Strategic Plan for the Development of Haiti (2012), specifically in the transversal objectives for achieving development. It indicates that the management of natural risks (earthquakes, floods, landslides) and anthropogenic risks (industrial, sanitary, epidemiological) must involve the application of preventive measures, punishment of offenders and joint management of events. Moreover, this strategic plan stresses that the conditions and norms of development, construction and land use must be defined according to the areas and levels of identified disaster risks.

2. Post disaster recovery, an opportunity for sustainable development

The NPRDM identifies a general framework for rehabilitation and reconstruction, but does not specify the obligation to formulate post-disaster recovery plans, or their role in reducing pre-existing vulnerability.

V. Jamaica

A. Governance framework for disaster risk management

1. Instruments to promote disaster risk management

a) National

The National Disaster Risk Management Act (NDRMA) (2014) is an important milestone in the evolution of the institutional framework for DRM in Jamaica.

The NDRMA is an update of the previous Disaster Preparedness and Emergency Management Act (DPEMA) (1994). The DPEMA had already emphasized the importance of disaster mitigation by promoting a number of policy developments and instruments focusing on preparedness for response and improved alert systems.

At the national level, the NDRMA defines a number of responsibilities for the Office of Disaster Preparedness and Emergency Management (ODPEM). This institution is responsible for coordinating all public, private and civil society institutions responsible for the implementation of the National Disaster Action (NDA) Plan (1997).

The main objectives of ODPEM are to: a) advance the preparations and emergency management measures in Jamaica, facilitating and coordinating the development and implementation of integrated management systems; and b) instituting measures that may be necessary to mitigate disasters.

The NDRMA proposes the creation of a National Disaster Risk Management Council that will replace the National Disaster Council, created in 2012, in order to restructure the governance of the DRM sector. Within the previously existing instruments, it is important to highlight the National Hazard-Risk Reduction Policy (NHRR) (2005). This policy already considered an integrated DRM approach to national development. This integration is decentralized and given at all levels: cross-sectoral, multi-agent and territorial.

Among the objectives of the NHRR are: a) to provide an integrated legislative, regulatory and institutional framework to support the mitigation of natural hazards at all levels of society; b) reduce environmental, social and economic distortions with emphasis on infrastructure, land-use planning and

rehabilitation of degraded areas; c) empower communities to manage risk, with a participatory approach and with emphasis on the importance of environmental care.

In addition, this comprehensive approach to DRM was also included in the National Development Plan (NDP) known as "Vision 2030" (2009).

Regarding the provisions for financing disaster response, the NDRMA contemplates the existence of a National Disaster Fund with resources that are allocated annually by Parliament. These resources shall be equal to one per cent, or a percentage defined by the Prime Minister in consultation with the Minister responsible for local government, of the amount paid annually to each local authority for building permits. The fund can be used for disaster mitigation, adoption or promotion of preventive and preparatory measures, and post-disaster response or recovery actions. It should be noted that the creation of a fund had been contemplated since 1993. In this regard, the fund has caused the updating of the Parish Councils for Construction Act and the Municipalities Act to make the contribution described.

b) Territorial

The NPRDM recognizes the decentralized character of DRM in the country and identifies territorial responsibilities. Among others, it establishes the function of elaborating a plan for DRM in each territorial unit (departmental, communal and local), as well as to elaborating and updating emergency plans. However, it neither specifies how such plans should be considered, nor how to include them in development and land use planning.

c) Sectoral

The NPRDM establishes a sectoral approach that gives responsibilities to the different ministries in the scope of their competences. All state institutions must establish committees (thematic, sectoral and institutional). These committees are responsible for defining the actions necessary to reduce the vulnerability of the sector/institution, avoiding the creation of vulnerabilities affecting third parties and developing disaster response plans.

2. Articulation of disaster risk management with climate change

The Climate Change Policy Framework (2015) aims primarily to support the goals of the Vision 2030 by reducing the risks posed by climate change to Jamaica's economy and its development goals. The Policy Framework creates an institutional mechanism and structures to facilitate the development, coordination and implementation of policies, sectoral plans, strategies, and legislation to address the impacts of climate change. The implementation of the policy is to be overseen and supported by the Ministry of Water, Land, Environment and Climate Change.

This policy provides a specific strategy for developing and incorporating mechanisms and tools to mainstream climate change into ecosystem protection and land-use and physical planning. The policy also identifies Special Initiative for Disaster Risk Financing, for Land Use Planning and for Water Resources Management. All of them promote the integration of climate change and DRM.

3. Access to information and public participation

In Jamaica there is no mandate explicitly requiring the availability of information on disaster risk analysis. However, under the NDRMA, among the functions of ODPEM is to "provide appropriate training programs and consultation services for all aspects of disaster preparedness and mitigation, loss reduction, disaster assessment and disaster management." Therefore, it is expected that these consultation services will operate as exchange mechanisms.

In addition, the DPEMA requires ODPEM to sensitize the public about disasters. This is reinforced in the NDRMA in which it is specified that the Director General of the ODPEM is responsible for exchanging information with municipalities, people and organizations in each parish, as well as analyzing and interpreting such information in order to formulate adequate responses.

Another opportunity for participation is created through the obligation for the Zone Committees to have Risk Management Plans, since these are community-level plans that should be inputs to the Parish Risk Management Plans.

Finally, citizenship, non-governmental organizations and the private sector have a space for participation in the definition of highly vulnerable areas.

4 Standards for integrating recovery into development policies

There are no measures in the DRM policy framework to infer the importance of livelihood recovery or any other explicit provision for post-disaster recovery or reconstruction. No regulations requiring that post-disaster recovery plans include the reduction of pre-existing vulnerability were identified either. The contents of the NHRR should be articulated with the NDP and promote the integration of the recovery and reconstruction phases with the development processes.

B. Quality information to guide decision making on disaster risk management

1. Responsibility for technical guidelines

No regulations are identified that designate a national authority as responsible for providing technical guidelines, technical assistance or other guidelines for territorial and sectoral levels that carry out risk analysis. Nor is there a national actor responsible for defining the territorial scale at which risk analysis should be carried out.

Jamaica does not have an Integrated Information System for DRM. Currently relevant information for disaster risk reduction is generated by government agencies, universities and research centers. This information is disseminated through the platforms of these institutions without the processes of their generation and dissemination being formally controlled or evaluated regularly.

2. Incentives to the generation and dissemination of information and knowledge

The Policy on Science and Technology for Socio-economic Development (2005) explicitly sought to promote the use of research and development to reduce ecological losses as well as to respond to natural or anthropogenic hazards including droughts and floods. However, no research fund was identified to finance research on these issues. On the other hand, as already mentioned, the obligation to have information for DRM is not guaranteed by any law.

The country established the National Spatial Data Management Division to implement GIS programs. The development model “ensures that experts in the field of GIS are available to provide services to the Office of Disaster Preparedness and Management (ODPEM) as one of many client agencies” (ECLAC 2015).¹⁶

Currently, some state institutions and universities are producing information related to threats. For example, the Geology and Mines Division of the Ministry of Science, Technology, Energy and Mines produces information on geophysical threats. The Water Resources Authority of the Ministry of Water, Land, Environment and Climate Change generates information on hydro-meteorological threats and is responsible for collaborating with ODPEM and the National Meteorological Division to reduce the impact of water-related disasters. This agency also serves in evaluating the probability of occurrence of extreme hydro-meteorological events such as floods and droughts.

¹⁶ ECLAC assessed the current state of information and communications technology (ICT) in the field of disaster risk management as practiced in the Caribbean and identified the lack of human capacity as the single largest constraint that is faced in the implementation of ICT projects for DRM. For more information about these issues and how the region is addressing them see: ECLAC (2015), “Information and communication technology for disaster risk management in the Caribbean: subregional solutions to the challenge of limited human resource capacity.”

The University of the West Indies manages the Seismological Network of Jamaica and has a Risk Reduction Center that conducts research, training and other functions to improve mitigation and emergency management capacities in the Caribbean region, including those caused by volcanoes and hurricanes. However, it is not clear at the policy or regulatory level what their formal role is in the work of ODPEM, or in relation to early warning mechanisms.

C. Integration of disaster risk management into project preparation and evaluation cycle

According to the Mitigation and Planning Division of ODPEM, the regulation of public investment does not require the integration of disaster risk reduction into any phase of the cycle of public investment projects. The main risk reduction instrument for smaller works is the 2009 Construction Code, which requires several considerations in order to reduce the vulnerability of buildings to natural hazards.

The Climate Change Policy Framework has several provisions for infrastructure related to mitigation and adaptation measures.

D. Territorial approach

1. Decentralization of disaster risk management process

The normative framework that regulates the functioning of the parishes does not establish obligations related to DRM, except in cases in which an emergency situation (fire, flood, earthquake) causes the suspension of elections. However, local authorities can carry out DRM activities and finance them through a Community Development Fund that receives funding from the Central Government.

In Jamaica there is a key local planning instrument: the Development Order, which is a legal document used to guide development. The original Development Orders were approved between the sixties and eighties, and although each parish must have one, they are not reviewed following an emergency. New Development Orders are currently under discussion, and it is expected that they will be approved for all parishes by the end of 2017.

2. Land-use planning

Among the purposes of Development Orders are to: a) guide land use and land use changes, b) facilitate protection and conservation of the natural environment, c) encourage cooperation and coordination among differing interests, and d) effect the most efficient use of limited resources in a manner that satisfies the need of the present generation without compromising the livelihood of future generations. Development Orders are binding instruments of territorial planning at the parish level.

The ODPEM is one of the agencies that may review Development Orders being elaborated for areas susceptible to flooding. The Mines and Geology Division of the Ministry of Science, Technology, Energy and Mines reviews orders in mountainous areas. The designation of highly vulnerable areas is the most effective instrument currently available in Jamaica to identify high-risk areas and to take special measures, as provided by the NDRMA. It empowers the Prime Minister to designate any area as particularly vulnerable following the recommendation of the Director of ODPEM or by consideration of other relevant reports, provided the following procedure is followed: a) the publication of a Ministerial Order draft in the Official Gazette and in national newspaper, b) a public consultation with government institutions, local authorities, non-governmental organizations and representatives of the private sector that the Director of ODPEM considers relevant. Declaring a zone as highly vulnerable does not necessarily imply that the State has the right and authority to relocate populations at risk since relocations are voluntary. The NDRMA only specifies that additional mitigation measures should be implemented in these areas.

E. Sectoral approach

As mentioned earlier, the regulatory framework for DRM does not define sector-specific obligations. However, there are sectors that are investing in DRM and have developed instruments to guide their actions in this regard. Agriculture and water resources are the most outstanding sectors for their efforts to manage the risk of disasters within the scope of their competencies.

The National Agriculture Disaster Risk Management (ADRM) Plan (2010) was prepared by the Ministry of Agriculture and Fisheries, and the Food and Agriculture Organization, United Nations (FAO). The plan establishes roles, responsibilities and activities at all stages of the DRM cycle, as well as guidelines to improve livelihoods through the promotion of sustainable agriculture. It seeks to strengthen local/community participation and involvement by including the elaboration of Community-based Agricultural Disaster Risk Reduction Plans, which are expected to increase resilience before, during and after a crisis. In 2012, the MOAF jointly with several partners, elaborated the Community-based Agricultural Disaster Risk Reduction Plan for Rocky Point, a vulnerable fishing community.

According to the plan (2012), “to be effective these plans require detailed livelihood assessments that are specific for the sector in order to ensure that preparedness is based on hazard typologies, pre-determined profiles of the most vulnerable households and a menu of responses that are efficient and targeted. Good baseline quantitative and qualitative data of existing agricultural assets facilitate planning for appropriate post-disaster compensation, improving coping, recovery and monitoring mechanisms. The growing significance of climate change in risk reduction requires that agro-meteorological data also be an integral part of the risk analysis and the livelihoods assessment.”

In the case of the Water sector, the Water Resources Authority works with OPDEM and the National Meteorological Division to assess the likelihood of extreme hydro-meteorological events such as droughts and floods and contributes to the mapping of flood zones. This is explained by the provisions of the Water Sector Policy (2004), which defined the responsibility of collaborating with ODPEM in the management of risks related to water management.

F. Macroeconomic policies

1. Policies

Jamaica has an expenditure classifier that identifies budgetary allocations related to DRM. In addition, it has estimated resource requirements to annually cover the response, rehabilitation and reconstruction processes caused by hurricanes and earthquakes in order to access the CCRIF SPC, although this has not been done for minor and frequent events.

The promotion of the use of risk transfer mechanisms is explicit in the NDP. However the country does not have a policy for financial management of the risk of disaster.

2. Management of funds

In addition to the National Disaster Fund, funds are available to finance DRM actions under development programs. Jamaica's Social Investment Fund can fund capacity-building projects. There is also the Circumscription Development Fund, which is mandated to promote human and infrastructure development at the community and constituency level through sustainable development projects.

3. Management of risk transfer mechanisms

Jamaica participates in the CCRIF SPC. However, the regulatory framework governing the technical provisions of the insurance sector does not establish that the estimation of reserves for goods should be based on models of probabilistic assessment of the risk of disasters, or that these should be defined or certified by the sector's regulatory body. Neither was there evidence that there are standards for the insurance of public buildings, or norms that regulate or promote the insurance of housing by private individuals. It is not mandatory to insure public assets.

G. Integration of disaster risk management and development

1. Disaster risk management in the national development strategy

The NDP Vision 2030 has four national goals: 1) a society empowered to achieve their fullest potential; 2) a safe, cohesive, orderly and just society; 3) a prosperous economy; 4) development in harmony with the natural environment. These goals are aligned with fifteen national outcomes. The implementation of the plan is based on a three-year Medium Term Socio-Economic Policy Framework (MTF). Each MTF includes a three-year package of priority outcomes, strategies, actions and programs. The follow-up and review of the plan are based on progress reports (annual and medium term) and on an Indicator Framework which comprises indicators by national outcomes and medium term and long term targets. It is worthy to mention that these goals and outcomes are directly aligned with the 17 SDGs.

There is specific attention to adaptation and disaster risk reduction in National Outcome 14 (hazard risk reduction and adaptation to climate change) linked to National Goal 4.

2. Post disaster recovery, an opportunity for sustainable development

The NDRMA shows efforts being made to link DRM to the development priorities the country has undertaken. Since 2005, the NHRR states that the lessons learned and incorporated into post-disaster recovery provide opportunities for future vulnerability reduction. The NHRR also states that the destruction of infrastructure and buildings allows for reconstruction with better standards, or to take advantage of the opportunity to relocate them to safer areas. These and other lessons learned in this instrument allow us to infer that the vision is to identify new opportunities to strengthen actions at the country level, for example, through the planning of recovery processes.

The challenges for post-disaster recovery to become an opportunity for sustainable development are: a) integrating DRM into the public investment planning cycle, and developing a framework for disaster-related financial protection; (b) access to quality information on vulnerability and threats, through an integrated and accessible system; c) the NDRMA laid the foundations for DRM with responsibilities for each territorial level. It remains to guide actions at all levels and also define clearer rules on the role and responsibilities of the sectors. It is important that other sectors follow the examples of the agriculture and water sectors.

VI. Final considerations

Countries have made progress in developing their normative and institutional frameworks for comprehensive risk management. Recent or updated regulatory and institutional frameworks have been modified to reflect the explicit roles and responsibilities of national agencies tasked with disaster risk management. Most notable are the efforts towards improving recovery and reconstruction processes, and incorporating measures of financial protection. However, this approach has not yet permeated the normative and institutional frameworks that govern sectoral and territorial institutions, or the planning and budgeting processes.

Countries like The Bahamas and Jamaica have comprehensively incorporated DRM into their national development plans, and most countries have elaborated sectoral policies that address the issue in varying degrees. Although normative and institutional sectoral frameworks do not yet incorporate the roles and responsibilities assigned to them through policy instruments of national DRM systems, sectors such as agriculture, environment, infrastructure and health show advances in the incorporation of the DRM.

Perhaps one of the strongest links identified in this study is between environment/climate change and disaster risk management. DRM policies in The Bahamas and Belize even recognize the importance of gathering data on the quality of the environment as it relates to the likelihood of disasters. Furthermore, some aspects of DRM have been considered in environmental impact studies, in particular the identification of natural hazards that may affect a given project, as well as the elaboration of mitigation measures to ensure its sustainability.

It is also observed that, to the extent that a country has updated frameworks for climate change adaptation and mitigation, there is articulation with the principles and activities of DRM. Although climate change policies do not necessarily address DRM, most of the improvement measures proposed to adapt or mitigate to climate change could have beneficial effects on improving DRM. Climate change policies reflect a strong understanding of the linkages between environmental degradation, and poverty alleviation, land use planning and disaster risk reduction. This link is also observed with the tourism and agriculture sectors in countries that depend on them as productive activities. Therefore, climate change policies are comprehensive and consider adaptation and mitigation measures for a variety of sectors, including transportation, housing, agriculture, energy and water management. An overall improvement of resilience to climate change would undoubtedly have similar effects in strengthening the countries' DRM efforts.

Similarly, several development and sectoral policies recognize the importance of land use and territorial planning to increase resilience and adapt to/mitigate the effects of climate change. Adequate territorial planning would facilitate the identification of areas apt for different types of development (commercial, residential, industrial, conservation/preservation), as well as identify risk-prone areas or areas for sustainable resettlement. Even if some land use and climate change policies do not address DRM directly, it is possible to observe complementarities in the recommendations, such as enforcing the use of construction codes, elaborating hazard maps, promoting the use of renewable energies, expanding insurance in productive sectors such as agriculture and tourism, and improving multisectoral coordination. In this regard, it is suggested that countries strengthen the territorial component of their DRM strategies, as it is observed that most local authorities are tasked primarily with emergency preparedness and response tasks. This requires an update of DRM frameworks to establish binding responsibilities for territorial levels, and incorporate or strengthen areas such as risk identification, planning of mitigation measures, data gathering, and considerations for reconstruction processes that do not reproduce the risks and vulnerabilities that led to the disaster.

The analysis of DRM governance frameworks also evidenced the importance of updated and readily available data and information for decision making. Although most development and sectoral policies acknowledge this need for data and identify important gaps, there are no clear guidelines for the generation and dissemination of DRM-related information. The countries analyzed have institutions responsible for the study and monitoring of geological and hydro-meteorological hazards, but this information is not necessarily accessible or used to guide actions and decisions. Information is still being primarily used in the academic sector and in early warning systems. Nevertheless, it should be noted that most countries already have acts/laws ensuring access to public information. Therefore, it is necessary to clarify the role of DRM in this regard and build upon the accomplishments of such acts/laws. As expressed in most DRM instruments, it is recommended to implement DRM information systems, as well as technical guidelines to support sectoral and territorial engagement, and ensure consistency in the collection of data.

On this matter, it is also important to highlight the importance of consistently collecting sectoral baseline data, as it not only contributes to identifying and reducing risks, but also in assessing the effects and impacts of disasters. Sectoral baseline data would allow line ministries to identify exposed assets and vulnerable populations, and take actions to mitigate or reduce the risk of disaster. Similarly, such data could be used in the event of an emergency to prioritize the allocation of resources and explore options for resilient reconstruction. In addition, the consistent assessment of disasters, regardless of their magnitude or intensity, is an important indicator of the cumulative effects and impacts of disasters in national development and finances.

The lack of national information systems and/or technical guidelines makes it difficult to properly consider DRM in the preparation and evaluation cycle of public investment and development projects in general. A combination of improved data and strengthened technical capabilities is crucial to incorporating DRM in public investment projects. The incorporation of a multi-hazard DRM component throughout the lifecycle of a project would increase its resilience and sustainability, and contribute to protecting public investments, while ensuring continuity in the provision of public services and products.

In all the countries analyzed, with the exception of Haiti, the regulatory framework of the national DRM system considers the establishment of funds. However, the existence of these funds does not necessarily ensure that there is a constant, permanent and sustainable financing of them. Nevertheless, it is also noted that, when ministries of economy and finance have well defined DRM roles and responsibilities, the design and establishment of national financial protection strategies has been facilitated, which also contributes both to the sustainability of the funds and for the acquisition of catastrophic insurance facilities in the international market.

In general terms, the analysis shows dynamism in terms of disaster risk management. Institutional and regulatory frameworks begin to reflect the experiences and lessons learned after the impacts of disasters in an increasingly challenging context. However, technical and financial capacities still limit the adoption of comprehensive DRM approaches. There is a trend towards mainstreaming risk

management into all key development sectors and instruments, including budgets and planning. Still, the findings show that, within countries, progress has not been matched in all key elements for the integration of risk management into development strategies. Likewise, the evidence indicates that there are marked differences between countries in the region. This scenario opens several opportunities for cooperation. Considering the vast similarities between Caribbean countries, it is recommended to explore bilateral and regional cooperation options, including technical assistance and information sharing in specialized forums. In addition, several regional organizations, such as ACS, CDEMA and CCRIF SPC have elaborated guidelines and protocols to incorporate DRM into national strategies, and are permanently convoking regional discussions.

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